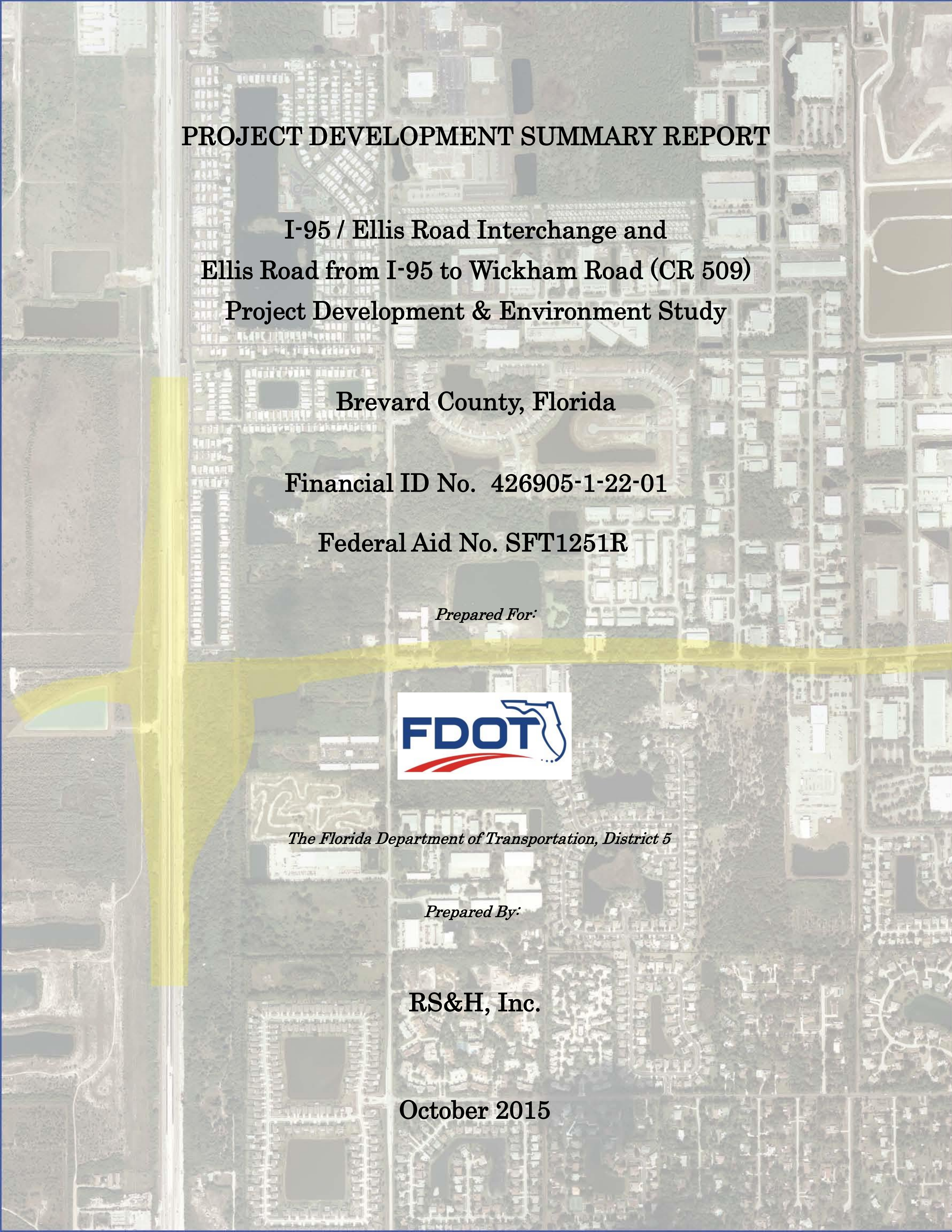

PROJECT DEVELOPMENT SUMMARY REPORT

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, Inc.

October 2015

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October 2015

PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that I am a registered professional engineer in the State of Florida practicing with RS&H, Inc., a Florida corporation authorized to operate as an engineering business (EB No. EB0005620) by the State of Florida Department of Professional Regulation, Board of Professional Engineers, and that I have supervised the preparation and approve the evaluation, findings, opinions, conclusions, and technical advice hereby reported for:

Project: I-95 at Ellis Road PD&E Study
Location: Just west of I-95 to Wickham Road, Brevard County

Report: Project Development Summary Report
Financial Project ID No.: 426905-1-22-01

This report includes a summary of data collection efforts, traffic analysis, alternative roadway analysis, discussion of preferred alternative, discussion of environmental impacts, and summary of conclusions. I acknowledge that the procedures and references used to develop the results contained in this report are standard to the professional practice of transportation engineering and planning as applied through professional judgment and experience.

Name: Daniel Kristoff, Jr., PE

Florida PE Registration No.: 30379

Signature: ____________________

Date: 8/18/15

PROJECT DEVELOPMENT SUMMARY REPORT
Ellis Road
Brevard County, Florida

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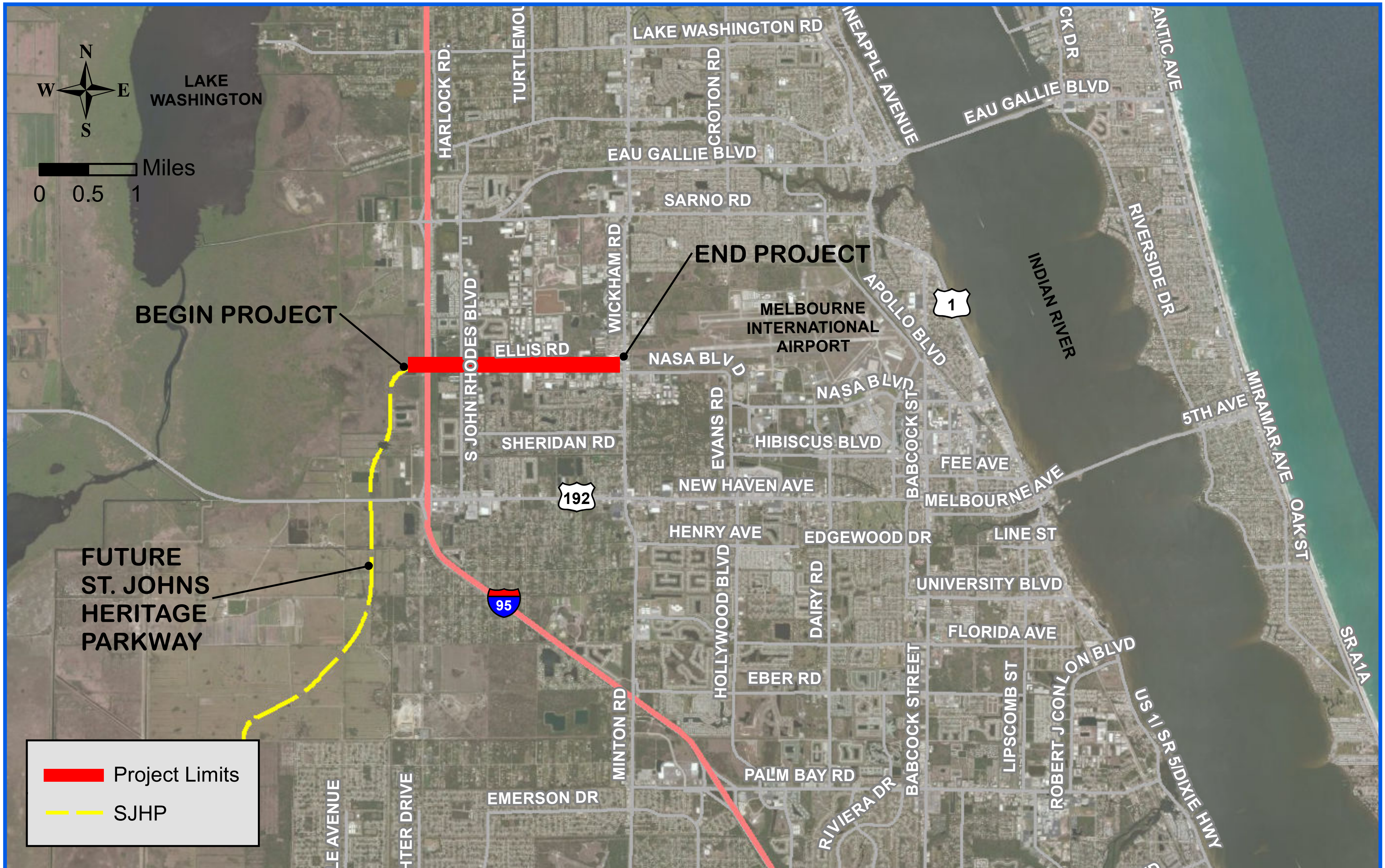
1.0 Executive Summary

Florida's Strategic Intermodal System (SIS) was designated by the Florida Legislature to efficiently serve the mobility needs of Florida's citizens, businesses, and visitors and help Florida become a worldwide economic leader, enhance economic prosperity and competitiveness, enrich quality of life, and reflect responsible environmental stewardship.

In Brevard County, Melbourne International Airport is an important transportation mode hub but also a major employment area for Melbourne and Palm Bay. Currently, the Melbourne International Airport and the Greyhound Bus Terminal are emerging SIS hubs. While the western limits of the airport are located approximately three miles from the interstate, access to I-95 is provided by way of Eau Gallie Boulevard (SR 518) from the north and New Haven Avenue (US 192) from the south, both of which are existing SIS connectors.

The proximity of I-95 to Melbourne International Airport is a primary stimulus for the study of an Ellis Road interchange and the upgrading of Ellis Road to a divided, four-lane facility.

This Project Development and Environment Study (PD&E) examines a direct, multi-lane Strategic Intermodal System connection from I-95 to Melbourne International Airport and Greyhound Bus Terminal. The improved Ellis Road will tie into St. Johns Heritage Parkway, a new four-lane arterial planned by Brevard County that begins at Malabar Road and ends at John Rodes Boulevard. A new interchange connecting Melbourne International Airport directly to I-95 will relieve Eau Gallie Boulevard / Sarno Road and US 192, both of which are existing SIS Connectors. The Ellis Road connection to I-95 will become the new direct connection to the Melbourne International Airport and will be designated as an SIS roadway. The improvements to and the extension of Ellis Road will provide a direct connection between the interstate and the airport as well as mitigate capacity deficiencies at the existing I-95 interchanges at US 192 and Eau Gallie Boulevard / Sarno Road. Upon the improvements, Ellis Road will be designated as a "SIS Connector" for the Melbourne International Airport. Figure 1.1 displays the general location of the project.



FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENTAL STUDY

PROJECT LOCATION MAP

FIGURE NO. 1.1

In 2009, an Interchange Justification Report (IJR) was accepted by the Federal Highway Administration (FHWA) for an interchange at an extension of Ellis Road. The IJR indicated that the US 192 and Eau Gallie Boulevard interchanges would operate at LOS F without an Ellis Road interchange. Future traffic growth related to the Melbourne International Airport and surrounding economic development is anticipated to strain the existing interchanges at US 192 and Eau Gallie Boulevard. An IJR Addendum was prepared and submitted by the FDOT to the FHWA in August of 2014. This addition to the original IJR updated the traffic projections based on the 2014 update to the Design Traffic Technical Memorandum, which is summarized in Chapter 3 of this report. The purpose and need for the proposed interchange was reviewed in addition to reasonable alternatives, operational safety on I-95, interchange configuration, consistency with regional and state plans and area development, and the consideration of environmental impacts. FHWA approved the IJR Addendum on August 28, 2014.

This PD&E Study, which is the next step in the process of advancing a new interchange, utilized 2040 as the build year, when an AADT ranging between 18,000 and 29,000 is projected to occur on Ellis Road.

Existing crash history was examined on Ellis Road for the years 2005 to 2009. Crash clusters were observed at John Rodes Boulevard, Wickham Road, and at four locations along I-95 between the Eau Gallie Boulevard and New Haven Avenue interchanges. The only location where the actual crash rate exceeded the statewide average is at the Wickham Road intersection. Both John Rodes Boulevard and Wickham Road have undergone significant intersection improvements in the past two years.

Existing Ellis Road is a two lane roadway beginning at John Rodes Boulevard and ending at Wickham Road, where it ties into a recently constructed extension of NASA Boulevard. The posted speed is 35 mph. The existing land along Ellis Road is generally zoned industrial with some commercial zoning and is characterized by various businesses, industrial use, and vacant lots. Nineteen residential lots are clustered just west of Wickham Road. The existing right-of-way varies from approximately 70 feet to 100 feet. The L-15 Canal parallels Ellis Road on the north side of the roadway for approximately three-fourths of the project length. This canal drains into the M-1 Canal, which parallels I-

95 on the east side of the interstate. The project is located within the Crane Creek Drainage Basin.

Several major utilities are located along the project corridor. Along the west side of I-95, a series of utility easements convey 8" and 26" gas mains as well as overhead electric distribution and transmission lines. Ellis Road also has a number of buried and overhead utilities, including water, sanitary sewer, buried fiber optic, gas, and overhead electric. Ellis Road passes through the jurisdiction of both West Melbourne and Melbourne.

While the Ellis Road corridor is mostly developed, sizable undeveloped tracts exist along I-95 in the northwest quadrant of the future interchange with Ellis road. This parcel, which borders the utility easements, is owned by Brevard County and contains a conservation easement encumbered by the Department of Environmental Protection. A sizable retirement community known as Lamplighter Village is located in the northeast quadrant of a future Ellis Road / I-95 junction. Other than the conservation easement, no significant cultural or environmental resources have been encountered within the project corridor.

At I-95 a modified diamond ramp configuration is examined in conjunction with two alignment alternatives across the interstate. While both alternatives avoid direct impacts to Lamplighter Village, Alternative 1 (a northerly alignment) utilizes a retaining wall in the vicinity of Lamplighter Village. By comparison, Alternative 2 (a southerly alignment) utilizes a fill section along the southern parcel boundary of Lamplighter Village. A total of eight ramp and alignment configurations are examined and displayed in an evaluation matrix, which can be found in Section 4.3 along with a detailed discussion.

The results of the traffic study are contained in a Design Traffic Technical Memorandum (DTTM) that was prepared in 2011. An updated DTTM was prepared in 2014. Based on the traffic analysis, this PD&E Study examines three typical sections for the Ellis Road portion between John Rodes Boulevard and Wickham Road:

1. Standard Urban 45 mph typical section comprised of four lanes with a 22-foot median, curb and gutter, bicycle lanes, and sidewalk.

2. SIS High Speed Urban 50 mph typical section comprised of four lanes with a 30'-foot median, 4-foot inside shoulder, 6.5-foot outside shoulder, curb and gutter, and sidewalk.
3. SIS High Speed Urban 50 mph typical section comprised of four lanes with a 30-foot median, 4-foot inside shoulder, 6.5-foot outside shoulder, 5-foot flush outside paved shoulder (8-foot total), a 6-foot grass separator, 16-foot-wide frontage roads (with curb and gutter), and sidewalk.

For each typical section, alignments were created by holding the north and south right-of-way lines. "Best Fit" alternatives were also developed for all three typical sections. These "Best Fit' alternatives optimize the alignment based on a given typical section by attempting to minimize social, environmental, and property impacts to the greatest extent practicable. The SIS High Speed Urban (50 mph) Frontage Road typical section (number 3 above) was dropped from further study based on the results of the 2011 Design Traffic Technical Memorandum. The six remaining alternatives based on the first two typical sections (Standard Urban 45 mph and SIS High Speed Urban 50 mph) were compared in an evaluation matrix. From this tabulation, the Best Fit alternatives of the six alternatives considered were carried forward for comparison with each other. To determine the optimal typical section and roadway configuration (45 mph or 50 mph) for the portion of Ellis Road between John Rodes Boulevard and Wickham Road, an evaluation matrix was prepared and can be found in Section 4.9.

In an effort to reduce the right-of-way footprint and associated right-of-way costs, alternate methods of conveying the L-15 Canal are also examined, including a trapezoidal channel, box culvert, and a bulkhead (rectangular) channel.

Access Management Class 3 and Class 5 are examined in detail. Appendix G contains the Access Management Report, which considers Access Management Classes 3, 5 (greater than 45 mph), and 5 (45 mph or less). Directional and full median opening spacings are shown on concept plan sheets assuming alternate full median openings at East Drive and Greenboro Drive.

This PD&E compares two regional pond concepts in conjunction with attenuation-only ponds with ponds requiring attenuation and treatment in each of the basins. The Pond Siting Report and Location Hydraulic Report, both of which are available under separate cover and are summarized in Section 4.12 of this report, analyze the drainage issues for this project.

In addition to meetings with Brevard County and the Space Coast TPO, a community meeting was held at Lamplighter Village in March of 2011. The Alternatives Public Meeting was held on March 29, 2012 at the Veterans Memorial Complex in West Melbourne. A Public Hearing was held on Thursday, October 25, 2012 at the Calvary Chapel Melbourne, 2955 Minton Road, West Melbourne.

1.1 Preferred Alternative

The following is a description of the preferred horizontal alignment beginning just west of I-95 and extending to just west of Wickham Road. The Preferred Alternative is a combination of Alternative 2 through the interchange area and the Standard 45 mph Urban Best Fit Alternative. Concept plan sheets of the Preferred Alternative are located in Appendix B.

The preferred alignment begins near the approximate profile touchdown point located approximately 1,350 feet west of the I-95 centerline. Through the interchange area, the Preferred Alternative utilizes alignment Alternative 2 in conjunction with the western ramp configuration recommended by the Value Engineering Study. The Preferred Alternative avoids impacts to the conservation easement in the northwest quadrant and eliminates the need for a retaining wall on the north side of Ellis Road in the vicinity of Lamplighter Village. By avoiding the conservation easement, this alignment demonstrates avoidance and minimization of environmental issues and will lessen the complexity of the permitting process and mitigation in future final design phases. An added benefit is that this alignment is farther away from Lamplighter Village compared to Alternative 1. At the informational meeting held on March 24, 2011 in Lamplighter Village, both the management, ownership, and residents of Lamplighter Village expressed their desire for Alternative 2.

The west-side ramps are aligned so that the main portion of the ramp is parallel to the existing limited access right-of-way line. This configuration was recommended by the Value Engineering Study. The ramps were positioned such that a distance of 12 feet occurs between the limited access right-of-way and the base of the retaining wall along the ramps. The bridge over I-95 consists of four through lanes, a westbound left-turn lane, dual 8-foot outside shoulders, and a dedicated 8-foot bicycle and pedestrian envelope (on each side) separated from the mainline shoulder by a concrete parapet wall.

East of the structure, the alignment begins to transition northward via an 8,400-foot radius (normal crown) curve on a fill section. A crossing over the M-1 Canal occurs immediately east of the eastern ramp intersection. While the size of the crossing has not been determined as part of this PD&E study, the preliminary recommendation is to utilize a single span or arch configuration in order to minimize the constraints within the channel. The L-15 Canal requires relocation and is shown as flaring northward in order to accommodate the increase in roadway fill as the roadway is raised to meet the structure over I-95.

Just west of John Rodes Boulevard and south of Ellis Road, a regional retention pond is proposed (Regional Pond Option B) as the preferred regional pond location. This regional pond concept utilizes attenuation-only ponds in the remaining basins. This pond configuration is desirable because the attenuation only ponds are significantly smaller than those that require sizing for both treatment and attenuation. Attenuation-only ponds reduce the right-of-way impacts along Ellis Road and can be seen in Appendix B as part of the Preferred Alternative.

At the John Rodes Boulevard intersection, the typical section changes from a high speed urban (50 mph) section west of John Rodes Boulevard to a standard 45 mph urban section east of John Rodes Boulevard. Across the intersection, the 30-foot median is reduced to 22 feet, and the 6.5-foot outside shoulder is reduced to a 4-foot bicycle lane.

East of John Rodes Boulevard, the alignment continues to curve via a normal crown radius such that the right-of-way impacts are on the north side of Ellis Road. Roughly halfway between John Rodes Boulevard and Stan Drive, the Preferred Alternative is transitioned to the south side of existing Ellis Road and continues roughly parallel to the existing roadway. Within this segment, the right-of-way impacts are primarily on the south side of the roadway. A total right-of-way width of 190.5 feet is required to accommodate the standard urban 45 mph typical section and canal relocation. The Preferred Alternative within this section of roadway requires has right-of-way impacts to the vacant building in the northeast corner of the Ellis Road / John Rodes Boulevard intersection, Wuestoff Health Systems, Empire Electric, and Affordable Signs, all located along the north side of Ellis Road. These properties are likely displacements or relocations.

Through the roadway transition between West Drive and East Drive, the Preferred Alternative significantly impacts the Coastal Mechanical Services (CMS) business on the north side of the roadway. The adjacent Coastal Mechanical Services to the east experiences a partial acquisition, which does not directly impact the existing building or parking. The ECAS business experiences a partial acquisition, but parking impacts are avoided. East of this parcel, impacts to several parcels are avoided, including Downtown Produce Market. Along the south side of the roadway between East Drive and Distribution Drive (east), the Preferred Alternative impacts the existing retention ponds and landscaping for Florida Power and Light, the existing parking for Structural Composites, and existing parking and landscaping for Medicomp.

Between Distribution Drive (east) and Technology Drive (east), the Preferred Alternative experiences a series of normal crown reverse curves, which transition the alignment from the south side of the roadway to the north side. Through this transition, commercial displacements on the south side of the roadway include a vacant building, Habitat for Humanity, American Door and Millwork, and Laundry Delivered.com. Partial right-of-way impacts on the south side include Brooks Enterprise, Hills Inc., and Tempstor Heating and Cooling. Partial impacts on the north side include Classic Floors and Ferguson Water Works. Just west of Technology Drive (east), the L-15 Canal ends, and the typical section includes a 1:4 slope that matches into the existing ground behind the back of proposed sidewalk. The termination of the canal reduces the right-of-way width from 190.5 feet to 134 feet, a reduction of 56.5 feet.

East of Technology Drive (east) the impacts are primarily located on the north side of the roadway, thereby impacting all 19 residential properties. The residences on nine of these properties are located 10 feet or less from the proposed right-of-way. Due to the proposed right-of-way required to construct the Preferred Alternative, the remnants of the 19 parcels were deemed to be undesirable for continuation as residential lots. The uneconomical remainders will be combined and utilized for a retention pond to meet stormwater treatment regulations. The total property acquisitions result in 19 residential displacements for the Preferred Alternative.

Between Shinn Avenue and Wickham Road, the Preferred Alternative matches into the recently constructed four lane section completed as part of the NASA Boulevard realignment. Partial business impacts on the south side of the roadway include Hott Cars Auto Service Center, Buckman's Auto Body, Mark's Body Shop, a vacant building, and Dependable Air Supply. On the north side, Walker's Ellis Road Auto Repair and Goodman A/C Heat are partially impacted by the transitioning typical section.

An eastbound right-turn lane is proposed at the Wickham Road intersection in order to optimize the level of service of the intersection.

The total number of wetland impacts of the Preferred Alternative (for the entire project) is 8.37 acres. The Preferred Alternative will directly impact 4.17 of acres of forested wetlands and 4.20 acres of wet prairie/marsh. Additionally, 13.20 acres of surface waters will be directly impacted. The Preferred Alternative avoids any direct impacts to the Florida Department of Environmental Protection conservation easement west of I-95.

Wetland impacts which will result from the construction of this project will be mitigated pursuant to Section 373.4137, Florida Statutes (F.S.) to satisfy all mitigation requirements of Part IV. Chapter 373, F.S. and 33 U.S.C. s.1344. If the project cannot be mitigated through S. 373.4137 F.S., then FDOT will develop a project-specific conceptual mitigation plan. Pursuant to the U.S. Army Corps of Engineers (USACE), St. Johns River Water Management District (SJRWMD), and Florida Department of Environmental Protection (FDEP) policies, compensatory mitigation for unavoidable wetland impacts can be in the form of upland and/or wetland preservation, wetland restoration, wetland enhancement, wetland creation, or a combination of these methods. Additionally, if the project is located within the service area of a permitted wetland mitigation bank, then the purchase of credits from the bank may be acceptable. In some cases, pursuant to Chapter 373.4137 F.S. (i.e., the Senate Bill), compensatory mitigation of wetland impacts can be implemented by the SJRWMD through funding supplied by FDOT. Mitigation for upland cut ditches is not required; however, ditches which overlap natural wetland areas are considered part of the adjacent wetland system and generally require compensatory mitigation. Compensatory mitigation will be offered for all unavoidable wetland impacts and will be subject to the approval by the SJRWMD and the USACE prior to final authorization of the project.

The proposed construction of the additional traffic lanes along Ellis Road and the construction of a new roadway and interchange with I-95 are not expected to adversely affect any federally or state listed species. There is no officially designated "Critical Habitat" along the project corridor. However, the project area is situated within USFWS designated Consultation Areas for the Florida scrub-jay, Audubon's caracara, Everglade snail kite and red-cockaded woodpecker. The proposed construction, for the most part, will impact highly disturbed remnant natural communities along a road corridor which is currently experiencing rapid urban growth.

Federally- and State-listed species having the potential to occur in the project study area include the American alligator, Florida scrub-jay, burrowing owl, southeastern American kestrel, Florida sandhill crane, bald eagle, wood stork, Audubon's crested caracara, listed wading birds (limpkin, little blue heron, snowy egret, tricolored heron and white ibis), gopher tortoises and associated commensals (gopher frog, Florida pine snake, Florida mouse and eastern indigo snake), and Sherman's fox squirrel. However, because of the quality of the habitat present and with the implementation of recommended protection and mitigation measures, these species and/or their habitats are not likely to be adversely affected by the construction of the I-95 interchange and the Ellis Road improvements.

The FDOT has determined the project has "no effect" on the Everglade snail kite and USFWS has concurred with this determination. The FDOT has determined the project "may affect, not likely to adversely affect" the Florida scrub-jay, Audubon's crested caracara, and eastern indigo snake. The results of surveys completed for these species, along with the request for concurrence with these determinations, were submitted to USFWS on May 27, 2015. USFWS has responded with their concurrence with these determinations in a letter dated July 29, 2015 (see Appendix C, Agency Coordination). Additionally, the FDOT has determined that this project "may affect, not likely to adversely affect" the wood stork based on the use of the wood stork effect determination key and available mitigation. This information and the request for concurrence with this determination was submitted to USFWS on October 1, 2015. USFWS responded with their concurrence in a letter dated October 9, 2015 (see Appendix C, Agency Coordination).

Based on a review of 2015 aerial photography compared to the original 2010 project photography, no land use changes are apparent during the course of this PD&E study.

The Preferred Alternative costs a total of $36.13 million for the interchange ($11.01 million for right-of-way and $25.13 million for construction, engineering, and utility relocations) and $55.39 million for the Ellis Road reconstruction ($40.99 million for right-of-way and $14.41 million for construction, engineering, and utility relocations). Utility relocation costs are estimated to be approximately $3.2 million and are ultimately dependent upon the agreement between the municipality and the utility company regarding accommodations within the right-of-way.

2.0 Location and Needs Summary

2.1 Need for Improvement

To determine the project need, several factors were analyzed, including population growth, anticipated development and the resulting future traffic volumes, existing safety issues on the current Ellis Road corridor, and consistency with local and regional transportation plans. The results of these analyses are discussed in the following sections.

2.1.1 Social Demands

According to the US Census Bureau, Brevard County ranks tenth out of the 67 Florida counties with a 2013 population of 550,823[1]. Brevard County has exhibited lower population growth than the state average (1.4% vs. 4.0%). According to the US Census Bureau, the median household income is estimated at $49,099 in the 2013 population estimate.

The cities of Melbourne and West Melbourne have 2013 populations of 77,508[2] and 19,667[3], respectively. Since the 2010 census, Melbourne has increased in population by 2% and West Melbourne has remained stagnant.

A primary employer in Brevard County is the John F. Kennedy Space Center, which has a workforce of 7,864[4]. The Space Center's direct spending impact on Brevard County in 2010 was $1.71 billion. Port Canaveral is also a large job-and-revenue generator for the area and is responsible for 16,983 jobs[5] generated by Port Canaveral cruise, cargo, marina, and real estate activity. According to the report entitled *The 2012 Economic Impacts of Port Canaveral*, businesses providing services at the Port-owned marine and cargo cruise terminals, marinas, as well as real estate tenants, received nearly $2 billion of revenue, excluding the value of cargo shipped through the marine facilities and the price of the

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1 http://quickfacts.census.gov/qfd/states/12/12009.html
2 http://quickfacts.census.gov/qfd/states/12/1243975.html
3 http://quickfacts.census.gov/qfd/states/12/1276500.html
4 Launching the Future: Kennedy's Space Center's Annual Report FY 2013
5 http://portcanaveral.com/general/economics.php: The 2012 Economic Impact of Port Canaveral

cruises homeported at Port Canaveral. A number of technology-related industries also reside in Brevard County. Table 2.1.1 displays the major employers within the County.

Table 2.1.1: Major Employers in Brevard County

Organization	Activity	Employees
Port Canaveral	Import / Export / Cruise Industry	16,983
NASA / JFK Space Center	Space Industry	7,864
Patrick Air Force Base	Military	16,280
School Board of Brevard County	Schools	9,000
Health First, Inc.	Integrated Healthcare Delivery System	7,285
Harris Corporation	Communication Equipment, Satellite Systems, Integrated Circuits	6,700
Publix Supermarket		2,850
Wal-Mart		2,620
Brevard County	Local Government Services	2,500
Holmes Regional Medical Center		2,500
Wuesthoff Health System, Inc	Integrated Healthcare Delivery System	2,400
Winn Dixie Supermarkets		1,830
Northrop Grumman Melbourne Systems	Airborne Radar Equipment	1,650
Rockwell Collins, Inc.	Avionics	1,150
Brevard Community College		960
CSR Computer Sciences Raytheon		1,050

Melbourne Regional Chamber of East Central Florida Community Profile: http://www.melbourneregionalchamber.com/home.htm)

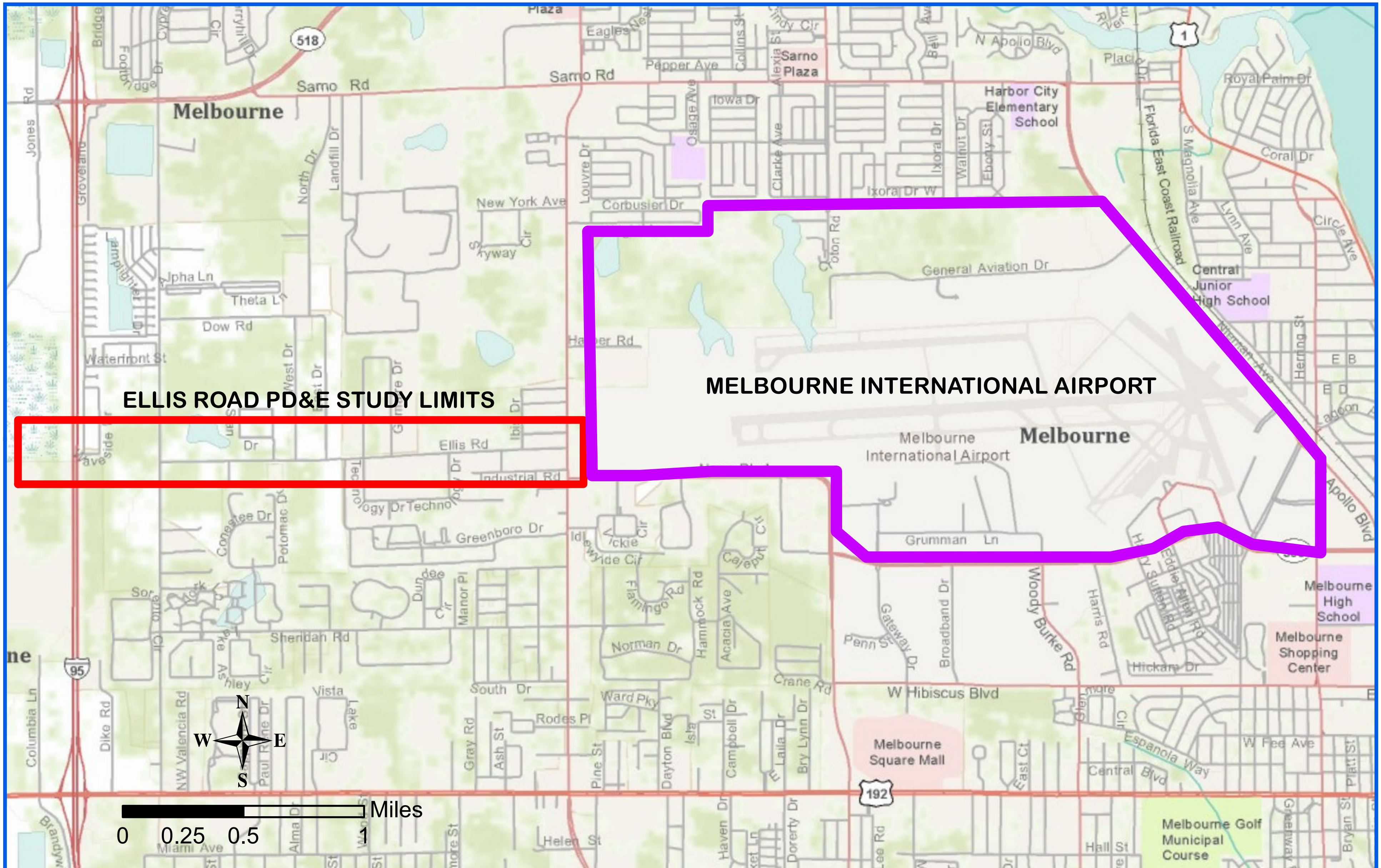
2.1.2 Melbourne International Airport and Vicinity

Melbourne International Airport is an important transportation hub but also a major employment area for Melbourne and Palm Bay. Melbourne International Airport and its surroundings are the central component of the city's industrial area and occupy over 3,000 acres. This area is the primary economic driver for southern Brevard County. According to a December 2008 Space Coast Economic Development Commission Report, over 55,000 jobs are within three miles of the airport.

The Melbourne International Airport vicinity is the hub of the largest high-tech, high-skilled industrialized area in east central Florida. The Airport's industrial park has the potential to grow over 300% in job attraction in future years and has had continuing growth despite the economic downturn in the US between 2009 and 2010. A Trip Generation Study conducted by the airport authority in March 2007 shows the potential development of an additional 3,700,000 square feet of office, warehousing, and retail on airport grounds. The ultimate build-out of the airport surroundings would result in approximately 113,700 daily vehicle trips, which would overwhelm any planned improvements on US 192 or Eau Gallie Boulevard and result in traffic operations below the LOS standards.

The proximity of I-95 to Melbourne International Airport is a primary stimulus for the study of an Ellis Road interchange and the upgrading of Ellis Road to a divided, four-lane facility. In February 2011, the Brazilian jet-maker Embraer opened its first US aircraft final assembly plant at Melbourne International Airport, where a new 80,000 square foot hanger and modern paint shop facility are located.

Figure 2.1.1 displays the Ellis Road project in conjunction with its proximity to I-95 and Melbourne International Airport.



FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENTAL STUDY

MELBOURNE AIRPORT & VICINITY

FIGURE NO. 2.1.1

2.1.3 Strategic Intermodal System

The Strategic Intermodal System (SIS) was designated by the Florida Legislature to:

- Efficiently serve the mobility needs of Florida's citizens, businesses, and visitors; and,
- Help Florida become a worldwide economic leader, enhance economic prosperity and competitiveness, enrich quality of life, and reflect responsible environmental stewardship.

The current designated SIS is a network of high-priority transportation facilities which:

- Includes the state's largest and most significant commercial service airports, spaceport, deepwater seaports, freight rail terminals, passenger rail and intercity bus terminals, rail corridors, waterways and highways; and,
- Carries more than 99 percent of all commercial air passengers and cargo, virtually all waterborne freight and cruise passengers, almost all rail freight, 89 percent of all interregional rail and bus passengers, and 55 percent of total traffic and more than 70 percent of all truck traffic on the State Highway System[6].

Florida's SIS has its own procedural document entitled *SIS Highway Component Standards & Criteria (effective September 11, 2014)*. This procedure explains the SIS background, Florida Department of Transportation (FDOT) responsibility, components, and policy guidelines.

Interstate 95 is a cornerstone of the Florida SIS, linking major population centers in Florida with one-third of the US population. Portions of the I-95 corridor have been utilized since the days of the Revolutionary War. I-95 is nation's longest north-south interstate at 1,920 miles, traversing 15 states, the most of any interstate[7].

As an integral component of the Florida SIS, I-95 links major activity centers with other modes of transportation, such as airports, bus hubs, seaports, spaceports, and train stations. Interstate access is provided via interchanges on SIS connectors, which may be

[6] , FDOT, www.dot.state.fl.us/planning/sis
[7] NPR News, August 27, 2010

state or local roads. Currently, the emerging SIS hubs at Melbourne International Airport and Melbourne Greyhound Bus Terminal are being connected to the SIS network via the Eau Gallie Boulevard / Sarno Road and the US 192 interchanges.

Both US 192 and Eau Gallie Boulevard are part of the Florida Hurricane Evacuation Network and connect population bases along the eastern Florida shore to the mainland. US 192, also known as Space Coast Parkway, is the southern-most Brevard County causeway over the Indian River and the last crossing for over 25 miles. The closest causeway to the south is in Indian River County near the town of Wabasso. As seen in the Ellis Road Interchange Justification Report (IJR), future traffic volumes on Eau Gallie/ Sarno Road and US 192 will exceed the standard level of service (LOS) volumes due to the local reliance on this facility for access to I-95. A new interchange at an extension of Ellis Road with I-95 in conjunction with upgrading Ellis Road to an SIS facility will divert traffic from the adjacent interchanges at US 192 and Eau Gallie Boulevard, thereby improving the level of service of these existing interchanges in the design year.

The improvements to and extension of Ellis Road to provide this direct connection between the interstate and the airport will address deficiencies at the existing I-95 interchanges at US 192 and Eau Gallie Boulevard / Sarno Road. Upon the completion of the improvements, Ellis Road will be designated as a "SIS Connector" for the Melbourne International Airport. As an SIS Connector, the Ellis Road improvement and extension to I-95 will be evaluated with respect to full SIS design criteria. Section 4.4.1 explains the design criteria and its applicability to this project in detail.

2.1.4 Previous Studies

Brevard County Public Works Department commissioned a preliminary engineering study to examine the reconstruction of Ellis Road as a four-lane facility between John Rodes Boulevard and Wickham Road. The 2001 study, which culminated in a Preliminary Engineering Report (PER), examined the following alternatives:

- Alternative #1 – 4-lane divided urban section with 11-foot lanes, 4-foot outside shoulder, 22-foot median, and 5-foot sidewalks, and street lighting; and,

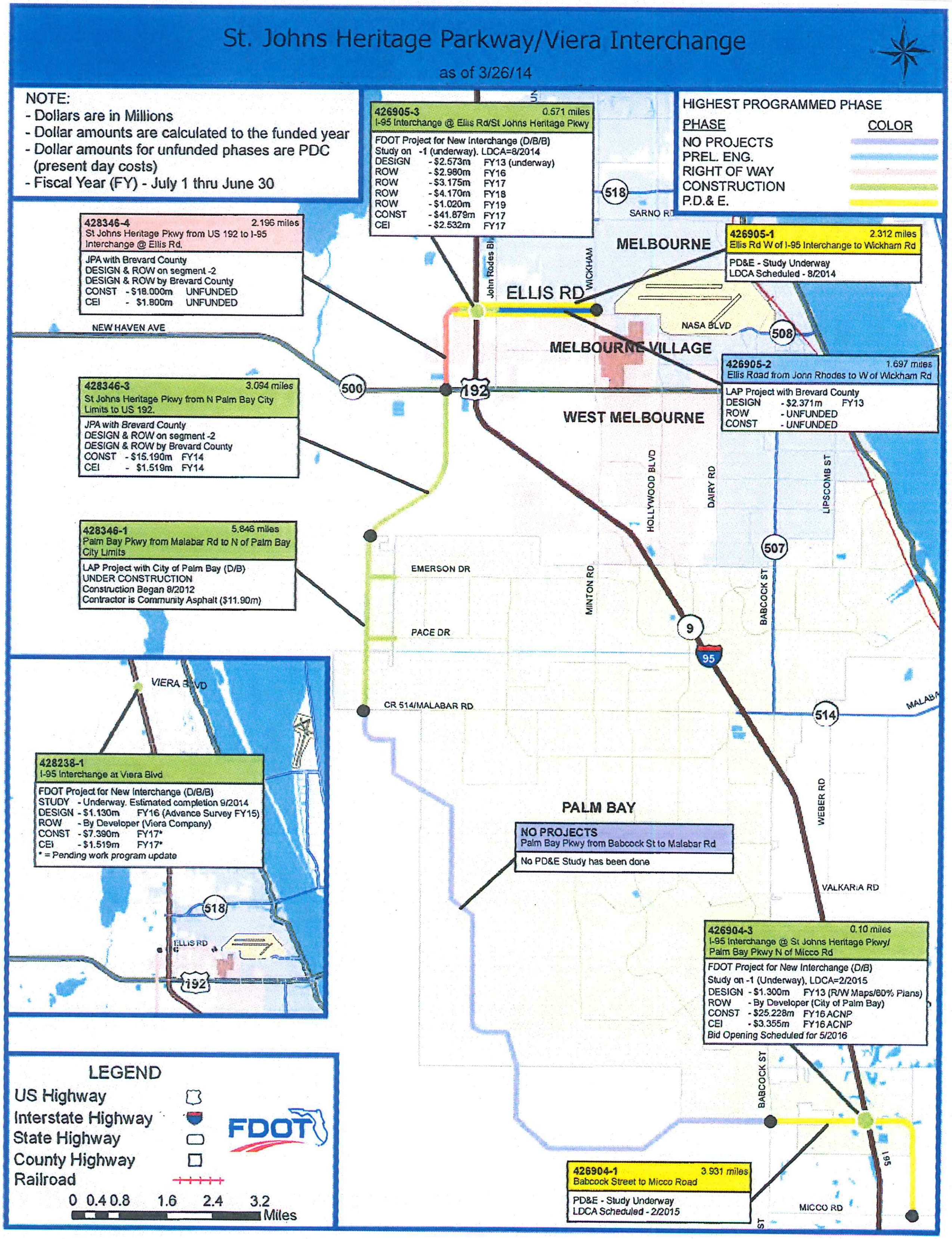
- Alternative #2 – Same as Alternative #1 but with 5-lane section (continuous center turn lane).

Based on the engineering analysis and comments received during the public involvement phase, the recommendation of the study was to implement the 4-lane, divided urban section (Alternative #1).

An IJR was accepted by the FHWA for an interchange at an extension of Ellis Road. The IJR indicated that the US 192 and Eau Gallie Boulevard interchanges would operate at LOS F without an Ellis Road interchange. As mentioned previously, a new interchange at I-95 and an extension of Ellis Road is critical to the functionality of the existing interchanges to the north and south. The Ellis Road interchange in the approved IJR is located 1.37 miles north of US 192 and 1.5 miles south of Eau Gallie Boulevard. This interchange spacing, which does not meet the FDOT standard, was approved by the FHWA with the approval of the IJR.

In December 2003, a final PER was prepared for FDOT for a future Palm Bay Parkway from Malabar Road to John Rodes Boulevard at Ellis Road. An accompanying Environmental Assessment (EA) was also submitted, with the Finding of No Significant Impact (FONSI) being approved on 12/11/2003. These documents underwent a re-evaluation, which was submitted to the FHWA on March 5, 2010. The re-evaluation was subsequently signed on 6/7/2011. The name of the proposed roadway was subsequently changed from "Palm Bay Parkway" to "St. Johns Heritage Parkway." Previous studies by the Space Coast Transportation Planning Organization (TPO) focused on a general lack of alternative north-south arterial roadways linking the southwest Palm Bay area with Melbourne and other destinations north of US 192. St. Johns Heritage Parkway (SJHP) is proposed to curve from its northerly bearing to easterly direction and terminate at the intersection of John Rodes Boulevard and Ellis Road. The planned roadway is in the final design phase, with the County's priority being the southern end. Figure 2.1.2 displays a summary of the various segments of the SJHP.

Figure 2.1.2: Status of St. Johns Heritage Parkway



2.1.5 Traffic Demand

The justification for an Ellis Road interchange with I-95 was achieved with the approval of the IJR by the FHWA in April 2009. Future traffic growth related to the Melbourne International Airport and surrounding economic development is anticipated to strain the existing interchanges at US 192 and Eau Gallie Boulevard. An additional access to I-95 is needed to address this deficiency in interchange access and provide a more direct connection to the Melbourne International Airport and the surrounding vicinity.

Future Traffic Forecast

Significant growth is projected in Brevard County through the Design Year 2034 (shown in Tables 2.1.2 and 2.1.3). Between the Existing 2009 and Design Year 2034 planning horizons, the county's growth in dwelling units and total employment is expected to increase 37% (87,300 dwelling units) and 39% (96,500 jobs), respectively. This growth in development will create significant growth in traffic volume for the study area. Interstate 95 is anticipated to increase in traffic volume by approximately 65% between 2009 and 2034. In addition, Ellis Road annual average daily traffic (AADT) east of I-95 is projected to increase from 4,700 vehicles (Existing 2009) to 22,400 vehicles (Year 2034).

Table 2.1.2: Brevard County Socio-Economic Data

Alternative Year	Dwelling Units	Population	Industrial Employment	Commercial Employment	Service Employment	Total Employment
Existing 2009	232,871	498,731	53,053	50,285	144,966	248,304
Opening 2014	250,327	536,926	55,404	56,231	155,970	267,606
Interim 2024	285,239	613,315	60,107	68,124	177,979	306,209
Design 2034	320,151	689,705	64,810	80,016	199,987	344,797

Table 2.1.3: Central Florida Regional Planning Model Traffic Volumes

Location	AADT			
	2009 Existing	2014 Build	2024 Build	2034 Build
I-95 (North of Ellis Rd)	66,900	92,700	107,200	110,900
I-95 (South of Ellis Rd)	66,900	87,700	103,100	109,600
John Rodes Blvd (North of Ellis Rd)	11,500	7,600	19,600	20,000
John Rodes Blvd (South of Ellis Rd)	12,400	3,200	8,600	15,600
Ellis Rd (East of John Rodes Blvd)	4,700	16,600	18,200	22,400

Chapter 3 contains a summary of the traffic analysis methodology, including the traffic forecasting, as well as the existing, No-Build, and Build Alternative traffic volumes and levels of service. A detailed discussion of the traffic forecasting can be found in the 2011 DTTM and 2014 DTTM, which are summarized in Chapter 3 of this report.

2.1.6 Crash Data and Safety Analysis

2.1.6.1 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 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 West New Haven Avenue (SR 500) interchange to the south gore of Eau Gallie Boulevard (SR 518) interchange. This segment of I-95 was 2.408 miles between milepost 20.902 and 23.310. A total of ninety-three crashed 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 Excel 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 Excel spreadsheets 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; and,
5. Each crash was assigned a number, and collision diagrams were plotted on 11x17 sheets as shown on in the Ellis Road Safety Analysis included in Appendix F.

Tables 2.1.4 to 2.1.7 summarize the crash data and characteristics for Ellis Road and I-95 within the study area.

Table 2.1.4: 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 2.1.5: 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 2.1.6: I-95 Crash Analysis Summary

	Length (Miles)	Land Use Type	Year: 2005	2006	2007	2008	2009	Accident Type: 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
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
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%*	*9%*	*100%*

	Lighting Condition: Daylight	Dusk	Dawn	Dark - St. Light	Dark - No St. Light	Actual vs. State & District-wide Crash Rates: 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	59	0	0	1	33	65,900			289,844,675		0.321	0.339	0.480
Percent of segment total	*63%*	*0%*	*0%*	*1%*	*35%*								

Table 2.1.7: I-95 Crash Characteristics

	Length (Miles)	Land Use Type	Wet-Dry: Wet	Dry	Vehicle Type: Automobile	Pickup Truck / Passenger Van	Motorhome	Medium-Large Truck	Motorcycle	Direction: Same Direction	Opposite Direction	Perpendicular directon	Driver Characteristics: Drivers involved	Accidents involving alcohol / drugs	Fatalities	Accidents involving fatalities	Injuries	Accidents involving injuries	Multi-vehicle crashes	Contributing Cause: 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	Driver Maneuvers: 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.

2.1.6.2 General Observations

After studying Tables 2.1.4 to 2.1.7 and the collision diagrams, 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 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 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-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.

2.1.6.3 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 2.1.6 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.

2.1.7 Consistency with Regional and Local Transportation Plans

The Space Coast Transportation Planning Organization (SCTPO) is responsible for transportation planning in Brevard County. The SCTPO works with transportation responsible municipalities in Brevard County and the FDOT. The agency's goal is to develop transportation plans that prioritize and facilitate projects receiving state and federal funds.

The SCTPO 2035 Long Range Transportation Plan (LRTP) identifies projects that are of importance in the next 25 years. Ellis Road has been identified in the LRTP as a project with an implementation year of 2016-2020. The expected total cost projected in the LRTP for Ellis Road is $19,239,000. The LRTP was amended on September 11, 2014 to include updated information for the Ellis Road project.

The SCTPO and FDOT also maintain a Transportation Improvement Plan (TIP) and a State Transportation Improvement Plan (STIP). Table 2.1.8 displays planning consistency for the project.

Table 2.1.8: Project Planning Consistency

Description	Phase	Planning Document	Total Cost	
			2013/14	2014/15
St Johns Heritage Pkwy @ Ellis Road from John Rodes Blvd. to West of Wickham Rd.	Preliminary Engineering	TIP (1)	$2,400,971	
		STIP (2)	$2,389,365	$11,764 (4)
	R/W	TIP (1)		
		STIP (2)		
I-95 Interchange at Ellis Rd. / St. Johns Heritage Parkway	Preliminary Engineering	TIP (1)	$2,582,819 (3)	
		STIP (2)	$2,588,072	$9,747 (4)
	R/W	TIP (1)		$11,006,000
		STIP(2)		$11,006,000

(1) TIP = Transportation Improvement Plan from Space Coast TPO
(2) STIP = State Transportation Improvement Plan (includes Ellis Road Interchange)
(3) Includes prior years
(4) District in-house charges

2.2 Existing Roadway Conditions

2.2.1 Existing Roadways

Existing roadways within the study area are described below.

Major Roads

I-95 is a freeway extending from Maine to South Florida along the eastern seaboard and serves many of the most populated areas in the country. Through the project corridor, was recently widened from 4 lanes to a 6-lane interstate facility with 10-foot paved shoulders and guardrail in the median. The posted speed limit is 70 mph. The existing interstate typical section is shown in Figure 2.2.1.

Existing Ellis Road

Ellis Road begins at John Rodes Boulevard and traverses eastward as a two-lane road to Wickham Road. The posted speed is 35 mph. Brevard County has jurisdiction over the roadway, although the City of West Melbourne has assumed maintenance over the section from Greenboro Drive to Wickham Road. Beginning at John Rodes Boulevard, Ellis Road has no paved shoulders or sidewalk. This typical section extends east to Greenboro Drive, where paved shoulders are added. The section with paved shoulders extends to the end of Ellis Road at the Ellis Road-Wickham Road intersection. The Ellis Road existing typical section is shown in Figure 2.2.2.

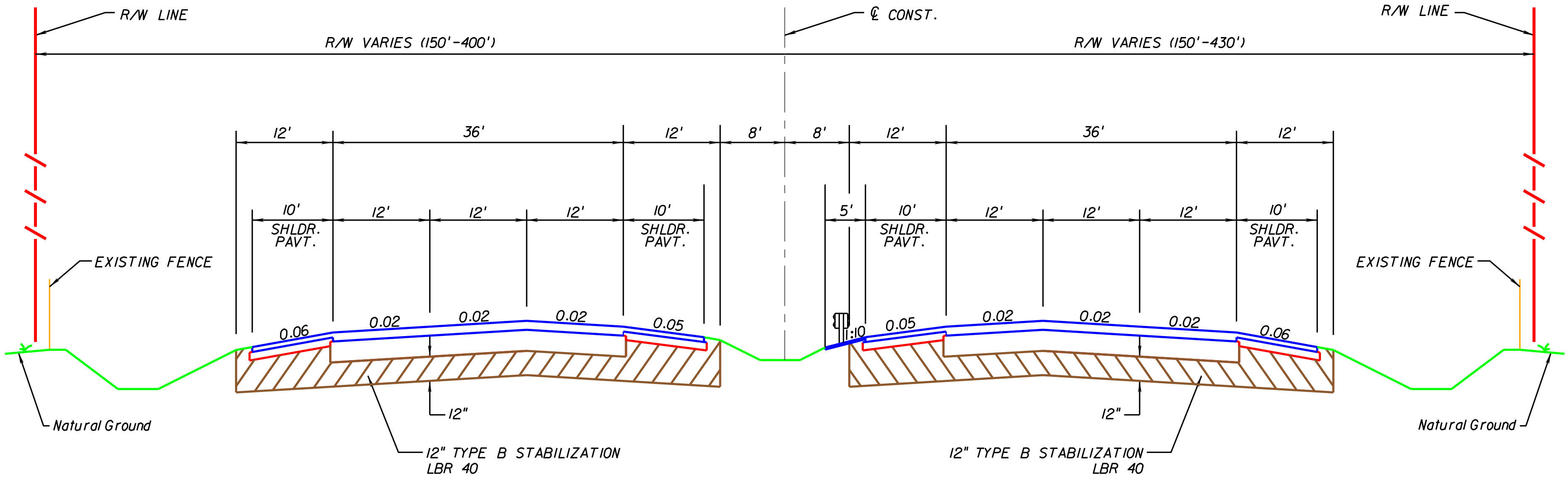
NASA Boulevard begins at the eastern terminus of Ellis Road, which is the Wickham Road intersection, and continues eastward to its eastern terminus at US 1 along the Indian River. Just east of Wickham Road, NASA Boulevard is a 4-lane, divided suburban facility and has curb and gutter in the median and 5' paved outside shoulders. The posted speed is 45 mph. A realignment of NASA Boulevard to tie into the Ellis Road/Wickham Road intersection was completed in 2010. This recently-constructed NASA Boulevard existing typical east of Wickham Road is shown in Figure 2.2.3.

West of Wickham Road, approximately 1,000 feet of Ellis Road was improved, transitioning from its existing two lanes to four lanes in accommodation of the aforementioned NASA Boulevard realignment. The existing typical section for this portion of the Ellis Road improvement is shown in Figure 2.2.4.

John Rodes Boulevard is a two-lane rural section that begins at West New Haven Avenue and extends northward to Aurora Road. The intersection of John Rodes Boulevard and Ellis Road was reconfigured in 2010 to add left turn lanes and a traffic signal. John Rodes Boulevard has a posted speed limit of 45 mph in the vicinity of the Ellis Road intersection.

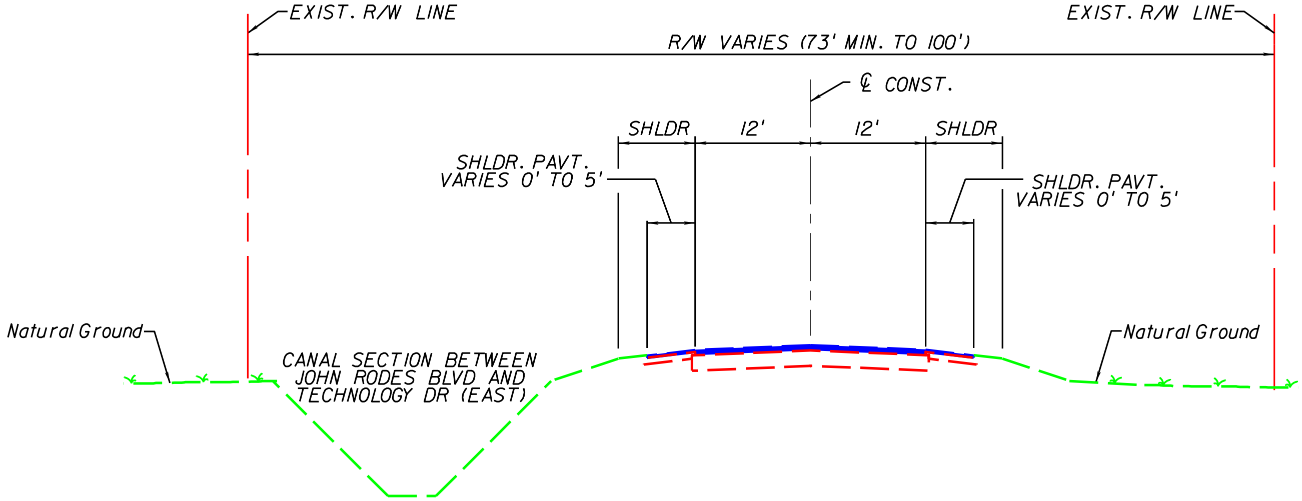
Wickham Road is a 4-lane, undivided urban section beginning at West New Haven Avenue, extending north past Eau Gallie Boulevard, and eventually turning westward and intersecting with I-95. South Wickham Road has a posted speed limit of 45 mph at Ellis Road.

St. Johns Heritage Parkway is a future four-lane, divided roadway proposed by Brevard County. The typical section is a suburban configuration consisting of a 30-foot median with 22 feet between the inside edges of curb and gutter. The outer roadside consists of a 5-foot paved shoulder, swale section, and 8-foot sidewalk. The typical section for St. Johns Heritage Parkway in the vicinity of the Ellis Road interchange is shown in Figure 2.2.5.



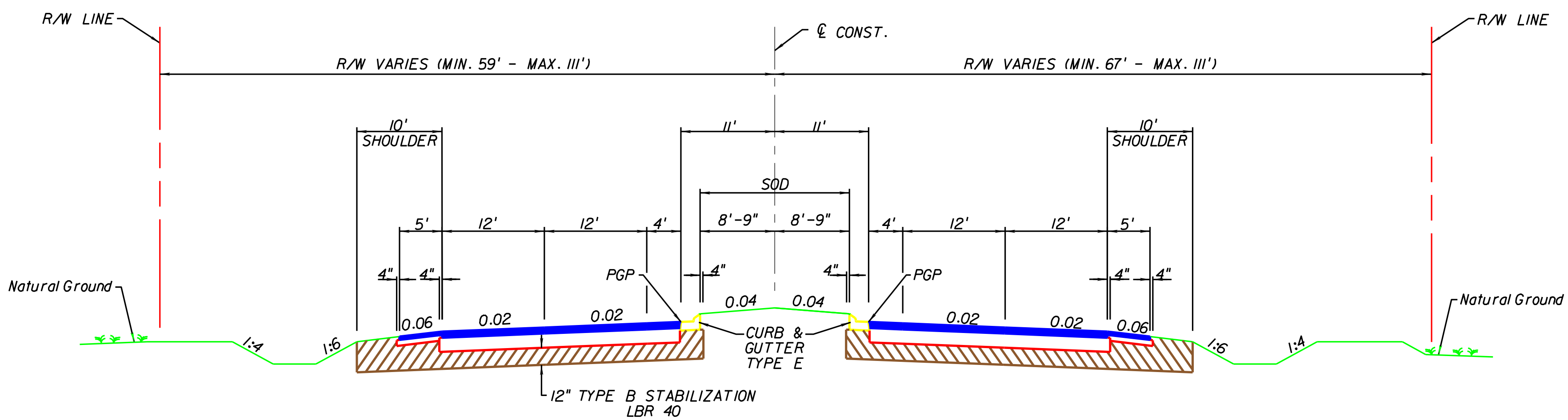
NOTE: VERTICAL SCALE IS ENLARGED BY A FACTOR OF TWO

FDOT	I-95 AT ELLIS ROAD PD&E STUDY PROJECT DEVELOPMENT SUMMARY REPORT	EXISTING TYPICAL SECTION I-95	FIGURE NO. 2.2.1



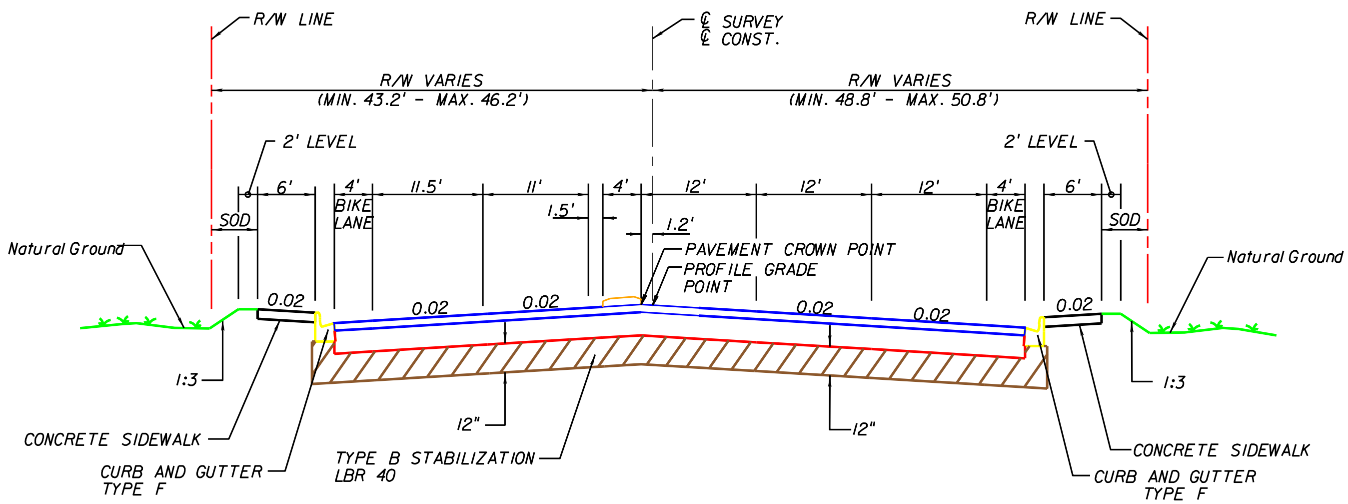
NOTE: VERTICAL SCALE IS
ENLARGED BY A FACTOR OF TWO

FDOT	**I-95 AT ELLIS ROAD PD&E STUDY** **PROJECT DEVELOPMENT SUMMARY REPORT**	**EXISTING TYPICAL SECTION** **ELLIS ROAD**	FIGURE NO. **2.2.2**



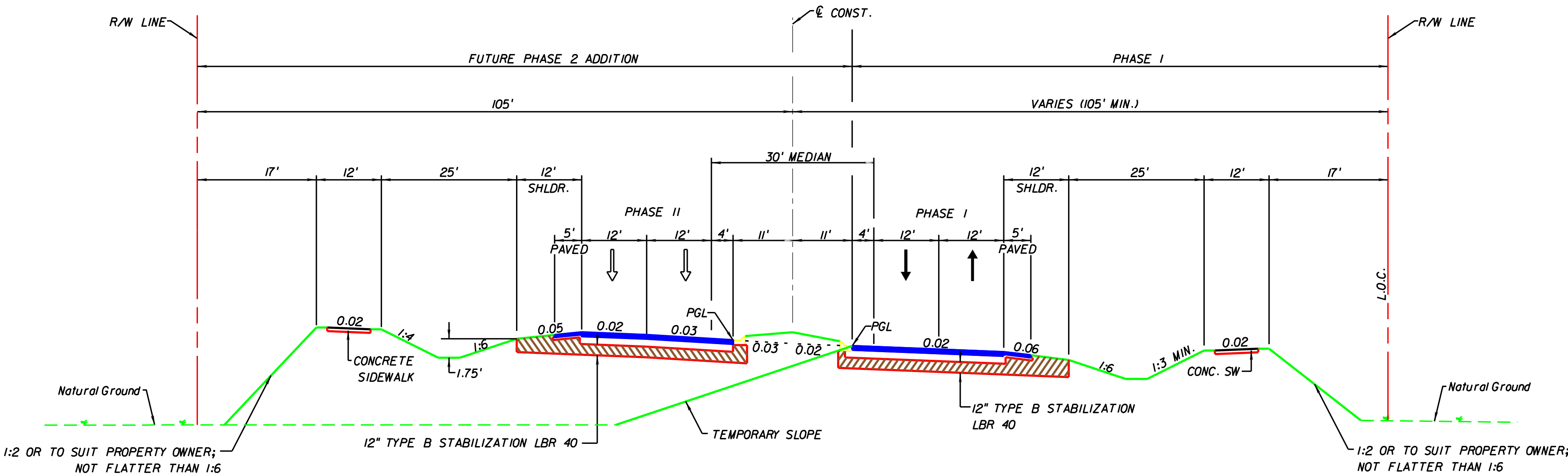
NOTE: VERTICAL SCALE IS ENLARGED BY A FACTOR OF TWO

FDOT	I-95 AT ELLIS ROAD PD&E STUDY PROJECT DEVELOPMENT SUMMARY REPORT	EXISTING TYPICAL SECTION NASA BLVD (EAST OF WICKHAM RD)	FIGURE NO. 2.2.3



NOTE: VERTICAL SCALE IS ENLARGED BY A FACTOR OF TWO

FDOT	**I-95 AT ELLIS ROAD PD&E STUDY** **PROJECT DEVELOPMENT SUMMARY REPORT**	**EXISTING TYPICAL SECTION** **ELLIS ROAD (WEST OF WICKHAM RD)**	FIGURE NO. **2.2.4**



ST. JOHNS HERITAGE PARKWAY - TYPICAL SECTION NO. 7
STA. 1224+09.90 TO STA. 1246+48.09

PHASE I - CONSTRUCT LANES ON SOUTHSIDE TO ACCOMODATE TWO TRAFFIC

PHASE I - CONSTRUCT LANES ON SOUTHSIDE TO ACCOMODATE TWO TRAFFIC
PHASE II - CONSTRUCT WESTBOUND LANES; CONVERT 2 LANES ON SOUTHSIDE, TO EASTBOUND ONLY.

NOTE: VERTICAL SCALE IS ENLARGED BY A FACTOR OF TWO

FDOT	I-95 AT ELLIS ROAD PD&E STUDY PROJECT DEVELOPMENT SUMMARY REPORT	FUTURE TYPICAL SECTION ST. JOHNS HERITAGE PARKWAY	FIGURE NO. 2.2.5

Minor Roads

Starting at John Rodes Boulevard and going east the minor roads that intersect Ellis Road are as follows;

- Stan Drive;
- West Drive;
- East Drive;
- Greenboro Drive;
- Distribution Drive and Technology Drive;
- Distribution Drive;
- Technology Drive;
- Shinn Avenue; and,
- Lake Ibis Drive.

All of these minor roads are 2-lane, paved local roadways.

2.2.2 Pedestrian and Bicycle Facilities

Ellis Road - No sidewalks exist on either side of Ellis Road for the entire corridor. Paved shoulders range from 0 feet to approximately 5 feet in width. No bicycle facilities, other than the paved shoulder, are provided on Ellis Road;

John Rodes Boulevard – No sidewalks exist on either side of the John Rodes Boulevard, and no bicycle facilities are provided;

Wickham Road – No sidewalks exist on either side of Wickham Road and no bicycle facilities are provided;

NASA Boulevard – No sidewalks exist on either side of NASA Boulevard. However, 5-foot paved shoulders can accommodate bicycles; and,

Proposed St. Johns Heritage Parkway – Both sidewalks and bicycle facilities will be provided.

2.2.3 Right-of-Way

Ellis Road

As shown in Figure 2.2.2, the existing right-of-way varies over the course of the project area. Table 2.2.1 below shows the range in right-of-way widths for the corresponding roadway segments.

Table 2.2.1: Existing Right-of-Way

Western End of Roadway Segment	Eastern End of Roadway Segment	Length of Segment (ft)	Approximate Range of R/W Width (ft)
John Rodes Blvd	1171' West of Stan Dr	1290	100
1170' West of Stan Dr	24' West of Stan Dr	1148	73
24' West of Stan Dr	336' East of Technology Dr	4155	100
336' East of Technology Dr	48' West of Lake Ibis Dr	1265	80
48' West of Lake Ibis Dr	Wickham Rd	973	93-97

I-95 – Right-of-way width in the vicinity of Ellis Road is approximately 300 feet;

John Rodes Boulevard – Right-of-way width north of Ellis Road is approximately 83 feet. Right-of-way width south of Ellis Road is approximately 75 feet;

Wickham Road – Right-of-way width north of Ellis Road is approximately 98 feet. Right-of-way width south of Ellis Road is approximately 110 feet; and,

NASA Boulevard – Right-of-way width approaching Ellis Road is approximately 118 feet.

2.2.4 Horizontal Alignment

Ellis Road runs east at a bearing of approximately N89°17'E from John Rodes Boulevard to a curve at a point in between East Drive and Greenboro Drive. Ellis Road deflects approximately 3° to the left to a bearing of approximately N86'30'E. Ellis Road continues on this bearing to a curve approximately 340 feet east of Technology Drive (East). Ellis Road then deflects approximately 1.5° to the right to a bearing of approximately N87°52'E and runs along this bearing to Wickham Road. There is no superelevation on Ellis Road and no sight distance deficiencies due to horizontal alignment.

2.2.5 Vertical Alignment

Ellis Road is generally flat with little change in grade. There is an approximate 7-foot elevation difference from an elevation of 25 feet at Wickham Road to an elevation of 19 feet near John Rodes Boulevard. There are no sight distance deficiencies due to vertical alignment.

2.2.6 Drainage

The project corridor is relatively flat but generally slopes east to west. Existing ground elevations vary from approximately 15 feet to 25 feet NGVD. There are currently no stormwater management facilities (SWMF) in place that accept runoff from the roadway.

Runoff within the segment from the western project limit to the highpoint of the proposed I-95 overpass enters existing drainage conveyances that drain west into the marshy headwaters of the St. Johns River. These marsh headwaters have been identified as being nutrient-impaired and are also classified by the State of Florida as Class I waters. Class I waters are approved as a public potable water supply and therefore have more stringent water quality requirements for SWMF's that discharge to them. The remainder of the project from I-95 to the eastern boundary is drained by a network of ditches and canals. The adjacent canals serve as the outfall for this segment of the project. These canals are part of a regional canal network that serves as the primary drainage conveyance for the Crane Creek Drainage Basin.

The Crane Creek Drainage Basin encompasses most of West Melbourne. Runoff in the basin eventually enters a network of named canals. The M-1 Canal serves as the main trunk line for the network. M-1 generally drains south then turns east along US Highway 192 before it empties into Crane Creek with ultimate discharge into the Intra-Coastal Waterway. The Crane Creek Basin exhibits a second outfall located north of the project. A 6' X 6' box culvert and a set of triple-48" cross drains are currently located at the junction between the L-16 Canal and the M-1 Canal. These culverts discharge west underneath I-95 before ultimately entering the Lake Washington/St. Johns River watershed.

The L-15 Canal is located almost completely within the Ellis Road right-of-way and is the primary stormwater conveyance for the project corridor. The L-15 Canal begins near Distribution Drive and drains from east to west along the roadway, before discharging into the M-1 Canal near I-95. Before reaching the M-1 Canal, the L-15 Canal encounters a junction with the L-11 Canal as it crosses south underneath Ellis Road in the form of a 60-inch culvert.

An existing dual 4-foot x 10-foot box culvert conveys the L-15 Canal west underneath John Rodes Boulevard. Recent roadway improvements to this intersection involved plugging the upstream end of this culvert and connecting the upstream L-15 Canal segment with a single 48-inch x 76-inch culvert.

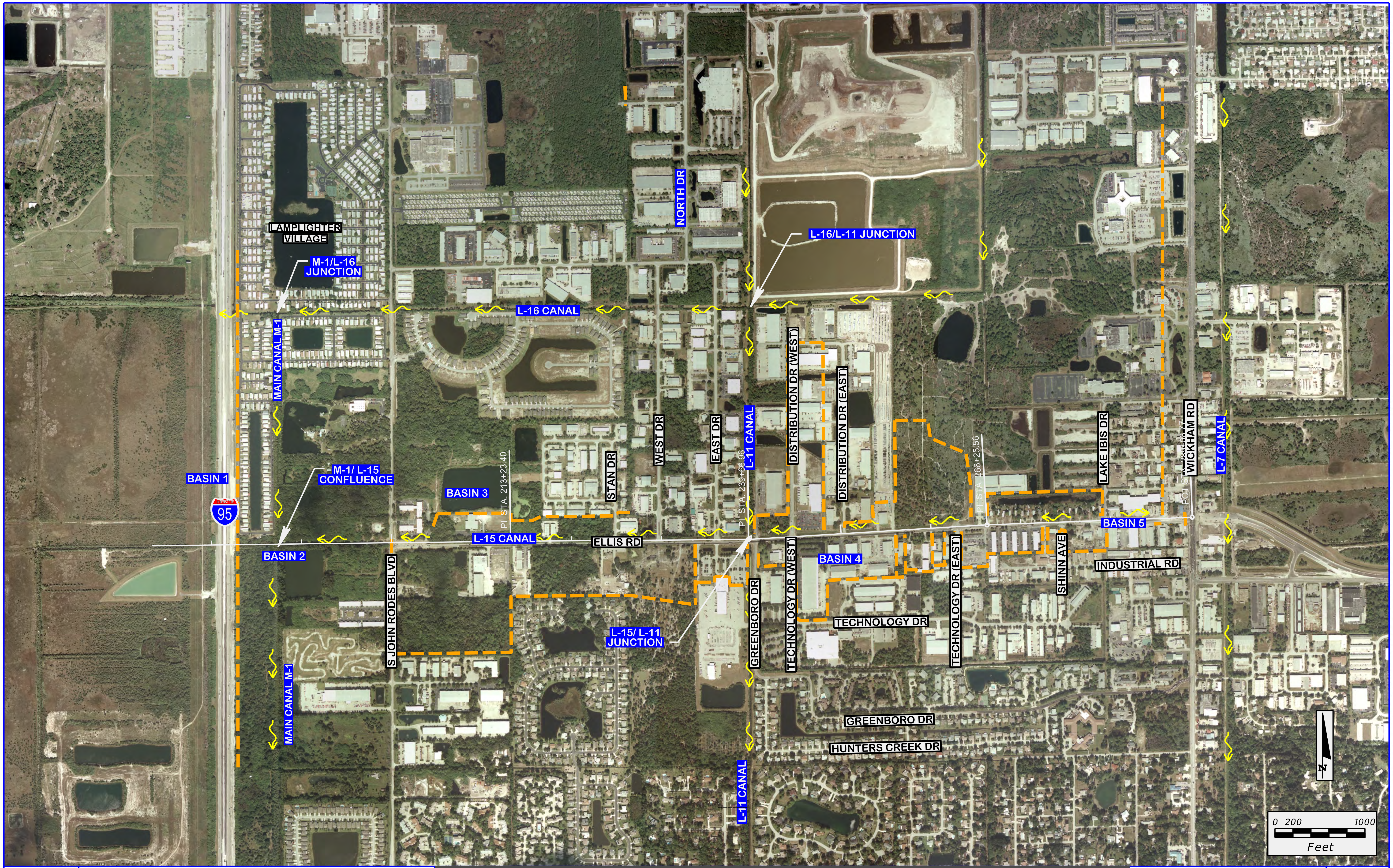
A cross-drain will be required where the new roadway will cross over M-1 Canal. According to the 90% St. Johns Heritage Parkway plans, a double 8-foox x 7-foot concrete box culvert is proposed at this location. The box culvert will convey the M-1 Canal south underneath Ellis Road. This cross-drain will convey a significant amount of flow and could potentially impact a large portion of the 1,612-acre upstream Crane Creek Regional Basin. Careful consideration should be made with regards to the size of this cross-drain in the final design phase of the interchange due to the additional impervious area from the interchange pavement and the upstream flooding history of Lamplighter Village. The next upstream culvert is located underneath Waterford Street in Lamplighter Village and is in the form of a dual 48-inch x 60-inch culvert. A noteworthy point is that the L-15 Canal discharges into the segment of M-1 Canal that is bound by Waterford Street to the north and the future Ellis Road extension to the south.

The intersection at Lake Ibis Road coincides with the point in the project corridor where flow patterns change from westerly to easterly. From this point to the eastern boundary of the project, Ellis Road drains east into the L-7 Canal which drains south before merging with the M-1 Canal. The L-7 Canal is the easterly drainage boundary of the Ellis Road drainage system.

The project corridor has the following drainage characteristics:

- Any SWMF serving the project west of I-95 will have to limit nutrient loading to the St. Johns River marsh to existing conditions. These facilities must also provide an additional 50% of the required treatment volume pursuant to the requirements of projects discharging to Class I waters;
- Proposed improvements are located within the 100-year floodplain from the western project limit to the intersection of West Drive. This will result in impacts to floodplain storage that must be compensated by creating flood storage areas elsewhere within the floodplain; and,
- The Crane Creek Basin has a history of flooding problems and Brevard County is currently implementing a series of capital improvements to reduce the duration and intensity of flooding that is occurring. Modifications to the canal system could potentially impact a large portion of the 1,612-acre upstream Crane Creek Regional Basin. All proposed modifications to the canals must be designed to exhibit the same hydraulic conveyance capabilities as the existing configuration.

Figure 2.2.6 displays a map of the existing drainage conditions.



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I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

DRAINAGE BASINS

EXISTING DRAINAGE MAP

FIGURE NO.
2.2.6

2.2.7 Geotechnical Data

A Contamination Screening Evaluation Report (CSER) was prepared for this project and contains information on existing soils and hydrogeological features as shown below.

2.2.7.1 Soils

The "Soil Survey of Brevard County, Florida" published by the United States Department of Agriculture (USDA), Soil Conservation Service (SCS) was reviewed. The USDA soil survey indicates 11 primary mapping soil units are identified within the project vicinity and are presented on the following page in Table 2.2.2.

Table 2.2.2: Soil Survey Summary

Soil Series	Depth (Inches)	Soil Description	AASHTO Classification	USDA SHGWT* (inches)	Risk of Corrosion	
					Uncoated Steel	Concrete
Basinger (Ba)	0-80	Sand	A-3	0-10	High	Moderate
Copeland (Cp)	0-15	Loamy fine sand	A-3	0-10	High	Low
	15-22	Sandy clay loam, sandy loam	A-2			
	22-30	Marl	--			
Chobee (Ch)	0-14	Sandy loam	A-2	0-10	Moderate	Low
	14-38	Sandy clay loam, sandy loam	A-2, A-6			
	38-63	Sandy clay loam, sandy loam, loamy sand	A-2, A-6			
Eau Gallie (Eg)	0-22	Sand	A-3	0-10	High	High
	22-35	Sand	A-2, A-3			Moderate
	35-55	Sand	A-3			Moderate
	55-61	Sandy clay loam, sandy loam, fine sandy loam	A-2			Low
	61-84	Loamy sand, sandy loam, loamy fine sand, fine sandy loam,	A-2			Low

Felda (Fa)	0-30	Sand	A-3	0-10	High	Low
	30-49	Sandy loam, sandy clay loam	A-2			
	49-62	Sandy loam, loamy sand, sand	A-2			
Chobee part of Fo	0-14	Sandy loam	A-2	0-10	Moderate	Low
	14-38	Sandy clay loam, sandy loam	A-2, A-6			
	38-63	Sandy clay loam, sandy loam, loamy sand	A-2, A-6			
Felda part of Fo	0-30	Sand	A-3	0-10	High	Low
	30-49	Sandy loam, sandy clay loam	A-2			
	49-62	Sandy loam, loamy sand, sand	A-2			
Malabar (Ma)	0-45	Sand	A-3	0-10	High	Low
	45-61	Sandy loam, sandy clay loam	A-2, A-6			
	61-65	Sand	A-3, A-2			
Myakka (Mk)	0-22	Sand	A-3	0-10	High	High
	22-35	Sand	A-2, A-3			
	35-46	Sand	A-2, A-3			
	46-63	Sand	A-3			
Quartzipsamments, smoothed (Qr)	--	--	--	--	--	--
Tomoka (Tw)	0-27	Muck	A-8	0-10	High	Low
	27-35	Sand	A-3		Low	Low
	35-55	Sandy clay loam, sandy loam	A-2		Moderate	Low
Valkaria (Va)	0-15	Sand	A-3	0-10	High	Low
	15-80	Sand	A-3			

Winder (Wn)	0-12	Loamy sand	A-2	0-10	High	Low
	12-17	Sandy loam	A-2			
	17-31	Sandy clay loam	A-2, A-6			
	31-47	Sandy clay loam, sandy loam	A-2			
	47-65	Sandy clay loam, sandy loam	A-2			

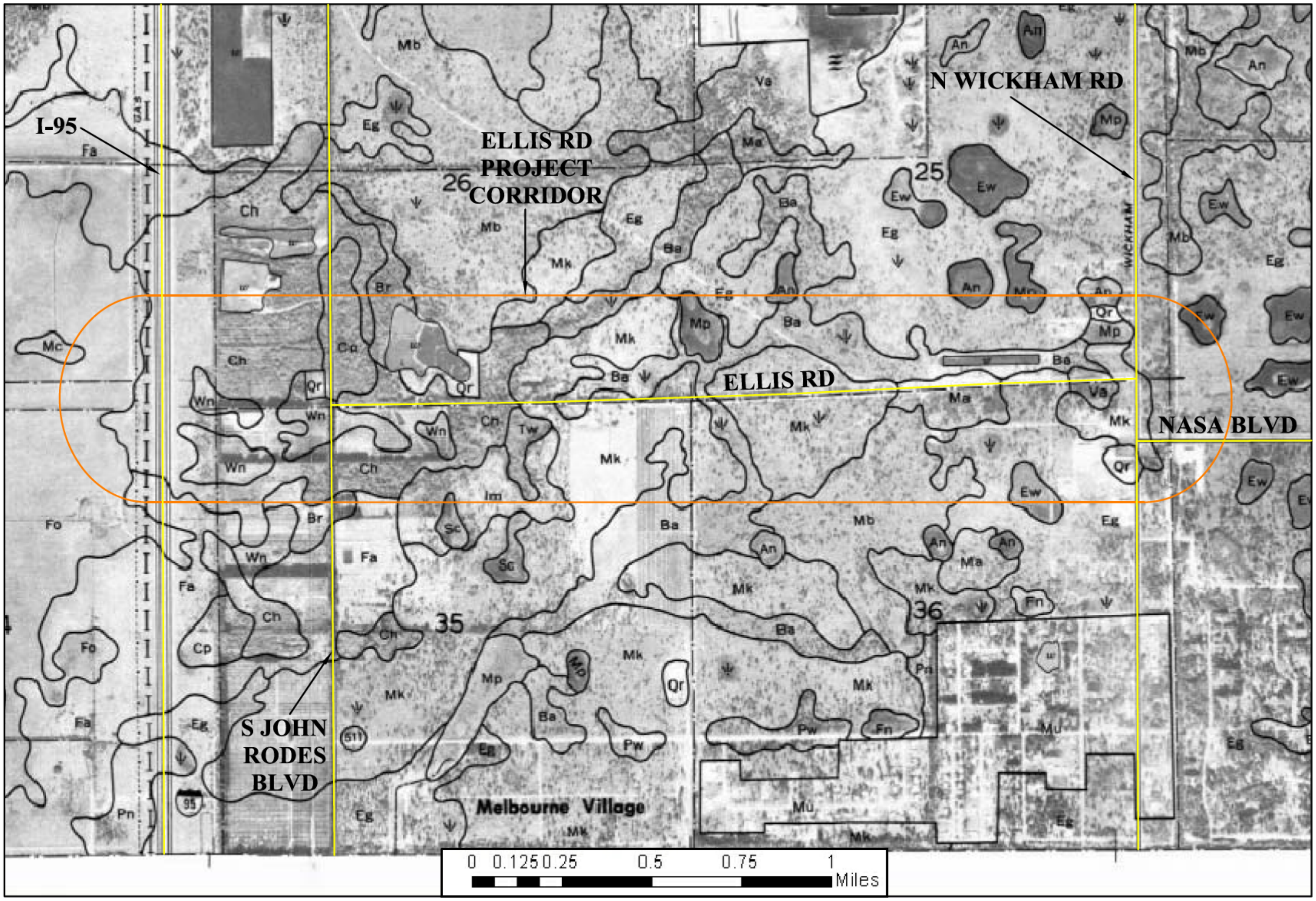
Note: Refer to Figure 2.2.7 for a reproduction of the Soil Conservation Service (SCS) map for the project

Information from the USDA Soil Survey is very general and may be outdated due to recent developments in the project site vicinity. Therefore, it may not reflect the actual soil and groundwater conditions, particularly where development has modified the natural soil conditions or surface and near surface drainage.

2.2.7.2 Hydrogeology

The geology of Brevard County is characterized by sedimentary strata. Groundwater in Brevard County occurs under artesian and non-artesian conditions. Non-artesian water (surface aquifer) occurs in the sediments of Pleistocene and Recent Age, whereas artesian water (Floridan Aquifer) is in the underlying limestone formations of Eocene Age.

The county is underlain by a series of limestone formations having a total thickness of several thousand feet. The upper several hundred feet of the limestone formations constitute the Floridan aquifer, which generally includes the Avon Park Limestone and the overlying Ocala Group of limestone formations, all of the Eocene age. The Floridan aquifer is one of the most productive aquifers in the world. The extremely high productivity of this aquifer is directly related to its numerous cavities and interconnected channels. The top of the artesian aquifer is approximately 75 feet below sea level in the northwestern corner of the county and more than 300 feet below sea level in the southeastern corner. In Brevard County, the direction of movement of the artesian water is generally northeastward, except under the barrier islands.



REFERENCE: United States Department of Agriculture (USDA)
Soil Conservation Service (SCS)

LEGEND:

Ba	Basinger	Eg	Eau Gallie	Ma	Malabar	Tw	Tomoka
Cp	Copeland	Fa	Felda	Mk	Myakka	Va	Valkaria
Ch	Chobee	Fo	Floridina, Chobee & Felda Soil	Qr	Quartzipsamments, smoothed		

ADAPTED FROM FIGURE 5 OF CSER

FDOT

I-95 AT ELLIS ROAD PD&E STUDY

PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

SOILS MAP

FIGURE NO.

2.2.7

Overlying the artesian aquifer are beds of sandy clay, shells and clay of the Hawthorn Formation of Early and Middle Miocene Age and deposits of Late Miocene or Pliocene Age. These beds serve to confine water under pressure in the underlying artesian aquifer. The confining beds are overlain by unconsolidated deposits of sand and sandy coquina of Pleistocene and Recent Age which completely cover all of Brevard County. The sediments of Pleistocene and Recent Age average approximately 50 feet in thickness in the coastal ridge area but are less than 20 feet thick in the vicinity of the St. Johns River. Non-artesian water saturates approximately 40 feet of these sediments in the coastal ridge area and the zone of saturation thins toward the St. Johns and Indian Rivers.

2.2.8 Intersections and Signalization

The following is a list of roads that intersect Ellis Road within the project study area:

Table 2.2.3: Existing Side Roads

Roadway Name	Number of Lanes	Roadway Width (ft)
John Rodes Blvd	3	33
Stan Dr	2	24
West Dr	2	52
East Dr	2	55
Greenboro Dr	3	38
Distribution Dr/Technology Dr	3/2	50/55
Distribution Dr	2	24
Technology Dr	2	34
Shinn Ave	2	29
Lake Ibis Dr	2	24
Wickham Rd	6	72

The Ellis Road intersections with Wickham Road and John Rodes Boulevard are signalized. The John Rodes Boulevard intersection signalization was completed in 2011.

2.2.9 Lighting

Except for isolated street lights on existing utility poles, there is currently no roadway lighting on Ellis Road.

2.2.10 Utilities

A Sunshine One Call was utilized to locate and identify utility companies and municipalities with facilities located along the study corridor. Each company or municipality identified was then contacted requesting specific information as to the nature of their facilities within the project limits. A request letter and project location map was transmitted to assist in the identification and documentation of facilities in the area and potential relocation costs. The following section discusses the facilities in the area, including the utility type, ownership, and approximate location of the existing utilities along the study corridor that have the potential to be impacted by the build alternatives.

Florida City Gas has a 4-inch polyethylene (PE) gas main located within the existing right-of-way along Ellis Road between 5 and 6 feet south of the existing edge of pavement, beginning at John Rodes Boulevard, continuing east and terminating at Technology Drive. The approximate depth of the gas main varies between 30 and 60 inches. The average per mile cost of relocating this utility is estimated at approximately $169,634 in 2011 dollars. This cost estimate also includes the removal of the existing 4-inch PE gas main. There currently no planned improvements for these facilities.

Florida Gas Transmission (FGT) has two easements west of I-95, outside the limited access right-of-way. The western-most easement is located 210' west of the limited access right-of-way and a contains a 26-inch steel pipeline. Immediately adjacent to the limited access right-of-way is a 30 foot north-south easement containing an 8-inch steel pipeline. Based on initial coordination with FGT during the St. Johns Heritage Parkway final design project (Brevard County), the relocation costs for these facilities may be cost prohibitive; therefore, relocation may not be reasonable or feasible at this time. There are no currently planned improvements for these facilities.

Florida Power & Light (FPL) has both overhead and underground facilities located on the north and south sides of the study corridor within the County's right-of-way. The overhead facilities are classified as distribution feeder poles and begin just west of John Rodes Boulevard and extend to Wickham Road. The height of these poles varies between 33 and 43 feet.

The underground facilities are primary conductor pad mounted transformer lines encased in polyvinyl chloride (PVC) piping. These facilities are located within existing County right-of-way and on private property (residences and businesses) and require a minimum depth of 36 inches. The cost for relocating these facilities is undetermined and involves significant effort to accurately estimate. These facilities are located south of the Lamplighter Mobile Home Park and again on the south side of Ellis Road beginning just west of West Drive. There are currently no planned improvements for these facilities.

Florida Power & Light (FPL) Fibernet has overhead fiber optic facilities located within a 110-foot and 100-foot easements adjacent to the western limited access right-of-way of I-95. The western-most 100-foot easement accommodates 7.6 kv distribution on single poles. The 110-foot easement, which is immediately adjacent to the limited access right-of-way, accommodates 240 kv transmission lines via dual poles. Overhead fiber optic facilities are also located at the southwest quadrant of John Rodes Boulevard and Ellis Road, continuing east along the south side of Ellis Road to a point opposite East Drive where the facilities travel underground into an FPL Service Center. These facilities are located underground from the FPL Service Center to a point on the south side of Ellis Road and just east of East Drive, and then cross Ellis Road aboveground and continue north along the east side of East Drive.

Additional facilities are located underground from the FPL Service Center to a point on the south side of Ellis Road just east of Greenboro Drive. The underground optic lines transition to overhead facilities and proceed along the north side of Ellis Road to the northeast corner of Lake Ibis Drive. At that point, the facilities turn south, cross Ellis Road and continue to the south side of Industrial Road, where it continues eastward and returns underground to Wickham Road. This underground segment then turns south along the west side of Wickham Road and crosses aboveground at Wickham Road to the east along the south side of NASA Boulevard.

The overhead fiber optics facilities vary in height throughout the corridor; the depths of the underground facilities vary between 36 and 48 inches. The approximate relocation cost of the facilities, including the costs to relocate the facilities within the transmission corridor along the west side of I-95, is estimated at $141,000 per mile in 2011 dollars. All facilities are located within existing County and FDOT right-of-way. There are currently no planned improvements for facilities in the area.

Level 3 Communications has fiber optic cables located on the south side of Ellis Road beginning at Wickham Road and continuing west to Lake Ibis Drive, at which point they cross to the north side of the corridor. These facilities then extend west to East Drive, where they travel north out of the study area. There are currently no planned improvements for these facilities and per mile relocation costs have not been made available. All facilities are located within County right-of-way.

The **City of Melbourne** has a 30-inch water main within the existing County right-of-way along the north side of Ellis Road beginning at Wickham Road, continuing west to a point just west of Technology Drive. The water main then travels in a northwesterly direction out of the Ellis Road Corridor. Additionally, a 20-inch water main is present within the existing right-of-way on the west side of John Rodes Boulevard. A 6-inch force main is located on the east side of John Rodes Boulevard. The approximate depth of the 30-inch water main and 6-inch force main vary between 3 and 5 feet.

Master meters are present in the following locations: southeast quadrant of Ellis Road and John Rodes Boulevard, northeast quadrant of Ellis Road and John Rodes Boulevard and north of Ellis Road on the west side of Lake Ibis Drive. There are currently no planned improvements for facilities in the area and relocation costs have not been made available.

Gas Meters at John Rodes Blvd.

Qwest Communications has a 2-inch high-density polyethylene (HDPE) fiber optic line located under Wickham Road beginning at NASA Boulevard, continuing north, and terminating in the area of Tropic Drive. These facilities are located within the existing County right-of-way and are approximately 6 to 12 feet in depth. The estimated per mile cost for relocation of these facilities will have to be estimated as the project moves into final design and more details are available. There are currently no planned improvements for these facilities.

AT&T has aerial and buried facilities on the north and south sides of Ellis Road from Wickham Road west to John Rodes Boulevard. These facilities consist of copper cables ranging in size from 50 to 1200 pair and various sizes of fiber cables. These copper cables range from 1-inch to 3.5-inch in diameter and range from approximately 24 to 36 inches in depth. There is also a duct run from Wickham Road extending west to Stan Drive that contains four to six, 4-inch ducts approximately 36 to 48 inches in depth. Fiber cables in this area range from 0.5 to 2 inches in diameter and are approximately 30 to 36 inches in depth. The estimated cost to replace these facilities if additional right-of-way is obtained will be in excess of $1.5 million dollars per mile. There are no immediate planned improvements for these facilities.

Traffic Control Devices' facilities are owned and operated by the FDOT and include traffic signals and signal controllers. An initial request for information was distributed in March 2011. There have been additional requests for information; however, no response or follow-up information has been received.

Bright House Networks has underground fiber optic and coaxial facilities along the west side John Rodes Boulevard within the existing right-of-way. These facilities cross John Rodes Boulevard and continue along the east side of John Rodes Boulevard and continue north out of the study area. Additionally, the underground facilities continue east on the south side of Ellis Road and are also located within existing right-of-way. A segment of these facilities cross underground just east of Stan Drive and then again just east of East Drive at which point they both become overhead facilities. The underground facilities continue northward and cross Ellis Road east and west of Greenboro Drive. These facilities continue on the north side of Ellis Road from Greenboro Drive to just west of Wickham

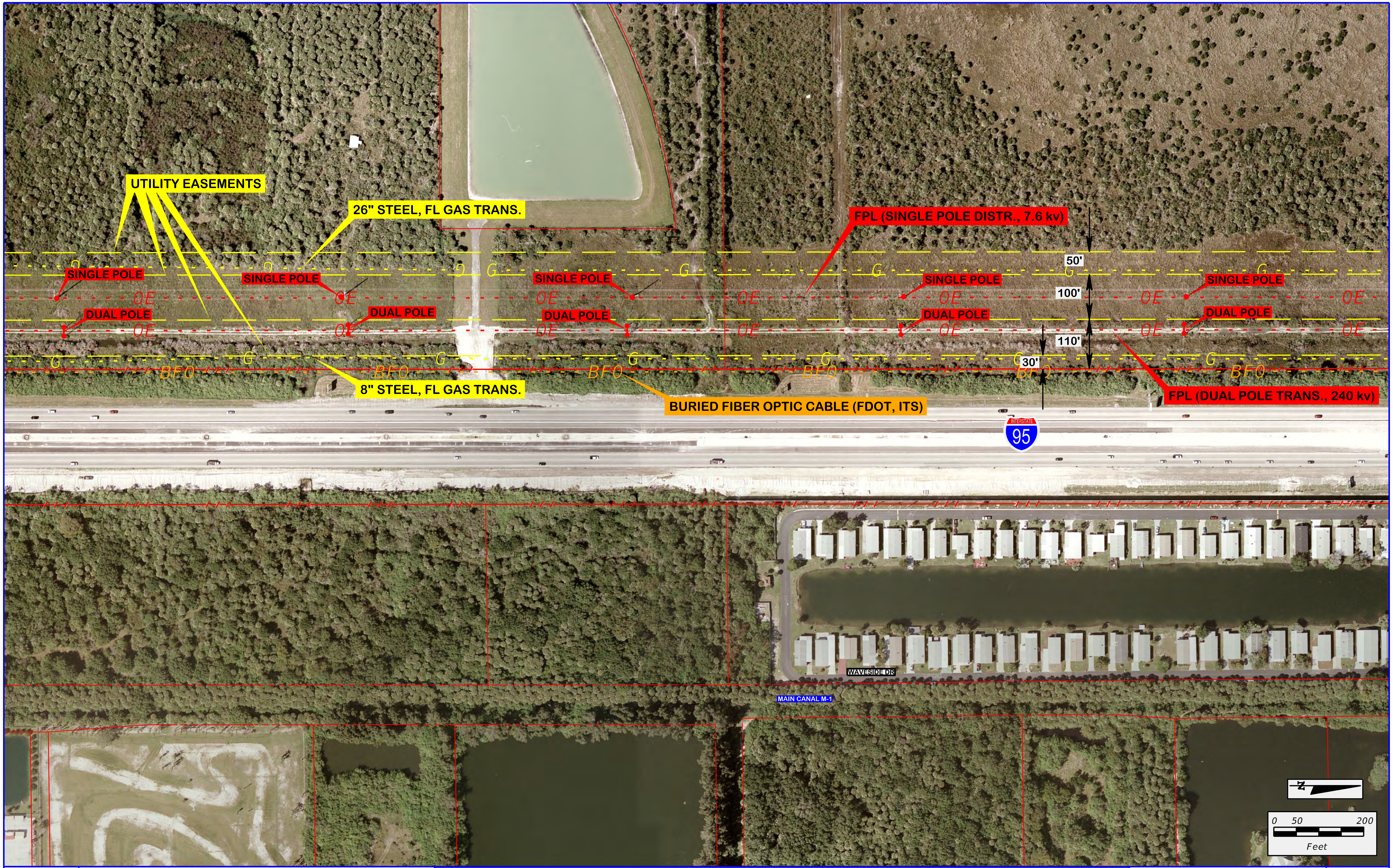
Road. The depth of these facilities varies between 30 and 36 inches and the approximate relocation costs are estimated at $38,000 per mile.

Overhead fiber optic and coaxial cables are also located within the existing right-of-way along various sections of the corridor beginning approximately 1000 feet east of John Rodes Boulevard. Additional facilities cross Ellis Road just west of Stan Drive and again just west of Greenboro Drive. The overhead lines continue on the north side of Ellis Road between Greenboro Drive and Technology Drive and on the south side of the road between Greenboro Drive and Technology Drive. These facilities are approximately 20 feet to 22 feet in height and the approximate relocation costs are estimated at $27,000 per mile. There are no immediate planned improvements for these facilities.

The City of West Melbourne has a master meter located in the southwest quadrant of the intersection at Ellis Road and John Rodes Boulevard. An 8-inch waterline extends from the master meter and crosses John Rodes Boulevard on the south side of Ellis Road and terminates in the vicinity of the United Service Source Corporation. An 8-inch waterline is also located along the north side of Ellis Road beginning at Technology Drive and extending to Wickham Road. This waterline crosses Ellis Road in the areas of Distribution Drive and Technology Drive. An additional master meter is located in the northeast quadrant of Ellis Road and Lake Ibis Drive.

Additionally, a 4-inch force main is located on the south side of Ellis Road beginning in the vicinity of the United Service Source Corporation and terminates at Greenboro Drive. There are currently no planned improvements or upgrades for facilities in the area and all utilities are located within existing County right-of-way. Per mile relocation costs have not been made available.

Figure 2.2.8 displays the existing utilities along the project corridor.



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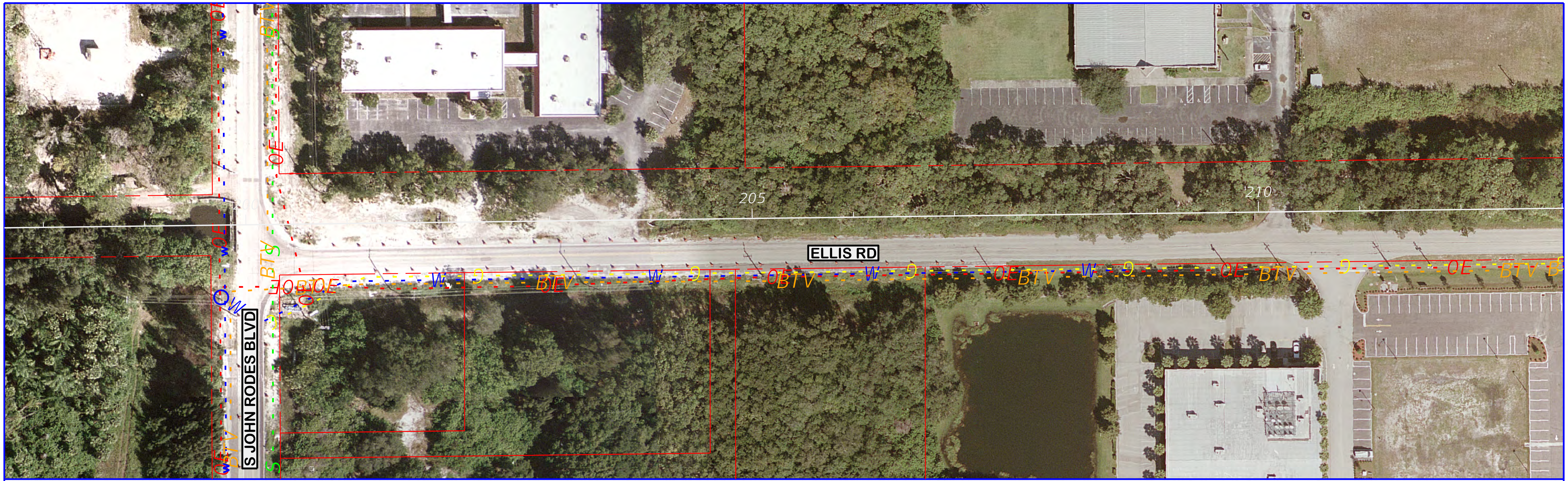
I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W	SANITARY	OVERHEAD ELECTRIC	
PROPERTY LINE	WATER	BURIED TV	
	BURIED FIBER OPTIC	OVERHEAD TV	
	GAS		

EXISTING UTILITIES

FIGURE NO. 2.2.8A



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I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W	SANITARY
PROPERTY LINE	WATER
	BURIED FIBER OPTIC
	GAS
	OVERHEAD ELECTRIC
	BURIED TV
	OVERHEAD TV

EXISTING UTILITIES

FIGURE NO. 2.2.8B

FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W	
PROPERTY LINE	
S	SANITARY
	WATER
BFO	BURIED FIBER OPTIC
G	GAS
	OVERHEAD ELECTRIC
BTV	BURIED TV
OTV	OVERHEAD TV

EXISTING UTILITIES

FIGURE NO. 2.2.8C

I-95 AT ELLIS ROAD PROJECT DEVELOPMENT AND ENVIRONMENT STUDY	EXISTING UTILITIES	FIGURE NO. 2.2.8D

EXISTING R/W
PROPERTY LINE
S SANITARY
WATER
BFO BURIED FIBER OPTIC
G GAS
OVERHEAD ELECTRIC
BTV BURIED TV
OTV OVERHEAD TV

2.2.11 Pavement Conditions

Ellis Road – The road was resurfaced in late 2010. Prior to the resurfacing, the road was showing signs of cracking and had been patched throughout the corridor. The existing pavement is not expected to be salvageable if Ellis Road is reconstructed.

I-95 – The interstate was widened in 2010, and the existing lanes were resurfaced. The widening placed ¾-inch friction course FC-5 (PG 76-22) on 3 inches of SP structural course (Traffic D) on 2 inches of SP structural course (Traffic D)(PG 76-22) over an optional base group 12.

2.3 Existing Environmental Conditions

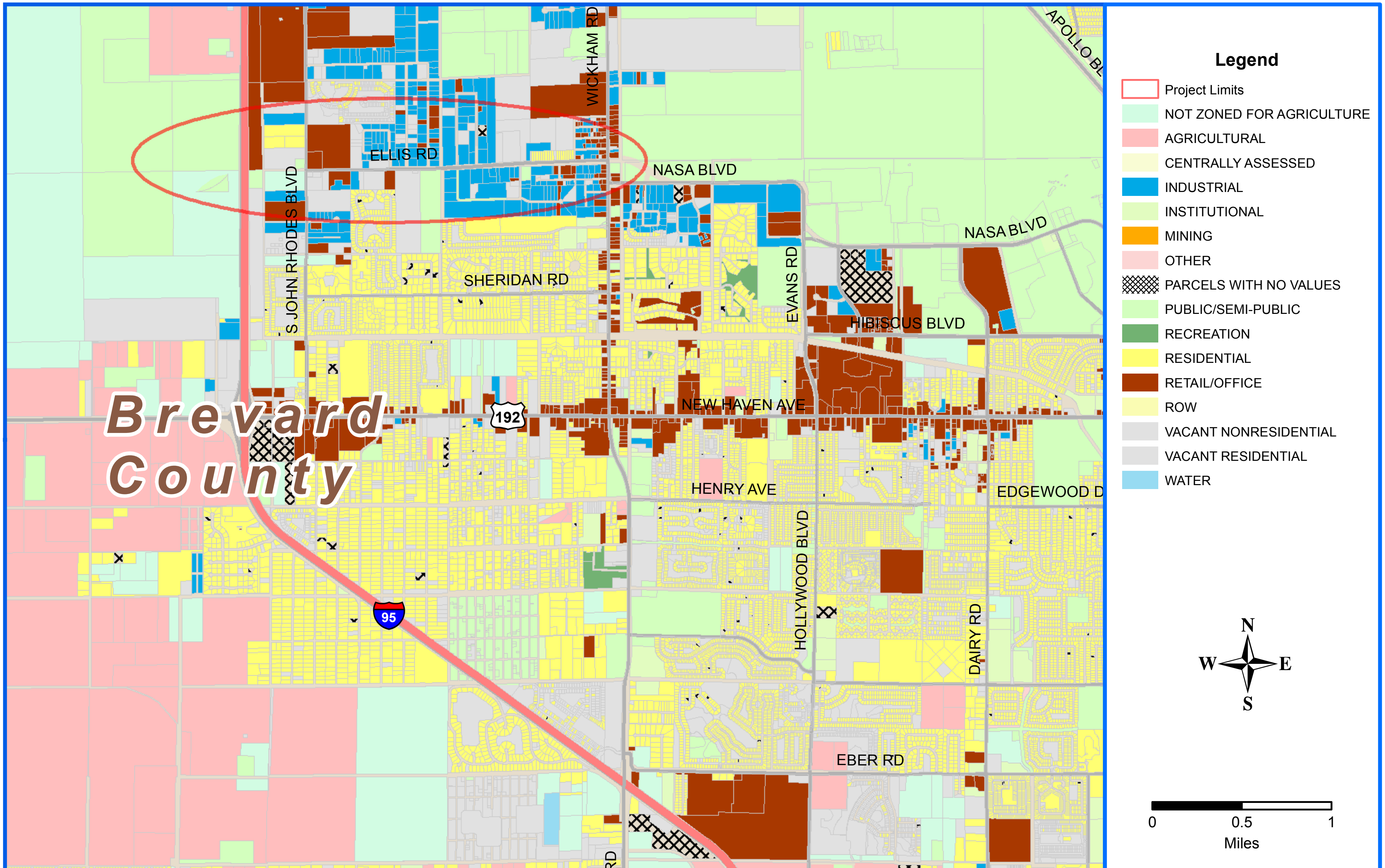
2.3.1 Land Use

West of the I-95 corridor, the existing land use is undeveloped, consisting of wetlands, vacant land, and wooded areas with a few unpaved access roads. Along the east side of I-95 and north of Ellis Road, one community, Lamplighter Village, is located. Beginning at the M-1 Canal and moving eastward to John Rodes Boulevard, the existing land use is undeveloped, consisting of wetlands, woodland, and an existing borrow pit. A tower on the northwest corner of Ellis Road and John Rodes Boulevard is utilized as an outer marker for the Melbourne International Airport. From John Rodes Boulevard to Wickham Road, the land use gradually changes from primarily undeveloped to completely developed. Along the north and south sides of Ellis Road, the land use is a mix of industrial and commercial zoning. Businesses along Ellis Road consist of commercial offices, warehouses, service centers, retail stores, and automobile repair facilities. A review of real estate records from the Brevard County Property Appraiser's Office found that Ellis Road has been historically used for industrial / commercial business. Nineteen residential lots are located on the north side of Ellis Road between Technology Drive and Lake Ibis Drive.

IRA Ellis Warehouses, a local business, is planning to develop the parcel on the southeast corner of Ellis Road and John Rodes Boulevard. Suncoast Roofer Supply has a plan to develop the parcel just to the south of IRA Ellis Warehouses with access to Ellis on the east side of IRA Ellis Warehouses. The airport has plans to construct a roadway connecting to

Ellis Road from the north across from Technology Drive (east). Left and right turn lanes have been added to existing Ellis Road for this connection.

Figure 2.3.1 displays the existing land use.



FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENTAL STUDY

EXISTING LAND USE

FIGURE NO.
2.3.1

2.3.2 Cultural Features and Community Services

Community Services

The northeast corner of Ellis Road and John Rodes Boulevard feature four interconnected buildings. The northern portion of the campus was previously advertised as Destiny Child Academy. A future charter school (Explorer Elementary and Middle Charter School) was also advertised for the southern portion of the campus. However, these buildings were vacant at the time of the Public Hearing in October 2012 and continue to be vacant as of September 2014. A telephone conversation with the property owner on September 10, 2014 confirmed that the proposed school never occupied the premises. There are no other significant community services within the project limits.

Parks and Recreation

Within the project limits, there are no public parks or recreation areas.

Cultural Resources

A Phase I Cultural Resource Assessment Survey (CRAS) was completed in May 2011. The purpose of the survey was to locate, identify, and delineate any cultural resources present within the Area of Potential Effect (APE) of the project corridor and evaluate their potential for listing in the National Register of Historic Places (NRHP). The APE was developed with the following characteristics:

- Consider visual, audible, and atmospheric effect that the project may have to historic properties;
- Include the existing and proposed right-of-way along the Ellis Road corridor, including the proposed interchange with I-95;
- Extend to the back or side of property lines of parcels adjacent to the corridor and interchange, limited to a distance of no more than 330 feet from the proposed right-of-way;
- The archaeological shovel testing was conducted within the existing and proposed right-of-way. The architectural survey included the entire APE.

A total of 31 shovel tests were excavated within the proposed and existing right-of-way. Numerous utilities are located along both sides of Ellis Road, leaving few undisturbed areas for testing, and shovel tests within the existing right-of-way were noted as heavily disturbed. Two shovel test locations were considered too disturbed by underground utilities to warrant excavation. Outside the existing right-of-way, the shovel tests appeared to be less disturbed, and in a few cases natural strata were observed.

The survey resulted in the identification of one new archaeological site located along the north side of Ellis Road, east of John Rodes Boulevard and west of Stan Drive. Laboratory analysis of the recovered glassware indicates that the bulk of the identifiable materials have manufacture dates beginning in the early part of the twentieth century to recent times. Also, aerial photography indicates that the area adjacent to the site, which contains Quartzipsamments soils, appears to have been utilized as a borrow pit at some time between 1951 and 1958. Thereafter, the borrow pit was likely utilized as a trash dump, and as the region became more developed, the refuse was burned. In the opinion of the Principal Investigator, this site is not eligible for listing in the NRHP.

Three historic resources were recorded within the APE. They were evaluated as to their potential for listing in the NRHP. The resources all lack the architectural distinction or significant historical associations necessary to be considered for listing in the NRHP and have been determined ineligible. No potential NRHP districts were located due to the lack of concentration of historic structures. No NRHP-listed or eligible resources were identified within the Ellis Road PD&E APE. No further work is recommended.

2.3.3 Natural and Biological Features

2.3.3.1 Wetlands

During the course of the PD&E Study, assessments of wetland and environmental resources within the project corridor have been conducted. The primary goal of these tasks was to determine the extent and characteristics of the wetlands located within the right-of-way. State and federal agencies may exert jurisdiction over all wetland areas occurring within the study area. In most cases, wetland impacts will require permits from both the St. Johns River Water Management District (SJRWMD) and the United States Army Corps of Engineers (USACE) and compensatory mitigation will be required. The *Wetland*

Evaluation and Biological Assessment Report (WEBAR) defines how the existing wetlands were identified and classified and contains a detailed description of each system.

A total of nineteen wetland systems have been identified, classified and characterized within the project corridor. The overall quality was assessed for those wetlands that could be potentially directly impacted by the project. Figure 2.3.2 shows the location of these systems within the project corridor. The majority of the wetland impacts will be caused by the proposed interchange. Surface waters (i.e., ditches and canals) will also be impacted by the proposed improvement and are shown in Figure 2.3.3.

In compliance with Presidential Executive Order 11990, consideration was given to the protection of wetland resources. However, given that the project has to occur adjacent to the existing right-of-way and the stormwater regulations must be met to receive state water quality certification, there may not be a viable option that would allow for the avoidance of the wetland systems. Best management practices will be used to reduce any secondary impacts to adjacent systems that fall outside of the project corridor. All mitigation for wetland impacts will be implemented by the SJRWMD through funding supplied by FDOT.

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I-95 AT ELLIS ROAD

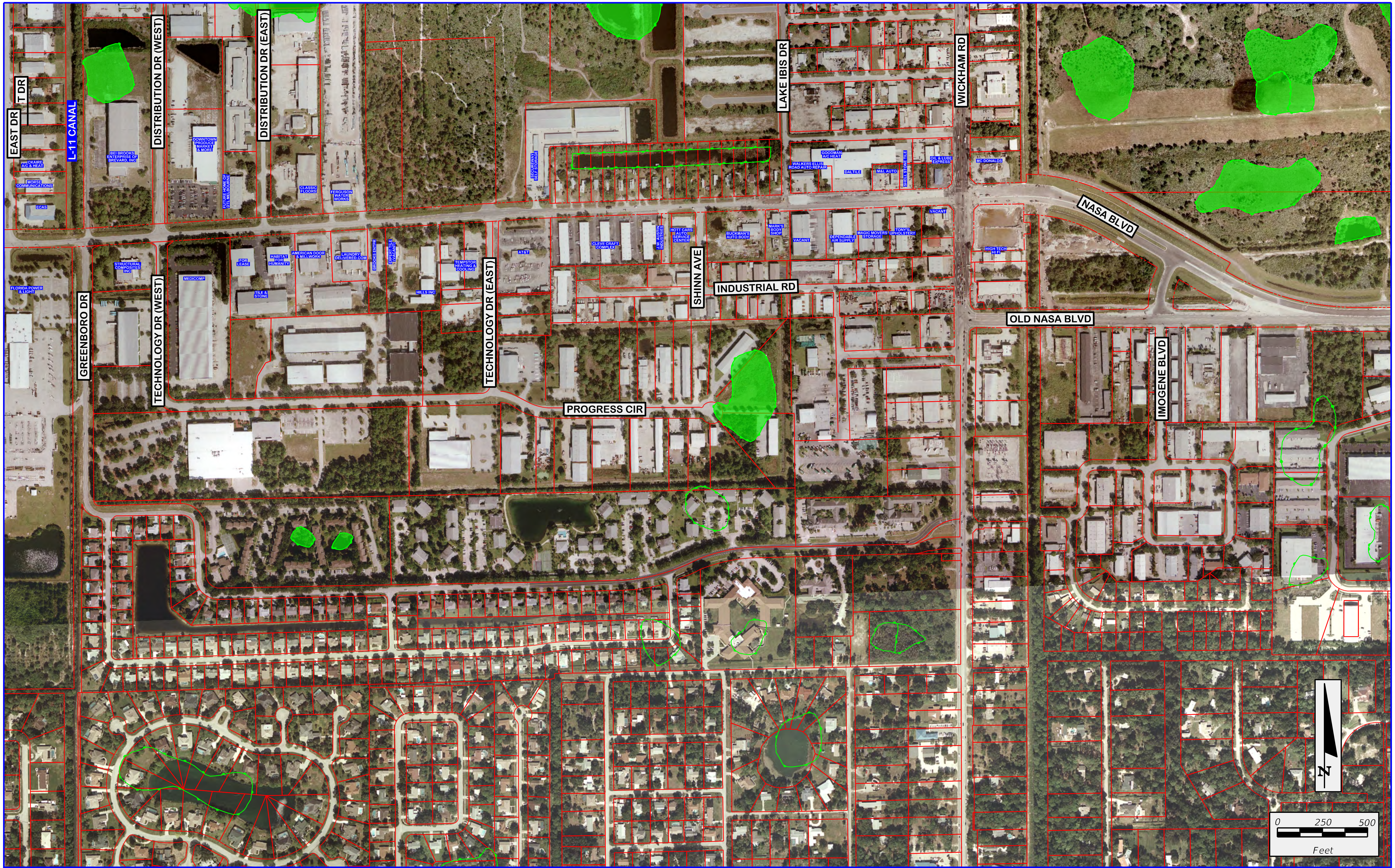
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

	EXISTING WETLANDS	EXISTING R/W	EXISTING EASEMENT
7 617/PF01C	WETLAND NO. FLUCFCS/NWI CODES	EXISTING L/A	PROPERTY LINE

EXISTING WETLANDS

FIGURE NO.

2.3.2A



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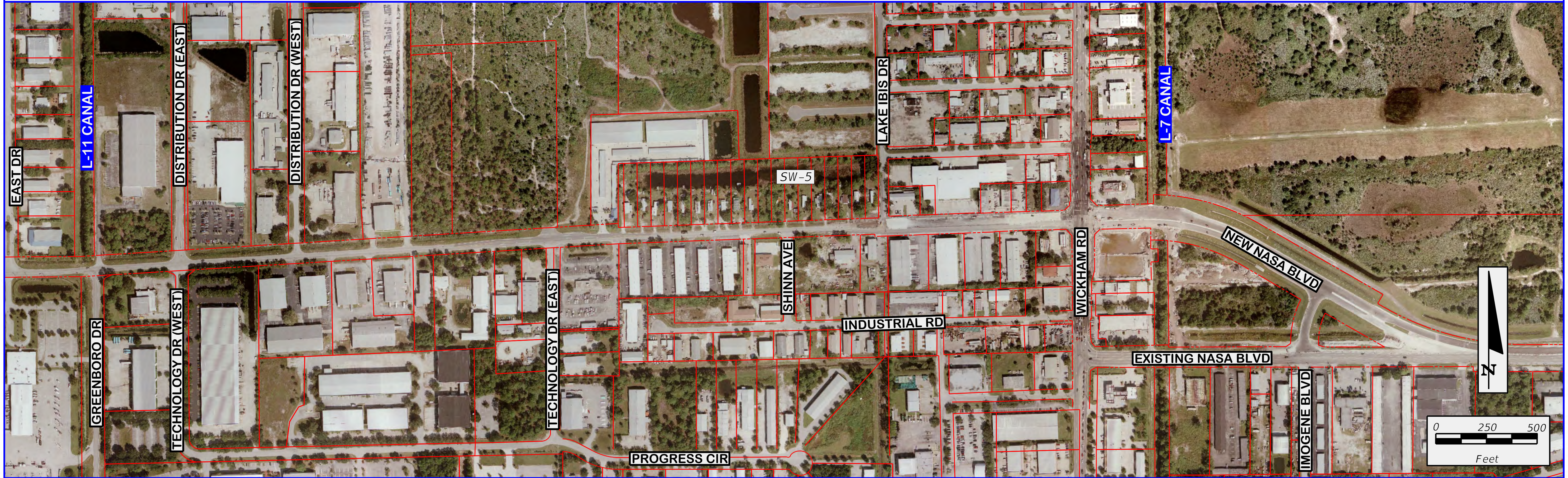
I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

	EXISTING WETLANDS		EXISTING R/W
7 617/PF01C	WETLAND NO. FLUCFCS/NWI CODES		EXISTING L/A
	EXISTING EASEMENT		PROPERTY LINE

EXISTING WETLANDS

FIGURE NO. 2.3.2B



FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

SW-5 EXISTING SURFACE WATERS

EXISTING R/W
EXISTING L/A
EXISTING EASEMENT
PROPERTY LINE

EXISTING SURFACE WATERS

FIGURE NO.
2.3.3

2.3.3.2 Listed Species

Threatened and endangered plant and animal species were examined in accordance with the Endangered Species Act of 1973, the Wildlife Code of the State of Florida, and the Florida Department of Transportation PD&E Manual. Databases from the US Fish and Wildlife Service (USFWS) and the Florida Fish and Wildlife Conservation Commission (FFWCC) were reviewed. Cursory surveys of the project corridor were conducted in August 2010 and April / May 2011. A detailed description of the research for this project and the potentially impacted species can be found in the WEBAR. This biological assessment examines species that are listed as endangered, threatened, candidate, proposed endangered, or proposed threatened by the USFWS and the National Marine Fisheries Service (NMFS). State listed species were also considered during this process and will be an integral part of the final permitting process.

The project area is not located within any area designated as Critical Habitat by USFWS. No endangered or threatened plant species listed by both USFWS and the Florida Department of Agriculture & Consumer Services (FDACS) are known to occur at the project area or were observed during the site surveys. A detailed discussion of listed species and their likelihood of occurrence are contained in Section 6.3.6 and Table 6.3.2.

Special Designations

There is a regulatory conservation easement located west of the existing utility easements in the northwest quadrant of the proposed interchange. These parcels are owned by Brevard County and are encumbered by a conservation easement through the Florida Department of Environmental Protection (FDEP) as mitigation for a county solid waste project that obtained an Environmental Resource Permit (ERP). Because the conservation easement for these parcels was part of an ERP through the FDEP, any possible modification of this conservation easement must be coordinated through the FDEP. Figure 2.3.2 displays the conservation easement.

3.0 Traffic Analysis

A traffic technical memorandum entitled the *Ellis Road Final Design Traffic Technical Memorandum* (DTTM) was prepared in 2011 as part of this study. This document provides existing and future traffic volumes on Ellis Road between I-95 and Wickham Road. The 2011 DTTM includes existing and future design traffic volumes and an evaluation of the operational conditions of the corridor. Sections 3.1 to 3.5 describe the methodology and results from the 2011 DTTM. In 2014, an updated DTTM was prepared to address concerns regarding the age of the 2011 analysis. The 2014 DTTM is summarized in Section 3.6 and provides updated traffic data and conclusions.

The methodology utilized in the preparation of the 2011 DTTM is based on FDOT Design Traffic Procedure Topic No. 525-030-120-f and includes the following topics:

1. Collect available traffic count information, previous studies, traffic characteristics, and other available data;
2. Based on historic data and information for future development within the project area, estimate future design characteristics for the corridor. This task includes Design Hour Demand (K_{30}), Design Hour Directional Demand (D_{30}), and percentage of trucks for both the design hour and daily demand (T_{24}, T_f);
3. Develop future year traffic volume forecasts for the No Build and Build conditions for the corridor based on trends analysis of historical traffic counts and the adopted Central Florida Regional Planning Model (CFRPM IV) Model, Version 4.5;
4. Provide level of service analysis for the corridor and intersections for existing and future (No Build and Build) conditions; and,
5. Based on the level of service analysis, provide recommendations to accommodate the anticipated travel demand within the corridor.

3.1 Traffic Study Methodology

Ellis Road is an east-west 2-lane undivided, urban, minor arterial with a posted speed limit of 35 mph. Ellis Road serves mainly commercial and industrial developments along its length and carries AADT ranging from 5,900 to 9,800 vehicles. The project's area of influence includes the full length of Ellis Road from John Rodes Boulevard to Wickham Road as well as a future interchange at I-95. This new interchange will be located west of John Rodes Boulevard and is proposed to be partial-cloverleaf with a loop in the southeast quadrant. This interchange will have two signalized ramp terminal intersections. The proposed interchange configuration is explained in more detail in Chapter 4. The roadway elements analyzed as part of this study are summarized below:

- I-95 mainline through movements; and,
- Ramp merge and diverge junctions.
- Arterials
  - Ellis Road.
- Intersections
  - Ellis Road @
    - St Johns Heritage Parkway (future years only);
    - I-95 Northbound Off/On Ramps (future years only);
    - I-95 Southbound Off/On Ramps(future years only);
    - John Rodes Boulevard;
    - Stan Drive;
    - West Drive;
    - East Drive;
    - Greenboro Drive;
    - Distribution Drive West;
    - Distribution Drive East;
    - Technology Drive;
    - Shinn Avenue;
    - Lake Ibis Drive; and,
    - Wickham Road.

In analyzing the existing conditions of the roadway system and intersections, the following procedure was utilized:

1. Field traffic counts provided the source of existing traffic for this study area. Forty-eight hour bi-directional machine counts were collected at four locations on Ellis Road and one location on I-95 in July 2010. Two-hour AM and PM peak-period turning movement counts were collected at 11 intersections on Ellis Road in August of 2010. The counts, tabulated in 15-minute increments, were used to determine the AM and PM peak hour traffic volumes along Ellis Road. The Existing Year 2010 peak hours were found to be 7:15-8:15 AM and 4:30-5:30 PM.

Table 3.1.1: Existing Year 2010 Data Collection Summary

Count Location	Date	Count Type
I-95 btw US 192 and Eau Gallie	July 13-14, 2010	48-Hour Machine Count
Ellis Road w/o Greenboro Drive	July 13-14, 2010	48-Hour Machine Count
Ellis Road e/o Greenboro Drive	July 13-14, 2010	48-Hour Machine Count
Ellis Road e/o John Rodes Blvd	July 13-14, 2010	48-Hour Machine Classification Count
Ellis Road w/o Wickham Rd	July 13-14, 2010	48-Hour Machine Classification Count
Ellis Rd @ Wickham Rd	August 3, 2010	Peak Period Turning Movement Counts
Ellis Rd @ Lake Ibis Dr	August 3, 2010	Peak Period Turning Movement Counts
Ellis Rd @ Shinn Ave	August 3, 2010	Peak Period Turning Movement Counts
Ellis Rd @ Technology Dr	August 4, 2010	Peak Period Turning Movement Counts
Ellis Rd @ Distribution Dr East	August 4, 2010	Peak Period Turning Movement Counts
Ellis Rd @ Distribution Dr West	August 4, 2010	Peak Period Turning Movement Counts
Ellis Rd @ Greenboro Dr	August 4, 2010	Peak Period Turning Movement Counts
Ellis Rd @ East Dr	August 5, 2010	Peak Period Turning Movement Counts
Ellis Rd @ West Dr	August 5, 2010	Peak Period Turning Movement Counts
Ellis Rd @ Stan Dr	August 5, 2010	Peak Period Turning Movement Counts
Ellis Rd @ John Rodes Blvd	August 5, 2010	Peak Period Turning Movement Counts

2. The 48-hour machine counts were converted to AADT by applying a seasonal factor of 1.02 in accordance with FDOT standards. Information from Florida Traffic Online, a website service provided by FDOT Transportation Statistics Office, was used to check the reasonableness of the existing traffic counts;

3. The existing traffic counts were used to determine the K, D, T, and Peak Hour Factors (PHF). The following is a description of each factor:
   a. K_{30} Factor – The proportion of AADT occurring during the 30^{th} highest hour of the design year;
   b. D_{30} Factor – The proportion of traffic in the 30^{th} highest hour of the design year traveling in the peak direction;
   c. T_{24} Factor – The percentage of truck traffic over 24 hours;
   d. T_f Factor – The percentage of truck traffic during the peak hour. Estimated as half of the T_{24} Factor;
   e. Peak Hour Factor (PHF) – A measure of the traffic volume fluctuation within the peak hour. The hourly volume during the maximum hour of the day divided by the peak 15-minute rate of flow within the peak hour multiplied by four. The closer the PHF is to 1.0, the more even the flow of traffic in the peak hour; and,
   f. The application of the K_{30} and D_{30} factors to the AADT volume produces the Directional Design Hourly Volume (DDHV). The value represents the hourly volume for which a roadway should be designed. Refer to the 2011 DTTM for details on how these values were established. The following values are recommended.

Table 3.1.2: Summary of Traffic Factors

Facility	K_{30}	D_{30}	MOCF	T_f	PHF
I-95	10.00	56.00	0.95	9.00	0.95
Ellis Road	10.30	56.00	0.91	4.00	0.95
Other Arterials	10.30	56.00	0.91	4.00	0.95

4. Once the existing traffic counts and K, D, T, and PHF values were determined, future traffic forecasts were developed based on procedures in the FDOT *Project Traffic Forecasting Handbook*. The process consists of using the approved regional demand model for developing daily forecasts and using approved traffic factors to convert daily volumes into design hour volumes. The approved travel demand model for this study is Central Florida Regional Planning Model (CFRPM) version 4.5,

which has a base year of 2009 and cost feasible year of 2035. Detailed information about the model and the validation of traffic volumes can be obtained from Chapter 5 of the 2011 DTTM;

5. The development of traffic for this study followed procedures consistent with the process defined in the 2002 FDOT *Project Traffic Forecasting Handbook.* The volume projections from CFRPM models were converted from Peak Season Weekday Average Daily Traffic (PSWADT) to AADTs using the Model Output Conversion Factor (MOCF). The MOCF based the Florida Traffic Online Resource for I-95 is 0.95 and 0.91 for the rest of the study area;

   The following periods are used for project traffic forecasts:
   - Opening Year – 2014;
   - Mid-Design Year – 2024; and,
   - Design Year – 2034.

6. The AADTs were converted to DDHVs through the application of the K_{30} and D_{30} factors. These DDHVs for the build alternatives were manually reassigned where necessary based on the proposed access management configuration;

7. Levels of Service (LOS) were determined for mainline I-95, ramps, Ellis Road, and Ellis Road intersections. FDOT maintains minimum acceptable operating LOS standards for the State Highway System as well as the Florida Intrastate Highway System (FIHS). The term "level of service" (LOS) is defined as the system of six designated ranges from "A" (best) to "F" (worst) used to evaluate roadway facility performance. Highway Capacity Manual (HCM) 2000 methodologies were used for the operational analysis of individual roadway elements, i.e., mainline segments, ramp junctions, and study intersections. The operational analysis of the mainline segments and ramp junctions was completed using Highway Capacity Software (HCS+) version 5.5. The operational analysis for the study intersections and link-level arterial analysis was completed using Synchro 7.0. The Synchro intersection analysis results documented in this study follow the HCM methodologies.

The acceptable LOS standard for major roadways is outlined below:

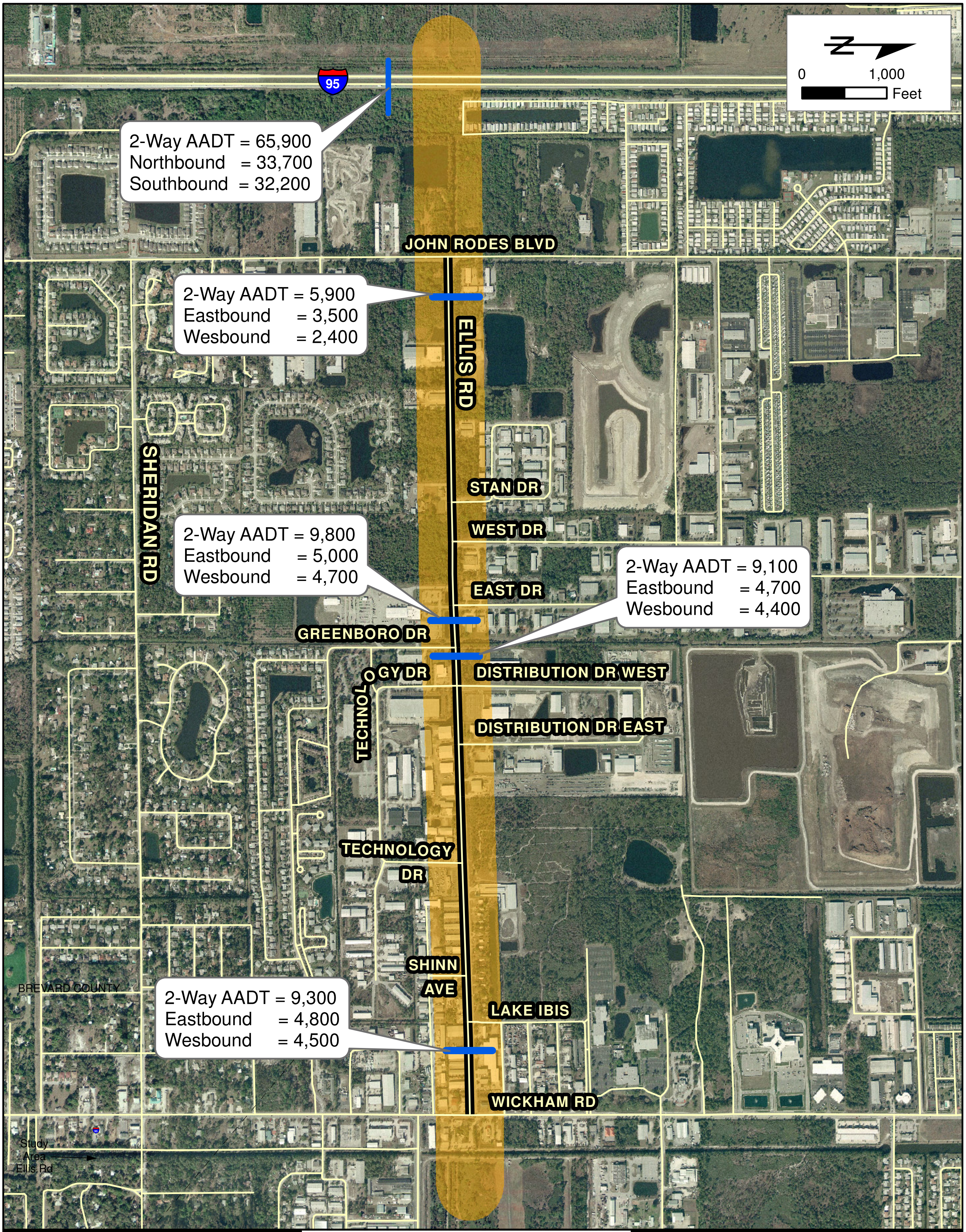
- I-95 Mainline and Ramps: LOS C;
- Ellis Road: LOS D; and,
- Study Intersections: LOS D.

3.2 Existing Operating Conditions

Based on the procedure described in Section 3.1, the following 2010 AADTs were computed as shown in Table 3.2.1 and Figure 3.2.1. Figure 3.2.2 shows the Existing Year 2010 AM and PM peak hour turning movement volumes and LOS used in this study. Figure 3.2.3 displays the existing lane configuration.

Table 3.2.1: 2010 Traffic Counts

Roadway	Count Location	AADT
I-95	Between US 192 and Eau Gallie Boulevard	65,900
Ellis Road	East of John Rodes Boulevard	5,900
	West of Greenboro Drive	9,800
	East of Greenboro Drive	9,100
	West of Wickham Road	9,300



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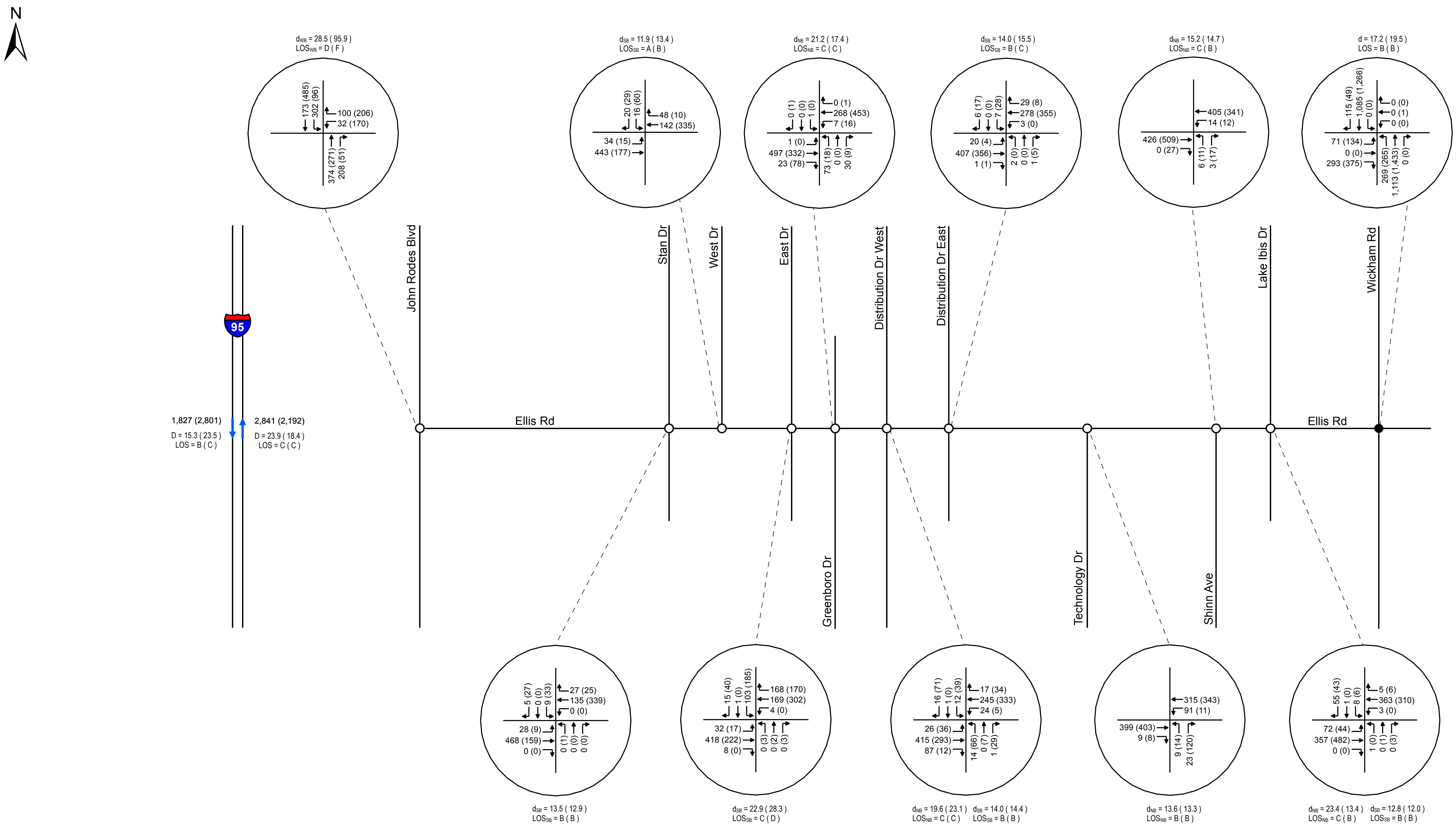
ELLIS ROAD PD&E STUDY

Legend
- Study Area
- Count Location

Existing Year 2010 Annual Average Daily Traffic (AADT)

Figure 3.2.1



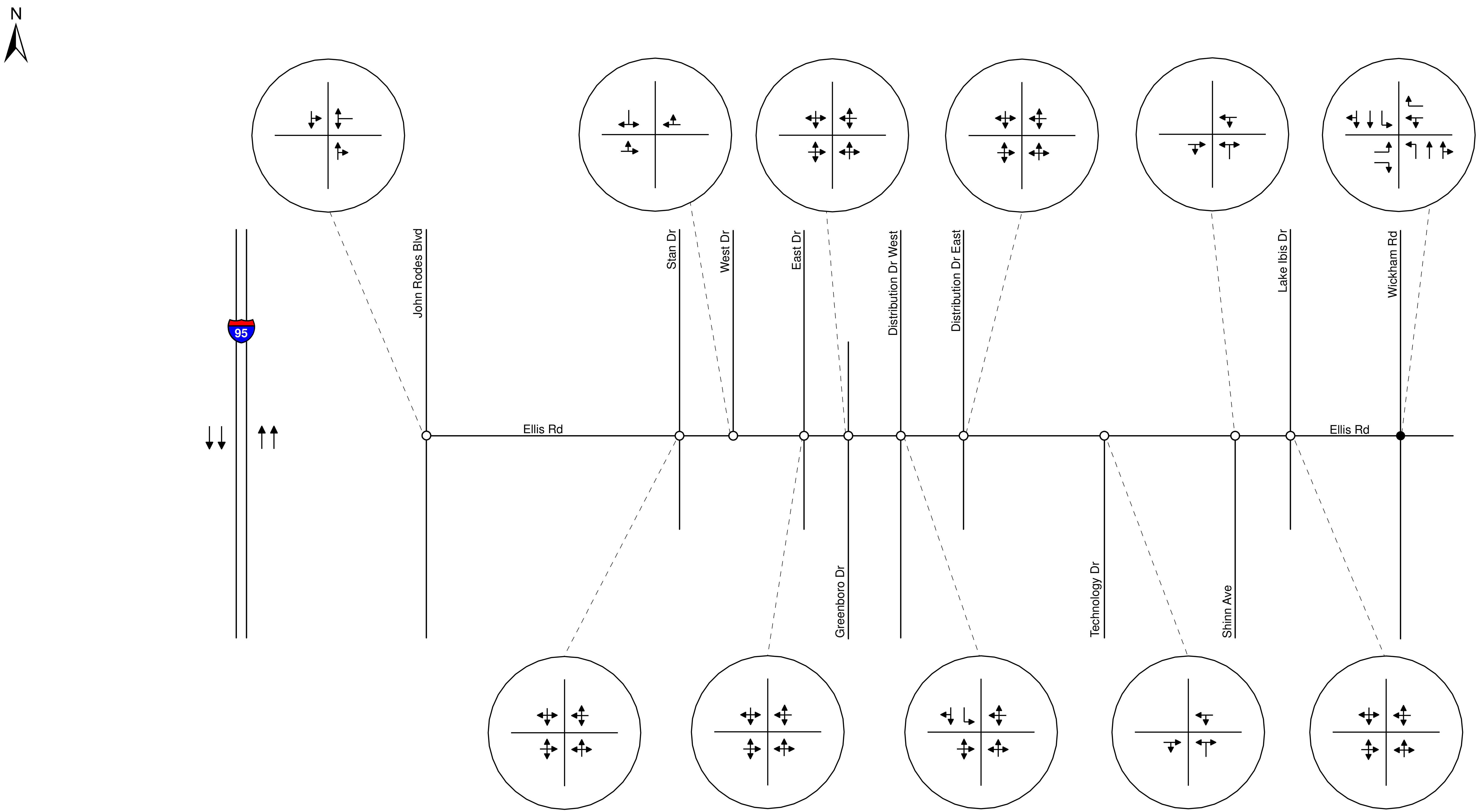
ELLIS ROAD PD & E STUDY

Legend

XXX (XXX)	AM (PM) Peak Hour Volume
D	AM (PM) Density pc/mi/ln
d	AM (PM) Control Delay sec/veh
LOS	AM (PM) Level of Service
●/○	Signalized/Unsignalized Intersection

Existing Year 2010
Peak Hour Volumes and Level of Service

Figure 3.2.2



ELLIS ROAD
PD&E STUDY

Legend

●/○ Signalized/Unsignalized Intersection

← Lane Configuration

Existing Year 2010 Intersection Lane Configuration

Figure 3.2.3

Mainline (I-95) Analysis

The results of the Existing Year 2010 mainline analysis are summarized in Table 3.2.2. In the existing conditions, the mainline segment on I-95 between US 192 and Eau Gallie Boulevard operates at acceptable LOS C or better in both the AM and PM peak hours.

Table 3.2.2: Existing Year 2010 Mainline Analysis Summary

Freeway Segment	Direction	# of Lanes	AM Peak			PM Peak		
			Volume	Density	LOS	Volume	Density	LOS
I-95 (US 192 - Eau Gallie Blvd)	NB	2	2,841	23.9	C	2,192	18.4	C
	SB	2	1,827	15.3	B	2.801	23.5	C

Intersection Analysis

The Existing Year 2010 intersection analysis is summarized in Table 3.2.3 below. In 2010, all study intersections operate at acceptable LOS with the exception of the intersection of Ellis Road at John Rodes Boulevard, which operates at LOS F in the PM peak hour for the WB approach.

Table 3.2.3: Existing Year 2010 Intersection Analysis Summary

Intersection – Ellis Rd @	Control Type[1]	Approach	AM Peak		PM Peak	
			Delay[2]	LOS	Delay[2]	LOS
John Rodes Blvd[3]	U	WB	28.5	D	**95.9**	**F**
Stan Dr	U	NB	0.0	A	14.0	B
		SB	13.5	B	12.9	B
West Dr	U	SB	11.9	A	13.4	B
East Dr	U	NB	0.0	A	13.9	B
		SB	22.9	C	28.3	D
Greenboro Dr	U	NB	21.2	C	17.4	C
		SB	19.2	C	11.2	B
Distribution Dr West	U	NB	19.6	C	23.1	C
		SB	14.0	B	14.4	B
Distribution Dr East	U	NB	15.1	C	10.4	B
		SB	14.0	B	15.5	C
Technology Dr	U	NB	13.6	B	13.3	B
Shinn Ave	U	NB	15.2	C	14.7	B
Lake Ibis Dr	U	NB	23.4	C	13.4	B
		SB	12.8	B	12.0	B
Wickham Rd	S	ALL	17.2	B	19.5	B

1. U = Unsignalized, S = Signalized
2. Delay reported in seconds per vehicle (s/veh) and represents control delay

3. At the time the *Final Ellis Road Technical Traffic Memorandum* was prepared, Johns Rodes Boulevard was an unsignalized intersection and modeled as such.

3.3 Future Traffic Volumes

In the 2011 DTTM, project traffic volumes were developed for the No Build alternative and three Build alternatives. The following is a description of the alternatives analyzed in the Technical Traffic Memorandum. The names of these alternatives apply to the Technical Traffic Memorandum and do not coincide with specific alignment alternatives described in the alternatives analysis (Chapter 4) of this PDSR.

3.3.1 No Build Alternative

The No-Build Alternative assumed the existing lane configuration on the study roadways plus the committed roadway improvements within the study area, including the proposed St. Johns Heritage Parkway and its connection to existing Ellis Road. This alternative maintains the full-access characteristics of the existing conditions. A signal at John Rodes Boulevard was included the modeling for the interim year 2024 and the design year 2034. The No-Build Alternative does not include the construction of the interchange at I-95 / Ellis Road or the widening of Ellis Road from two to four lanes.

No-Build Mainline (I-95) Analysis

Future failing levels of service at the adjacent interchanges with US 192 and Eau Gallie Boulevard are a primary reason for the study of a new interchange with Ellis Road. The No-Build interstate analysis is summarized in Table 3.3.1. In the Opening Year 2014 and Interim Year 2024, the mainline interstate segment between US 192 and Eau Gallie Boulevard is expected to operate below the LOS standard of C in the northbound direction in the AM peak and in the southbound direction in the PM peak.

In the Design Year 2034, the mainline interstate segment between US 192 and Eau Gallie Boulevard are expected to operate below the LOS standard of C in both the AM and PM peak hours.

Table 3.3.1: No-Build Mainline (I-95) Analysis Summary

Freeway Segment	Direct-ion	No. of Lanes	2014			2024			2034		
			Volume AM (PM)	Density[1] AM (PM)	LOS AM (PM)	Volume AM (PM)	Density[1] AM (PM)	LOS AM (PM)	Volume AM (PM)	Density[1] AM (PM)	LOS AM (PM)
I-95 (US 192 - Eau Gallie Blvd)	NB	3	4,900 (3,910)	27.4 (21.4)	D (C)	5,760 (4,600)	34.9 (25.4)	D (C)	6,000 (4,790)	37.8 (26.6)	E (D)
	SB	3	3,910 (4,900)	21.4 (27.4)	C (D)	4,600 (5,760)	25.4 (34.9)	C (D)	4,790 (6,000)	26.6 (37.8)	D (E)

1. Density = passenger cars per mile per lane (pc/mi/ln)

No-Build Arterial Analysis

The No-Build Alternative assumes the existing plus committed roadway network. No interim improvements such as new signals or turn lane improvements were considered in the No-Build analysis. The driving force for all improvements on Ellis Road is the proposed new interchange and a new SIS connector between I-95 and Melbourne International Airport. Without the interchange, Ellis Road is assumed to remain a minor arterial serving only the residential and commercial properties directly adjacent to the corridor. The analysis years considered under the No-Build Alternative are Opening Year 2014, Interim Year 2024, and Design Year 2034.

The No-Build arterial analysis is summarized in Table 3.3.2. The Opening Year 2014 Arterial Analysis was conducted using the HCS+ Two-Lane Highway Module. To use the two-lane highway methodology assumptions were made regarding free flow speed and two-way traffic volumes. A measured free flow speed of 35 mph (the posted speed limit) and the two-way link volumes between Lake Ibis Drive and Wickham Road were used in the analysis to estimate the facility LOS for 2014. Using the assumed values, Ellis Road is expected to operate at LOS C in both the AM and PM peak hours in 2014.

Interim Year and Design Year arterial analyses were conducted using Synchro 7.0. In the Design Year 2034, Ellis Road is expected to operate at LOS B in both the AM and PM peak hours in the eastbound direction and LOS F in both the AM and PM peak hours in the westbound direction.

Table 3.3.2: No-Build Arterial Analysis Summary

Ellis Road		Direction	2014[1]		2024		2034	
From	To		Speed AM (PM)	LOS AM (PM)	Speed AM (PM)	LOS AM (PM)	Speed AM (PM)	LOS AM (PM)
John Rodes Blvd	Wickham Rd	Eastbound	26.1 (25.8)	C (C)	23.7 (24.2)	C (B)	24.5 (25.4)	B (B)
Wickham Rd	John Rodes Blvd	Westbound			19.5 (21.1)	C (C)	6.6 (6.9)	F (F)

1. Arterial Analysis for 2014 No-Build was conducted using HCS+ Two-Lane Highway Module

No-Build Intersection Analysis

In the Opening Year 2014, John Rodes Boulevard, East Drive, Greenboro Drive, and Distribution Drive West are expected to operate below the LOS standard of D in one or both peak periods. The remaining study intersections are expected to operate at acceptable LOS in 2014.

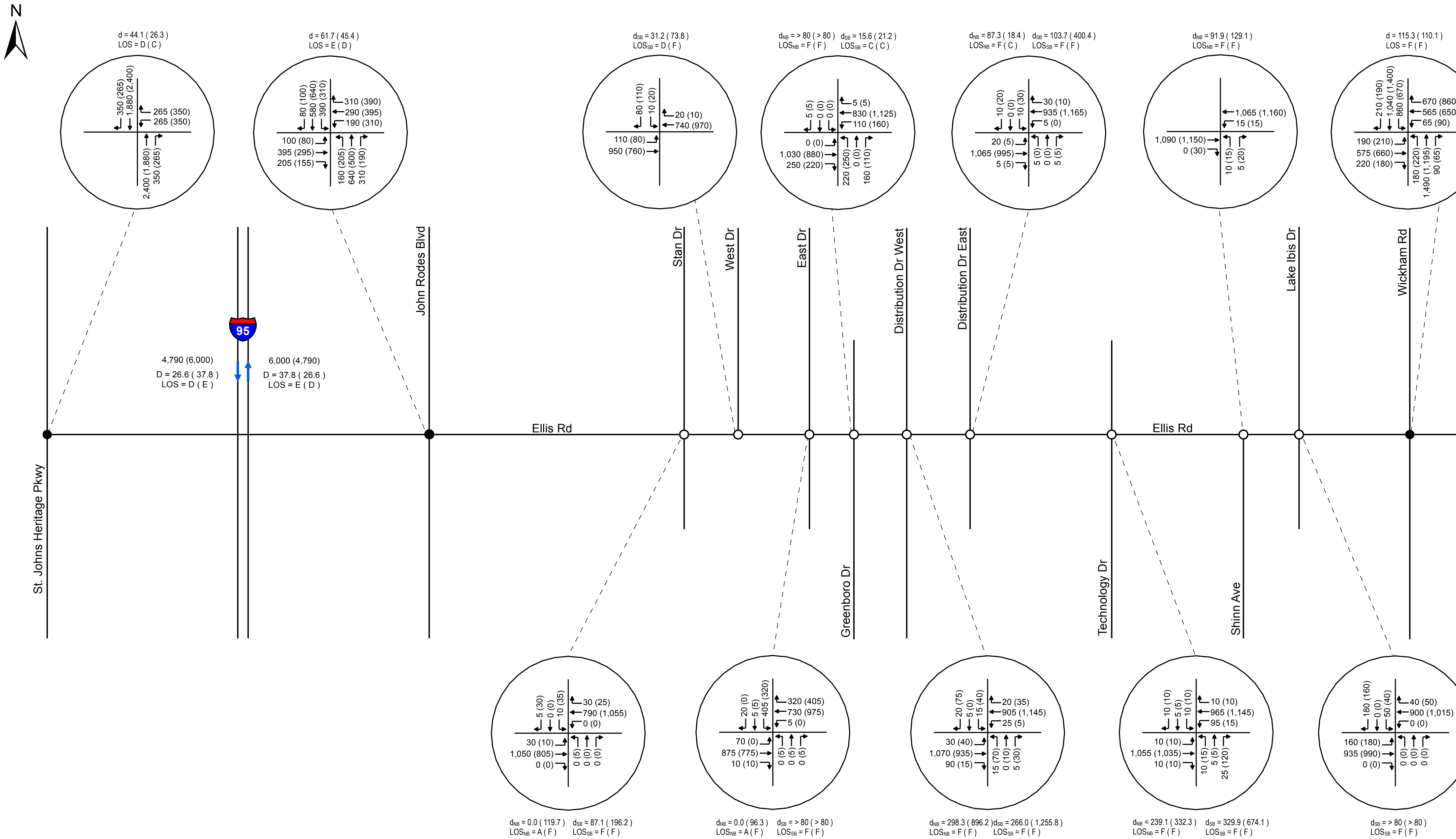
In Design Year 2034, all study intersections operate at unacceptable LOS in one or both peak periods. No-Build Alternative volumes and LOS results are illustrated in Table 3.3.3.

Table 3.3.3: No-Build Intersection Analysis Summary

Intersection Ellis Road @	Control Type 2014/ 2024/ 2034	Approach	2014				2024				2034			
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
			Delay [1]	LOS	Delay [1]	LOS	Delay [1]	LOS	Delay [1]	LOS	Delay [1]	LOS	Delay [1]	LOS
St. Johns Heritage Pkwy	NA/NA/S	All	NA	NA	NA	NA	NA	NA	NA	NA	44.1	D	26.3	C
John Rodes Blvd	U/S/S	WB	17.2	C	59.4	F	26.7	C	29.3	C	61.7	E	45.4	D
Stan Dr	U/U/U	NB	0.0	A	14.1	B	0.0	A	21.3	C	0.0	A	119.7	F
		SB	12.7	B	12.7	B	15.4	C	18.6	C	87.1	F	196.2	F
West Dr	U/U/U	SB	17.9	C	21.4	C	17.7	C	15.8	C	31.2	D	73.8	F
East Dr	U/U/U	NB	0.0	A	17.8	C	0.0	A	24.4	C	0.0	A	96.3	F
		SB	38.7	E	30.5	D	540.0	F	687.7	F	>80[3]	F	>80[3]	F
Greenboro Dr	U/U/U	NB	72.1	F	31.4	D	>80[3]	F	806.7	F	>80[3]	F	>80[3]	F
		SB	10.1	B	11.5	B	11.8	B	15.7	C	15.6	C	21.2	C
Distribution Dr West	U/U/U	NB	22.8	C	37.1	E	64.6	F	613.6	F	298.3	F	896.2	F
		SB	24.5	C	28.1	D	68.7	F	218.2	F	266.0	F	1255.8	F
Distribution Dr East	U/U/U	NB	16.4	C	10.9	B	33.9	D	14.3	B	87.3	F	18.4	C
		SB	16.3	C	19.0	C	35.1	E	79.8	F	103.7	F	400.4	F
Technology Dr	U/U/U	NB	19.1	C	16.3	C	48.6	E	55.3	F	239.1	F	332.3	F
		SB	23.1	C	23.5	C	66.0	F	110.0	F	329.9	F	674.1	F
Shinn Ave	U/U/U	NB	17.9	C	17.6	C	36.6	E	44.4	E	91.9	F	129.1	F
Lake Ibis Dr	U/U/U	SB	13.7	B	17.9	C	33.6	D	559.6	F	>80[3]	F	>80[3]	F
Wickham Rd	S/S/S	ALL	38.3	D	32.5	C	65.1	E	57.4	E	115.3	F	110.1	F

1. NA = Not available since facility is not open, S = Signalized, U = Unsignalized
2. Delay is reported in seconds per vehicle (s/veh) and represents control delay
3. Approaches with high volume to capacity ratio (v/c), Synchro does not compute average delay

Figure 3.3.1 displays the 2034 No-Build Peak Hour Volumes and LOS, while Figure 3.3.2 displays the 2034 No-Build intersection lane configuration. On the west side of the study area, a node is shown at the junction of St. Johns Heritage Parkway and a future north-south roadway. This node is shown as an intersection, although no provision for an intersection is included in the proposed St. Johns Heritage Parkway. For the purposes of this PDSR, only figures pertaining to the Design Year 2034 are included. Refer to the 2011 DTTM for the Opening Year 2014 and the Interim Year 2024 figures.



FDOT

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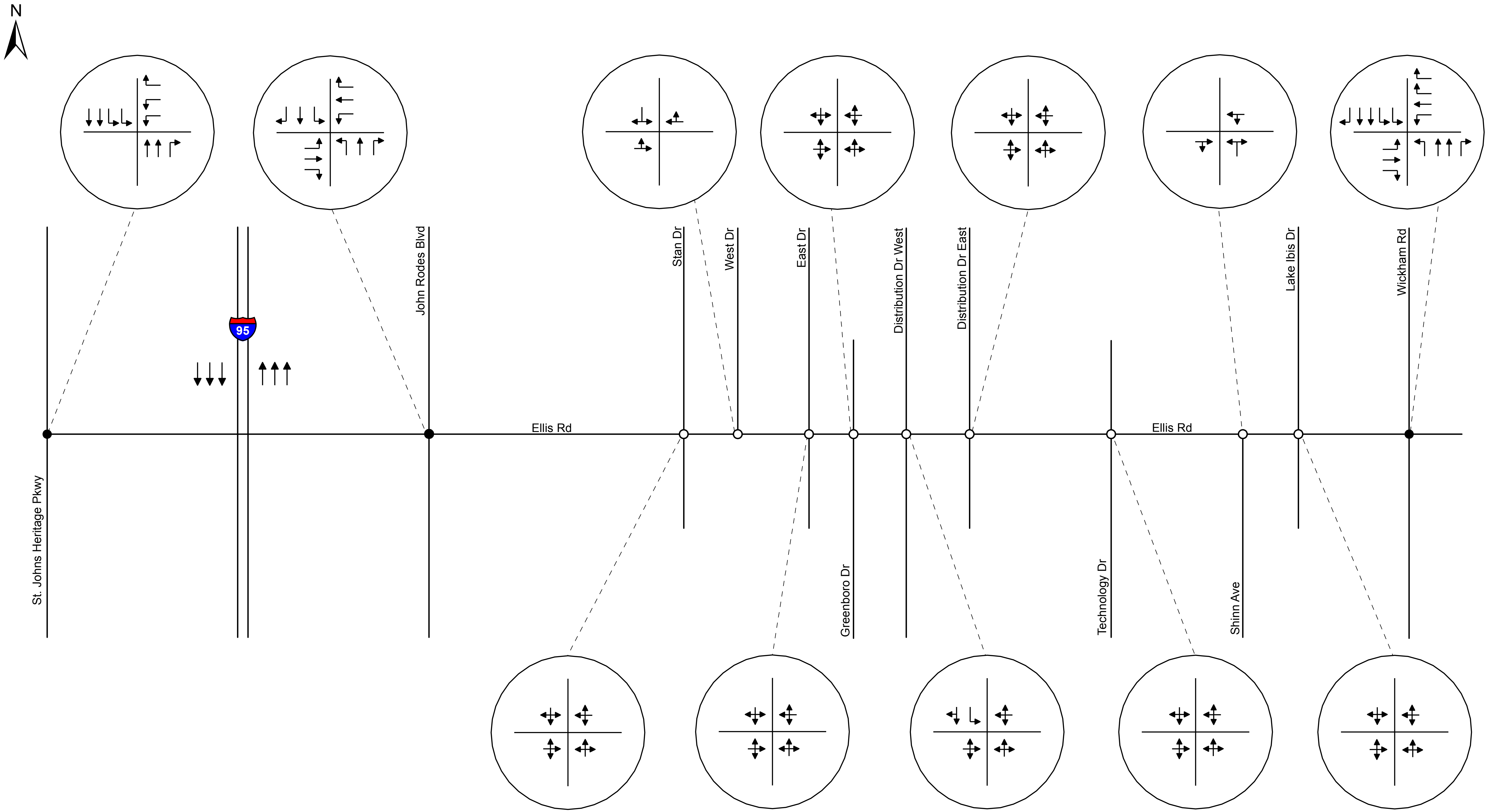
Legend

XXX (XXX)	AM (PM) Peak Hour Volume
D	AM (PM) Density pc/mi/ln
d	AM (PM) Control Delay sec/veh
LOS	AM (PM) Level of Service
●/○	Signalized/Unsignalized Intersection

Design Year 2034
No-Build
Peak Hour Volumes and Level of Service

Figure 3.3.1



ELLIS ROAD PD&E STUDY

Legend

●/○ Signalized/Unsignalized Intersection

← Lane Configuration

Design Year 2034
No-Build
Intersection Lane Configuration

Figure 3.3.2

3.3.2 Build Alternatives

A number of Build alternatives are being considered for the PD&E Study. The alternatives are based on three typical sections:

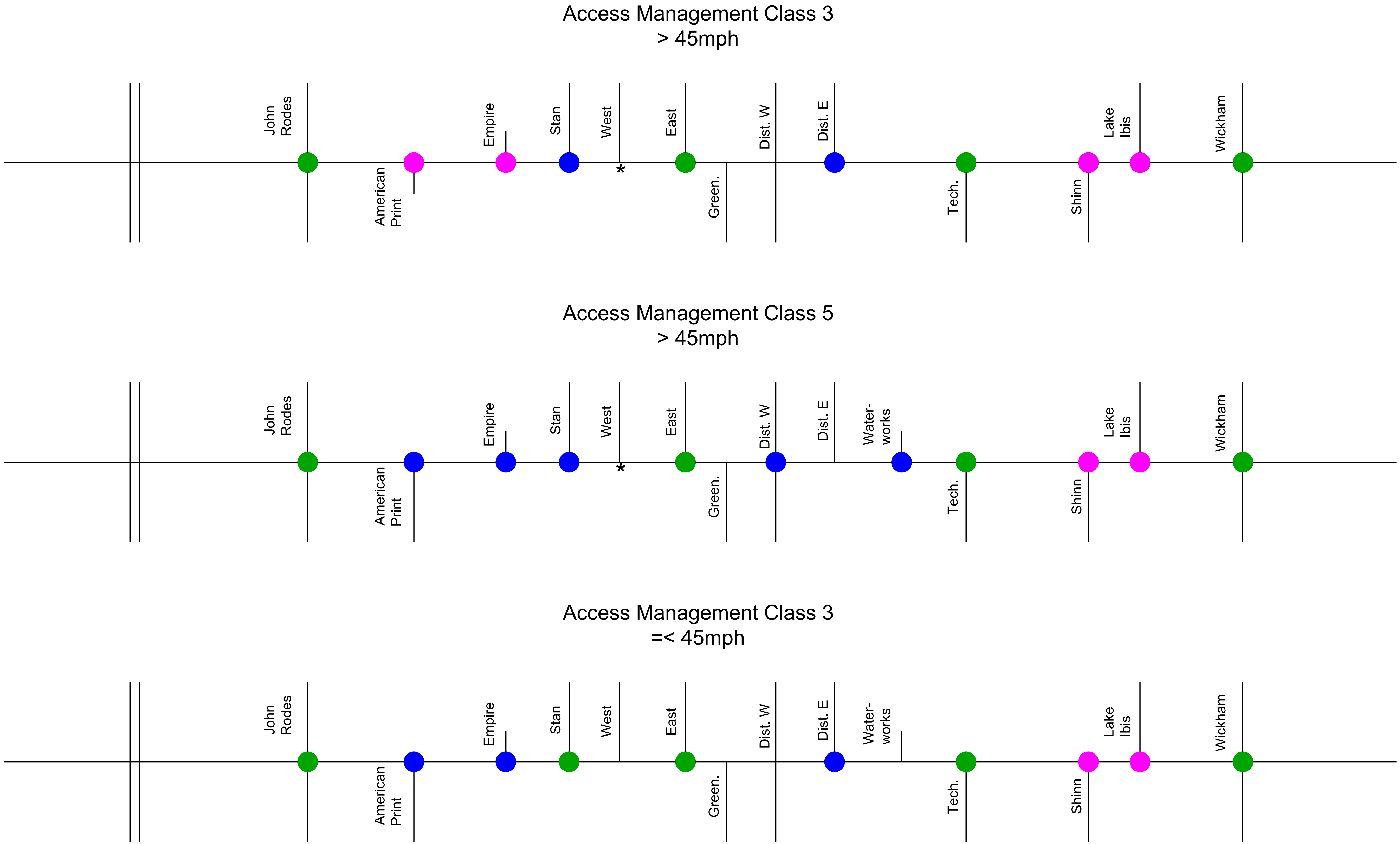
- High Speed Urban – 50 mph;
- Urban – 45 mph; and,
- High Speed Urban with Frontage Roads – 50 mph.

Chapter 4 describes the geometry of these typical sections in detail. Different access classifications are also being considered (between John Rodes Boulevard and Wickham Road) for each typical section. For the purposes of this Technical Traffic Memorandum, each typical section is combined with an access management class to create the following Build alternatives:

- Build Alternative 1 – High Speed Access Class 3;
- Build Alternative 2 – Urban Class 5; and,
- Build Alternative 3 – High Speed Access Class 3 with Frontage Roads.

These three build alternatives assume that Ellis Road is widened from 2 lanes to 4 lanes in the study area. Included in all three alternatives is a new interchange at I-95 / Ellis Road. The configuration of the interchange is common to all three alternatives and is based on the preferred interchange alternative from the 2008 I-95 / Ellis Road/Melbourne International Airport IJR. In addition, St. Johns Heritage Parkway is constructed to various levels starting in the Interim Year 2024.

Figure 3.3.3 displays the access management configurations considered as part of this traffic analysis.



Ellis Road
PD&E Study

Legend:
- Full Median Opening
- Directional Median Opening
- Split Directional Median Opening
- * Design variation required for distance between median openings

ACCESS MANAGEMENT CONFIGURATION

Figure 3.3.3

3.3.2.1 Build Alternative 1

Table 3.3.4 displays the arterial analysis summary for Build Alternative 1. Table 3.3.5 displays the intersection analysis for Build Alternative 1. Table 3.3.6 contains the recommended queue lengths based on a Synchro analysis.

Table 3.3.4: Build Alternative 1 Arterial Analysis Summary

Direction	Ellis Road		2014		2024		2034	
	From	To	Speed AM (PM)	LOS AM (PM)	Speed AM (PM)	LOS AM (PM)	Speed AM (PM)	LOS AM (PM)
Eastbound	SJHP	I-95 SB Ramps	NA	NA	27.7 (26.3)	C (D)	23.4 (22.9)	D (D)
	I-95 SB Ramps	I-95 NB Ramps	11.2 (12.5)	F (F)	13.1 (8.2)	F (F)	11.7 (10.2)	F (F)
	I-95 NB Ramps	John Rodes Blvd	28.2 (32.4)	C (C)	30.0 (29.9)	C (C)	18.8 (18.1)	E (E)
	John Rodes Blvd	East Dr	36.9 (37.9)	B (B)	35.4 (36.3)	B (B)	33.2 (33.0)	C (C)
	East Dr	Technology Dr	35.8 (33.3)	B (C)	35.8 (31.8)	B (C)	35.8 (32.1)	B (C)
	Technology Dr	Wickham Rd	20.8 (23.1)	E (D)	21.9 (23.5)	D (D)	21.7 (22.2)	D (D)
	SJHP	Wickham Rd	27.6 (29.2)	C (C)	28.3 (26.9)	C (D)	25.2 (24.3)	D (D)
Westbound	Wickham Rd	Technology Dr	40.6 (31.7)	B (C)	40.6 (32.8)	B (C)	39.2 (32.1)	B (C)
	Technology Dr	East Dr	32.8 (35.8)	C (B)	29.6 (32.0)	C (C)	24.6 (27.6)	D (C)
	East Dr	John Rodes Blvd	35.7 (33.8)	B (C)	28.3 (27.5)	C (C)	28.9 (30.0)	C (C)
	John Rodes Blvd	I-95 NB Ramps	35.3 (35.6)	B (B)	32.0 (23.1)	C (D)	27.6 (26.6)	C (D)
	I-95 NB Ramps	I-95 SB Ramps	13.3 (18.3)	F (E)	31.1 (30.3)	C (C)	21.4 (20.4)	D (E)
	I-95 SB Ramps	SJHP	NA	NA	NA	NA	12.9 (21.6)	F (D)
	Wickham Rd	SJHP	33.5 (32.8)	C (C)	31.6 (28.9)	C (C)	24.2 (27.3)	D (C)

NA = Not Applicable – Link does not satisfy definition of "segment"

Table 3.3.5: Build Alternative 1 Intersection Analysis Summary

Intersection Ellis Road @	Control Type 2014/ 2024/	Approach	2014				2024				2034			
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
			Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS
St. Johns Heritage	NA/NA/S	ALL	NA	NA	NA	NA	NA	NA	NA	NA	47.7	D	43.4	D
I-95 SB Off/On	S/S/S	ALL	17.8	B	16.4	B	25.7	C	22.6	C	20.1	C	18.8	B
I-95 NB Off/On	S/S/S	ALL	20.9	C	15.4	B	15.1	B	23.6	C	17.3	B	19.4	B
John Rodes Blvd	S/S/S	ALL	19.5	B	21.8	C	24.3	C	33.4	C	40.1	D	36.1	D
American Paint	U/U/U	NB	9.3	A	9.7	A	9.4	A	8.9	A	10.0	A	9.6	A
Empire Electric	U/U/U	SB	10.9	B	13.6	B	11.0	B	12.8	B	12.0	B	13.7	B
Stan Dr	U/U/U	NB	0	A	10.9	B	0.0	A	11.0	B	0.0	A	12.0	B
		SB	9.7	A	10	A	11.1	B	13.6	B	12.1	B	12.2	B
West Dr	U/U/U	SB	9.1	A	9.8	A	10.1	B	11.0	B	10.8	B	11.7	B
East Dr	S/S/S	ALL	14.3	B	12.1	B	20.6	C	15.7	B	29.3	C	23.9	C
Greenboro Dr	U/U/U	NB	11.5	B	11.3	B	13.0	B	12.9	B	16.9	C	16.3	C
		SB	12.5	B	15.2	C	0.0	A	0.0	A	15.0	C	16.9	C
Distribution Dr West	U/U/U	NB	10.4	B	12.3	B	11.5	B	13.4	B	11.8	B	13.3	B
		SB	13.2	B	19.5	C	13.4	B	17.5	C	16.2	C	23.3	C
Distribution Dr East	U/U/U	NB	12.8	B	11.8	B	12.0	B	11.6	B	13.2	B	13.3	B
		SB	10.9	B	9.9	A	11.0	B	9.5	A	9.7	A	10.0	A
Technology Dr	S/S/S	ALL	7.8	A	16.6	B	7.7	A	16.7	B	8.3	A	17.5	B
Shinn Ave	U/U/U	NB	9.3	A	9.4	A	9.3	A	9.4	A	9.4	A	10.1	B
Lake Ibis Dr	U/U/U	SB	9.7	A	9.8	A	10.5	B	10.3	B	11.7	B	10.9	B
Wickham Rd	S/S/S	ALL	48.8	D	38.5	D	37.5	D	34.7	C	52.0	D	45.4	D

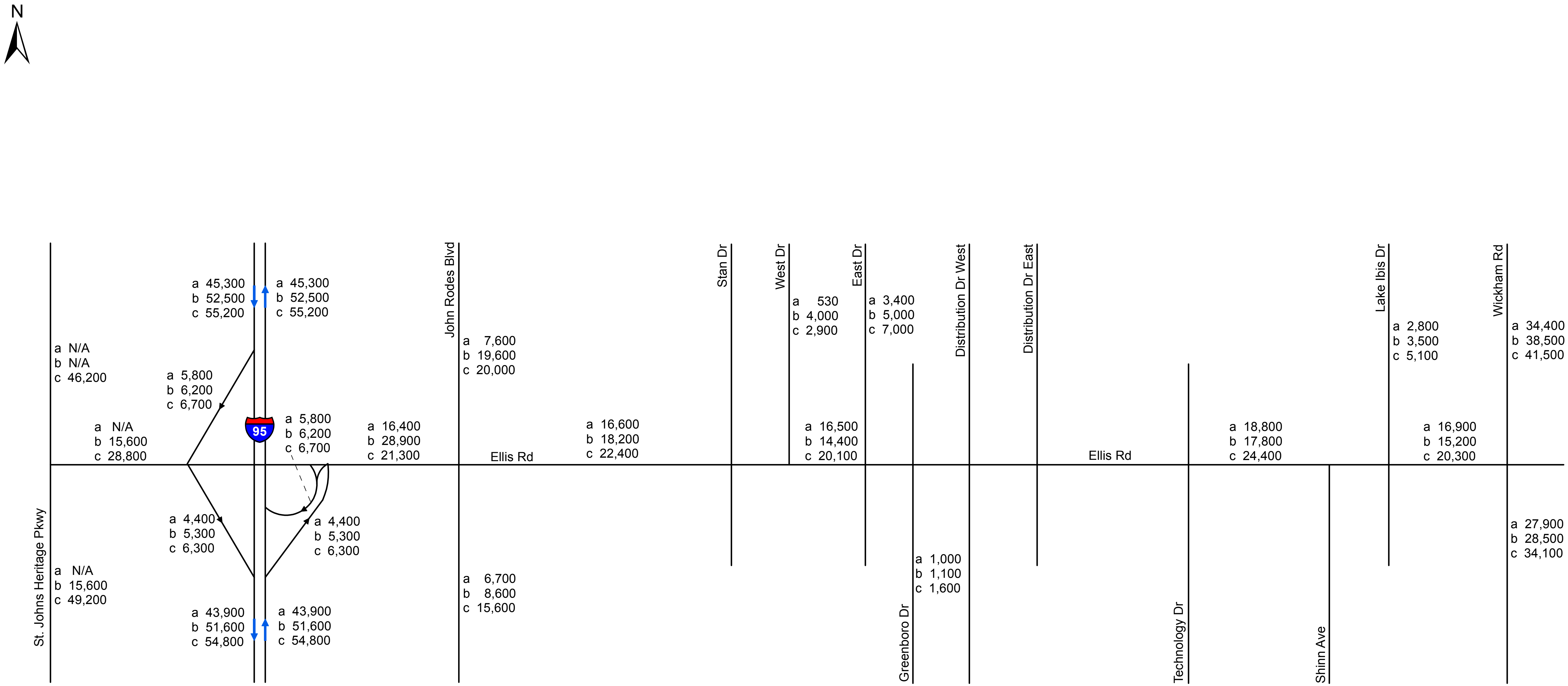
1. NA = Not available since facility is not open, S = Signalized, U = Unsignalized
2. Delay is reported in seconds per vehicle (s/veh) and represents control delay

Table 3.3.6: Build Alternative 1 Design Year 2034 Queuing Analysis Summary

Intersection Ellis Road @	Movement	95th Percentile Queue		Recommended Queue Lengths[1]
		AM Peak	PM Peak	
St. Johns Heritage Pkwy	NBR	323	121	325
	SBL	367	221	375
	WBL	229	156	250
	WBR	521	473	525
I-95 SB Ramps	SBL	280	208	300
	SBR	96	222	225
	EBR	133	74	150
	WBL	94	73	100
I-95 NB Ramps	NBL	272	333	350
	NBR	78	71	100
	EBR	4	5	50
	WBL	176	207	225
John Rodes Blvd	NBL	44	95	100
	NBR	136	73	150
	SBL	261	175	275
	SBR	92[2]	400[2]	400[2]
	EBL	141	298	300
	WBL	200	100	200
East Drive	SBL	299	274	300
	EBL	278[2]	58[2]	300[2]
	WBL	120	163	175
Technology Drive	EBL	7	12	50
	WBL	18	14	50
Wickham Road	NBL	117	134	150
	NBR	49	36	50
	SBL	479	406	500
	SBR	119	46	125
	EBL	260	371	375
	EBR	62	55	75
	WBL	76	84	100
	WBR	182	240	250

1. Recommended queue lengths do not include deceleration or taper distances
2. Reported queues and queue recommendation based on 2024 95th percentile queues.

Figure 3.3.4A displays the Build Average Annual Daily Traffic, and Figure 3.3.4B displays the 2034 peak hour volumes and LOS for Build Alternative 1. Figure 3.3.5 displays the 2034 intersection lane configuration for Build Alternative 1.



FDOT

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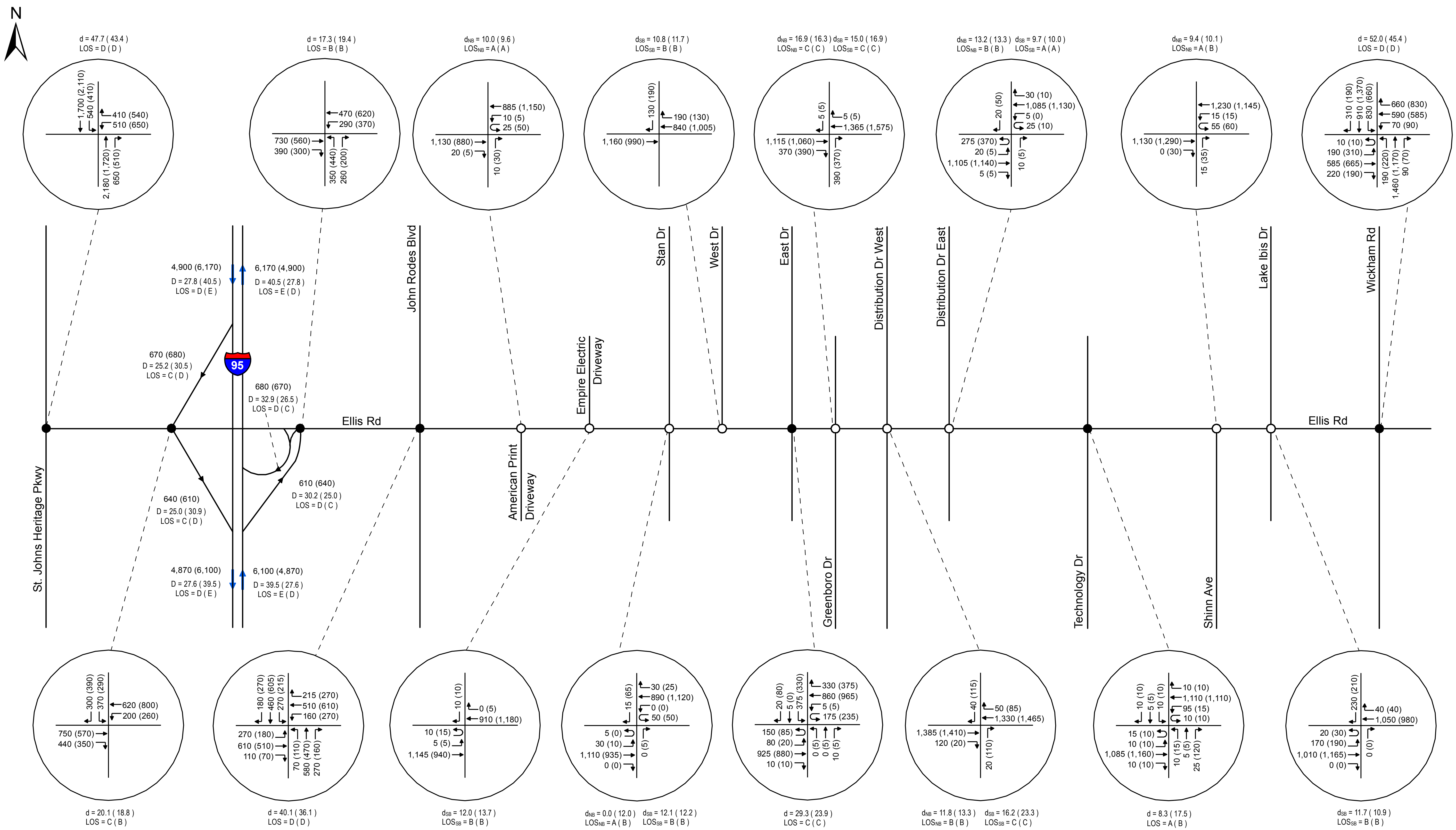
Legend

a Opening Year 2014 AADT
b Interim Year 2024 AADT
c Design Year 2034 AADT
N/A Not Applicable: facility not open

Build
Annual Average Daily Traffic (AADT)

Figure 3.3.4A



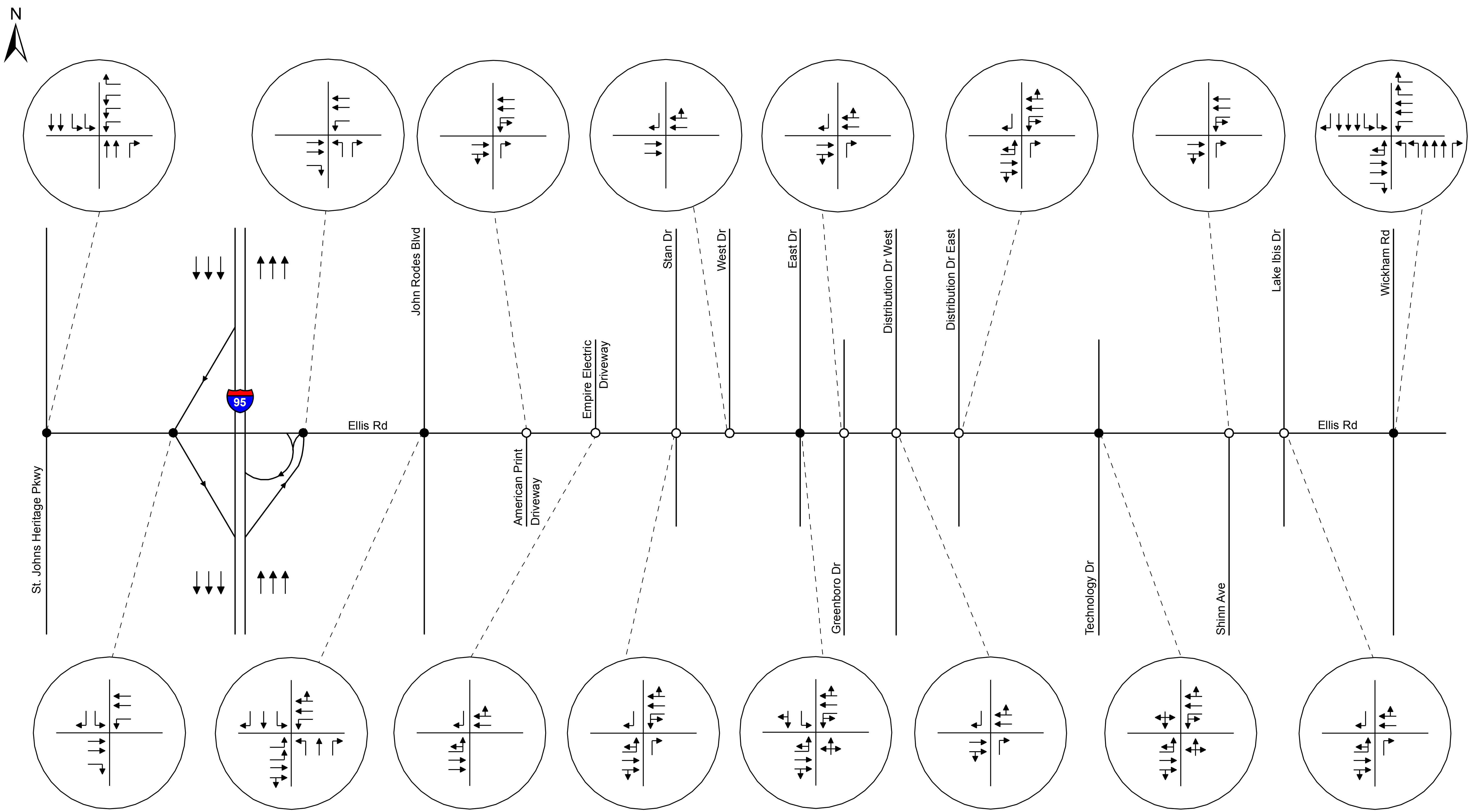
FDOT

ELLIS ROAD PD&E STUDY

Legend		
	XXX (XXX)	AM (PM) Peak Hour Volume
	D	AM (PM) Density pc/mi/ln
	d	AM (PM) Control Delay sec/veh
	LOS	AM (PM) Level of Service
	●/○	Signalized/Unsignalized Intersection

Build Alternative 1
Design Year 2034
Peak Hour Volumes and Level of Service

Figure 3.3.4B



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Legend

●/○ Signalized/Unsignalized Intersection

← Lane Configuration

Build Alternative 1
Design Year 2034
Intersection Lane Configuration

Figure 3.3.5

3.3.2.2 Build Alternative 2

Table 3.3.7 displays the arterial analysis summary for Build Alternative 2. Table 3.3.8 displays the intersection analysis for Build Alternative 2. Table 3.3.9 contains the recommended queue lengths based on a Synchro analysis.

Table 3.3.7: Build Alternative 2 Arterial Analysis Summary

Direction	Ellis Road		2014		2024		2034	
	From	To	Speed AM (PM)	LOS AM (PM)	Speed AM (PM)	LOS AM (PM)	Speed AM (PM)	LOS AM (PM)
Eastbound	SJHP	I-95 SB Ramps	NA	NA	27.8 (25.1)	C (C)	22.2 (21.8)	C (D)
	I-95 SB Ramps	I-95 NB Ramps	11.1 (12.1)	F (F)	11.0 (9.3)	F (F)	11.6 (10.1)	F (F)
	I-95 NB Ramps	John Rodes Blvd	26.3 (30.4)	C (B)	30.0 (25.8)	B (C)	17.0 (18.3)	D (D)
	John Rodes Blvd	East Dr	34.5 (35.8)	B (A)	32.9 (33.8)	B (B)	31.0 (31.0)	B (B)
	East Dr	Technology Dr	32.6 (30.4)	B (B)	32.7 (29.6)	B (B)	32.5 (29.5)	B (B)
	Technology Dr	Wickham Rd	19.7 (21.7)	D (D)	20.7 (22.1)	D (C)	20.2 (20.9)	D (D)
	SJHP	Wickham Rd	26.0 (27.4)	C (C)	26.8 (25.5)	C (C)	23.4 (23.2)	C (C)
Westbound	Wickham Rd	Technology Dr	36.8 (29.2)	A (B)	36.6 (30.7)	A (B)	36.3 (30.5)	A (B)
	Technology Dr	East Dr	30.3 (32.4)	B (B)	27.4 (29.6)	C (B)	23.1 (25.7)	C (C)
	East Dr	John Rodes Blvd	33.1 (31.9)	B (B)	27.2 (25.2)	C (C)	27.9 (28.1)	C (B)
	John Rodes Blvd	I-95 NB Ramps	33.7 (33.6)	B (B)	31.3 (32.6)	B (B)	27.7 (26.5)	C (C)
	I-95 NB Ramps	I-95 SB Ramps	12.9 (17.0)	F (D)	26.8 (28.4)	C (B)	20.8 (18.9)	D (D)
	I-95 SB Ramps	SJHP	NA	NA	NA	NA	12.6 (20.6)	F (D)
	Wickham Rd	SJHP	26.0 (26.1)	C (C)	25.9 (25.3)	C (C)	21.0 (22.5)	D (C)
NA = Not Applicable – Link does not satisfy definition of "segment"								

Table 3.3.8: Build Alternative 2 Intersection Analysis Summary

Intersection Ellis Road @	Control Type 2014/ 2024/ 2034	Approach	2014				2024				2034			
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
			Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS
St. Johns Heritage Pkwy	NA/NA /S	ALL	NA	NA	NA	NA	NA	NA	NA	NA	47.7	D	43.4	D
I-95 SB Off/On Ramps	S/S/S	ALL	17.8	B	16.7	B	26.1	C	23.5	C	20.1	C	18.9	B
I-95 NB Off/On Ramps	S/S/S	ALL	20.7	C	15.8	B	15.4	B	16.3	B	17.3	B	18.8	B
John Rodes Blvd	S/S/S	ALL	20.1	C	21.5	C	23.5	C	35.5	D	42.1	D	35.9	D
American Paint Driveway	U/U/U	NB	9.4	A	9.9	A	9.6	A	9	A	10.1	B	9.8	A
Empire Electric Driveway	U/U/U	SB	10.8	B	13.4	B	10.9	B	12.6	B	11.9	B	13.5	B
Stan Dr	U/U/U	NB	0	A	24	C	0	A	29.5	D	0.0	A	40.1	E
		SB	23.2	C	27.1	D	24.4	C	31.5	D	33.4	D	44.1	E
West Dr	U/U/U	SB	9.1	A	9.8	A	10	B	11	B	10.7	B	11.7	B
East Dr	S/S/S	ALL	14	B	11.8	B	20.5	C	15.5	B	29.2	C	23.5	C
Greenboro Dr	U/U/U	NB	11.4	B	11.3	B	12.9	B	12.7	B	16.7	C	15.9	C
		SB	12.5	B	0	A	0	A	0	A	14.9	B	16.6	C
Distri-bution Dr West	U/U/U	NB	10.6	B	12.8	B	11.6	B	13.7	B	12.0	B	13.5	B
		SB	13.2	B	19	C	13.3	B	17.1	C	16.1	C	22.4	C
Distri-bution Dr East	U/U/U	NB	27.2	D	11.6	B	23	C	11.5	B	30.7	D	13.1	B
		SB	24.5	C	24.3	C	22.5	C	20.7	C	30.8	D	35.5	E
Tech-nology Dr	S/S/S	ALL	7.7	A	16.8	B	7.6	A	15.7	B	7.9	A	16.8	B
Shinn Ave	U/U/U	NB	9.2	A	9.4	A	9.5	A	9.4	A	9.4	A	10.1	B
Lake Ibis Dr	U/U/U	SB	9.7	A	9.8	A	10.6	B	10.4	B	11.6	B	10.9	B

Intersection Ellis Road @	Control Type 2014/ 2024/ 2034	Approach	2014				2024				2034			
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
			Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS
Wickham Rd	S/S/S	ALL	48.8	D	38.5	D	37.4	D	34.7	C	48.5	D	45.4	D

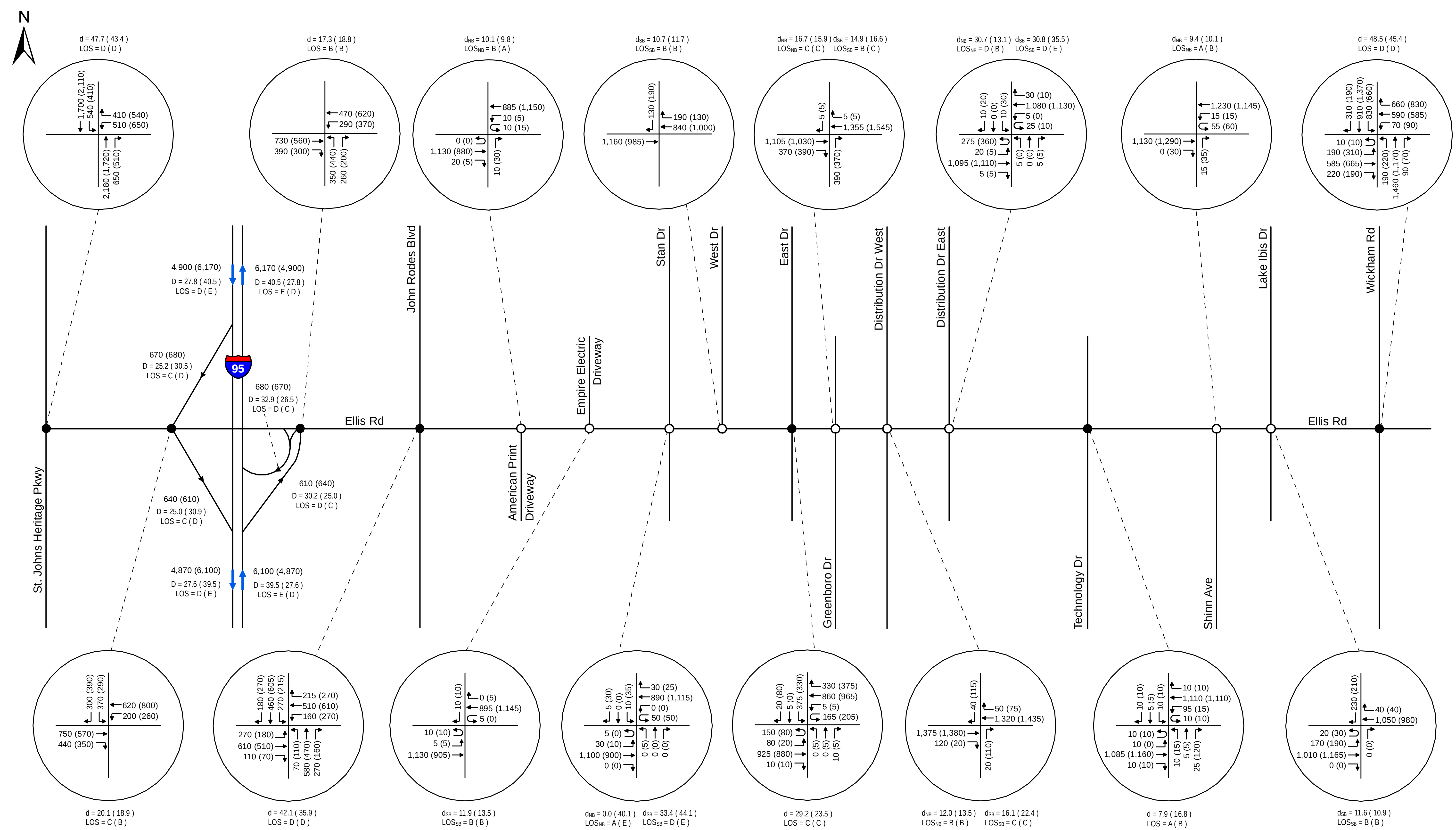
1. NA = Not available since facility is not open, S = Signalized, U = Unsignalized
2. Delay is reported in seconds per vehicle (s/veh) and represents control delay

Table 3.3.9: Build Alternative 2 Design Year 2034 Queuing Analysis Summary

Intersection Ellis Road @	Movement	95th Percentile Queue		Recommended Queue Lengths[1]
		AM Peak	PM Peak	
St. Johns Heritage Pkwy	NBR	323	121	325
	SBL	367	221	375
	WBL	229	156	250
	WBR	521	473	525
I-95 SB Ramps	SBL	280	208	300
	SBR	96	222	225
	EBR	133	74	150
	WBL	93	76	100
I-95 NB Ramps	NBL	272	333	350
	NBR	78	71	100
	EBR	2	3	50
	WBL	174	202	225
John Rodes Blvd	NBL	44	95	100
	NBR	136	73	150
	SBL	261	175	275
	SBR	94[2]	408[2]	425[2]
	EBL	184[2]	278[2]	300[2]
	WBL	188	298	300
East Drive	SBL	299	274	300
	EBL	279[2]	56[2]	300[2]
	WBL	99	120	125
Technology Drive	EBL	6	8	50
	WBL	18	14	50
Wickham Road	NBL	119	134	150
	NBR	48	36	50
	SBL	492	406	500
	SBR	118	46	125
	EBL	267	371	375
	EBR	63	55	75
	WBL	78	84	100
	WBR	190	240	250

1. Recommended queue lengths do not include deceleration or taper distances
2. Reported queues and queue recommendation based on 2024 95th percentile queues.

Figure 3.3.6 displays the 2034 peak hour volumes and LOS for Build Alternative 2. Figure 3.3.7 displays the 2034 intersection lane configuration for Build Alternative 2.

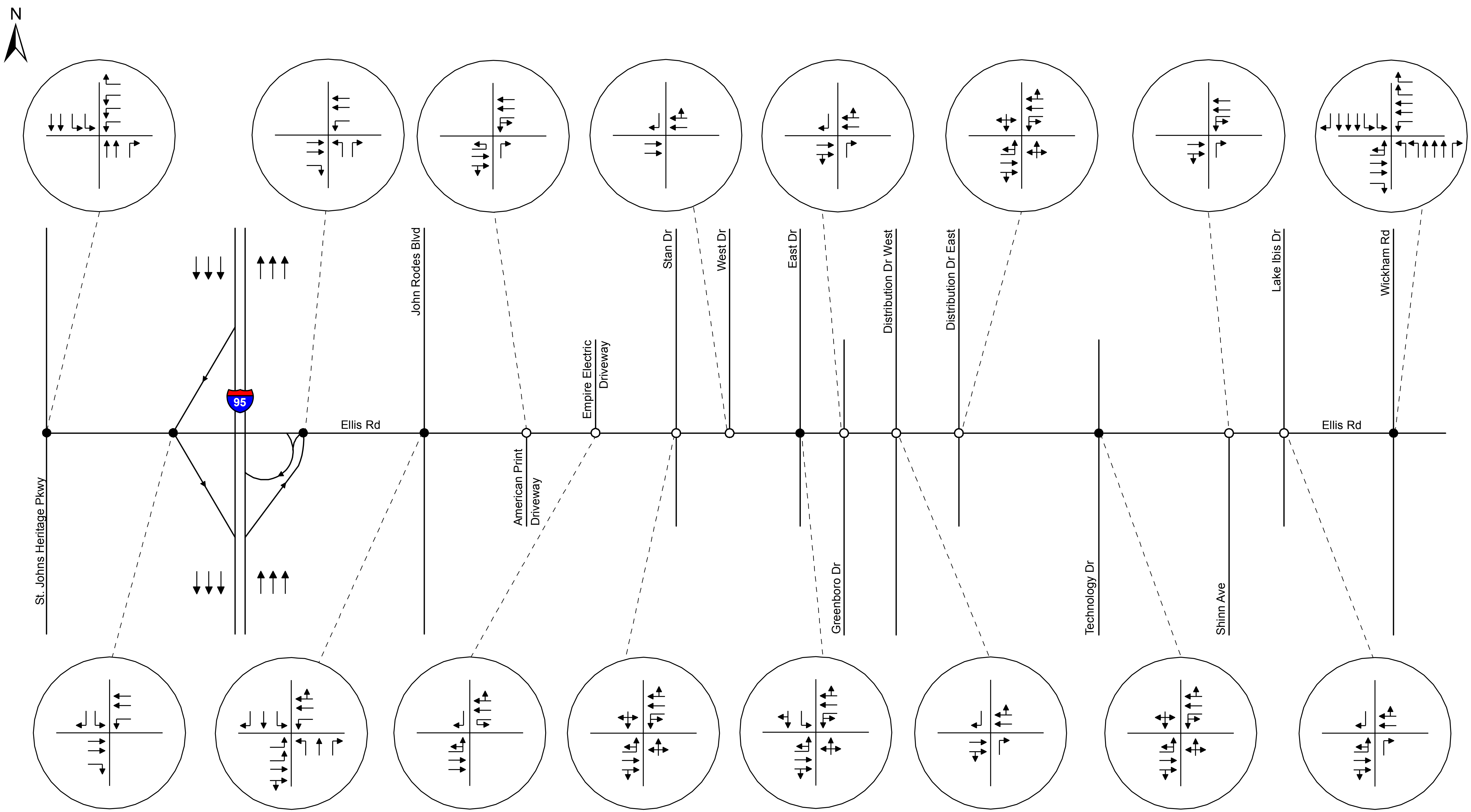


ELLIS ROAD PD&E STUDY

Legend	
XXX (XXX)	AM (PM) Peak Hour Volume
D	AM (PM) Density pc/mi/ln
d	AM (PM) Control Delay sec/veh
LOS	AM (PM) Level of Service
●/○	Signalized/Unsignalized Intersection

Build Alternative 2
Design Year 2034
Peak Hour Volumes and Level of Service

Figure 3.3.6



ELLIS ROAD
PD&E STUDY

Legend

●/○ Signalized/Unsignalized Intersection

← Lane Configuration

Build Alternative 2
Design Year 2034
Intersection Lane Configuration

Figure 3.3.7

3.3.2.3 Build Alternative 3

Table 3.3.10 displays the arterial analysis summary for Build Alternative 2. Table 3.3.11 displays the intersection analysis for Build Alternative 2. Table 3.3.12 contains the recommended queue lengths based on a Synchro analysis

Table 3.3.10: Build Alternative 3 Arterial Analysis Summary

Direction	Ellis Road		2014		2024		2034	
	From	To	Speed AM (PM)	LOS AM (PM)	Speed AM (PM)	LOS AM (PM)	Speed AM (PM)	LOS AM (PM)
Eastbound	SJHP	I-95 SB Ramps	NA	NA	29.6 (27.8)	C (C)	23.4 (22.9)	D (D)
	I-95 SB Ramps	I-95 NB Ramps	11.2 (13.8)	F (F)	18.1 (12.7)	E (F)	13.0 (11.9)	F (F)
	I-95 NB Ramps	John Rodes Blvd	27.9 (24.5)	C (D)	25.5 (22.4)	D (D)	12.4 (11.7)	F (F)
	John Rodes Blvd	East Dr	25.0 (28.2)	D (C)	24.1 (27.8)	D (C)	23.9 (25.4)	D (D)
	East Dr	Technology Dr	19.5 (21.4)	E (D)	18.7 (18.2)	E (E)	18.2 (19.0)	E (E)
	Technology Dr	Wickham Rd	21.8 (22.4)	D (D)	22.4 (22.9)	D (D)	21.9 (22.1)	D (D)
	SJHP	Wickham Rd	21.9 (23.4)	D (D)	23.5 (23.2)	D (D)	19.4 (19.5)	E (E)
Westbound	Wickham Rd	Technology Dr	21.2 (19.1)	D (E)	19.5 (17.5)	E (E)	18.5 (19.2)	E (E)
	Technology Dr	East Dr	22.2 (19.9)	D (E)	19.3 (21.9)	E (D)	16.3 (17.4)	E (E)
	East Dr	John Rodes Blvd	35.7 (33.7)	B (C)	29.0 (26.7)	C (D)	28.1 (31.5)	C (C)
	John Rodes Blvd	I-95 NB Ramps	35.3 (35.6)	B (B)	32.6 (32.2)	C (C)	29.5 (28.1)	C (C)
	I-95 NB Ramps	I-95 SB Ramps	13.3 (18.3)	F (E)	30.0 (30.0)	C (C)	19.7 (14.5)	E (F)
	I-95 SB Ramps	SJHP	NA	NA	NA	NA	12.8 (15.7)	F (F)
	Wickham Rd	SJHP	23.0 (24.5)	D (D)	21.7 (23.3)	D (D)	18.0 (20.9)	E (E)

NA = Not Applicable – Link does not satisfy definition of "segment" as described in Section 10.1

Table 3.3.11: Build Alternative 3 Intersection Analysis Summary

Intersection Ellis Road @	Control Type 2014/ 2024/ 2034	Approach	2014				2024				2034			
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
			Delay 1	LOS	Delay 1	LOS	Delay 1	LOS	Delay 1	LOS	Delay 1	LOS	Delay 1	LOS
St. Johns Heritage Pkwy	NA/S/S	ALL	NA	NA	NA	NA	NA	NA	NA	NA	38.3	D	28.2	C
I-95 SB Off/On Ramps	S/S/S	ALL	17.8	B	16.4	B	26.4	C	22.2	C	17.0	B	12.2	B
I-95 NB Off/On Ramps	S/S/S	ALL	20.9	C	15.1	B	14	B	13.2	B	15.0	B	13.4	B
John Rodes Blvd	S/S/S	ALL	20	C	24.6	C	26.7	C	37.8	D	49.8	D	47.8	D
WB Frontage Rd Entrance	U/U/U		11.1	B	17	C	12.8	B	19.9	C	13.9	B	21.3	C
American Paint Driveway	U/U/U	NB	8.5	A	8.5	A	8.5	A	8.5	A	8.5	A	8.5	A
Empire Electric Driveway	U/U/U	SB	8.6	A	9.1	A	9.5	A	10.3	B	9.2	A	9.8	A
Stan Dr	U/U/U	NB	0	A	8.6	A	0	A	8.6	A	0.0	A	8.6	A
		SB	8.7	A	9.1	A	9.6	A	10.4	B	9.3	A	9.8	A
West Dr	U/U/U	SB	9	A	8.9	A	10.7	B	10.7	B	10.0	A	9.9	A
East Dr/WB Frontage Rd	S/S/S	ALL	16.7	B	28.3	C	26.1	C	25.4	C	30.9	C	30.6	C
East Dr	S/S/S	ALL	34.3	C	33.7	C	41.6	D	31.1	C	42.2	D	38.3	D
East Dr/EB Frontage Rd	S/S/S	ALL	6.7	A	11.9	B	7.8	A	11.9	B	11.7	B	11.5	B
Greenboro Dr	U/U/U	NB	12.2	B	10.4	B	13.7	B	11.4	B	18.2	C	13.3	B
		SB	8.6	A	9.2	A	8.6	A	9.2	A	8.6	A	9.2	A
Distribution Dr West	U/U/U	NB	10.5	B	10.3	B	10.9	B	10.9	B	11.7	B	12.0	B
		SB	8.7	A	9.4	A	8.7	A	9.4	A	8.7	A	9.4	A
Distribution Dr East	U/U/U	NB	10.1	B	10.2	B	10.5	B	10.7	B	11.2	B	11.6	B
		SB	8.8	A	9.1	A	8.8	A	9.1	A	8.8	A	9.1	A
Technology Dr/EB Frontage Rd	S/S/S	ALL	48.8	D	60.5	E	53.4	D	53.5	D	110.3	F	82.0	F
Technology	S/S/S	ALL	37.4	D	36	D	38.8	D	40.8	D	42.2	D	36.9	D

Intersection Ellis Road @	Control Type 2014/ 2024/ 2034	Approach	2014				2024				2034			
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
			Delay 1	LOS	Delay 1	LOS	Delay 1	LOS	Delay 1	LOS	Delay 1	LOS	Delay 1	LOS
Dr														
Technology Dr/WB Frontage Rd	S/S/S	ALL	39.9	D	37.1	D	45.6	D	40.5	D	91.6	F	141.7	F
Shinn Ave	U/U/U	NB	8.5	A	8.8	A	8.5	A	8.8	A	8.5	A	8.8	A
Lake Ibis Dr	U/U/U	SB	9.2	A	9.2	A	9.6	A	9.5	A	10.2	B	10.3	B
EB Frontage Rd Entrance	U/U/U	NB	13.4	B	13.8	B	12.5	B	13.6	B	14.1	B	16.7	C
Wickham Rd	S/S/S	ALL	64.4	E	42	D	43.9	D	38.2	D	52.5	D[3]	47.3	D

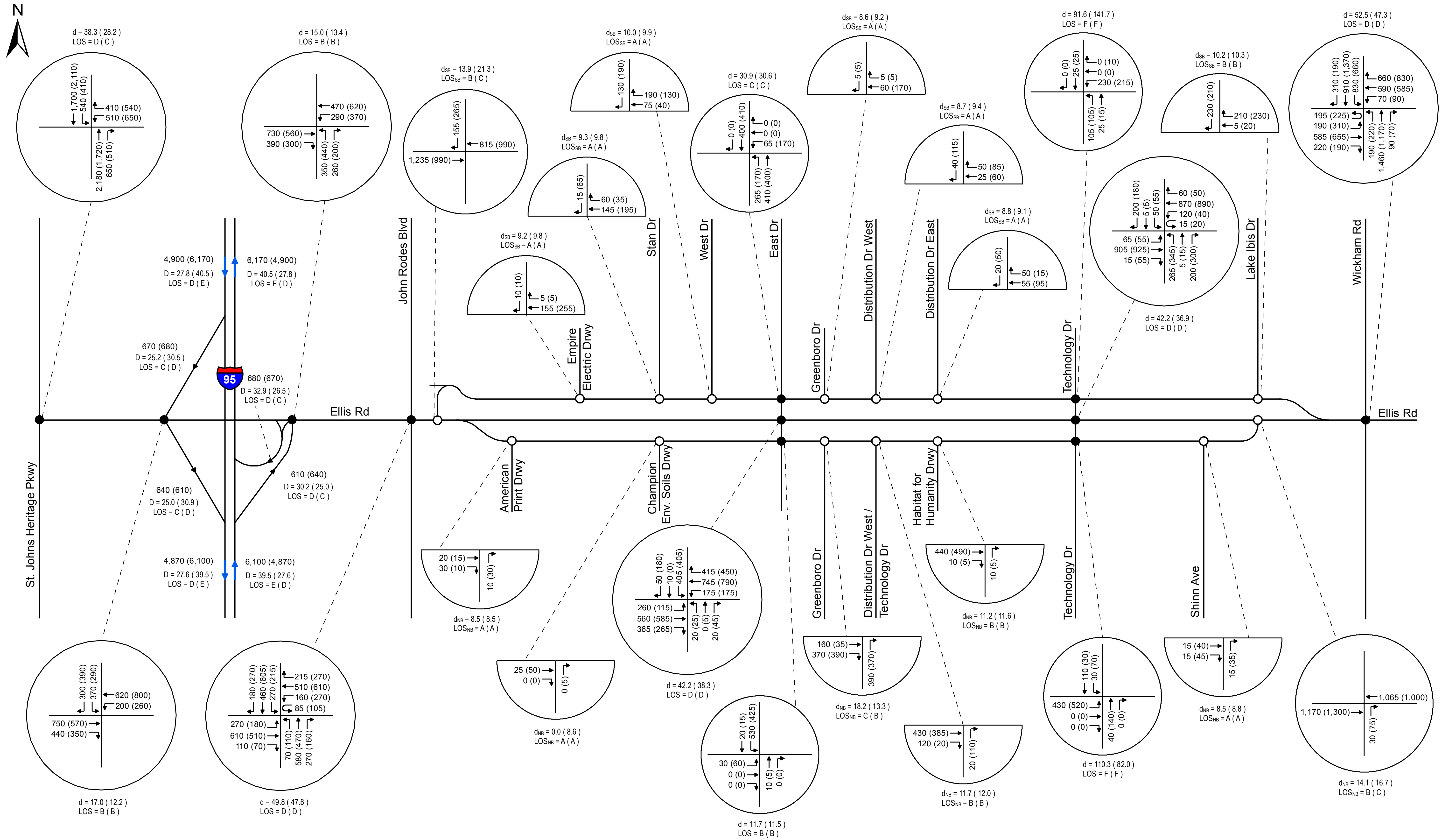
1. NA = Not available since facility is not open, S = Signalized, U = Unsignalized
2. Delay is reported in seconds per vehicle (s/veh) and represents control delay
3. Overall intersection operates at LOS D; however, EBL/WBL/SBL operate at LOS F

Table 3.3.12: Build Alternative 3 Design Year 2034 Queuing Analysis Summary

Intersection Ellis Road@	Movement	95th Percentile Queue		Recommended Queue Lengths
		AM Peak	PM Peak	
St. Johns Heritage Pkwy	NBR	237	145	250
	SBL	321	126	325
	WBL	225	215	225
	WBR	560	565	575
I-95 SB Ramps	SBL	280	208	300
	SBR	96	222	225
	EBR	133	74	150
	WBL	105	121	125
I-95 NB Ramps	NBL	272	333	350
	NBR	78	71	100
	EBR	1	16	50
	WBL	162	147	175
John Rodes Blvd	NBL	45	117	125
	NBR	136	73	150
	SBL	273	210	275
	SBR	94[2]	404[2]	425[2]
	EBL	244[2]	265[2]	275[2]
	WBL	284	406	425
East Drive	SBL	101	156	175
	EBL	408[2]	134[2]	425[2]
	EBR	152	119	175
	WBL	164	159	175
	WBR	292	340	350
Technology Drive	NBL	12	13	50
	SBL	0	0	50
	EBL	71	63	75
	EBR	27	62	75
	WBL	159	68	175
	WBR	67	58	75
Wickham Road	NBL	117	146	150
	NBR	48	36	50
	SBL	502	406	525
	SBR	219	120	225
	EBL	262	336	350
	EBR	61	55	75
	WBL	163	85	175
	WBR	184	246	250
Eastbound Frontage Rd @				
East Drive	EBL	62	97	100
Technology Drive	SBL	1	5	50
	EBL	731	894	900
Westbound Frontage Rd @				
East Drive	WBL	115	280	300
Technology Drive	WBL	458	406	475

Notes: Recommended queue lengths do not include deceleration or taper distances
Reported queues and queue recommendation based on 2024 95th percentile queues.

Figure 3.3.8 displays the 2034 peak hour volumes and LOS for Build Alternative 3. Figure 3.3.9 displays the 2034 intersection lane configuration for Build Alternative 3.



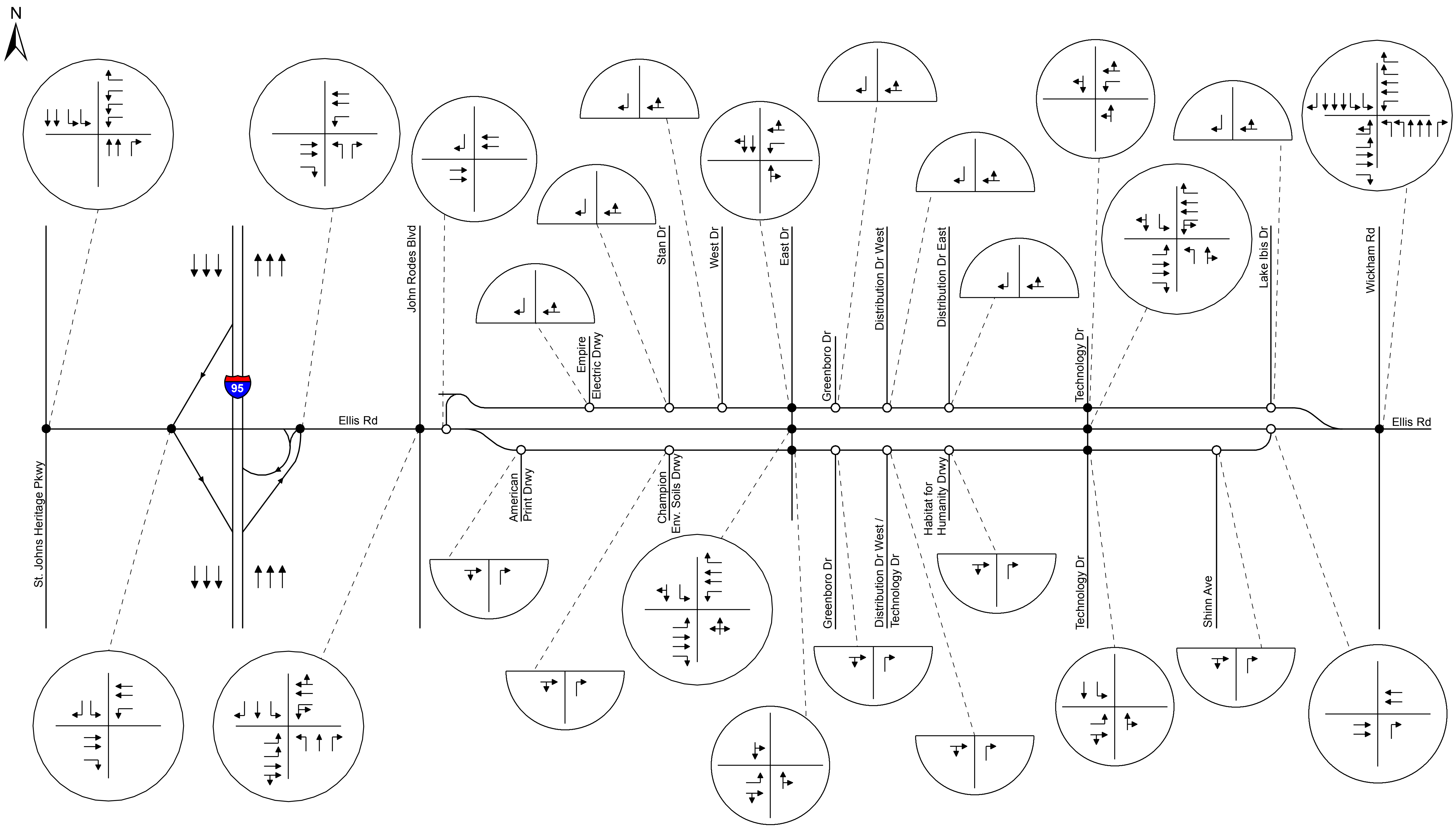
ELLIS ROAD PD&E STUDY

Legend

XXX (XXX)	AM (PM) Peak Hour Volume
D	AM (PM) Density pc/mi/ln
d	AM (PM) Control Delay sec/veh
LOS	AM (PM) Level of Service
●/○	Signalized/Unsignalized Intersection

Build Alternative 3
Design Year 2034
Peak Hour Volumes and Level of Service

Figure 3.3.8



FDOT

ELLIS ROAD
PD&E STUDY

Legend

●/○ Signalized/Unsignalized Intersection

← Lane Configuration

Build Alternative 3
Design Year 2034
Intersection Lane Configuration

Figure 3.3.9

3.4 Comparison of Build Alternatives 1, 2, and 3

3.4.1 Mainline I-95 Comparison

Table 3.4.1 compares the mainline traffic operational performance of the No-Build and Build Alternatives for mainline segments south and north of the proposed I-95 / Ellis Road interchange. The acceptable LOS standard for mainline segments is 'C'.

The No-Build Alternative assumes no interchange at I-95 / Ellis Road. Therefore, the mainline analysis is the same for the segments south and north of the proposed interchange when compared to the Build Alternatives. The Build Alternatives 1, 2 and 3 considered for the study were based on the different access management criteria for Ellis Road between John Rodes Boulevard and Wickham Road. The interchange configuration (partial cloverleaf alternative recommended in the I-95 / Ellis Road / Melbourne International Airport IJR) remained the same among the three Build Alternatives.

The mainline operational analysis for the No-Build Alternative shows that it will not sustain an acceptable LOS through Opening Year 2024 and will require the widening of I-95 from 6-lanes to 8-lanes. The Build Alternatives operational analysis shows similar results to the No-Build Alternative. Therefore, the I-95 / Ellis Road interchange does not degrade the mainline operations.

3.4.2 Ramps Comparison

Table 3.4.2 compares the ramp merge / diverge operational performance of the No-Build and Build Alternatives for the proposed I-95 / Ellis Road interchange. The acceptable LOS standard for ramp junctions is 'C'.

The No-Build Alternative assumes no interchange at I-95 / Ellis Road. Therefore, there are no results provided for this alternative. The interchange configuration (partial cloverleaf recommended in the I-95 / Ellis Road / Melbourne International Airport IJR) remained the same among the three Build Alternatives.

The ramp merge / diverge operational analysis for the Build Alternatives shows that all the ramp junctions will operate at LOS C in the Opening Year 2014 with I-95 having 6-lanes mainline. All the ramp junctions will operate at LOS D during AM or PM Peak Hour through Interim Year 2024 and Design Year 2034 with I-95 having 6-lanes mainline. However, all the ramp junctions will operate at acceptable LOS C or better once I-95 mainline is widened from 6-lanes to 8-lanes, which is also needed for the No-Build Alternative.

Table 3.4.1: Mainline I-95 Comparison

		No-Build			Alternatives 1, 2 & 3		
Freeway Segment	Direction	Volume AM (PM)	Density[1] AM (PM)	LOS AM (PM)	Volume AM (PM)	Density[1] AM (PM)	LOS AM (PM)
Opening Year 2014							
I-95 South of Ellis Rd	NB	4,900 (3,910)	27.4 (21.4)	D (C)	4,880 (3,900)	27.6 (21.7)	D (C)
	SB	3,910 (4,900)	21.4 (27.4)	C (D)	3,900 (4,880)	21.7 (27.6)	C (D)
I-95 North of Ellis Rd	NB	4,900 (3,910)	27.4 (21.4)	D (C)	4,900 (4,120)	27.8 (22.9)	D (C)
	SB	3,910 (4,900)	21.4 (27.4)	C (D)	4,120 (4,900)	22.9 (27.8)	C (D)
Interim Year 2024							
I-95 South of Ellis Rd	NB	5,760 (4,600)	34.9 (25.4)	D (C)	5,740 (4,580)	35.1 (25.6)	E (C)
	SB	4,600 (5,760)	25.4 (34.9)	C (D)	4,580 (5,740)	25.6 (35.1)	C (E)
I-95 North of Ellis Rd	NB	5,760 (4,600)	34.9 (25.4)	D (C)	5,750 (4,750)	35.2 (26.7)	E (D)
	SB	4,600 (5,760)	25.4 (34.9)	C (D)	4,750 (5,750)	26.7 (35.2)	D (E)
Design Year 2034							
I-95 South of Ellis Rd	NB	6,000 (4,790)	37.8 (26.6)	E (D)	6,100 (4,870)	39.5 (27.6)	E (D)
	SB	4,790 (6,000)	26.6 (37.8)	D (E)	4,870 (6,100)	27.6 (39.5)	D (E)
I-95 North of Ellis Rd	NB	6,000 (4,790)	37.8 (26.6)	E (D)	6,170 (4,900)	40.5 (27.8)	E (D)
	SB	4,790 (6,000)	26.6 (37.8)	D (E)	4,900 (6,170)	27.8 (40.5)	D (E)

1. Density = passenger cars per mile per lane (pc/mi/ln)

Table 3.4.2: Ramp Comparison

Interchange	Ramp	No-Build	Alternatives 1, 2 & 3 Volume AM (PM)	Alternatives 1, 2 & 3 Density[2] AM (PM)	Alternatives 1, 2 & 3 LOS AM (PM)
Opening Year 2014					
I-95/Ellis Rd	NB Off	NA[1]	490 (380)	24.8 (19.9)	C (B)
	NB On		510 (600)	26.0 (22.2)	C (C)
	SB Off		600 (510)	21.4 (24.9)	C (C)
	SB On		380 (490)	19.9 (24.6)	B (C)
Interim Year 2024					
I-95/Ellis Rd	NB Off	NA[1]	590 (460)	28.7 (23.4)	D (C)
	NB On		600 (630)	30.7 (25.6)	D (C)
	SB Off		630 (600)	24.5 (28.7)	C (D)
	SB On		460 (590)	23.2 (29.1)	C (D)
Design Year 2034					
I-95/Ellis Rd	NB Off	NA[1]	610 (640)	30.2 (25.0)	D (C)
	NB On		680 (670)	32.9 (26.5)	D (C)
	SB Off		670 (680)	25.2 (30.5)	C (D)
	SB On		640 (610)	25.0 (30.9)	C (D)

1. NA: Not Applicable - No interchange is included in the No-Build Alternative
2. Density = passenger cars per mile per lane (pc/mi/ln)

3.4.3 Arterial Comparison

Tables 3.4.3A and 3.4.3B compare the arterial analysis for Ellis Road from John Rodes Boulevard to Wickham Road. The acceptable LOS standard for arterial performance is 'D'.

The comparison of the arterial analysis shows that the three Build Alternatives provide better arterial performance than the No-Build Alternative. Among the three Build

Alternatives, Build Alternatives 1 and 2 both provide LOS D or better through Design Year 2034. However, Build Alternative 1 provides higher average speed as compared to Alternative 2 due to Class 3 access management control and higher design speed (50 mph).

Table 3.4.3A: AM Peak Hour Arterial Comparison

Ellis Road	Direction	No-Build[2]		Alternative 1		Alternative 2		Alternative 3	
		Speed[3]	LOS	Speed [3]	LOS	Speed [3]	LOS	Speed [3]	LOS
Opening Year 2014									
From I-95 SB Ramps to Wickham Rd[1]	EB	26.1	C	27.6	C	26.0	C	21.9	D
From Wickham Rd to I-95 SB Ramps[1]	WB			33.5	C	26.0	C	23.0	D
Interim Year 2024									
From SJHP to Wickham Rd	EB	23.7	C	28.3	C	26.8	C	23.5	D
From Wickham Rd to SJHP	WB	19.5	C	31.6	C	25.9	C	21.7	D
Design Year 2034									
From SJHP to Wickham Rd	EB	24.5	B	25.8	D	23.4	C	19.4	E
From Wickham Rd to SJHP	WB	6.6	F	24.2	D	21.0	D	18.0	E

1. 2014 No-Build Arterial Analysis was conducted using HCS+ Two-Lane Highway Module.
2. No-Build Arterial Analysis was conducted between John Rodes Blvd and Wickham Road for all analysis years.
3. Speed is in miles per hour (mph)

Table 3.4.3B: PM Peak Hour Arterial Comparison

Ellis Road	Direction	No-Build[2]		Alternative 1		Alternative 2		Alternative 3	
		Speed[3]	LOS	Speed [3]	LOS	Speed [3]	LOS	Speed [3]	LOS
Opening Year 2014									
From I-95 SB Ramps to Wickham Rd[1]	EB	25.8	C	29.2	C	27.4	C	23.4	D
From Wickham Rd to I-95 SB Ramps[1]	WB			32.8	C	26.1	C	24.5	D
Interim Year 2024									
From SJHP to Wickham Rd	EB	24.2	B	26.9	C	25.5	C	23.2	D
From Wickham Rd to SJHP	WB	21.1	C	28.9	C	25.3	C	23.3	D
Design Year 2034									
From SJHP to Wickham Rd	EB	25.4	B	24.3	D	23.2	C	19.5	E
From Wickham Rd to SJHP	WB	6.9	F	27.3	C	22.5	C	20.9	E

1. 2014 No-Build Arterial Analysis was conducted using HCS+ Two-Lane Highway Module.
2. No-Build Arterial Analysis was conducted between John Rodes Blvd and Wickham Road for all analysis years.
3. Speed is in miles per hour (mph)

3.4.4 Intersection Comparison

Tables 3.4.4A and 3.4.4B compare the intersection operational analysis for the signalized study intersections. The acceptable LOS standard for study intersections is 'D'.

The comparison of the intersection operational analysis shows that the three Build Alternatives provide better LOS at the signalized intersections than the No-Build Alternative. Among the three Build Alternatives, Build Alternatives 1 and 2 both provide LOS D or better and provide equivalent performance at the signalized intersections. However, Build Alternative 1 provides better operations at the unsignalized as compared to Alternative 2 due to Class 3 access management.

There are two major intersections (East Drive and Technology Drive) in Build Alternative 1 between the Johns Rodes Boulevard and Wickham Road. These intersections are full-access intersections and both are proposed to be signalized to control the traffic volumes generated from the Class 3 access management. Build Alternative 2 has moderate delays at the unsignalized intersections. However, Stan Drive and Distribution Drive East intersections operate at LOS E during the PM Peak Hour.

Table 3.4.4A: AM Peak Hour Comparison

Intersection	Control Type NB/1/2/3	No-Build	Alternative 1	Alternative 2	Alternative 3
Opening Year 2014					
St. Johns Heritage Pkwy	NA / NA / S /S	NA	NA	NA	NA
I-95 SB Off/On Ramps	NA / S / S / S	NA	B	B	B
I-95 NB Off/On Ramps	NA / S / S / S	NA	C	C	C
John Rodes Blvd	U / S / S / S	C	B	C	C
East Dr	U / S / S / S	E	B	B	C
Technology Dr	U / S / S / S	C	A	A	D
Wickham Rd	S / S / S / S	D	D	D	E
Interim Year 2024					
St. Johns Heritage Pkwy	NA / NA / S /S	NA	NA	NA	NA
I-95 SB Off/On Ramps	NA / S / S / S	NA	C	C	C
I-95 NB Off/On Ramps	NA / S / S / S	NA	B	B	B
John Rodes Blvd	U / S / S / S	C	C	C	C
East Dr	U / S / S / S	F	C	C	D
Technology Dr	U / S / S / S	F	A	A	D
Wickham Rd	S / S / S / S	E	D	D	D
Design Year 2034					
St. Johns Heritage Pkwy	NA / NA / S /S	NA	D	D	D
I-95 SB Off/On Ramps	NA / S / S / S	NA	C	C	B
I-95 NB Off/On Ramps	NA / S / S / S	NA	B	B	B
John Rodes Blvd	U / S / S / S	E	D	D	D
East Dr	U / S / S / S	F	C	C	D
Technology Dr	U / S / S / S	F	A	A	D[1]
Wickham Rd	S / S / S / S	F	D	D	D

1. Technology Dr Frontage Road intersections operate at LOS F in Design Year 2034
Note: NB: No-Build, NA: Not Applicable, S: Signalized, U: Unsignalized

Table 3.4.4B: PM Peak Hour Comparison

Intersection	Control Type NB/1/2/3	No-Build	Alternative 1	Alternative 2	Alternative 3
Opening Year 2014					
St. Johns Heritage Pkwy	NA / NA / S /S	NA	NA	NA	NA
I-95 SB Off/On Ramps	NA / S / S / S	NA	B	B	B
I-95 NB Off/On Ramps	NA / S / S / S	NA	B	B	B
John Rodes Blvd	U / S / S / S	F	C	C	C
East Dr	U / S / S / S	D	B	B	C
Technology Dr	U / S / S / S	C	B	B	D
Wickham Rd	S / S / S / S	C	D	D	D
Interim Year 2024					
St. Johns Heritage Pkwy	NA / NA / S /S	NA	NA	NA	NA
I-95 SB Off/On Ramps	NA / S / S / S	NA	C	C	C
I-95 NB Off/On Ramps	NA / S / S / S	NA	C	B	B
John Rodes Blvd	U / S / S / S	C	C	D	D
East Dr	U / S / S / S	F	B	B	C
Technology Dr	U / S / S / S	F	B	B	D
Wickham Rd	S / S / S / S	E	C	C	D
Design Year 2034					
St. Johns Heritage Pkwy	NA / NA / S /S	NA	D	D	C
I-95 SB Off/On Ramps	NA / S / S / S	NA	B	B	B
I-95 NB Off/On Ramps	NA / S / S / S	NA	B	B	B
John Rodes Blvd	U / S / S / S	D	D	D	D
East Dr	U / S / S / S	F	C	C	D
Technology Dr	U / S / S / S	F	B	B	D[1]
Wickham Rd	S / S / S / S	F	D	D	D

1. Technology Dr Frontage Road intersections operate at LOS F in Design Year 2034
Note: NB: No-Build, NA: Not Applicable, S: Signalized, U: Unsignalized

3.5 Conclusion of Technical Traffic Memorandum

This study evaluated one (1) No-Build and three (3) Build Alternatives. Based on the operational analysis comparison, Alternative 1 has the most desirable projected future operations. The conclusions of the operational analysis are summarized below for both I-95 and Ellis Road.

<u>I-95 Mainline</u>

The number of lanes needed to satisfy the LOS C requirement on I-95 for both the 2034 No-Build and Build Alternatives is 8 lanes (4 in each direction). The number of lanes required on I-95 has changed from the results of the IJR study prepared in 2008. In 2008, the 6-lanes on I-95 were sufficient to satisfy the LOS requirement. The reason for the change in the number of lanes is directly related to the increased interstate traffic caused by changes in the land use in Brevard County.

<u>Ellis Road</u>

Three access management Build Alternatives were analyzed on Ellis Road between John Rodes Boulevard to Wickham Road in this study. Two of the alternatives considered FDOT Access Management Class 3 and 5, while the third was a frontage road alternative. Based on the analysis, the frontage road alternative (Build Alternative 3) does **<u>not</u>** meet the mobility and quality of flow objectives for the project. Both of the non-frontage road alternatives (Build Alternatives 1 and 2) satisfy the quality of flow objectives for the project. There is a slight advantage of the Class 3 alternative (most restrictive access management) over the Class 5 alternative. A summary of each alternative is as follows:

Build Alternative 1 (Access Management Class 3 – 50 mph)

Alternative 1 provides acceptable LOS D standard or better through Design Year 2034 for both the arterial and intersection operations. Build Alternative 1 provides better operations at the unsignalized intersections as compared to both Alternatives 2 and 3. Build Alternative 1 also provides the highest speeds and therefore the lowest travel times on the corridor of all three build alternatives.

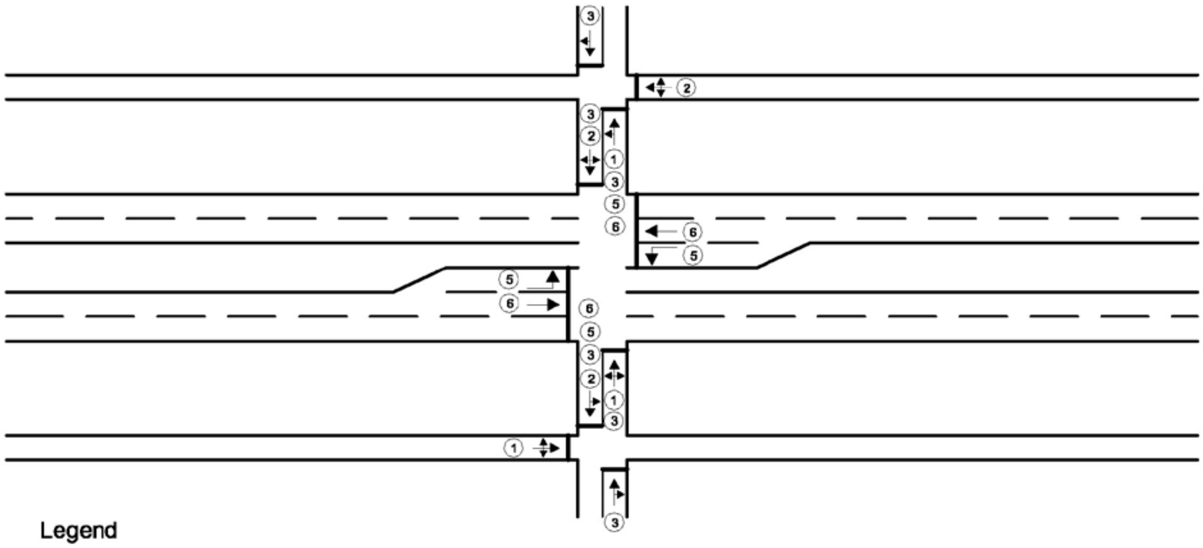
Build Alternative 2 (Access Management Class 5 – 45 mph)

Alternative 2 provides acceptable LOS D standard or better through Design Year 2034 for both the arterial and signalized intersection operations. However, two unsignalized intersections (i.e., Stan Drive and Distribution Drive East) operate at LOS E during the PM Peak Hour. While Alternative 2 provides better performance compared to Alternative 3, it does not perform as well as Alternative 1. However, the difference in design year travel times between Alternative 1 and 2 ranges from 1.1 to 4.8 minutes in the AM and PM peak hours, depending on the direction of travel. While Build Alternative 1, with a Class 3 access management, is superior in terms of speed and time delay, Alternative 2 is recommended as the preferred alternative for this study, as the travel time savings between the alternatives is less than five minutes.

Build Alternative 3 (Access Management Class 3 with Frontage Road – 50 mph)

Alternatives 3 does <u>not</u> provide acceptable LOS D standard through Design Year 2034 for both the arterial and intersection operations with the optimal lane configuration provided. Build Alternative 3 does not meet the mobility and quality of flow objectives for the corridor. The geometric design and signal phasing requirements of Build Alternative 3 (shown in Figure 3.5.1) result in increased delay at the signalized intersections. While the signalized intersections on Ellis Road are expected to operate at LOS D, the adjacent intersections on the frontage roads are expected to operate at LOS F which further impacts the arterial operations. These factors result in lower speeds between signalized intersections and an overall longer travel time for the corridor. Therefore, this alternative is not recommended.

Figure 3.5.1: Build Alternative 3 Signalized Intersection Geometry and Signal Phasing



3.6 Design Traffic Technical Memorandum Update (June 2014)

The 2011 DTTM explained in the above sections was approved by the Department in March 2011. In June 2014, an updated DTTM was prepared. The 2014 update analyzed the existing and no-build conditions along with opening, interim, and design year volumes for the Build Alternative. The following sections highlight the pertinent information contained in the 2014 DTTM.

3.6.1 Data Collection and Analysis Years

Intersection counts along Ellis Road were conducted on April 2, 2014, 7 AM – 9 AM and 4 PM – 6 PM. In addition, 48-hour bi-directional vehicular volume and classification counts were conducted in the study area between April 2 and April 3, 2014. The years identified for the analysis are:

- Existing conditions (2014)
- Opening Year 2020
- Interim Year 2030
- Design Year 2040

3.6.2 Travel Demand Forecasting

The current adopted travel demand forecasting model for the study area is CFRPM v5.01, which has a base year of 2005 and cost feasible year of 2035. FDOT D5 is working with MPOs to develop the CFRPM v6 2010 base year model for the upcoming Long Range Transportation Plan (LRTP) updates. In reviewing the progress of the new model development, the 2010 socio economic and roadway network data were found to be available for use. To best utilize the latest developed model information, the adopted Central Florida Regional Planning Model (CFRPM) 5.01 was updated to the 2010 Ellis Road PD&E Study Methodology as the base year for this study. The subarea 2010 model was prepared and validated based on procedures outlined in the FDOT 2014 Project Traffic Forecasting Handbook and the FSUTMS-Cube Framework Phase II: Model Calibration and Validation Standards. The validated CFRPM v5.01 subarea model meets the FSUTMS standards and is expected to provide a reasonable future traffic projection.

3.6.3 Development of Design Traffic

The development of the design traffic was based on a comprehensive evaluation of historical trends and growth rates, existing traffic volumes, and the CFRPM v5.01 model projected AADTs. Future intersection turning movements were projected using both FDOT's TURNS5 program and NCHRP 255 methodologies

For Level of Service Criteria, LOS D standards were used for I-95 mainline and ramps as well as Ellis Road.

3.6.4 Analysis Procedures

Traffic analysis conducted for this study follows the guidelines provided in FDOT's Traffic Analysis Handbook (2014). Highway Capacity Manual (HCM) 2010 methodologies were used for the operational analysis of intersections, arterial segments, freeway mainline, and ramps. In summary, the analysis tools selected for this study are consistent with the guideline, as follows:

- Intersections were analyzed using HCM 2010 methodologies implemented in Synchro 8, for both signalized and unsignalized intersections.

- Arterial facility and segments were analyzed using HCM 2010 methodologies implemented in HCS 2010.
- Freeway mainline and ramp merge/diverge were analyzed using HCM 2010 methodologies implemented in HCS 2010.

3.6.5 Recommended K, D, and T_{24} DHT Factors

The recommended traffic factors are summarized in Table 3.6.1. The Design Hour Truck (DHT) values representing the percentage of trucks expected to use the facility within the design hour were calculated as (T_{24}/2), per FDOT Traffic Forecasting Handbook guidelines.

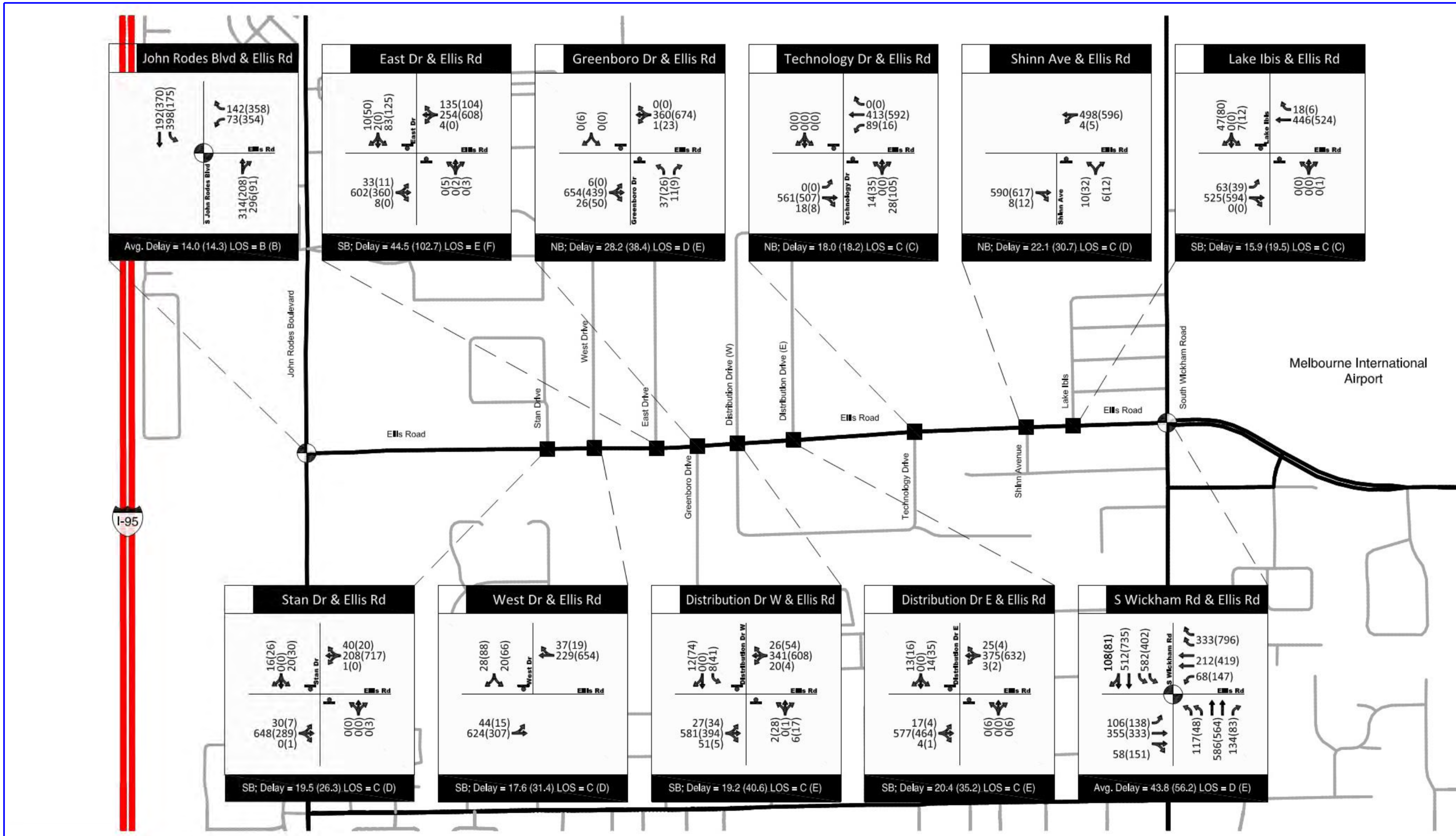
Table 3.6.1: Summary of K, D, and T_{24} DHT Factors

Facility	K Factor	D Factor	T_{24} Factor	DHT
I-95	9.0	55.0	11.0	5.5
Ellis Road	9.0	56.0	8.1	4.1
Adjacent Arterials & Roadways	9.0	56.0	8.1	4.1

3.6.6 Average Annual Daily Traffic and Intersection Turning Movements

The 48-hour traffic counts obtained on April 2 and 3, 2013 were adjusted using a seasonal adjustment factor or 0.91, obtained from the 2013 Florida Traffic Online per FDOT procedures, to estimate 2014 AADT. The two-hour AM and PM peak period intersection turning movement counts were aggregated every 15 minutes to develop peak hour traffic volumes.

Figure 3.6.1 displays the existing intersection volume, geometry, and LOS.



EXCERPTED FROM FIGURE 5 OF
DESIGN TRAFFIC TECHNICAL MEMORANDUM(JUNE 2014)

AM(PM) = Traffic Volume, Delay, LOS
= Lane Geometry
= Signalized Intersection
= Stop Sign

0 0.25 0.5 Miles

FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING INTERSECTION VOLUME, GEOMETRY AND LOS

FIGURE NO. 3.6.1

3.6.7 Description of Alternatives

3.6.7.1 No-Build Alternative

The No-Build Alternative assumed the existing lane configuration on the study roadways plus the committed roadway improvements within the study area. These include:

- Apollo Road extension and widening between Sarno Road and W. Eau Gallie Boulevard (by 2020)
- St. John's Heritage Parkway (by 2020)
- Washingtonia Drive (by 2030)

3.6.7.2 Build Alternative

The Build Alternative includes a new interchange on Ellis Road at I-95, with partial cloverleaf type configuration, as recommended in the I-95 at Melbourne International Airport IJR. The following major components are included in the Build alternative:

- Ellis Road widened from 2-lanes to 4-lanes, with upgrades to class 3 urban arterial, a more restrictive access management facility. This includes limiting some or all left turn access in and/or out of these five intersections along Ellis Road: West Drive, Greenboro Drive, Distribution Drive West, Shinn Avenue, and Lake Ibis.
- Design speed for Ellis Road increased from existing 35 mph to 45 mph.
- New traffic signals at East Drive and Technology Drive intersections along Ellis Road.
- New traffic signals at both northbound and southbound ramp termini at the Ellis Road interchange.

3.6.8 Traffic Forecasting

A detailed description of the traffic forecasting methodology is available in Section 6 of the for the 2014 DTTM. The adopted Central Florida Regional Planning Model (CFRPM) 5.01 base year was updated to the year of 2010 using the 2010 socio economic and roadway network data from the on-going CFRPM v6 2010 model base year development. Future volume forecasts of 2020 (Opening Year), 2030 (Mid-Year), and 2040 (Design Year) were developed. The Opening Year and Mid-Year projections can be found in the 2014 report.

The AADTs were converted to Directional Design Hour Volumes (DDHVs) through the application of the recommended K and D factors.

Two methods were used to determine future intersection turning movement volumes. The first method follows procedures described in NCHRP 255, and the second method uses the FDOT Turns5 (v2014) spreadsheet. Both of these methods are consistent with acceptable tools described in FDOT's Project Traffic Forecasting Handbook (2014). Based on evaluation of the future turning volumes generated from both methods, it was determined that the NCHRP 255-based results were more reasonable. The FDOT Turns5 results often were unable to reach convergence, and produced unreasonable future volumes lower than existing conditions in many cases. The FDOT Turns5 outputs are included in Appendix D of the 2014 DTTM.

The following figures on the next pages summarize the results of the traffic forecasting:

- Figures 3.6.2 and 3.6.3 display the future No-Build and Build AADT, respectively.
- Figure 3.6.4 displays the No-Build arterial and freeway LOS.
- Figure 3.6.5 displays the Build arterial and freeway LOS.
- Figure 3.6.6 displays the 2040 No-Build intersection volume, geometry, and LOS.
- Figure 3.6.7 displays the Build intersection volume, geometry, and LOS.

Figure 3.6.2: Future No-Build Annual Average Daily Traffic (AADT)

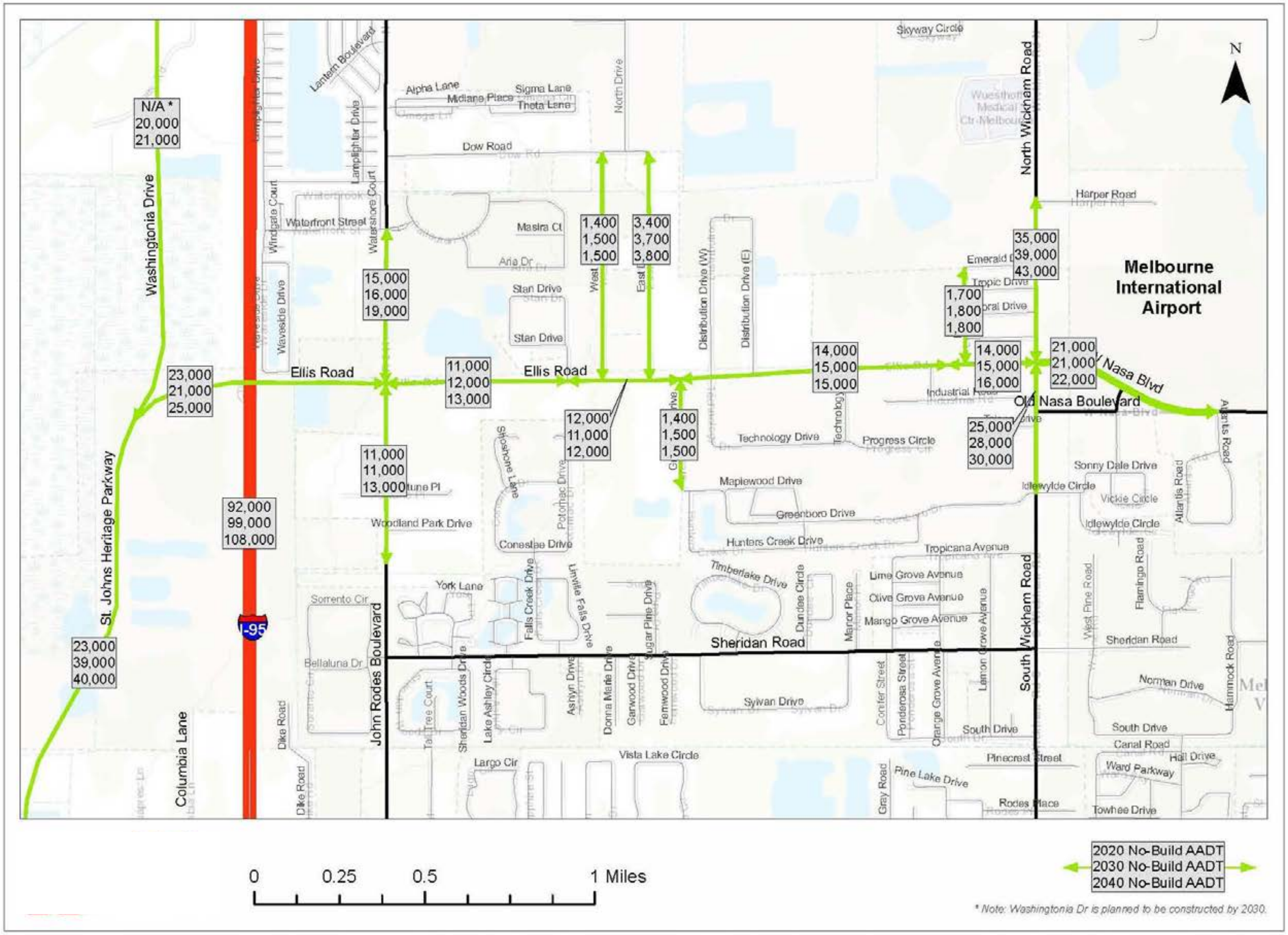


Figure 3.6.3: Future Build Annual Average Daily Traffic (AADT)

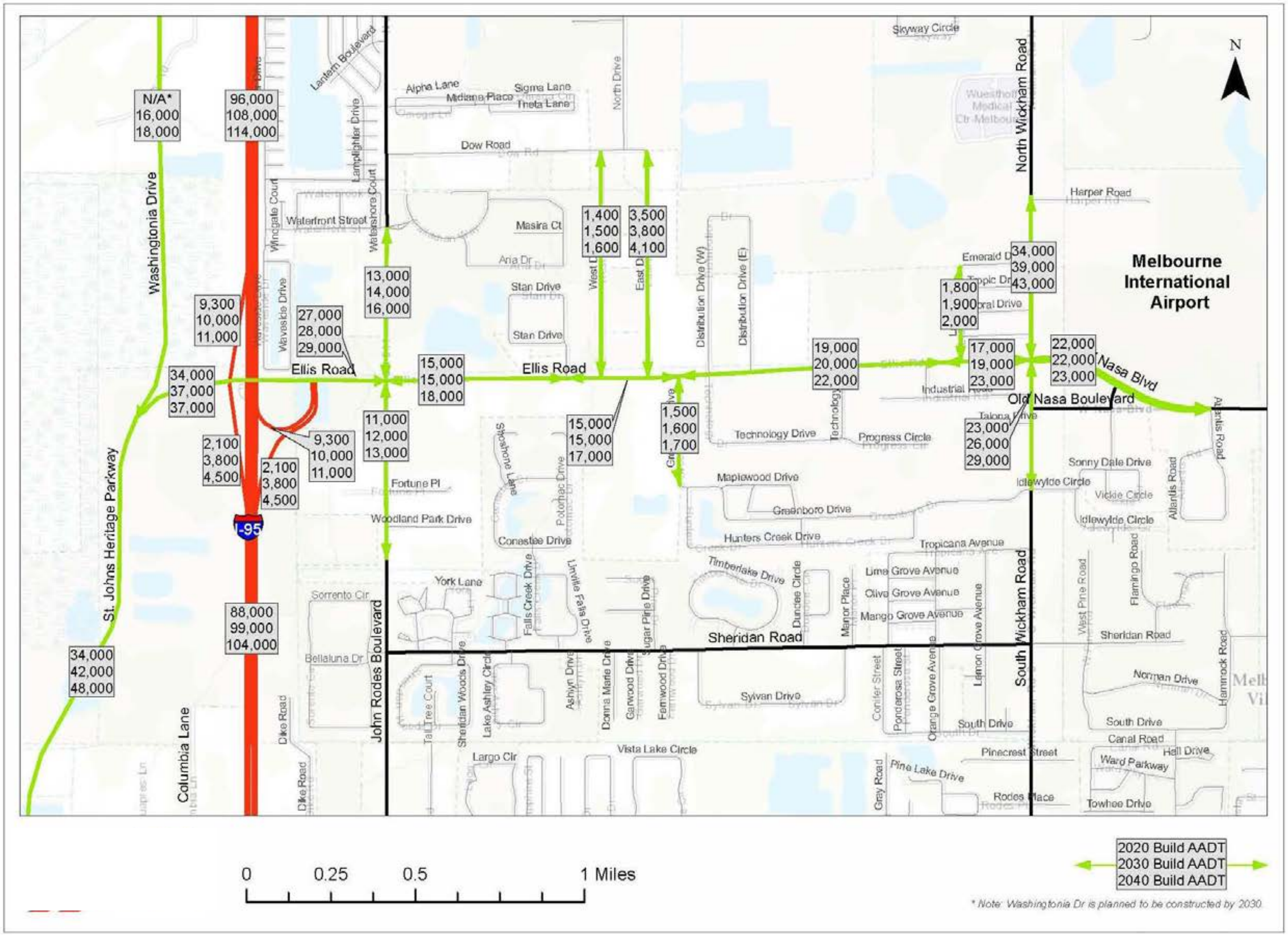


Figure 3.6.4: 2040 No-Build Arterial and Freeway LOS

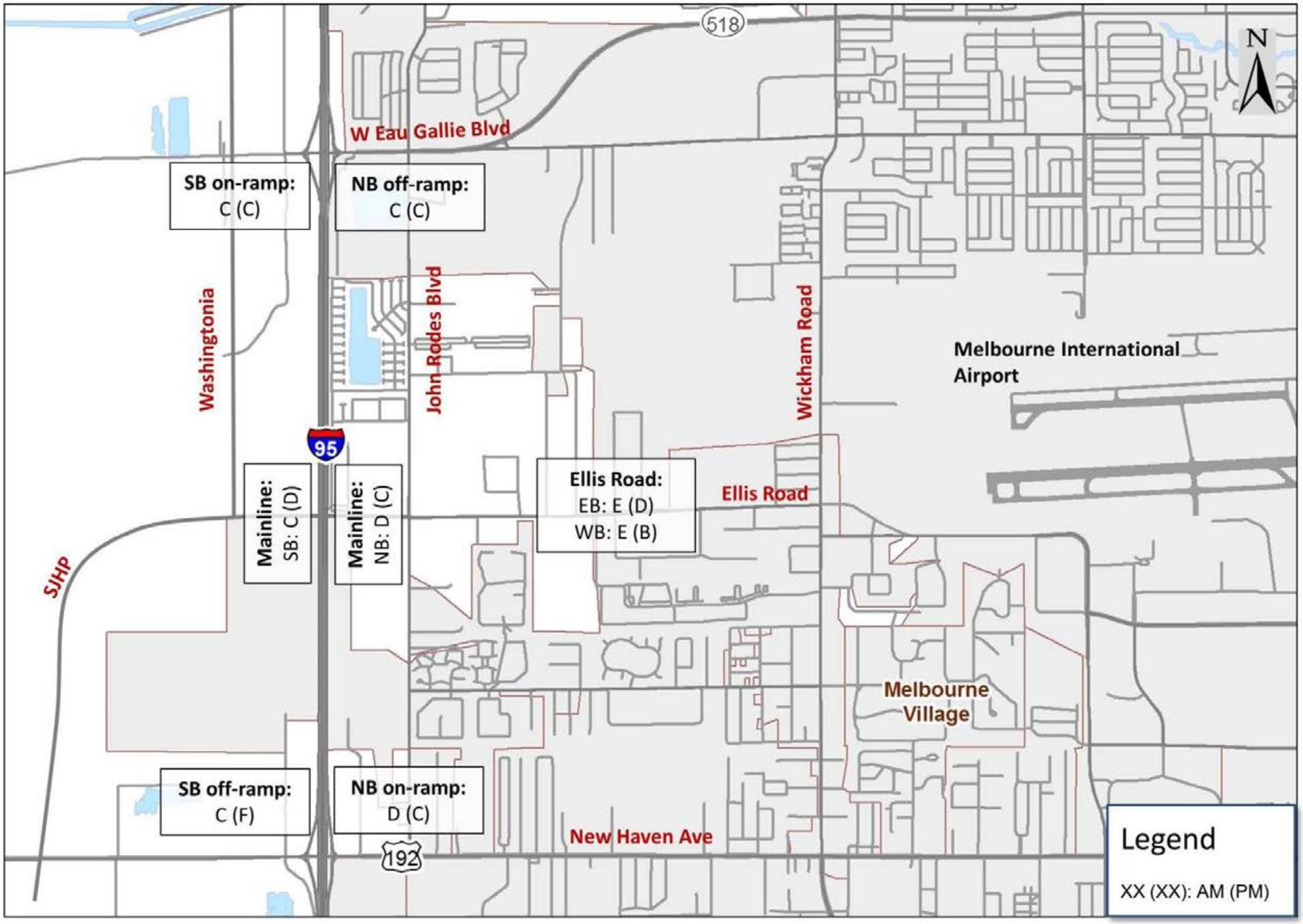
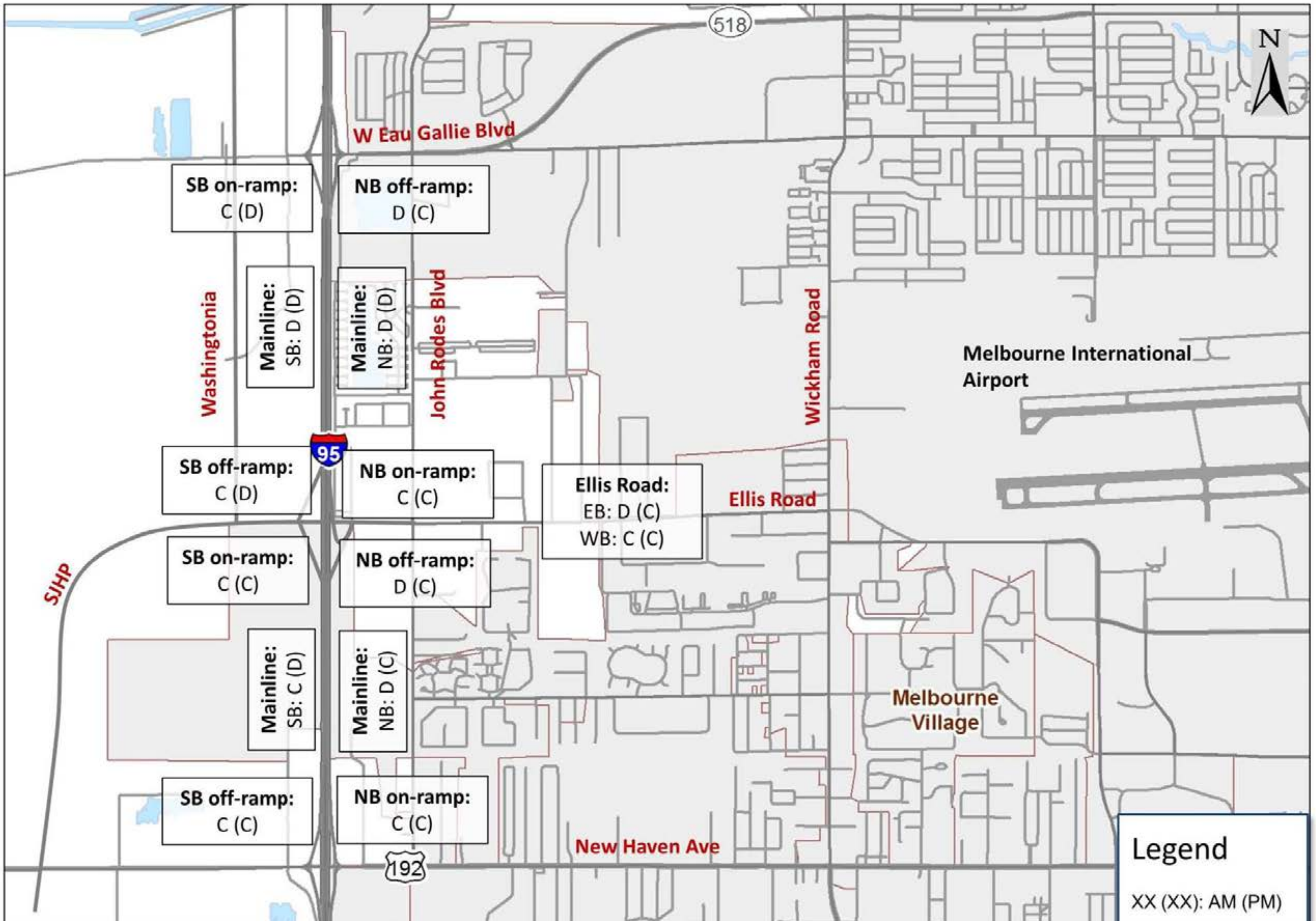
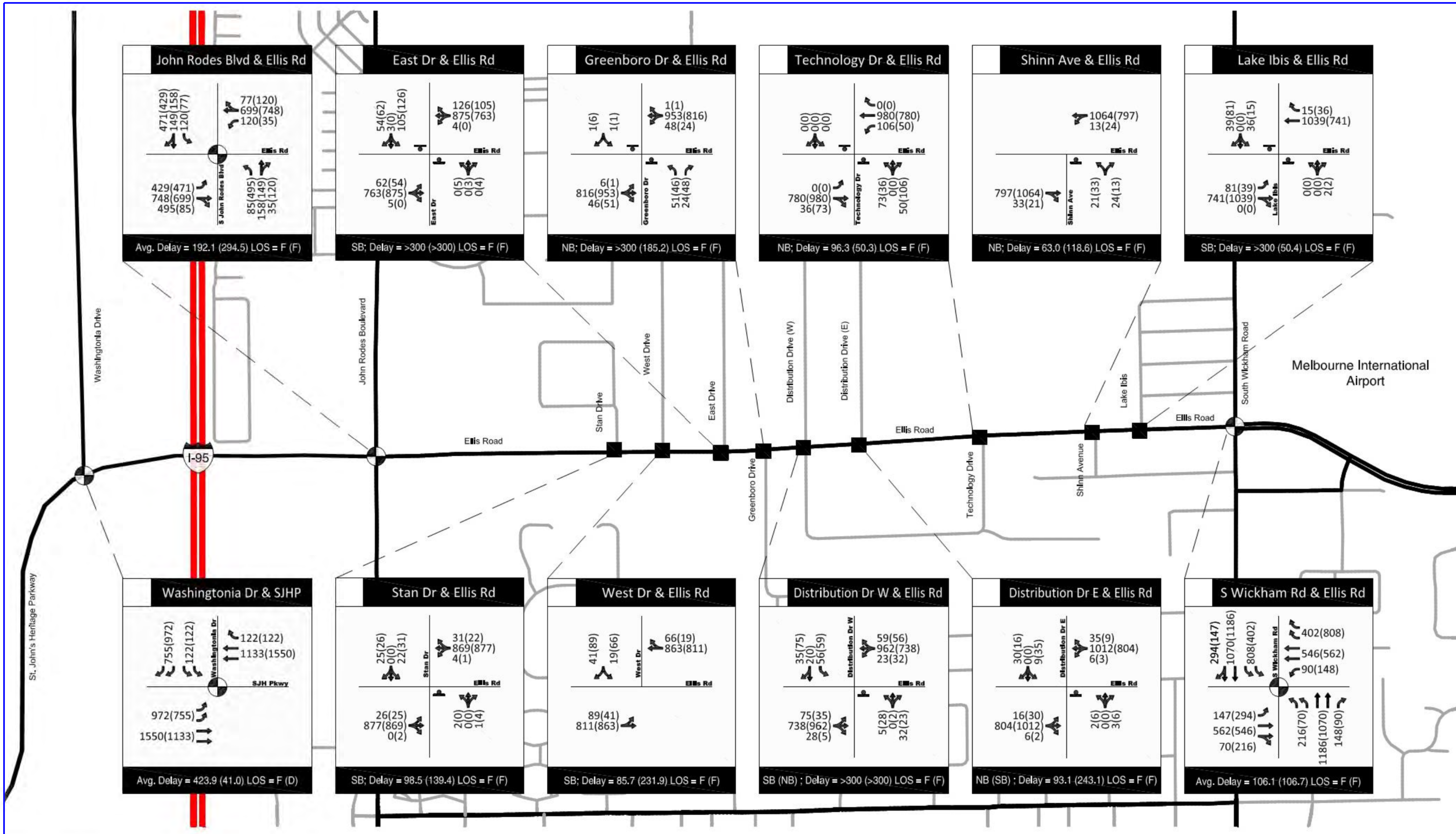


Figure 3.6.5: 2040 Build Arterial and Freeway LOS





EXCERPTED FROM FIGURE 14 OF
DESIGN TRAFFIC TECHNICAL MEMORANDUM(JUNE 2014)

AM(PM) = Traffic Volume, Delay, LOS
= Lane Geometry
= Signalized Intersection
= Stop Sign

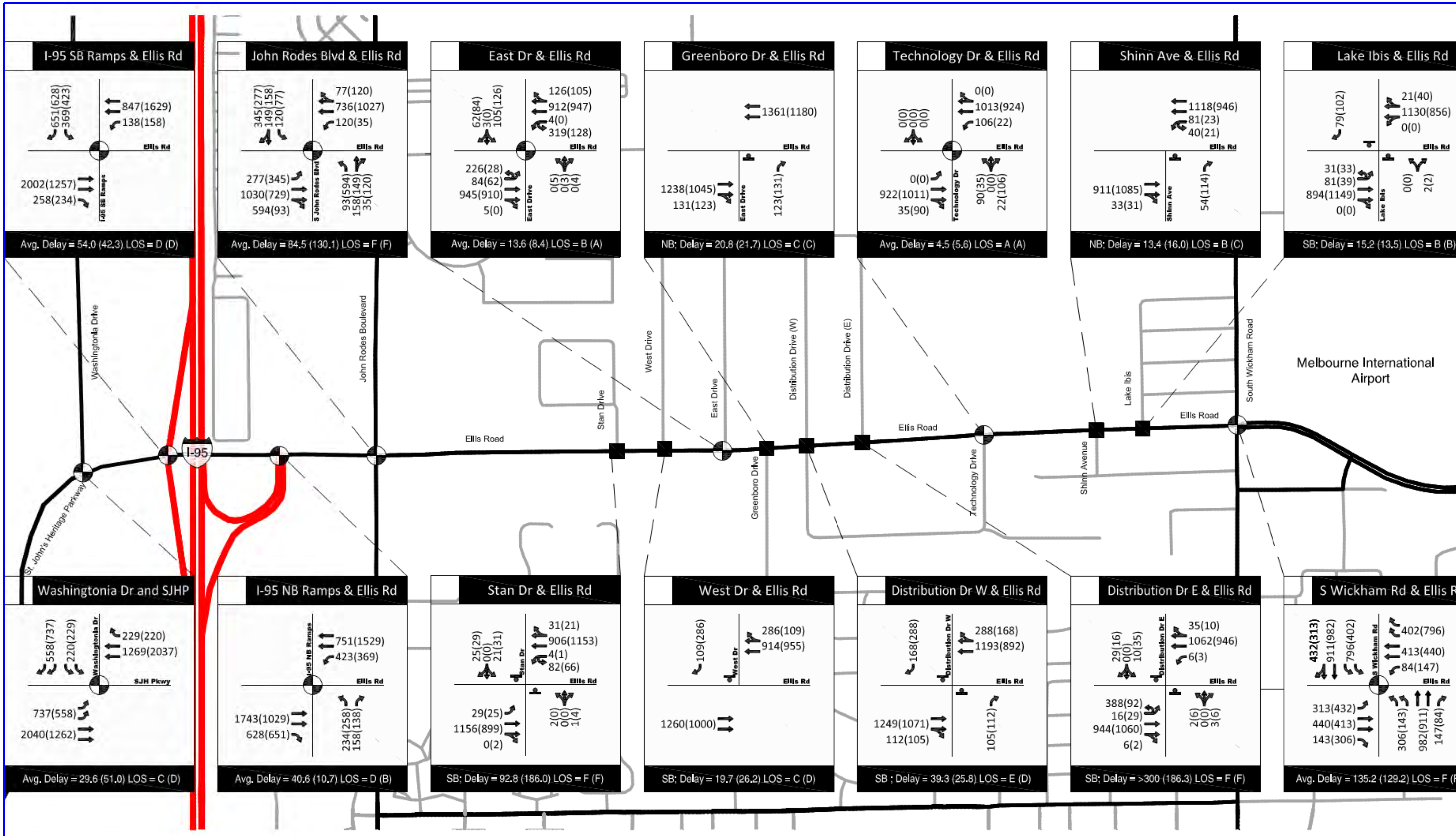
0 0.25 0.5 Miles

FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

2040 NO-BUILD
INTERSECTION VOLUME,
GEOMETRY AND LOS

FIGURE NO.
3.6.6



EXCERPTED FROM FIGURE 20 OF
DESIGN TRAFFIC TECHNICAL MEMORANDUM(JUNE 2014)

AM(PM) = Traffic Volume, Delay, LOS
= Lane Geometry
= Signalized Intersection
= Stop Sign

0 0.25 0.5 Miles

FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

2040 BUILD INTERSECTION VOLUME, GEOMETRY AND LOS

FIGURE NO.
3.6.7

3.6.9 Design Year Queuing Analysis

A queuing analysis was performed to evaluate necessary turn lane lengths for the 2040 design year. The 95th percentile queue was reported from the Synchro analysis for all signalized intersections, as shown in Table 3.6.2. Generally, the 95th percentile queue is adequate for the purpose of designing turn lane lengths. The recommended queue length was determined using the higher value between AM and PM peak hours. Note that the deceleration and taper distances are not included as part of the queue lengths.

Table 3.6.2: Summary of 2040 Design Year 95th Percentile Queuing Analysis

Intersections Along Ellis Road	Movement	95th Percentile Queue		Recommended Queue Lengths[1]
		AM Peak	PM Peak	
St. Johns Heritage Pkwy	EBL	444	417	450
	WBR	123	74	130
	SBL	152	145	160
	SBR	255	431	440
I-95 SB Ramps	EBR	63	54	70
	WBL	258	271	280
	SBL	472	430	480
	SBR	912	806	920
I-95 NB Ramps	EBR	330	43	330
	WBL	645	197	650
	NBL	395	324	400
	NBR	67	56	70
John Rodes Blvd	EBL	484	678	680
	WBL	297	93	300
	NBL	147	966	970
	SBL	182	116	190
East Drive	EBL	431	66	440
	WBL	418	89	420
Technology Drive	WBL	62	15	70
Wickham Road	EBL	635	982	990
	EBR	22	289	290
	WBL	136	288	290
	WBR	61	651	660
	NBL	310	168	310
	NBR	23	16	30
	SBL	709	474	710

[1] Does not include taper and deceleration distances.

3.6.10 Potential Improvements for Build Alternative

The signalized intersections along Ellis Road at John Rodes Boulevard and at Wickham Road would operate with LOS F with the current design configuration. This section identifies improvements to potentially enhance traffic operations at these two intersections. Note that the improvements were identified from a traffic operational standpoint, additional evaluation of potential right-of-way, environmental and other impacts need to be further investigated.

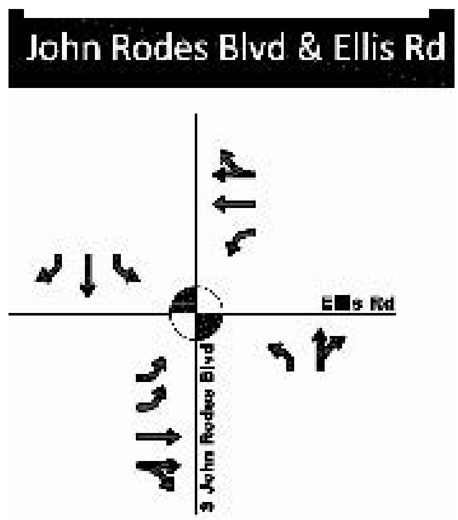
3.6.10.1 John Rodes Boulevard and Ellis Road Intersection

Potential improvements for this intersection include:

- Adding an eastbound left turn lane (from single left to dual left); this would require John Rodes Boulevard northbound north of Ellis Road to be widened to 2 lanes in order to receive the dual left turn lane traffic from Ellis Road.
- An exclusive southbound right turn lane is also identified.
- Additional signal phasing improvements include providing an overlap phase for southbound right turn, and converting the northbound and southbound left turn movements to protected-plus-permitted phasing.

With these improvements, this intersection would operate with LOS D (52 seconds of delay) during the AM peak hour, and LOS E (61 seconds of delay) during the PM peak hour in 2040. Figure 3.6.8 provides an illustration of the lane configurations.

Figure 3.6.8: Potential Geometric Improvements at John Rodes Blvd. / Ellis Rd.



3.6.10.2 Wickham Road and Ellis Road Intersection

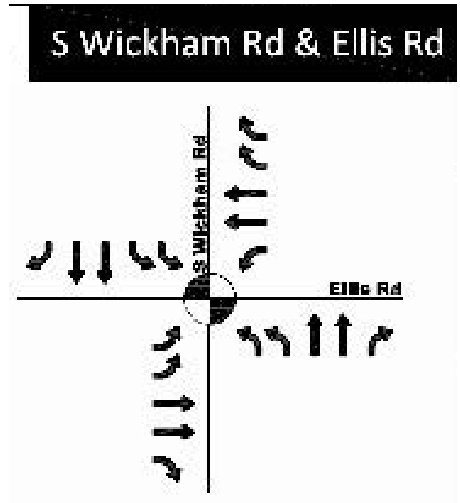
Potential improvements for this intersection include:

- Adding a southbound right turn lane on Wickham Road.
- Adding an eastbound left turn lane on Ellis Road for a total of two eastbound left turn lanes.

- Additional signal phasing improvements include providing an overlap phase for westbound right turn and eastbound right turn movements, and increasing cycle length to 240 seconds.

With these improvements, this intersection would operate with LOS E (77 seconds of delay) during the AM peak hour, and LOS E (69 seconds of delay) during the PM peak hour in 2040. Volume / capacity ratios would also be reduced to less than 1.0 with these changes. Figure 3.6.9 provides an illustration of the potential lane configuration.

Figure 3.6.9: Potential Geometric Improvements at Wickham Rd. / Ellis Rd.



3.6.11 Conclusion

The update to the 2011 DTTM, entitled the 2014 DTTM, evaluated traffic operations for the No-Build and the Build Alternatives for the Ellis Road PD&E study. Freeway mainline and ramp operations, arterial and intersection operations were conducted. Based on the analysis, the Build Alternative provides better overall operational performance in terms of lower delays and improved level of service.

The Build Alternative would help alleviate and improve adjacent interchange ramp operations at US 192 and SR 518. Ellis Road would be improved at a facility level, from below LOS standards in the No-Build Alternative to meeting LOS standard in the Build Alternatives. Intersection operations would also be significantly improved at a majority of the intersections along Ellis Road.

4.0 Alternatives Considered

The following sections analyze three typical sections and various alignment alternatives.

4.1 No-Build Alternative

The No Build Alternative retains the existing roadway network. Under this scenario, existing Ellis Road would not be improved. The No-Build Alternative has certain advantages and disadvantages. The advantages of the No-Build Alternative include:

- No new design, utility, right of way, or construction costs, saving taxpayer dollars;
- No inconveniences to the motoring public during construction;
- No business or residential damages or displacements;
- No environmental degradation.

The disadvantages of the No Build Alternative include:

- No traffic relief for Eau Gallie Boulevard and New Haven Avenue;
- No direct route from I-95 to Melbourne International Airport;
- No access to I-95 for St. Johns Heritage Parkway at Ellis Road;
- Future failing level of service on the roadway network, particularly at the Eau Gallie Boulevard and US 192 (New Haven Avenue) interchanges;
- Increased congestion and potential crashes on the existing two-lane section;
- No treatment of stormwater runoff.

4.2 Transportation System Management

Transportation System Management (TSM) activities include improvements such as separate turn lanes, traffic signal timing optimization, and pavement marking improvements to enhance traffic safety and mobility. Projected traffic volumes on Ellis Road support the justification of additional lanes on the mainline. The implementation of TSM strategies will aid in local intersection safety and will be utilized in the proposed concepts. However, TSM improvements alone to Ellis Road do not sufficiently address the capacity problems or improve overall network efficiency, such as more direct access to

Melbourne International Airport. The TSM alternative is not considered a viable option and no further evaluation of the TSM alternative is conducted in this study.

4.3 Build Alternatives – Interchange at I-95

4.3.1 Interchange Configuration

The concept of developing a new interchange along I-95 between the existing US 192 and Eau Gallie Boulevard interchanges has been considered in previous studies. An Interchange Feasibility Study was conducted as part of the PD&E Study completed by the FDOT in December 2003 for a future Palm Bay Parkway (subsequently renamed as the St. Johns Heritage Parkway) from SR 514 (Malabar Road) to the intersection of John Rodes Boulevard and Ellis Road east of I-95. The primary purpose of this PD&E Study was to identify the purpose and need and develop alternatives for the future Parkway alignment to be located principally west of I-95. The Interchange Feasibility Study was conducted to evaluate the potential need for new interchange access in the vicinity of I-95 and the proposed Palm Bay Parkway corridor.

Subsequent to the Palm Bay Parkway PD&E Study and Interchange Feasibility Study, an Interchange Justification Report (IJR) was prepared by the FDOT and was ultimately accepted by the FHWA. The Melbourne International Airport is classified as an "Emerging SIS" hub and serves an important regional role for access to Port Canaveral and neighboring urban developments. The new interchange, and improvements along Ellis Road, will enhance accessibility to the Melbourne International Airport and reduce traffic loads on adjacent roadway facilities (US 192 and Eau Gallie Boulevard) as well as existing interchanges on I-95.

The location of the proposed new interchange evaluated in the IJR was consistent with the Interchange Feasibility Study conducted during the Palm Bay Parkway PD&E Study. The roadway alignment considered in the IJR closely followed the location of the preferred Palm Bay Parkway previously approved by FHWA in December 2003. The IJR was subsequently approved by FHWA in April 2009.

The following sections present a summary of the development of interchange configurations proposed at this location including a summary of the IJR concepts and the modifications proposed as part of the Ellis Road PD&E Study. This discussion also includes a summary of the coordination which has occurred with Brevard County relative to the development of final design plans for the Palm Bay Parkway (known as St. Johns Heritage Parkway in Brevard County). Specifically, the discussion includes the results of several on-going preliminary engineering analyses to provide consistency in the location of the Parkway alignment over I-95 as it is being developed by Brevard County as well as the evaluation of interchange alternatives at I-95 and the connection to the Ellis Road improvement alternatives addressed in the Ellis Road PD&E Study.

4.3.2 Concepts Evaluated For 2009 Interchange Justification Report

Two alternative configurations for the I-95 interchange were studied as part of the IJR:

- Standard four-leg diamond interchange; and,
- Partial cloverleaf (Parclo) interchange with a loop ramp in the southeast quadrant.

The IJR included an evaluation of traffic and operational improvements of the new interchange and considered potential social, economic, and environmental impacts in a very cursory manner consistent with FDOT's IJR procedures. The IJR concluded that the Parclo alternative (loop ramp in the southeast quadrant) provided the intended LOS of the new interchange while eliminating direct impacts to the Lamplighter Village community located in the northeast quadrant of the interchange.

The task of the Ellis Road PD&E Study is to study the IJR interchange concept in more detail. Examinations to the IJR interchange include the loop ramp radii and corresponding design speed, the recently-constructed improvements to mainline I-95, coordination with Brevard County for tie-in to the proposed St. Johns Heritage Parkway, and impacts to utilities along I-95 and the conservation easement in the northwest quadrant. These considerations resulted in adjustments to the roadway and bridge typical section concepts compared to the concepts from previous studies and the final design plans for St. Johns Heritage Parkway.

4.3.3 Coordination with St. John Heritage Parkway Project (Brevard County)

The concept of the St. Johns Heritage Parkway (formerly known as the Palm Bay Parkway) was originally developed in the mid-1970's by Brevard County. The proposed roadway has been part of the County's Comprehensive Land Use Plan, Traffic Circulation Element since the 1970's. The entire Parkway alignment extends from I-95 near Micco Road in the southern portion of Brevard County to the intersection of John Rodes Boulevard and Ellis Road in the central portion of Brevard County, a distance of approximately 20 miles. As previously noted, the segment of the Parkway from SR 514 (Malabar Road) to John Rodes Boulevard / Ellis Road, a distance of approximately 8 miles, was the subject of a PD&E Study conducted by FDOT. An Environmental Assessment / Finding of No Significant Impact (EA/FONSI) was approved by FHWA in December 2003.

Following this federal action, the City of Palm Bay and Brevard County independently advanced the final design and right-of-way acquisition for their respective segments. The City segment extends from SR 514 (Malabar Road) to the County line, while the county segment extends from the city limit to John Rodes Boulevard / Ellis Road. Both the City and County may require federal funding to complete the right-of-way acquisition and construction phases of their segments of the Parkway (the federalized portion) and have engaged in the appropriate federal re-evaluation process to maintain this eligibility.

The St. Johns Heritage Parkway project improves intra-county travel, diverting inter-city and local traffic from I-95, which presently has capacity issues. The initial construction phase for St. Johns Heritage Parkway (both city and county segments) will be two lanes, which will ultimately serve as the northbound (eastbound) lanes of the future four-lane roadway. The Brevard County project will include a new two-lane bridge over I-95, which will be expandable (to the north) to a four-lane width. The proposed bridge will also include a right-turn deceleration lane into the new loop ramp of the I-95 interchange.

Brevard County has plans for a northward extension of St. Johns Heritage Parkway along the west side of I-95 for a distance of three miles, which is proposed to be called Washingtonia Boulevard. These projects are being coordinated with the FDOT Ellis Road project.

4.3.4 Phasing of St. Johns Heritage Parkway / Ellis Road

Due to funding uncertainties at the county, state, and federal levels, the timeline for construction phasing of St. Johns Heritage Parkway has not been determined and may not be constructed prior to an extension of Ellis Road and the associated interchange. Brevard County has developed final design plans for St. Johns Heritage Parkway to a 90% development stage. An ERP application has been submitted to the SJRWMD, but a permit has not yet been granted. While Brevard County does not have funds to construct all of St. Johns Heritage Parkway, the County is proceeding with the acquisition of properties along the corridor as well as an ERP authorizing construction.

There is approximately ½ mile of overlap between the Ellis Road PD&E Study and the St. Johns Heritage Parkway final design effort. Since St. Johns Heritage Parkway has not yet been constructed, the east-west alignment of the Parkway as it crosses I-95 was not considered as a fixed alignment in this study. Depending on the final preferred interchange configuration, there may be final design plans for St. Johns Heritage Parkway that require revisions by Brevard County. Because this PD&E Study is following the National Environmental Protection Act (NEPA) process through FDOT, the interchange and the extension of Ellis Road will be eligible for future federal funding.

4.3.5 Ellis Road Alternative Alignments: West of I-95 to John Rodes Boulevard

The St. Johns Heritage Parkway typical section consists of four through lanes, a 30-foot median (22 feet between edges of curb and gutter with 4-foot inside shoulder on each side) and 5-foot paved shoulders on the outside. The design speed is 50 mph. Section 4.4 of this report explains the Ellis Road typical sections in detail. However, the consensus by the Department is to utilize the 50 mph design speed through the interchange area. As described in Section 4.4, the 50 mph Ellis Road typical section shares similar characteristics to the St. Johns Heritage Parkway typical section, except that the outer 5-foot paved shoulder is replaced with a 6.5-foot paved shoulder and curb and gutter. A grass strip of 8.25-foot has been provided between the back of curb and the inside edge of sidewalk. St. Johns Heritage Parkway utilizes an 8-foot sidewalk on both sides of the roadway. This configuration has also been carried through the interchange to John Rodes Boulevard.

Based on this typical section through the interchange area, two alignment alternatives were considered across I-95. The primary constraints within the interchange area are:

- Proximity of Lamplighter Village;
- Brevard County conservation easement in northwest quadrant;
- Existing borrow pit;
- Existing M-1 Canal;
- Existing retention pond on the east side (constructed as part of I-95 widening);
- Existing wetlands in southeast and southwest quadrants;
- Existing 300' utility easements containing electrical transmission and distribution as well as 8-inch and 26-inch gas pipelines.

Just west of the study area, St. Johns Heritage Parkway has a north-south orientation located approximately 2,000 feet west of I-95. This alignment curves from northward to eastward via an approximate 1,430-foot radius as it approaches its eastern terminus at John Rodes Boulevard. The official beginning of the Ellis Road PD&E alignment alternatives is the western limits of the limited access right-of-way for the western ramp intersection. Figure 4.3.1 displays the noteworthy constraints in the vicinity of the crossing over I-95 as well as the 90% concept from St. Johns Heritage Parkway (December, 2011). While the portion of St. Johns Heritage Parkway between US 192 and I-95 at Ellis Road is in various stages of design or right-of-way acquisition, the FDOT is currently engaged in the preliminary engineering activities for the future interchange at I-95 and an extension of Ellis Road. The Brevard County roadway plans for this portion of St. Johns Heritage Parkway are therefore not being completed in the vicinity of the interchange.

Alternative 1 is consistent with the alignment contained in Brevard County's 90% final design plans for St. Johns Heritage Parkway. Alternative 2 is located approximately 80 feet south of Alternative 1 at the center of I-95. The next sections describe these two alignments in more detail.

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I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W	PROPOSED R/W
EXISTING L/A	PROPOSED L/A
EXISTING EASEMENT	WETLANDS
PROPERTY LINE	LIMITS OF CONSERVATION EASEMENT

EXISTING CONDITIONS
W/ SJHP CONCEPT
AT I-95 CROSSING

FIGURE NO.
4.3.1

4.3.5.1 Alternative 1 - Mechanically Stabilized Earth (MSE) Wall Option

Lamplighter Village Property Line

The primary controlling geographical feature for developing an east-west alignment across I-95 is the southern property line of Lamplighter Village as well as the southern property line of the existing Brevard County conservation easement. These lines, which is also coincident with a section line, is located approximately 118 feet south of the existing edge of pavement of Waveside Drive, the internal loop road within Lamplighter Village. The south side of Waveside Drive contains an outdoor pavilion and maintenance area. A strip of trees separates the privacy fence behind the pavilion from the southern property line. Just south of the property line, a ditch with a bottom width of 7 feet and depth of approximately 2 feet conveys sheet flow south of Wayside Drive into the east-side ditch along I-95.

The intent of Alternative 1 is to accommodate the existing ditch and provide space on the south side of the ditch for future maintenance. The centerline of Alternative 1 is located approximately 108 feet south of the Lamplighter Village property line. This configuration allows the MSE wall to be located a sufficient distance from the top of ditch backslope to allow space for maintenance vehicles. Approximately 22 feet has been provided for future maintenance between the base of the retaining wall and ditch.

Due to the location of the loop ramp in the southeast quadrant, the eastern ramp intersection with Ellis Road is located roughly in the same location as the M-1 Canal. Enclosing the M-1 Canal beneath Ellis Road and the northbound exit ramp is not hydrologically desirable due to the approximate 800 feet of enclosure that would be required. As a result, the M-1 Canal is proposed to be shifted to the east along the northbound exit ramp. This canal relocation, which is common to both alignment alternatives, will also impact the existing borrow pit.

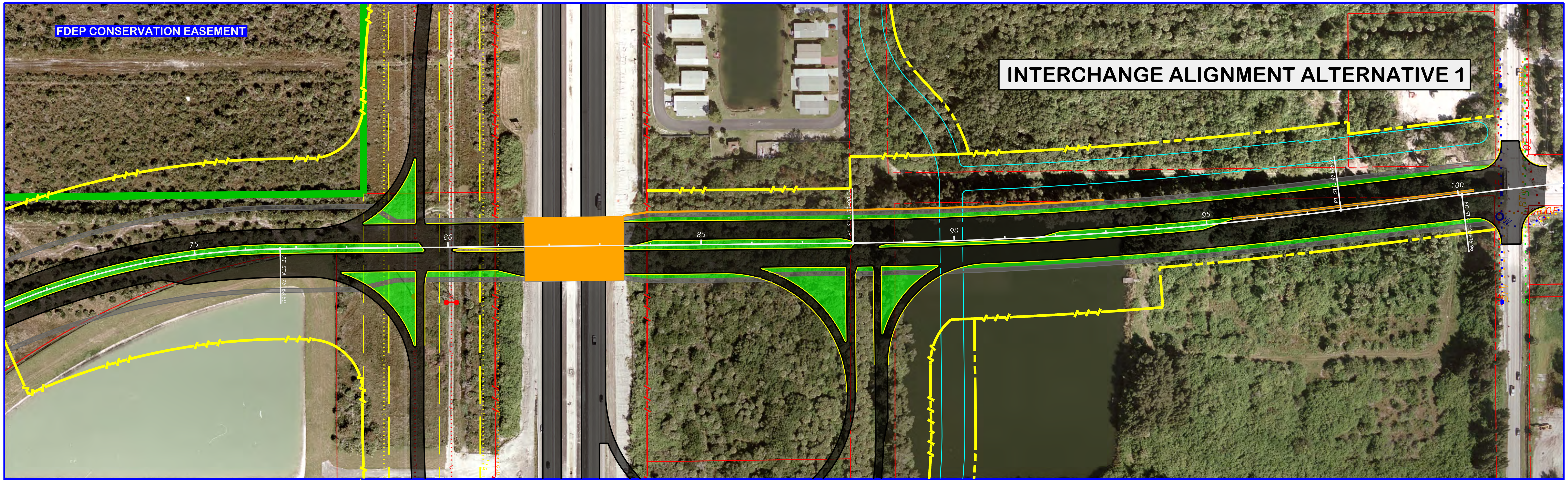
4.3.5.2 Alternative 2 – Fill Section

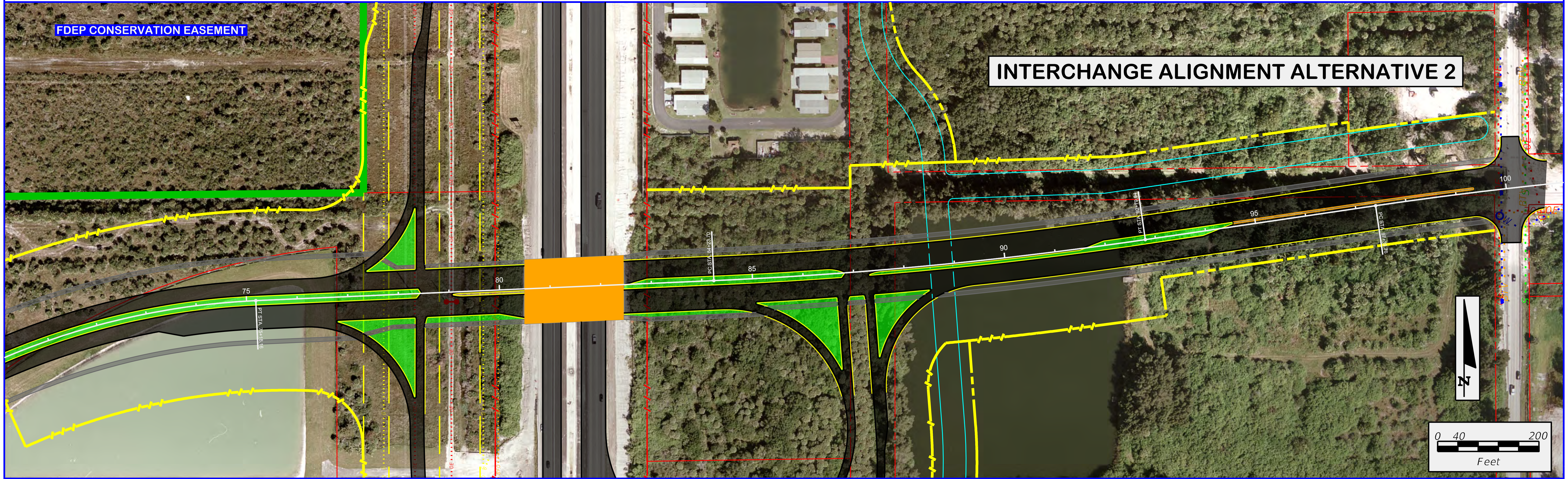
As with Alternative 1, Alternative 2 seeks to avoid right-of-way impacts to the Lamplighter Village parcel to the north. In lieu of an MSE wall, Alternative 2 utilizes a 50 mph high speed urban typical section with 1:3 slopes beginning at the back of sidewalk. With this typical section (discussed in detail in Section 4.5), the clear zone requirement of 24 feet is achieved at a distance of 2 feet behind the proposed sidewalk. The 1:3 foreslope is therefore allowable and has no effect on the distance to meet the clear zone requirement.

Alternative 2 has been set to allow for a 1:3 foreslope on the north side of the Ellis Road extension as well as a ditch at the base of the slope without impacting the Lamplighter Village parcel. Unlike Alternative 1, the angle across I-95 has been skewed to approximately 87.5 degrees to allow for an easier transition to a future St. Johns Heritage Parkway to the west and proposed Ellis Road alignments to the east. Due to this angle, the centerline of Alternative 2, as it overpasses I-95, ranges from 160 feet to 180 feet south of the Lamplighter Village property line. Compared to the east-west orientation of existing Ellis Road, the Alternative 2 crossing of I-95 is over 150 feet south. A transition to a future Ellis Road alignment requires a series of reverse curves. The slight skew angle at I-95 mitigates these alignment shifts that are needed to align with a reconstructed Ellis Road.

After the FHWA's approval of the 2003 EA/FONSI and subsequent approval of a southerly alignment shift of the I-95 crossing, Brevard County independently advanced the final design and right-of-way acquisition for its portion of St. Johns Heritage Parkway. With the inclusion of an FHWA-approved interchange, this alignment is being re-examined as part of this PD&E Study. This proposed interchange and the extension of Ellis Road are anticipated to be eligible for federal and state funding once Location Design Concept Approval for this Study has been attained from the FHWA.

Figure 4.3.2 displays a comparison of the Alternative 1 and 2 alignments.





FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W	PROPOSED R/W	CONCRETE MEDIAN
EXISTING L/A	PROPOSED L/A	CANAL
EXISTING EASEMENT	SIDEWALK	RETAINING WALL
PROPERTY LINE	GRASSED AREA	

INTERCHANGE ALIGNMENT ALTERNATIVES 1 & 2

FIGURE NO. 4.3.2

4.3.6 Comparison of Interchange Alternatives 1 and 2

Both Alternatives 1 and 2 impact the existing "Pond 13A" from the 2009 widening project for I-95. This project expanded I-95 to six lanes. The *Ellis Road Pond Siting Report* (summarized in section 4.12 of this report) includes an expansion of this existing pond as a possible pond alternative for the portion of the proposed interchange that is west of I-95. The reconfiguration of this pond is not anticipated to be a major impact.

Existing I-95 Pond 13A West of I-95

Both Alternatives 1 and 2 also impact an existing borrow pit in the southeast quadrant of the interchange. There are no permits on record for this pond, which appears to be a borrow pit. According to the survey for the St. Johns Heritage Parkway final design plans, the borrow pit has side slopes of approximately 1:1 and a bottom elevation of 1 foot above sea level. Based on the Light Detection and Ranging (LiDAR) water surface elevation of 15 feet, the water depth in the pond can be assumed to be in the range of 14 feet. This existing borrow pit will be impacted by both alignment alternatives, a relocation of the M-1 Canal, and a potential retention pond on this parcel. The primary difference between the cost of Alternatives 1 and 2 across the borrow pit is the fill cost, as Alternative 1 requires less fill through the borrow pit compared to Alternative 2. However, Alternative 1 requires an MSE wall on the north side. The difference between these two alternatives can best be summarized in the comparison matrix shown in Table 4.3.1.

Existing Borrow Pit - North Bank

Table 4.3.1: Interchange Alternative 1 vs. Alternative 2

	Interchange Alignment					
	Alternative 1			Alternative 2		
Resource	**Quantity**	**Unit Cost**	**Cost**	**Quantity**	**Unit Cost**	**Cost**
Embankment, Cu Yd	109,787	$ 4.74	$ 520,390	154,125	$ 4.74	$ 632,654
MSE Wall, Sq Ft	20,260	$ 42.00	$ 850,920			
TOTAL			**$ 1,371,310**			**$ 632,654**
Wetland Impacts Ac [1]	6.16			4.46		

[1] Wetland impacts include the entire interchange

The primary advantages and disadvantages of Alternative 1 are as follows:

Advantages

- Minimizes impacts to the existing retention pond constructed for the I-95 widening project;
- Crosses I-95 at 90 degrees;
- Concurrent with ultimate alignment of St. Johns Heritage Parkway, which is partially designed to 90% plans but not yet constructed;
- Possibly avoids a transmission tower in the southwest quadrant if MSE wall is utilized;
- An approximate 400-foot temporary transition could be constructed between the future eastbound lanes and existing Ellis Road if the eastbound lanes of St. Johns Heritage Parkway are constructed by Brevard County prior to the construction of the interchange;
- Minimizes fill requirements within the footprint of the existing borrow pit;
- Requires less right-of-way for the roadway footprint.

Disadvantages

- Impacts the existing Brevard County conservation easement in the northwest quadrant;

- Closer proximity to Lamplighter Village. A community meeting held on March 24, 2011 yielded a number of comments regarding a preference for Alternative 2;
- Requires an MSE wall, which is more costly than fill;
- Greater wetland impacts than Alternative 2.

The primary advantages and disadvantages of Alternative 2 are as follows:

Advantages

- Fewer wetland impacts (1.7 acres);
- Mainline pavement is farther from Lamplighter Village. At the midpoint of the Lamplighter Village parcel, the distance between the property line to the northernmost edge of proposed pavement is 62 feet and 130 feet for Alternatives 1 and 2, respectively;
- Approximately $739,000 less costly to construct due to the elimination of the MSE wall.
- Avoids all impacts to the Brevard County conservation easement;

Disadvantages

- Bridge across I-95 is slightly skewed to 87.5 degrees, slightly increasing the complexity of the structural design;
- Greater impacts to the existing retention pond constructed for the I-95 widening;
- Slightly more abrupt alignment shift as Alternative 2 is tied into Ellis Road concepts to the east. However, all transitions can be accomplished by meeting FDOT standards and with normal crown curves;
- Requires a redesign of approximately 4,700 feet of the overlapping portion of St. Johns Heritage Parkway.

Impacts to the existing I-95 retention pond and borrow pit are also not considered major impacts.

The most prominent differences between Alternatives 1 and 2 are as follows:

- Alternative 2 has a construction cost savings of $739,000 over Alternative 1;
- Alternative 2 avoids the existing conservation easement in the northwest quadrant; and
- Alternative 2 is more desirable to the Lamplighter Village community;

4.3.7 Other Interchange Features

4.3.7.1 Conceptual Profile and Ramp Intersection Sight Distance

The crest of St. Johns Heritage Parkway / Ellis Road over I-95 will be designed for a 50 mph design speed, with a minimum K[1] value of 136, minimum stopping sight distance of 465 feet, and a minimum length of 816 feet. Based on an intersection sight distance analysis using object and eye heights of 3.5 feet and passenger car sight distance triangles of 600 feet, the vertical sight distance is more than adequate, and the proposed crest will not be a sight distance obstruction for left-turning vehicles. Depending on the location of the ramp intersections, the horizontal sight distance will be adequate, given the shoulder widths provided on the bridge over I-95 based on the concept presented in this PD&E Study.

4.3.7.2 Structure Typical Section – Ellis Road over I-95

Several typical section options were evaluated for the bridge over I-95, including 4-lane Urban Divided, 4-lane High-Speed Urban Divided and 4-lane High-Speed Suburban Divided, each with an auxiliary lane in each direction for interchange turning movements. Twin bridge structures were not considered due to the need for cross-over turning from the westbound direction. The 4-lane Urban Divided section was eliminated from consideration because the maximum design speed did not meet the requirements for an SIS-compliant roadway.

The exclusive difference between the High-Speed Urban Divided and High-Speed Suburban Divided typical section options is the width of the outside shoulders. The High-Speed Urban section permits smaller outside shoulders resulting in an overall reduced bridge width

[1] The K value is the length of vertical curve per percent change in grade.

while still providing full access to vehicles, bicyclists and pedestrians. The High-Speed Urban section has been selected as the preferred configuration for the crossing of I-95.

4.3.7.3 Pedestrian Accommodations

Pedestrian accommodation is required on the bridge since pedestrian facilities exist on the approach roadways and reasonable alternate routes for pedestrians to cross I-95 are not available in the vicinity. Fully enclosed 8-foot sidewalks will be provided on both sides of the bridge for safe and easy pedestrian access. The 2003 PD&E Study for St. Johns Heritage Parkway recommended the use of wider-than-normal sidewalks given the planned development of the St. Johns Heritage Parkway corridor.

4.3.7.4 Accommodation of M-1 and L-15 Canals

Existing M-1 Canal

As mentioned in the discussion of Alternates 1 and 2, the M-1 Canal requires relocation along the northbound exit ramp due to the proximity of the eastern ramp intersection. To carry the mainline Ellis Road lanes across the M-1 Canal, detailed structural analysis has not been completed as part of this PD&E Study. Based on the size of the canal, a large box culvert or series of box culverts is not desirable. Likewise, a bridge structure would be complicated by the close proximity of the eastern ramp intersection. A possible resolution for conveying the M-1 Canal beneath the mainline through lanes would be to install an arch of approximately 40 feet to 50 feet in length. The final design phase of this project will investigate the crossing requirements in more detail. A soil boring was sampled as part of this study and is included in the Ellis Road Geotechnical Report.

Between the M-1 Canal and John Rodes Boulevard, the L-15 Canal will require a reconfiguration, regardless of which alignment alternative is selected. Section 4.10 contains a detailed discussion on canal protection criteria, which will be applied for the L-15 Canal in this segment of the project.

4.3.8 I-95 / Ellis Road Interchange Ramps

4.3.8.1 Design Components of I-95 / Ellis Road Interchange

Table 4.3.2 displays the design criteria for the interstate and interchange ramps. While taper-type ramp terminals are permitted, parallel-type ramp terminals are preferred.

Table 4.3.2: Interchange Ramp Design Criteria

Design Element	Design Criteria		Source
Design Vehicle	WB-62FL[1]		Green Book[5], Fig. 2-15, p. 2-24; PPM, 1.12
Design Speed - Mainline (I-95) - Diamond Ramp - Loop Ramp	 70 mph 50 mph 30 mph		 PPM, Table 1.9.1 Green Book, p. 10-89 Green Book, p. 10-89
Min. Lane Width - Mainline (I-95) - One-Lane Ramp - Two-Lane Ramp	 12' 15' 24'		 PPM, Table 2.1.1 PPM, Table 2.1.3 PPM, Table 2.1.3
Max. Lane "Roll-Over"	4%		PPM, Section 2.1.5
Max. Algebraic Difference in Cross Slope at Turning Roadway Terminals	5%		PPM, Table 2.1.4
Min. Median Width - Without Barrier - With Barrier	 64'[2] 26' [6]		PPM, Table 2.2.1
Min. Shoulder Width (w/o gutter) General Use Lane One-Lane Ramp Two-Lane Ramp	*Outside* Full/Paved 12' / 10' 6' / 4' 12' / 10'	*Median* Full/Paved 12' / 10' 6' / 2' 8' / 4'	PPM, Table 2.3.1
Min. Shoulder Width (w/ gutter) General Use Lane One-Lane Ramp Two-Lane Ramp	*Outside* Full/Paved 15.5' / 8' 11.5' / 4' 15.5' / 8'	*Median* Full/Paved 15.5' / 8' 11.5' / 4' 13.5' / 6'	PPM, Table 2.3.1
Border Width (Mainline & Ramps)	94'[3]		PPM, Table 2.5.3
Max. Profile Grade - Mainline (I-95) - Diamond Ramp - Loop Ramp	 3% (70 mph) 5% (45 to 50 mph) 7% (25-30 mph)		PPM, Table 2.6.1
Max. Change in Grade w/o Vertical Curve			

Design Element	Design Criteria	Source
- Mainline (I-95) - Diamond Ramp - Loop Ramp	0.20% (70 mph) 0.60% (50 mph) 1.00% (30 mph)	PPM, Table 2.6.2
Min. Stopping Sight Distance - Mainline (I-95) - Diamond Ramp - Loop Ramp	 820' (70 mph) 425' (50 mph) 200' (30 mph)	 PPM, Table 2.7.1 Values assume grade $\leq$ 2%
Max. Degree of Curve - Mainline (I-95) - Diamond Ramp - Loop Ramp	 3°00' 8°15' 24°45'	 PPM, Table 2.8.3 (e max = 0.10)
Min. Crest Vertical Curve Length - Mainline (I-95) - Diamond Ramp (excluding terminal) - Loop Ramp (excluding terminal)	 1,000', 1,800' min. within limits of interchange 150' (50 mph) 90' (30 mph)	PPM, Table 2.8.5 - Interstate - Other Facility (3 x design speed) - Other Facility (3 x design speed)
Min. Sag Vertical Curve Length - Mainline (I-95) - Diamond Ramp - Loop Ramp	 800' 150' (50 mph) 90' (30 mph)	PPM, Table 2.8.6 - Interstate - Other Facility (3 x design speed) - Other Facility (3 x design speed)
Max. Superelevation (e)	0.10	PPM, Section 2.9; Standard 510
Min. Vertical Clearance - Bridges over I-95	 16'-6"	 PPM, Table 2.10.1
Max. Shoulder "Roll-Over"	7%	Standard 510
Recoverable Terrain (Clear Zone) - Mainline (I-95) - One-Lane Ramp - Two-Lane Ramp - Loop Ramp	<u>Distance from EOP</u> 36' (> 55 mph) 24' (> 55 mph) 36' (> 55 mph) 10' (< 45 mph)	 Standard 700 PPM, Table 2.11.11 $\geq$ 1500 ADT
Min. Freeway Ramp Terminal Spacing - Entrance to Exit (weaving) - Exit to Entrance - Exit to Exit - Entrance to Entrance	<u>Full Freeway</u> 2,000' 500' 1,000' 1,000'	 Green Book, Figure 10-68 (p. 10-106)
Entrance Ramp (Grades $\leq$ 2%) - <u>Taper Type</u> - <u>Parallel Type</u> - Acceleration Lane Distance	 1,200' (1:50 taper) 1350' (from 30 mph loop)	 Standard 525 Green Book, Figure 10-69 (p.

Design Element	Design Criteria	Source
- End of Lane Taper	580' (from 50 mph ramp) 300'	10-110), Table 10-3 Green Book, Figure 10-69 (p. 10-108)
Exit Ramp (Grades ≤ 2%) - Taper Type - Divergence Angle - Taper Length - Parallel Type - Beginning of Decel. Lane Taper - Deceleration Lane Length	 4° 350' (12' width to PC) 250' 520' (for 30 mph exit) 340' (for 50 mph exit)	 Standard 525 Green Book, Figure 10-70 (p. 10-114); Table 10-5 (p. 10-115);
Auxiliary Lane Add / Drop Length - Entrance or Exit, Taper or Parallel	2,500'	Green Book, Figure 10-53 (p. 10-78)
Cross Road Limited Access Limits - Urban Limited Access - Rural Limited Access	Urban - 100' beyond radius return or end of taper Rural - 300' beyond radius return or end of taper	PPM, Section 2.14.1
Cross Road Access Management - Class 3 Distance from intersection - Class 5 Distance from intersection	Full Median Spacing 2,640' 1,320' (≤45); 2640' (>45)	PPM, Table 1.8.2; Section 2.14.2

(1) WB-62FL is the same size as WB-67 specified on p. 2-24 of the 2011 AASHTO Green Book.
(2) Required median width is 88 feet when future lanes are planned.
(3) Measured from the edge of the outside travel lane to the right-of-way. Width may be reduced to no less than 50 feet as long as the design criteria meets requirements for clear zone, horizontal clearance, drainage, maintenance access, etc.
(4) Includes 6 inches of clearance for future overlays per p. 385 of the Green Book.
(5) 2011 AASHTO Green Book and FDOT 2014 PPM used.
(6) Based on 2-foot median barrier and 12-foot shoulder.

The exit ramps in the northwest and southeast quadrants utilize a deceleration taper of 250 feet followed by a parallel-type deceleration lane of 340 feet. The diamond-type entrance ramp in the southwest quadrant utilizes a 580-foot parallel-type acceleration lane in conjunction with a 300-foot taper. The acceleration lane for the loop ramp in the southeast quadrant utilizes a 1,350-foot acceleration lane with a 300-foot taper (see Figures 4.3.1 and 4.3.2).

4.3.8.2 Ramp Intersection Configuration

All ramps in the Ellis Road / I-95 interchange are single lane. Figures 3.3.4 and 3.3.6 show the 2034 lane configuration required for successful levels of service. In the ultimate 2034 design year configuration, all turning movements require single-lane turn lanes. The 30-mph loop ramp will receive a 395-foot free-flow deceleration lane, which will be carried westward across the proposed structure crossing I-95. Left-turn storage lanes will be provided in the westbound direction. All ramp intersection curb returns will be designed to accommodate the FDOT-standard WB-62FL semi-truck design vehicle.

4.3.9 Ramp Alignment Alternatives in Northwest and Southwest Quadrants

As described in the existing utilities section of Chapter 2, 300-foot-wide series of four utility easements is adjacent to the limited-access right-of-way along the west side of I-95. Beginning at the I-95 limited-access right-of-way, the following easements and utilities conflict with the west-side ramps:

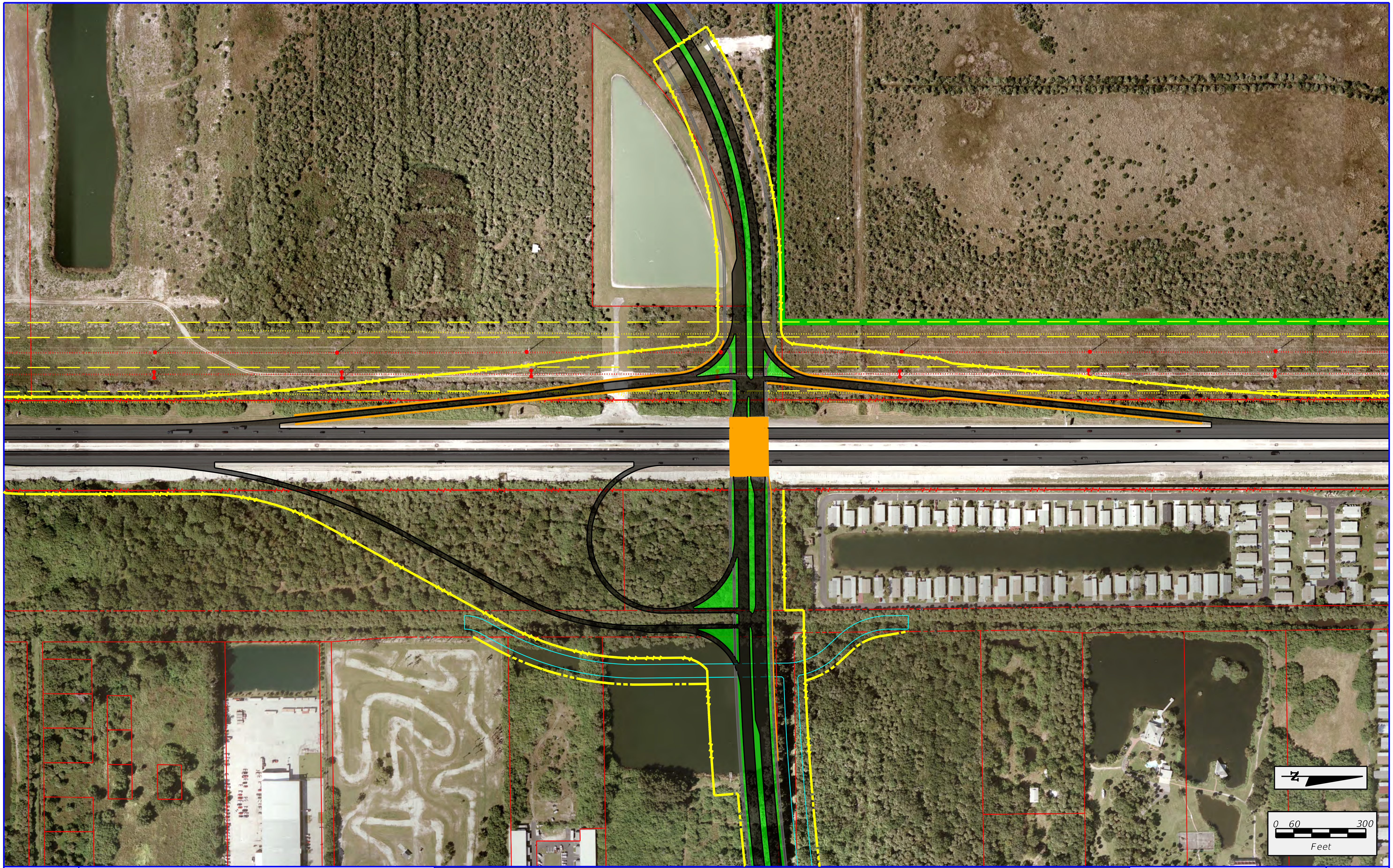
Existing Utilities Along I-95

- 30-foot easement / 8-inch Florida Gas Transmission gas main;
- 110-foot easement / Florida Power & Light Transmission;
- 100-foot easement / Florida Power & Light Distribution; and,
- 50-foot easement / 26-inch Florida Gas Transmission (FGT) gas main

Based on examination of the interchanges to the north and south (US 192 and Eau Gallie Boulevard), the existing transmission and distribution towers were accommodated within the west-side infield of the interchange. Accommodation of the existing gas mains, particularly the 26-inch gas transmission line, is a larger challenge. Initial discussions with the utility indicated that any attempt to cross the gas mains would require bridging over the easement. Previous roadway projects affecting large gas transmission lines have resulted in lawsuits by the utility. On a recent interstate project in District 4, the consensus between FDOT and FGT was to place a roadway adjacent to the gas easement such that the MSE wall supporting the roadway was a specified distance outside of the utility easement. For the purposes of this study, any MSE wall along the easement for the 26-inch gas main should be 15 feet between the edge of the easement and base of retaining wall. This configuration will allow maintenance access at the base of the retaining wall without encroaching into the FGT easement. Based on the two alignment alternatives described in Section 4.3.5, several ramp alternatives were examined for the ramps on the west side of I-95:

- "MSE Wall" ramp alignment requiring MSE wall between the east side of the ramps and the mainline;
- Alternative A (Tight) ramp alignment placing ramps within the utility easements but avoiding the poles;
- Alternative B (Wide) ramp alignment with the tangent portion of the ramp supported on MSE wall and 15 feet outside of the outermost FGT easement; and,
- Alternative C (Parclo) ramp configuration placing all ramps south of Ellis Road over I-95.

These configurations are shown in Figures 4.3.3A through H. Each of the four ramp configurations are shown with both the Alternative 1 and 2 alignments of Ellis Road over I-95. In order to show a conceptual interchange at a larger scale, Appendix A contains detailed concept plans of Alternative 1 with the Alternative A ramp configuration (1-A). Concept plans of each ramp-alignment configuration are not developed. However, concept plans of the Preferred Alternative are included in Appendix B.



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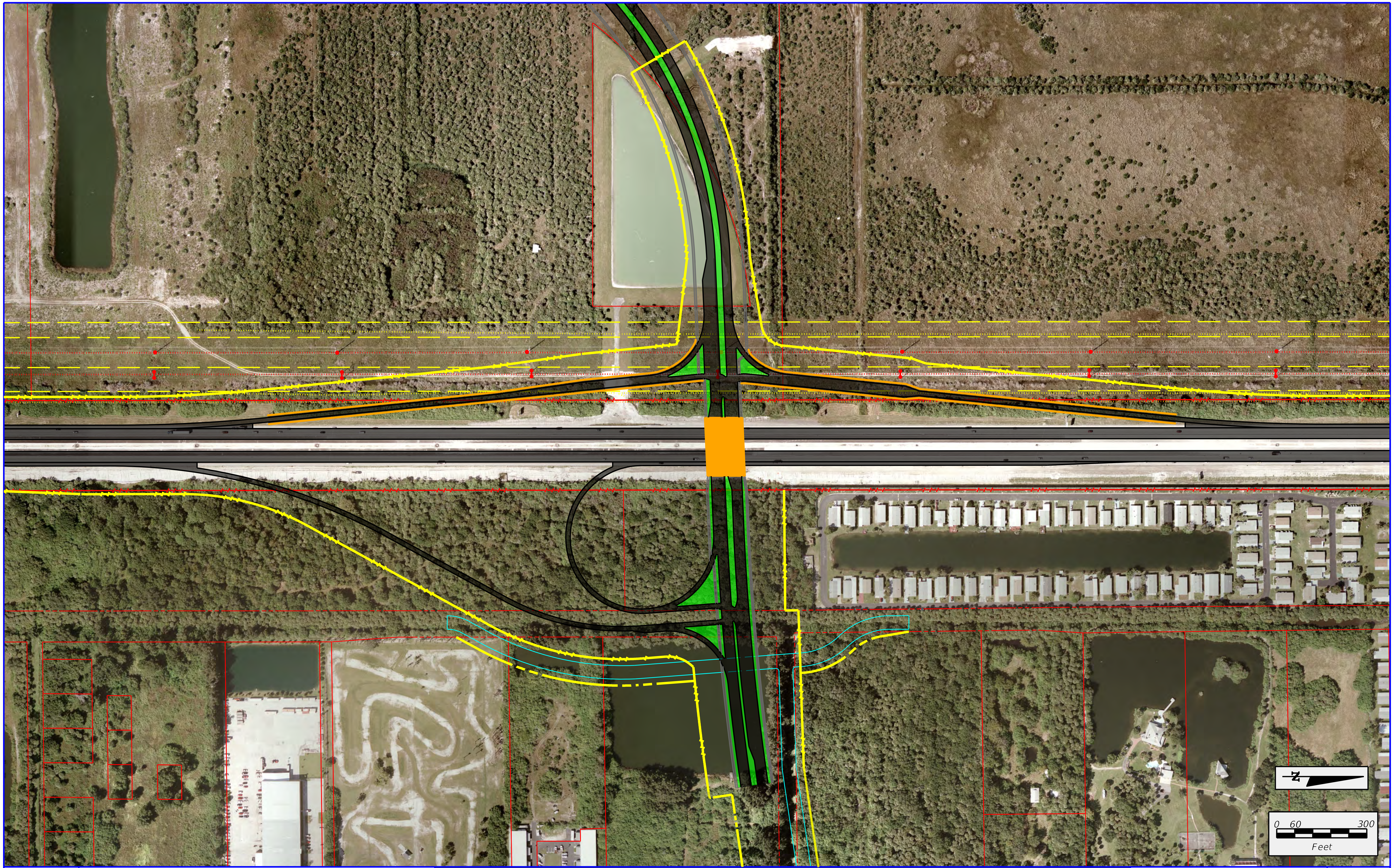
I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W	PROPOSED R/W	OVERHEAD ELECTRIC
EXISTING L/A	PROPOSED L/A	UTILITY POLES
EXISTING EASEMENT	G BURIED GAS	RETAINING WALL
PROPERTY LINE	BFO BURIED FIBER OPTIC	BRIDGE

ALIGNMENT ALT 1
W/ MSE WALL RAMPS

FIGURE NO.
4.3.3A



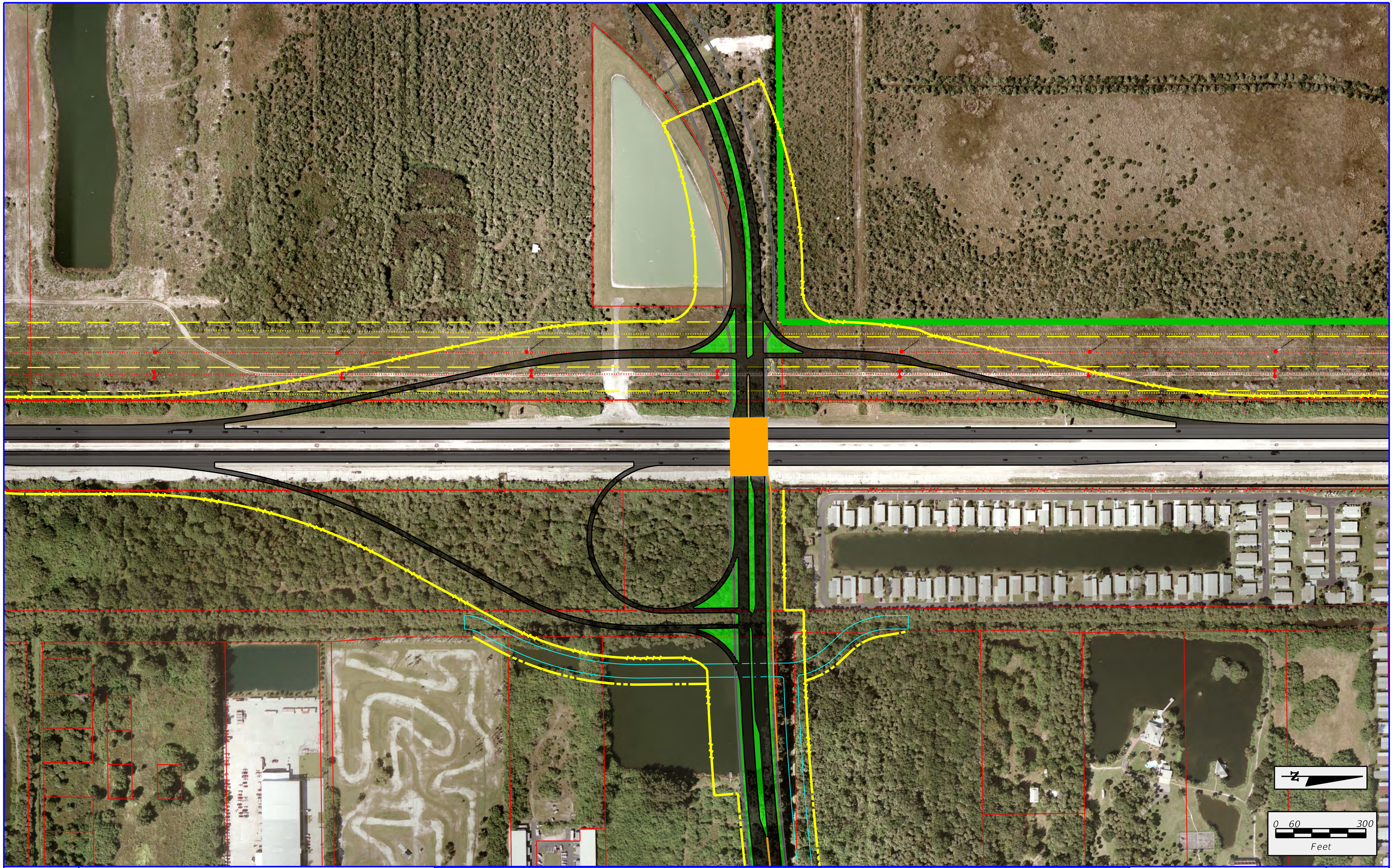
FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W	PROPOSED R/W
EXISTING L/A	PROPOSED L/A
EXISTING EASEMENT	BURIED GAS
PROPERTY LINE	BURIED FIBER OPTIC
OVERHEAD ELECTRIC	UTILITY POLES
RETAINING WALL	BRIDGE

ALIGNMENT ALT 2
W/ MSE WALL RAMPS

FIGURE NO.
4.3.3B

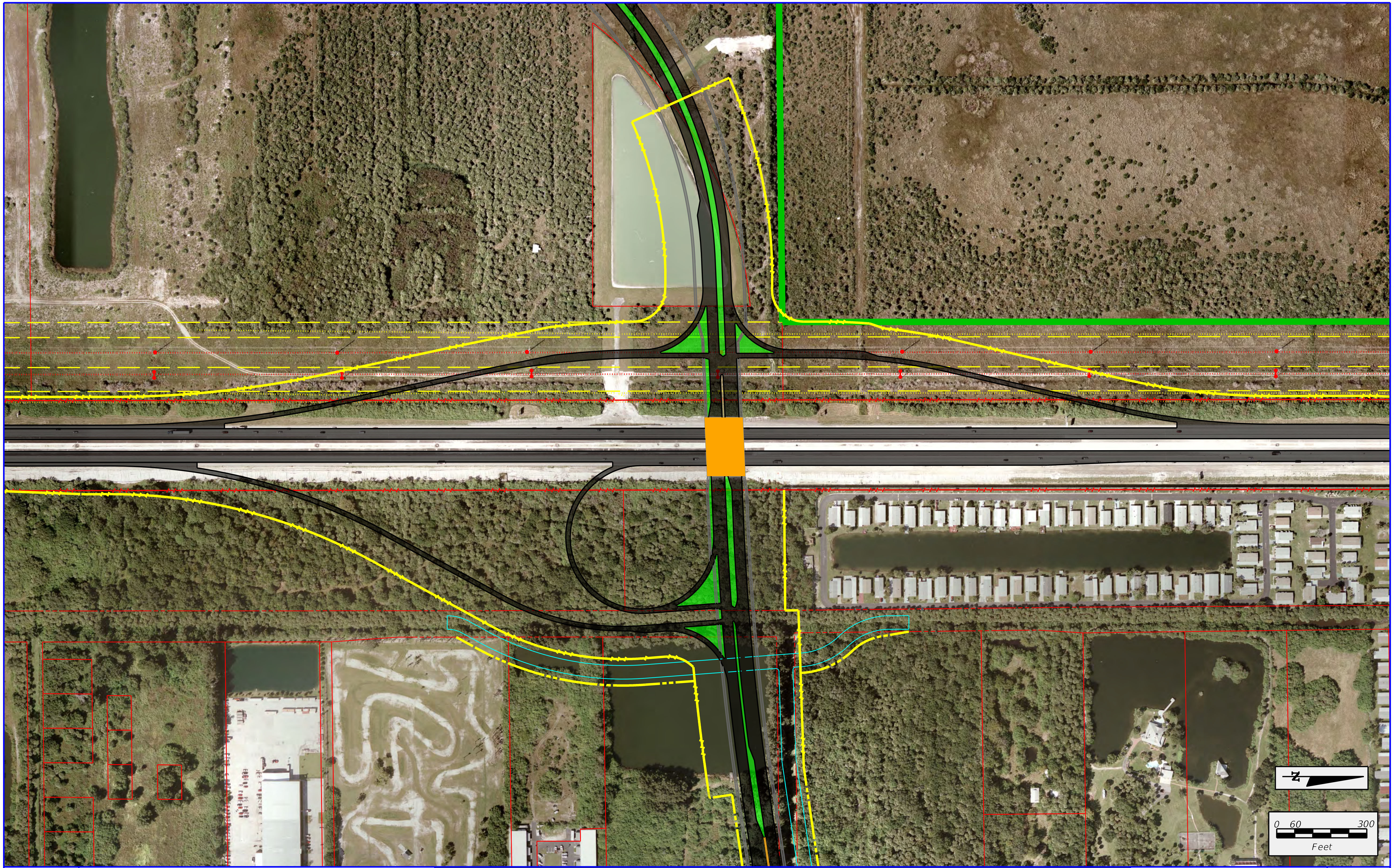


I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W	PROPOSED R/W	OVERHEAD ELECTRIC
EXISTING L/A	PROPOSED L/A	UTILITY POLES
EXISTING EASEMENT	BURIED GAS	RETAINING WALL
PROPERTY LINE	BURIED FIBER OPTIC	BRIDGE

ALIGNMENT ALT 1
W/ ALT A RAMPS (TIGHT)
(1-A)

FIGURE NO.
4.3.3C



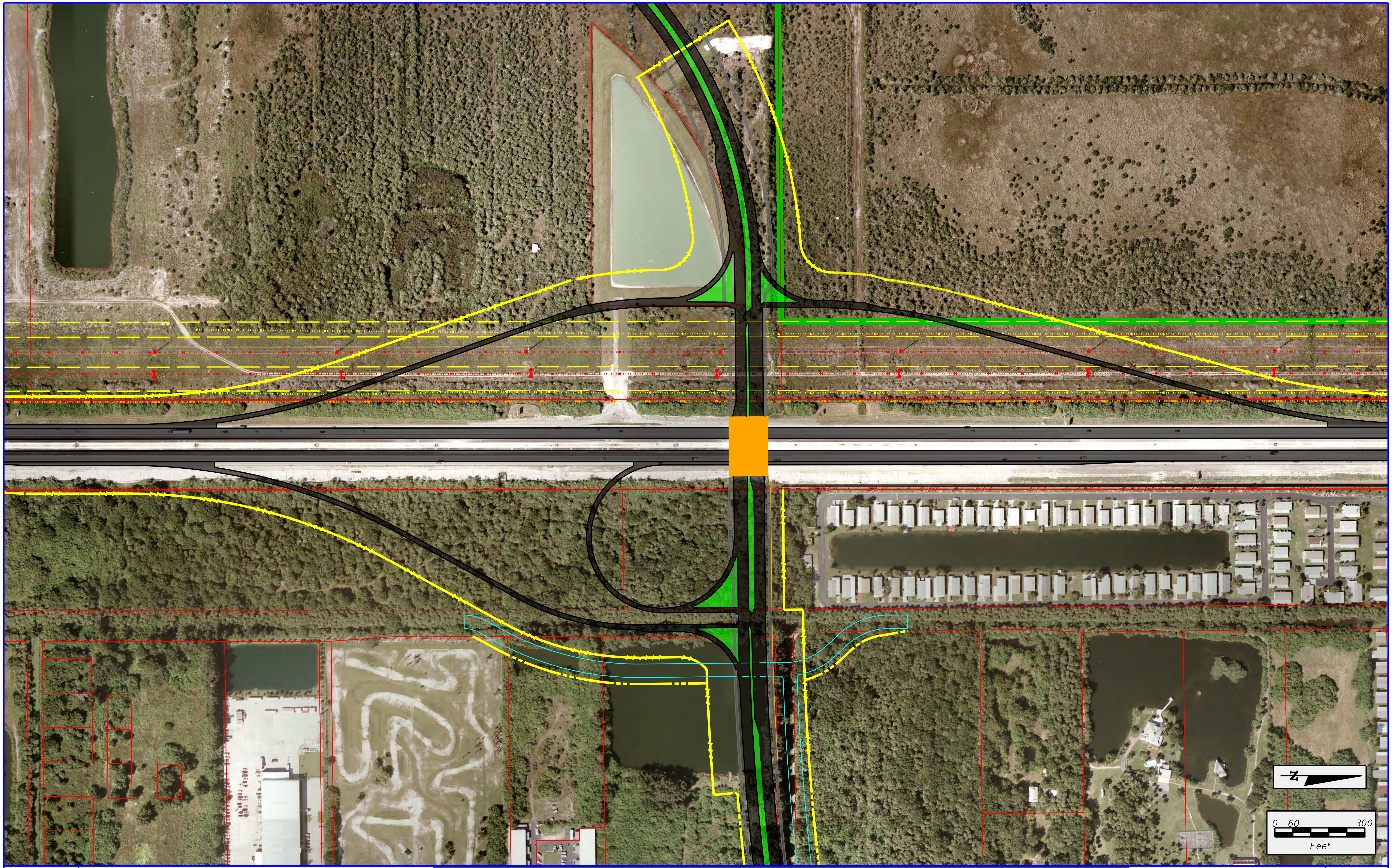
FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W	PROPOSED R/W	OVERHEAD ELECTRIC
EXISTING L/A	PROPOSED L/A	UTILITY POLES
EXISTING EASEMENT	BURIED GAS	RETAINING WALL
PROPERTY LINE	BURIED FIBER OPTIC	BRIDGE

ALIGNMENT ALT 2
W/ ALT A RAMPS (TIGHT)
(2-A)

FIGURE NO.
4.3.3D



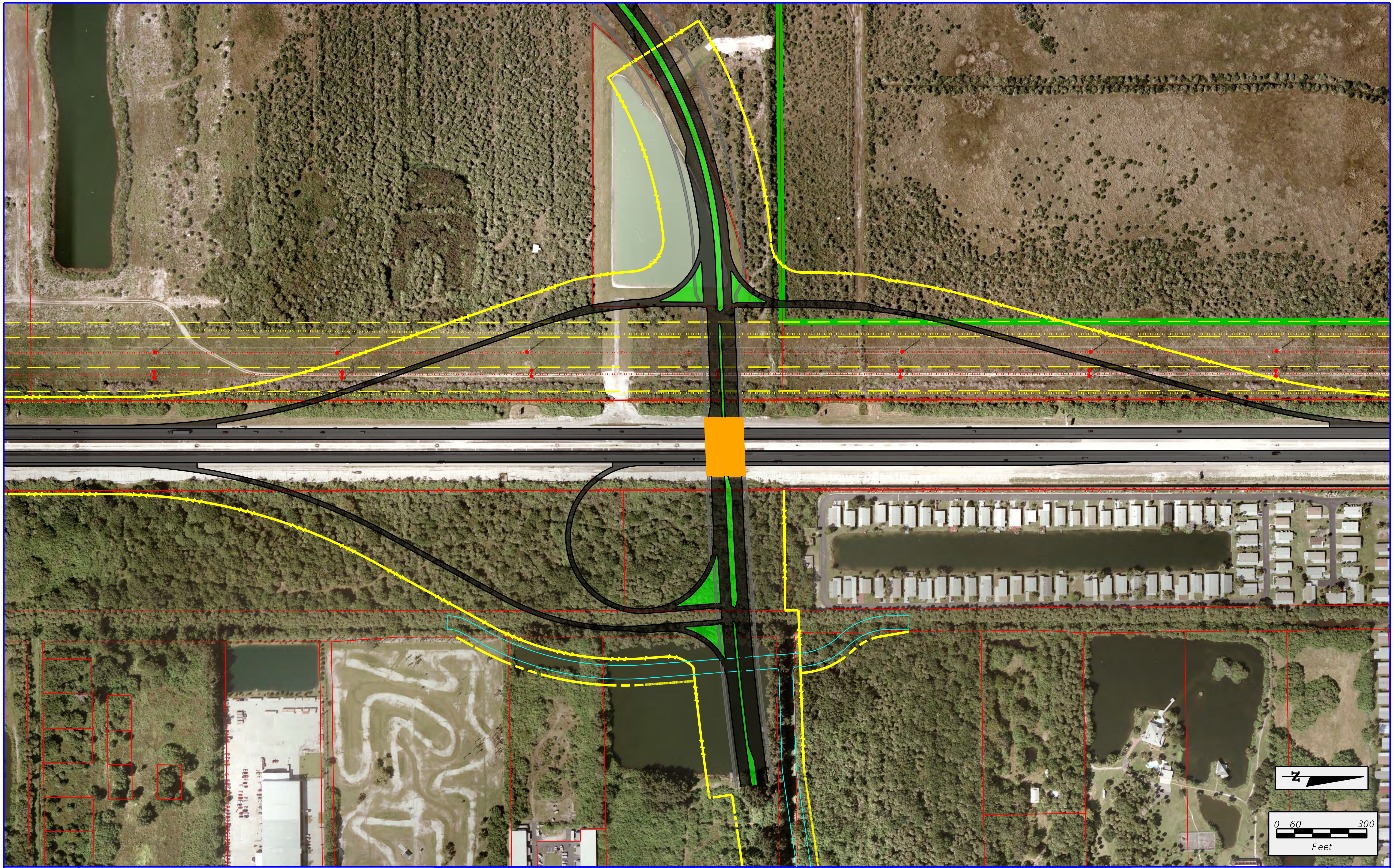
FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

	EXISTING R/W		PROPOSED R/W		OVERHEAD ELECTRIC
	EXISTING L/A		PROPOSED L/A		UTILITY POLES
	EXISTING EASEMENT		BURIED GAS		RETAINING WALL
	PROPERTY LINE		BURIED FIBER OPTIC		BRIDGE

ALIGNMENT ALT 1
W/ ALT B RAMPS (WIDE)
(1-B)

FIGURE NO.
4.3.3E

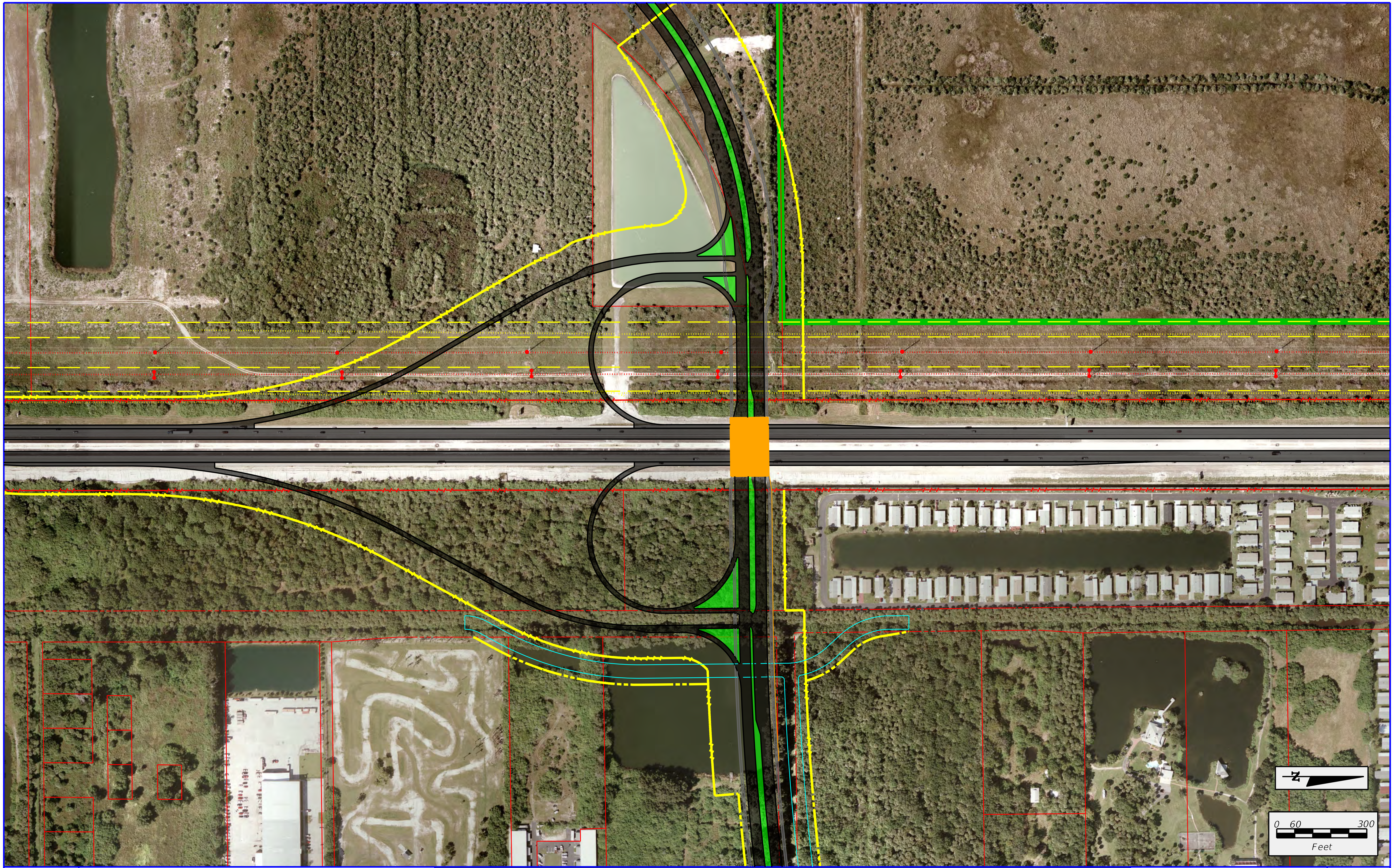


I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

	EXISTING R/W		PROPOSED R/W	OE	OVERHEAD ELECTRIC
	EXISTING L/A		PROPOSED L/A		UTILITY POLES
	EXISTING EASEMENT	G	BURIED GAS		RETAINING WALL
	PROPERTY LINE	BFO	BURIED FIBER OPTIC		BRIDGE

ALIGNMENT ALT 2
W/ ALT B RAMPS (WIDE)
(2-B)

FIGURE NO. 4.3.3F



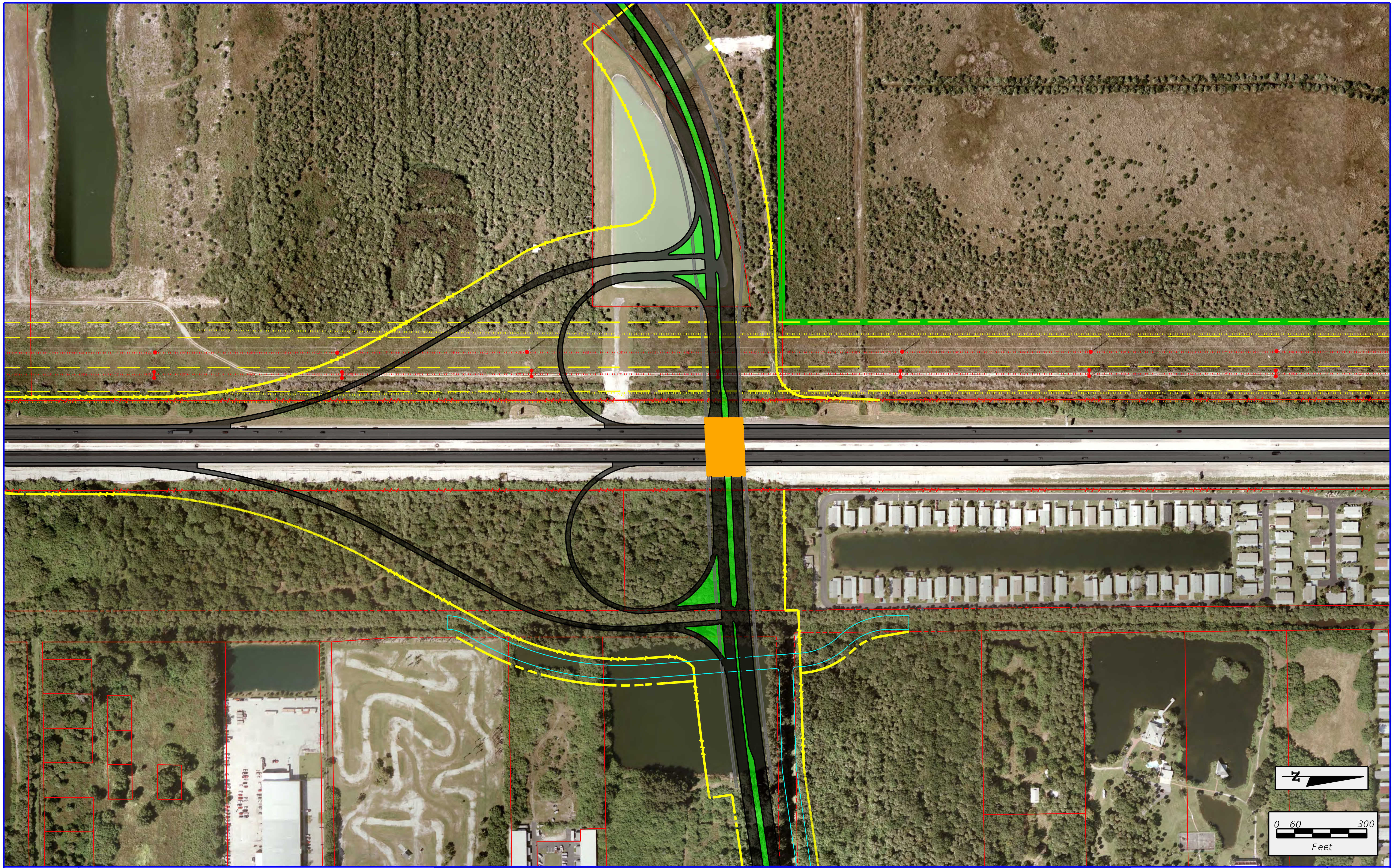
FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W	PROPOSED R/W
EXISTING L/A	PROPOSED L/A
EXISTING EASEMENT	BURIED GAS
PROPERTY LINE	BURIED FIBER OPTIC
OVERHEAD ELECTRIC	
UTILITY POLES	
RETAINING WALL	
BRIDGE	

ALIGNMENT ALT 1
W/ ALT C RAMPS (PARCLO)
(1-C)

FIGURE NO.
4.3.3G



FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W	PROPOSED R/W	OVERHEAD ELECTRIC
EXISTING L/A	PROPOSED L/A	UTILITY POLES
EXISTING EASEMENT	BURIED GAS	RETAINING WALL
PROPERTY LINE	BURIED FIBER OPTIC	BRIDGE

ALIGNMENT ALT 2
W/ ALT C RAMPS (PARCLO)
(2-C)

FIGURE NO.
4.3.3H

As seen from Figures 4.3.3 A and B, the ramp configuration requiring MSE walls have significant impacts to the 8-inch gas main. The small infield areas are not conducive to accommodating drainage. For these reasons, the MSE wall ramp alignments are dropped from further analysis.

The Tight, Wide, and Parclo configurations are shown in Figures 4.3.3C through H. To assess the relative cost of the utility impacts, a cost analysis was performed assuming that the gas mains were accommodated by crossing of an arch or bridge. The cost of conservation easement and wetland impacts were also tabulated. As seen in Table 4.3.3, the Parclo ramp configuration based on alignment Alternative 2 is the least costly overall at $2.4 million when considering utility and mitigation costs. The second least costly option is the Tight ramp configuration based on Alternative 2 at $3.0 million. The Wide ramp configuration was ultimately discounted due to the high cost of mitigating for the conservation easement impacts.

Alternative 2 is the preferred alignment through the interchange area and is described further in Chapter 5 of this report.

Table 4.3.3 - West Side Ramp Evaluation Matrix																		
	West Side Ramp Alternatives																	
	Alignment Alternative 1 (MSE Wall at Lamplighter Village)									Alignment Alternative 2 (Fill at Lamplighter Village)								
	Tight Ramps			Wide Ramp Configuration			Parclo Ramp Configuration			Tight Ramps			Wide Ramp Configuration			Parclo Ramp Configuration		
Resource	Quantity	Unit Price	dsgnem010.dgn	Quantity	Unit Price	dsgnem012.dgn	Quantity	Unit Price	dsgnem014.dgn	Quantity	Unit Price	dsgnem011.dgn	Quantity	Unit Price	dsgnem013.dgn	Quantity	Unit Price	dsgnem015.dgn
	1-A	**1-A**	**1-A**	**1-B**	**1-B**	**1-B**	**1-C**	**1-C**	**1-C**	**2-A**	**2-A**	**2-A**	**2-B**	**2-B**	**2-B**	**2-C**	**2-C**	**2-C**
Environmental Involvement																		
Wetland Impacts (ac)	5.48			7.54			7.38			4.29			6.26			5.63		
Conservation Easement Impacts (ac) [(1)]	0.83	$ 18,000	$ 74,837	2.88	$ 18,000	$ 259,624	0.77	$ 18,000	$ 69,748	0	$ 18,000	$ -	2.34	$ 18,000	$ 210,696	0	$ 18,000	$ -
Utility Involvement																		
FPL Transmission Towers Displaced			0			0			0			1			1			1
FPL Transmission Towers in Fill Slope			2			1			0			2			1			0
FPL Transmission Line Adjustment ($)																		
FPL Distribution Towers Displaced			1			0			0			1			1			1
FPL Distribution Towers in Fill Slope			2			2			1			2			1			0
FPL Distribution Line Adjustment ($)																		
FGT 26" Gas Crossing w/ Arch (ft)	370			801			436			372			725			436		
FGT 26" Gas 50' Easement Crossing w/ bridge (sq ft)	10888	$ 125	$ 1,361,000	16303	$ 125	$ 2,037,875	10349	$ 125	$ 1,293,625	10962	$ 125	$ 1,370,250	16295	$ 125	$ 2,036,875	10354	$ 125	$ 1,294,250
FGT 8" Gas Main Crossing w/ Arch	933			746			521			934			748			510		
FGT 8" Gas 30' Easement Crossing w/ bridge (sq ft)	11780	$ 125	$ 1,472,500	9925	$ 125	$ 1,240,625	7151	$ 125	$ 893,875	11782	$ 125	$ 1,472,750	9928	$ 125	$ 1,241,000	7153	$ 125	$ 894,125
Engineering Involvement																		
Additional cost for MSE wall at Lamplighter Village			$ 738,656			$ 738,656			$ 738,656									
Cost of replacing displaced FDOT pond w. of I-95	0.71	$ 71,756	$ 51,050	1.13	$ 71,756	$ 81,356	2.09	$ 71,756	$ 150,009	2.04	$ 71,756	$ 146,472	2.55	$ 71,756	$ 183,017	3.19	$ 71,756	$ 228,975
Grand-Total With Arch Crossing Over FGT																		
Grand-Total With Bridge Crossing Over FGT [(2)]			***$ 3,698,042***			***$ 4,358,136***			***$ 3,145,913***			***$ 2,989,472***			***$ 3,671,589***			***$ 2,417,350***

(1) Mitigation cost is assumed to be a 5:1 ratio; $18,000/acre based on Brevard County Property Appraiser values of similar parcels in vicinity.

(2) Bridge over FGT easements should consider ramp profile constraints.

Gray shading denotes alternative dropped from further consideration due to cost and impacts to conservation easement.

4.4 Build Alternatives – Ellis Road

A total of nine build alternatives are examined, from which a preferred alternative is generated and examined as part of this PD&E Study. A number of specific project issues govern the selection of the typical section and alignment. These issues include:

Community / Environmental Issues

- Travel time through the corridor;
- Connection to St. Johns Heritage Parkway and NASA Boulevard;
- Residential impacts;
- Business impacts.

Engineering Issues

- Canal configuration;
- Utility relocations;
- Stormwater treatment system;
- Access management.

All of the Build alternatives assume that the existing pavement will be removed and the roadway re-profiled. All roadway alternatives were assumed to utilize a proposed profile based on K values of 50 mph.

Regarding pedestrian and bicycle accommodations, the existing roadway provides no sidewalk or bicycle facilities other than an intermittent paved shoulder which is sometimes only on one side of the roadway. All of the Build alternatives examined include 5-foot sidewalks and accommodations for bicycles via bicycle lanes or paved shoulders. Chapter 8 of the *2014 Plans Preparation Manual* governs bicycle and pedestrian accommodations on Florida state roadways.

To determine the optimal typical section and roadway alignment, three preliminary typical sections were considered. The three typical sections were an urban typical, a high speed urban typical, and a high speed urban typical with frontage roads. Horizontal geometry based on these three typical sections is evaluated based on the following themes:

- Hold north right-of-way line;
- Hold south right-of-way line;
- Best Fit based on right-of-way impacts.

Sections 4.4.1 to 4.4.5 describe the three typical sections and alignment configurations. Appendix A includes 1"=100' scale concept plan sheets for each of these alternatives.

4.4.1 Strategic Intermodal System Design Criteria

As mentioned in Section 2.2.1, the Department has design criteria specific to roadways on the SIS. Since Ellis Road is to become an SIS connector roadway upon improvement, consideration is given to applying the same design criteria as for an actual SIS facility. Page 13 of the 2013 SIS Handbook references the SIS procedure (FDOT Topic No. 525-030-260-a). The following are excerpts from applicable sections of the Department's procedure entitled *Strategic Intermodal System (SIS) Highway Component Standards and Criteria (effective September 14, 2011):*

> **Scope**
>
> This procedure will be used by all offices of the Florida Department of Transportation dealing with the SIS Highway component. . .
>
> **2.2 Design Standards for SIS and Emerging SIS Highway Corridors**
>
> SIS highway corridor plans must address all SIS highway component standards. These standards shall be incorporated into Project Development and Environment (PD&E) and design.
>
> **2.2.1. Design Speed Standards**
>
> SIS highway facilities shall be designed to safely accommodate high-volume travel at the highest practical speed. For all new facilities and for the reconstruction of existing facilities design speed standards shall be as follows:
>
> **(A) Limited Access Facilities**
> The design speed for limited access facilities shall be at least 70 MPH in the FHWA urbanized areas design speed for limited access facilities may be reduced to a minimum of 60 MPH.
>
> **(B) Controlled Access Facilities**
> The design speed for controlled access facilities shall be 65 MPH in rural areas and at least 50 MPH in FHWA urban clusters and urbanized areas.

2.2.2 Geometric Design Criteria

SIS highway component facilities constructed on new alignment and facilities undergoing major reconstruction should be designed and constructed as limited or controlled access facilities.

(A) Limited Access Facilities

For limited access SIS highway component facilities, new construction design criteria for freeway type facilities as designated in the Department's ***Plans Preparation Manuals (Topic Nos. 625-000-005*** and ***625-000-006)*** shall be used.

(B) Controlled Access Facilities

For controlled access SIS highway component facilities, design criteria for new arterial roadway construction as designated in the Department's ***Plans Preparation Manuals (Topic Nos. 625-000-005*** and ***625-000-006)*** shall be used.

2.2.4 Design Exceptions and Design Variation Process for Design Speed Standards on the SIS Highway Component

Improvements to existing SIS highway component facilities and new construction should meet the SIS Highway component Design Speed Standards. However, occasionally it becomes necessary to deviate from the design speed standards when improving existing or constructing new SIS highway facilities. Whenever this is necessary, a design exception or design variation is required. All potential design exceptions and design variations for design speed shall follow the process outlined in the Department's ***Plans Preparation Manual, Topic Nos. 625-000-007 Chapter 23*** and be identified in the earliest possible planning or production phase. Additionally, these design exceptions and design variations require the concurrence from the Chief Engineer.

When the design exceptions or design variations impacts are determined to be significant by the State Transportation Development Administrator so as to affect the viability of the facility as an SIS highway component corridor, the design exception or design variation will be reviewed with the Assistant Secretary for Intermodal System Development. As a result of this review, the Assistant Secretary may recommend to the Secretary that the facility is removed for the SIS, and may request designation of an alternative SIS highway corridor. In the event an existing SIS facility is removed from the SIS, the design exception or design variation will no longer require the concurrence from the Chief Engineer.

2.6.2 Access Management Standards for Controlled Access Facilities for Planning and Design

(A) Standards

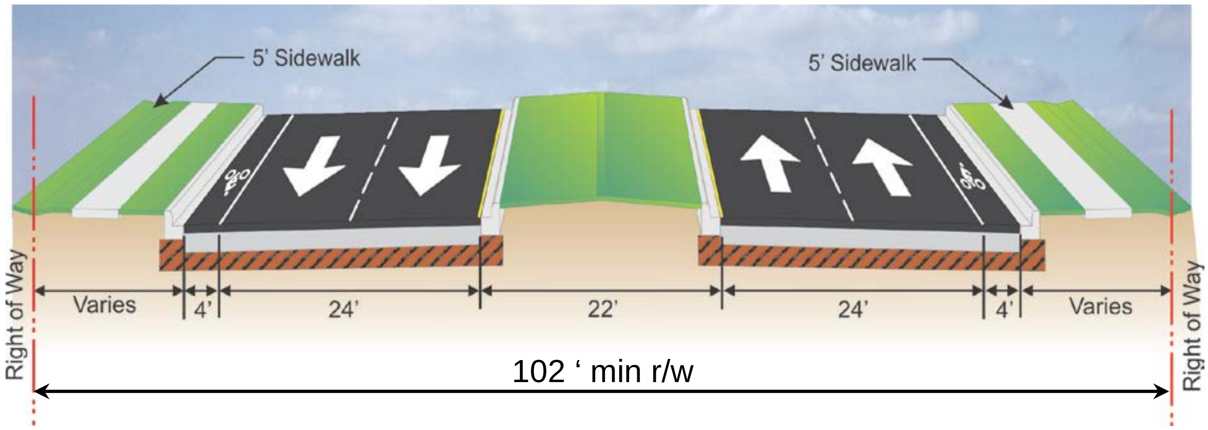
The access management standards for controlled access segments of the SIS highway component shall be those contained in Access Class 2 or 3 as defined in Department ***Rule Chapter 14-97, F.A.C.***

Two mainline typical section alternatives were examined as part of this study. While FIHS criteria stipulate that the design speed should be at least 50 mph, a 45 mph typical section is examined in order to reduce right-of-way impacts within the urbanized area. Sections 4.5 and 4.6 describe the 45 and 50 mph typical sections and analyze three alignment alternatives for each typical section (Hold North Right-of-Way, Hold South Right-of-Way, Best Fit). A variation on the 50 mph typical section featuring one-way frontage roads is also described in Section 4.7. However, as indicated in Section 3.5, this alternative is not carried forward based on conclusions from the traffic analysis.

4.5 Urban 45 mph Alternatives

Figure 4.5.1 displays the urban 45 mph typical section analyzed in this PD&E Study. The typical section is based on the standard FDOT urban typical section shown on Exhibit Typ-5 in the 2014 *Plans Preparation Manual (Volume II)*. The typical section features four lanes separated by a 22-foot grass median flanked by curb and gutter on both sides. Beyond the outside edge of the traveled way is a 4-foot-wide bicycle lane, curb and gutter, and a 5-foot-wide sidewalk separated from the back of curb by 3 feet of sod. Two feet of turf is located behind the back of sidewalk prior to matching into the adjacent existing ground. The minimum right-of-way width required for this typical section is 102 feet. Additional right-of-way will be needed for the canal and ditch sections and for slopes to tie into existing ground. The drainage requirements and the resulting effect on the right-of-way width are discussed in Section 4.10.

Figure 4.5.1: Urban Typical Section



4.5.1 Design Criteria

Table 4.5.1 summarizes the design criteria utilized in applying the urban typical section. This typical section features Type E curb along the inside and Type F curb along the outside edge of pavement. This configuration is used with design speeds less than or equal to 45 mph. However, the horizontal and vertical geometry is designed for 50 mph in accordance with the accepted practice of designing roadway features for at least 5 mph higher than the anticipated posted speed limit. Exhibit Typ-5 in the *2014 Plans Preparation Manual (Volume II)* lists the design speed for this type of typical section as 45 mph due to the available clear zone and type of curb and gutter. This typical section requires a minimum of 102 feet, which does not include additional right-of-way for drainage elements or utilities behind the sidewalk. Refer to Appendix C (Typical Sections Considered and Typical Section Package) to view a detailed version of this typical section.

Table 4.5.1: Urban Roadway Design Criteria

Ellis Road – Standard Urban		
Design Element	**Design Value**	**Source**
Facility Type	Urban Minor Arterial	FDOT
Design Speed	45 mph; min. 50 mph for horizontal & vertical geometry;	PPM, Vol. II Exhibit Typ-5; PPM, Table 1.9.1 (Vol. I)
Minimum Lane Widths	12' - travel lane; 4' bicycle lane;	PPM, Table 2.1.1; Ch. 8.4.1
Shoulders	None (curb and gutter)	PPM, Vol. II Exhibit Typ-5
Median Width	22' (design speed ≤ 45 mph)	PPM, Table 2.2.1
Minimum Border Width	12' (with bicycle lane)	PPM, Table 2.5.2
Grades	6% max (urban arterial / flat terrain)	PPM, Table 2.6.1
Max. Change in Grade w/o VC	0.60	PPM, Table 2.6.2
Pavement Cross Slopes	2% (inside 2 lanes); 3% outside lane;	PPM, Figure 2.1.1
Minimum Grade	0.30%	PPM, Table 2.6.4
Roadway Base Clearance	1' above D.H.W.	PPM, Table 2.6.3
Min. Stopping Sight Distance	425' (flat terrain)	PPM, Table 2.7.1
Horizontal Curves		PPM, Ch. 2.8
Min. Length of curve	50 mph: 15V (min. 400')	PPM, Table 2.8.2a
Max. Curvature	6 deg 30'	PPM, Table 2.8.3
Max. Curvature w/o Superelevation	2 deg 00' (e max = 0.05)	PPM, Table 2.8.4
Superelevation	80% of super trans. in tangent	PPM, Table 2.9.2 Design Standard 511
	Superelevation Transition Rate - 1:200	PPM Table 2.9.3
Max. Deflection w/o curve	1 deg 00' 00"	PPM, Table 2.8.1a
Crest Vertical Curve	50 mph: K=136;	PPM, Table 2.8.5
	Min. L = 300'	
	L=KA (where A=Algebraic Dif in Grades in %)	
Sag Vertical Curve	50 mph: K = 96;	PPM, Table 2.8.6
	Min. L = 200'	
Minimum Vertical Clearance	16' 6" Roadway Over Roadway	PPM, Table 2.10.1
Clear Zone	24' Travel Lanes; 14' Aux Lanes;	Design Standard 700
Left Turn Lane Length	240' deceleration length + queue	Design Standard 301
Notes:		
PPM = Plans Preparation Manual (Volume 1 & 2 - Revised January 2014), Florida Department of Transportation ; Design Standards = 2015 FDOT Design Standards		

4.5.2 Alternative Alignment Comparison

The concept plan sheets for the Urban Hold North Right-of-Way, Urban Hold South Right-of-Way, and Urban Best Fit alternatives are contained in Appendix A. Summaries of buildings and parcels were compiled in October 2012. The following is a segment-by-segment comparison of the alternatives based on the standard urban typical section:

I-95 to John Rodes Boulevard

Currently, no roadway exists in this segment. There is a 60-foot right-of-way section for the L-15 Canal between the M-1 Canal and John Rodes Boulevard. There is no development in this segment to determine the horizontal location of the roadway. All three alignments will use normal crown reverse curves with radii of 7,000 feet to transition from the common location of the interchange to each alternatives location at Ellis Road.

John Rodes Boulevard to East Drive

Existing right-of-way in this segment is 100 feet wide, with the exception of a 73-foot wide section that traverses east of Stan Drive for a distance of approximately 1,150 feet. This segment is the least densely-developed segment on Ellis Road with more land undeveloped than developed. As of October 2012, this segment includes eleven buildings that could be possibly impacted - seven buildings on the north side of the road and four on the south side of the road. The summary of the building and parcels on the north side of the road are as follows:

- One currently vacant building;
- Wuestoff Health Systems;
- Two buildings for Coastal Mechanical Services (each on a separate parcel with the buildings along the side of the road);
- Three warehouse-type facilities with multiple tenants (two on one parcel and the third on a separate parcel);
- Two vacant parcels; and
- One retention pond for an underground communications business located just north of the project along West Drive.

The summary of the building / businesses and parcels on the south side of the road are as follows:

- USSI;
- Two warehouse type facilities with multiple tenants (both are on the same parcel);
- Champion Environmental Soils;
- Seven vacant parcels.

Another consideration is a proposed site plan for additional warehouse facilities on the south east corner of Ellis Road and John Rodes Boulevard. The Hold North Right-of-Way alternative physically impacts every building on the south except USSI. However, the driveway and parking in front of USSI is impacted, as are the retention ponds for Florida Power and Light.

The Hold South Right-of-Way alternative physically impacts every building on the north except one of the warehouse structures. The warehouse building that was not physically impacted is oriented parallel to the roadway, with the front of the units facing the roadway with garage doors in the rear. This alignment impacts all customer parking located in the front of the businesses.

The Best Fit alternative was adjusted after a field meeting with FDOT Right-of-way personnel on February 8th, 2011. The USSI structure and Champion Environmental Soils structure are both considered high risk acquisitions, according to the Department Right-of-way personnel. Due to concerns about major impacts to these businesses, the Best Fit alignment holds the south right-of-way line up to Champion Environmental Soils before transitioning south with a 9,000-foot radius curve toward the undeveloped parcel to the south. The impacts of the Best Fit alternative, as of October 2012, are as follows:

- Currently vacant building (northside of roadway);
- Wuestoff Health Systems building (northside of roadway);
- Two warehouse-type structures with multiple tenants (northside of roadway);
- Parking of a warehouse-type facility with multiple tenants (northside of roadway) ;
- The western Coastal Mechanical Service structure (northside of roadway).

East Drive to Technology Drive (East)

Existing right-of-way is approximately 100' feet throughout this segment. Proposed right-of-way is reduced when the canal section ends just west of Technology Drive (east). This proposed right-of-way reduction occurs on the north side of the road. Although there are more structures in this segment, they are farther away from the roadway. The summary of the buildings / businesses and parcels on the north side of the road are as follows:

- ECAS;
- A vacant parcel;
- Downtown Produce Market & More;
- Future Home of DTL Melbourne;
- Classic Floors;
- Ferguson Water Works;
- Two vacant lots.

The buildings / businesses and parcels on the south side of the road are as follows:

- Florida Power and Light;
- Structural Composites Inc.;
- Medicomp;
- One vacant building for lease and Habitat for Humanity (both occupy one parcel);
- American Door & Mill Work;
- Laundry Delivered.com;
- Brooks Enterprise;
- Hills Inc.(two parcels with a total of 5 buildings);
- Tempstor Heating & Cooling.

Hold North Right-of-Way has physical impacts to six structures which are Structural Composites Inc.; the vacant building for lease, Habitat for Humanity; American Door & Mill Work; Laundry Delivered.com; and Brooks Enterprise. Of the remaining structures on the south not sustaining a building impact, all have impacts to their parking with the exception of Florida Power and Light. Three retention ponds also have impacts. There is also a small right-of-way acquisition on the north side of two parcels in the vicinity of the L-11 canal where there is a deflection in the corridor. One of the northern impacted parcels is the grass frontage of ECAS and the second if along the frontage of the adjacent vacant parcel.

Hold South Right-of-Way impacts four out of the five structures on the north side of the road. The Downtown Produce Market is the one structure not directly impacted however, impacts to its parking does occur. According to FDOT Right-of-way personnel, the 35 parking spaces impacted from Downtown Produce Market would be a major impact due to the size of the business and the resultant lack of space on the parcel to cure the parking.

The Best Fit alternative shifts to hold the north right-of-way with an 8,400-foot radius. Just west of Technology Drive (East), the canal section ends, thereby reducing the right-of-way on the north side by 56.5 feet. In the vicinity of Ferguson Water Works, the alignment begins to transition north to the open field east of Ferguson Water Works with an 8,400-foot radius curve. The impacts of the Best Fit alternative on the south side of the roadway are as follows:

- Florida Power and Light retention pond;
- Structural Composites Inc.;
- Retention pond and parking impact to Medicorp (approximately 20 spaces);
- One vacant building for lease and Habitat for Humanity;
- American Door & Mill Work;
- Laundry Delivered.com;
- Retention pond, parking and circulation impact to Brooks Enterprise;
- Retention pond, frontage, parking and circulation impact to Hills Inc.;
- Frontage from Tempstor Heating & Cooling.

On the north side of the roadway, the impacts of the Best Fit alternative are all along the frontage of the properties. The properties affected are

- ECAS;
- A vacant parcel;
- Classic Floors;
- Ferguson Water Works;
- Two vacant lots.

Technology Drive (East) to Lake Ibis Drive

The right-of-way width in this segment is 80 feet, with the exception of the western 310 feet of the segment, which has a right-of-way width of 100 feet. This segment has the only residential area on Ellis Road. There are 18 single family dwellings, with one additional parcel with a structure on the north side of the road. The only other building on the north side is the Secureway Self Storage. On the south side of the roadway the parcels and building associated with them are as follows:

- AT&T;
- Cleve Craft Complex (five buildings having multiple garages that serve individual businesses);
- J. W. Industries;
- Hot Cars Auto Service Center;
- Buckman's Auto Body;
- Mark's Body Shop.

Hold North Right-of-Way physically impacts five buildings of the Cleve Craft Complex as well as J. W. Industries and Mark's Body Shop. In addition the parking of AT&T, Hot Cars Auto Service Center and Buckman's Auto Body are affected. Although there is right-of-way take from nine of the residential parcels on the north, none are physically impacted. The reason for the impact to the northern parcels is due to the alignment tying into the existing road just west of Lake Ibis Drive.

Hold South Right-of-Way physically impacts Secureway Self Storage on the north side and Mark's Body Shop on the south side. Although the residential units are not physically impacted, all of the 19 residential parcels on the north side are affected and several of dwellings are within five feet of the proposed right-of-way. On the south side, slight impact to the frontage of the Cleve Craft Complex, J. W. Industries, Hot Cars Auto Service Center, Buckman's Auto Body and Mark's Body Shop occurs. Like the hold north alternative, some parcels on both sides of the road are impacted due to the alignment tying into the existing road just west of Lake Ibis Drive.

The Best Fit alternative has similar impacts as the hold south right-of-way in this segment. An 8,000-foot radius curve moves the alignment north away from the structures on the south. In the vicinity of Shinn Avenue, a gradual 14,000-foot radius curve brings the road in line with the existing alignment so that it can match into existing just west of Lake Ibis Drive. The impacts of the best fit alternative are as follows:

- Secureway Self Storage;
- 19 residential parcels with four direct dwellings impacts and seven additional within 20 feet;
- AT&T;
- Cleve Craft Complex (corner clip);
- Frontage from Hot Cars Auto Service Center;
- Parking impact to Buckman's Auto Body; and,
- Mark's Body Shop.

Lake Ibis Drive to Wickham Road

In this segment, the existing right-of-way width varies from 93 to 97 feet. Most of the structures are multiple garage-warehouse type structures. At Lake Ibis Drive, the proposed roadway immediately begins to transition into the existing recently-constructed improvements from the NASA Boulevard project. All three alignments impact parking to Walkers Ellis Road Auto Repair to the north and parking of a vacant warehouse type structure to the south. The Best Fit alignment terminates approximately 270 feet east of Lake Ibis Drive, impacting one parking space of Dependable Air Supply and minor impacts to Goodman AC/Heat and Dal-Tile.

An examination of carrying the full typical section to Wickham Road is described in Section 4.8. Table 4.5.2 displays a comparison matrix of potential impacts for the Urban 45 mph alternatives.

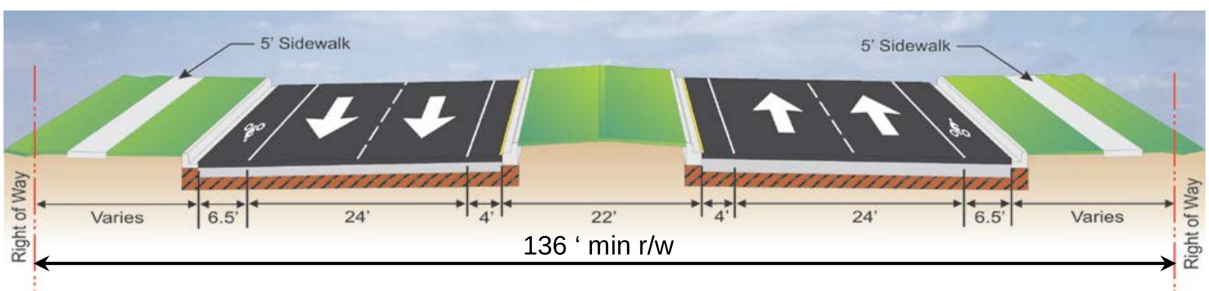
Table 4.5.2 - Ellis Road Urban 45 mph Alternatives Evaluation Matrix of Potential Impacts						
	Preliminary Alternatives					
	Urban 45 mph					
Resource	**Hold North R/W Line Impacts to South**		**Hold South R/W Line Impacts to North**		**Best Fit**	
Right-of-way						
Number of Parcels						
Business	21		19		28	
Residential	8		18		18	
Unimproved	17		13		16	
Total	46		50		62	
Number of Relocates						
Business	18.5		11		10	
Residential	5		18		18	
Total	**23.5**		**29**		**28**	
Environment						
Wetlands Impacts (ac)	0.66		1.05		1.05	
Contamination	Low		Low		Low	
Historical & Cultural Resources	Low		Low		Low	
Utility Involvement	Major		Major		Major	
Estimated Costs (in millions)						
[(1)]Right of Way	$	35.66	$	35.04	$	36.07
Construction	$	9.80	$	9.80	$	9.80
Engineering & Construction Management	$	1.47	$	1.47	$	1.47
Grand-Total	***$***	***46.93***	***$***	***46.31***	***$***	***47.34***

[(1)] Does not include right-of-way costs for ponds

4.6 SIS High Speed (50 mph) Urban Alternatives

Figure 4.6.1 displays the SIS high speed urban typical section analyzed in this PD&E Study. The typical section is based on the standard FDOT typical section shown on Exhibit Typ-17 in the 2014 *Plans Preparation Manual (Volume II)*. This typical section also meets the required design speed of 50 mph for an SIS facility. Similar to the urban typical section, the SIS high speed urban typical section features four lanes separated by a 30' median, which is comprised of 18 feet of grass, curb and gutter and 8 total feet of inside shoulder. The inside yellow edge of pavement marking is offset by 4 feet from the edge of the curb and gutter, thereby meeting the clear zone requirements between the inside travel lanes. Beyond the edge outside of the traveled way is a 6.5-foot-wide bicycle lane, curb and gutter, and a 5-foot-wide sidewalk separated from the back of curb by 8.25 feet of sod. The tie-down slope of the typical section begins 2 feet behind the proposed sidewalk. The minimum right-of-way width required for this typical section is 136 feet. Additional right-of-way will be needed for the canal and ditch sections and for slopes to tie into existing ground. The drainage requirements and the resulting effect on the right-of-way width are discussed in Section 4.8.

Figure 4.6.1: SIS High Speed (50 mph) Urban Typical Section



4.6.1 Design Criteria

Table 4.6.1 summarizes the design criteria utilized in applying the SIS high speed urban typical section. This typical section has a design speed of 50 mph. This typical section requires a minimum of 136 feet, which does not include additional right-of-way for drainage elements or utilities behind the sidewalk. Refer to Appendix C (Typical Sections Considered and Typical Section Package) to view a detailed version of this typical section.

Table 4.6.1: SIS High Speed Urban Roadway Design Criteria

Ellis Road – SIS High Speed Urban		
Design Element	**Design Value**	**Source**
Facility Type	Urban Minor Arterial	FDOT
Design Speed	50 mph	PPM, Table 1.9.1
Minimum Lane Widths	12' – travel lane	PPM, Table 2.1.1
Shoulders	Inside: 4' paved (w/ curb & gutter) Outside: 6.5' paved (w/curb & gutter)	PPM Vol. II, Exhibit Typ-17
Median Width	30'	PPM, Figure 2.16.1
Minimum Border Width	29'	PPM, Figure 2.16.1
Grades	6% max (urban arterial / flat terrain)	PPM, Table 2.6.1
Max. Change in Grade w/o VC	0.60	PPM, Table 2.6.2
Pavement Cross Slopes	2% (inside 2 lanes); 3% outside lane;	PPM, Figure 2.1.1
Minimum Grade	0.30%	PPM, Table 2.6.4
Roadway Base Clearance	1' above D.H.W.	PPM, Table 2.6.3
Min. Stopping Sight Distance	425' (flat terrain)	PPM, Table 2.7.1
Horizontal Curves		PPM, Ch. 2.8
Min. Length of curve	50 mph: 15V (min. 400')	PPM, Table 2.8.2a
Max. Curvature	6 deg 30'	PPM, Table 2.8.3
Max. Curvature w/o Superelevation	2 deg 00' (e max = 0.05)	PPM, Table 2.8.4
Superelevation	80% of super trans. in tangent	PPM, Table 2.9.2 Design Standard 511
	Superelevation Transition Rate - 1:200	PPM, Table 2.9.3
Max. Deflection w/o curve	1 deg 00' 00"	PPM, Table 2.8.1a
Crest Vertical Curve	50 mph: K=136;	PPM, Table 2.8.5
	Min. L = 300'	
	L=KA (where A=Algebraic Dif in Grades in %)	
Sag Vertical Curve	50 mph: K = 96	PPM, Table 2.8.6
	Min. L = 200'	
Minimum Vertical Clearance	16' 6" Roadway Over Roadway	PPM, Table 2.10.1
Clear Zone at 50 mph	24' Travel Lanes; 14' Aux Lanes;	Design Standard 700
Left Turn Lane Length	240' deceleration length + queue	Design Standard 301
Notes:		
PPM = Plans Preparation Manual (Volume 1 & 2 - Revised January 2014), Florida Department of Transportation ; Design Standards = 2015 FDOT Design Standards		

4.6.2 Alternative Alignment Comparison

The concept plan sheets for the SIS high speed urban Hold North Right-of-Way, Hold South Right-of-Way, and Best Fit alternatives are contained within Appendix A. The following is a segment-by-segment comparison of the alternatives based on the SIS high speed urban typical section:

I-95 to John Rodes Boulevard

As previously mentioned, this segment has a 60-foot right-of-way section for the L-15 Canal between the M-1 Canal and John Rodes Boulevard with no development in this segment. All three alignments will use normal crown curves with radii of 8,400 feet to transition from the common location of the interchange to each alternatives location at Ellis Road.

John Rodes Boulevard to East Drive

This segment has an existing right-of-way width of 100 feet, with the exception of a 73-foot wide section that traverses east of Stan Drive for a distance of approximately 1,150 feet. This least densely-developed segment on Ellis Road includes eleven buildings that could be possibly impacted - seven buildings on the north side of the road and four on the south side of the road. The summary of the buildings / businesses and parcels on the north side of the road are as follows:

- Currently vacant building;
- Wuestoff Health Systems;
- Two buildings for Coastal Mechanical Services (each on a separate parcel with the buildings along side the road);
- Three warehouse-type facilities with multiple tenants (two on one parcel and the third on a separate parcel);
- Two vacant parcels; and,
- One retention pond for an underground communications business located just north of the project along West Drive.

The summary of the building and parcels on the south side of the road are as follows:

- USSI;
- Two warehouse type facilities with multiple tenants (both are on the same parcel);

- Champion Environmental Soils;
- Seven vacant parcels.

The SIS Hold North Right-of-Way impacts every structure along the south side of the road as well as the retention pond for USSI and one associated with Florida Power and Light. All five vacant parcels are affected by this alternative. A narrow right-of-way impact occurs on the north side of the roadway for the two vacant parcels and two of the warehouse-type facilities. The SIS Hold South Right-of-Way impacts every structure along the north side of the road and the two vacant parcels. A small impact to the frontage of two vacant parcels and a clip to the USSI parcel also occur. The SIS Best Fit alternative avoids the same structures as the Standard Urban Best Fit alternative for the reasons discussed in that section. As with the Urban Best Fit alternative, the SIS Best Fit holds the south right-of-way line up to Champion Environmental Soils before transitioning to the undeveloped parcel to the south using an 8,400-foot radius curve. The impacts of the Best Fit alternative to the north side of the roadway are as follows:

- Currently vacant structure;
- Wuestoff Health Systems;
- The three warehouse type structures;
- Western Coastal Mechanical Services structure; and,
- Two vacant parcels.

The impacts to the south are:

- Small frontage impact to four vacant parcels
- Sliver of frontage near the USSI pond area;,
- Frontage impact to Champion Environmental Soils; and,
- The western Florida Power and Light retention pond.

East Drive to Technology Drive (East)

Existing right-of-way is approximately 100 feet throughout this segment. Proposed right-of-way is reduced, on the north side of the roadway, when the canal section ends just west of Technology Drive (east). The summary of the buildings / businesses and parcels on the north side of the road are as follows:

- ECAS;
- A vacant parcel;
- Downtown Produce Market & More;
- Future Home of DTL Melbourne;
- Classic Floors;
- Ferguson Water Works; and,
- Two vacant lots.

The buildings / businesses and parcels on the south side of the road are as follows:

- Florida Power and Light;
- Structural Composites Inc.;
- Medicomp;
- One vacant building for lease and Habitat for Humanity (both occupy one parcel);
- American Door & Mill Work;
- Laundry Delivered.com;
- Brooks Enterprise;
- Hills Inc.(two parcels with a total of 5 buildings); and,
- Tempstor Heating & Cooling.

SIS Hold North Right-of-Way has impacts to nine structures which are Structural Composites Inc.; the vacant building for lease; Habitat for Humanity; American Door & Mill Work; Laundry Delivered.com; Brooks Enterprise; and three buildings associated with Hills, Inc. The three structures that are not impacted have parking impacts. Additionally, the ponds that are affected are associated with Florida Power and Light (eastern pond), Medicomp, Brooks Enterprise, and Hills Inc.

SIS Hold South Right-of-Way impacts four of the five structures along the north side of the roadway. The one structure not directly impacted, Downtown Produce Market & More has impacts to 52 parking spots. The three vacant parcels on the north are also affected.

The SIS Best Fit alternative is shifted south to minimize any impact to the Downtown Produce Market and transitions to the undeveloped land to the north using a 9,200-foot radius curve. Just west of Technology Drive (East), the canal section ends, thereby reducing the right-of-way on the north side by 64.5 feet. The impacts of the Best Fit alternative to the south are as follows:

- Florida Power and Light pond;
- Structural Composites Inc.;
- Roughly 40 Medicomp parking spots and a portion of the retention pond;
- One vacant building for lease and Habitat for Humanity;
- American Door & Mill Work;
- Laundry Delivered.com;
- Retention pond of Brooks Enterprise;
- Frontage from Hills Inc. parcels (two); and,
- Frontage from Tempstor Heating & Cooling parcel.

The impacts to the north are:

- Frontage of ECAS;
- Frontage along the vacant parcel;
- Clip to Downtown Produce Market & More's frontage
- Frontage of Future Home of DTL Melbourne;
- Frontage of Classic Floors;
- Ferguson Water Works; and,
- Frontage from the two vacant parcels.

Technology Drive (East) to Lake Ibis Drive

The right-of-way width in this segment is 80 feet, with the exception of the western 310 feet of the segment, which has a right-of-way width of 100 feet. This segment has the only residential area on Ellis Road. There are 18 single family dwellings, with one additional parcel with a structure on the north side of the road. The only other building on the north side is the Secureway Self Storage. On the south side of the roadway the parcels and buildings / businesses associated with them are as follows:

- AT&T;
- Cleve Craft Complex (five buildings having multiple garages that serve individual businesses);
- J. W. Industries;
- Hot Cars Auto Service Center;
- Buckman's Auto Body; and,
- Mark's Body Shop.

Hold North Right-of-Way impacts five buildings of the Cleve Craft Complex as well as J. W. Industries, Hot Cars Auto Service Center and Mark's Body Shop. In addition the parking of AT&T and Buckman's Auto Body are affected. Although there is right-of-way take from ten of the residential parcels on the north, none are physically impacted. The reason for the impact to the northern parcels is due to the alignment tying into the existing road just west of Lake Ibis.

Hold South Right-of-Way impacts the Secureway Self Storage and ten of the residential dwellings on the north side while Mark's Body Shop on the south side. There are moderate to major right-of-way impacts to the remaining nine residential parcels. There are also minor right-of-way impacts to the frontage of Cleve Craft Complex, J. W. Industries, Hot Cars Auto Service Center and Buckman's Auto Body. Again, like the hold north alternative, some parcels on both sides of the road are impacted due to the alignment tying into the existing road just west of Lake Ibis Drive.

The Best Fit alternative is shifted north via an 8,400-foot curve in order to avoid the structures on the south side of the roadway. The alignment utilizes a 13,000-foot radius curve to gradually transition the alignment to the center of the right-of-way to match into existing pavement. The impacts of the Best Fit alternative are as follows:

- Secureway Self Storage;
- Physical impact to eleven of the residential units and frontage impact to the remaining eight parcels;
- Mark's Body Shop; and,
- Frontage clip from Cleve Craft Complex;

- Frontage from J.W. Austin Industries;
- Frontage from Hot Cars Auto Service Center; and,
- Parking impact to Buckman's Auto Body.

One item to note regarding the alternatives along this segment of Ellis Road, the left turn lanes into Shinn Avenue and Lake Ibis Drive both provide approximately 192 feet of total deceleration distance, less than the 230 feet required in Index 301.

Lake Ibis Drive to Wickham Road

From Lake Ibis Drive to Wickham Road, the proposed roadway immediately begins to transition into existing, recently-constructed pavement. All three alignments impact parking to Walkers Ellis Road Auto Repair to the north and parking of a vacant warehouse type structure to the south. The Best Fit alignment terminates approximately 230 feet west of Lake Ibis Drive with minor impacts to Dependable Air Supply and Goodman AC/Heat.

An examination of carrying the full typical section to Wickham Road and is described in Section 4.8.

Table 4.6.2 displays a comparison matrix of potential impacts for the SIS 50 mph alternatives.

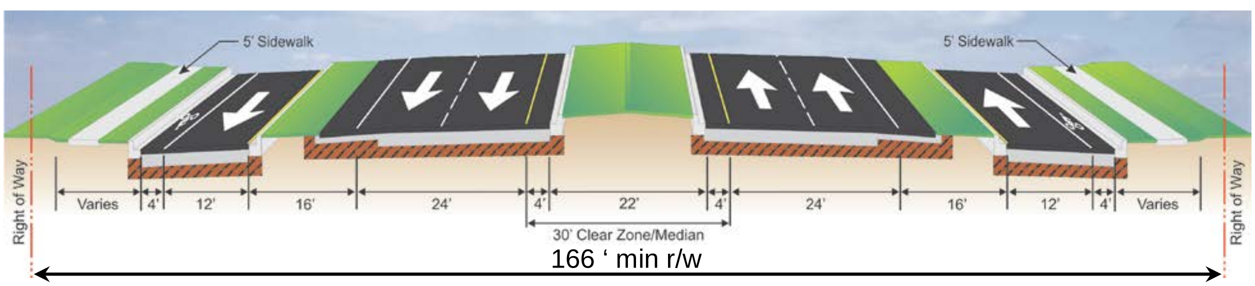
Table 4.6.2 - Ellis Road SIS 50 mph Alternatives Evaluation Matrix of Potential Impacts			
	Preliminary Alternatives		
	SIS 50 mph		
Resource	**Hold North R/W Line Impacts to South**	**Hold South R/W Line Impacts to North**	**Best Fit**
Right-of-way			
Number of Parcels			
Business	21	19	31
Residential	9	18	18
Unimproved	15	15	18
Total	45	52	67
Number of Relocates			
Business	20.5	13	10
Residential	6	18	18
Total	26.5	31	28
Environment			
Wetlands Impacts (ac)	0.78	1.17	1.17
Contamination	Low	Low	Low
Historical & Cultural Resources	Low	Low	Low
Utility Involvement	Major	Major	Major
Estimated Costs (in millions)			
[(1)]Right of Way	$ 45.93	$ 42.00	$ 43.26
Construction	$ 10.42	$ 10.42	$ 10.42
Engineering & Construction Management	$ 1.56	$ 1.56	$ 1.56
Grand-Total	***$ 57.91***	***$ 53.98***	***$ 55.24***

(1) Does not include right-of-way costs for ponds

4.7 SIS High Speed Urban Typical with Frontage Roads

Figure 4.7.1 displays the SIS high speed (50 mph) urban typical with frontage roads analyzed in this PD&E Study. The typical section is based on the standard FDOT typical section shown on Exhibit Typ-18 in the *2014 Plans Preparation Manual (Volume II)* with the addition of one way frontage roads. Similar to the urban typical section, the SIS high speed urban typical with frontage roads features four mainline lanes separated by a 30-foot median flanked by curb and gutter on both sides. The inside edge of travel lane is offset by 4 feet from the edge of the curb and gutter. Beyond the outside edge of the traveled way is an 8-foot-wide shoulder (5 feet of which is paved), 5.75 feet of sod, followed by the type E curb and gutter for the frontage road. The frontage road is a one-way 12-foot lane. Beyond the outside edge of the frontage road's traveled way is a 4-foot-wide bicycle lane, curb and gutter, and a 5-foot-wide sidewalk separated from the back of curb by 3 feet of sod. The tie-down slope begins 2 feet behind the proposed sidewalk. The minimum right-of-way width required for this typical section is 182 feet. The SIS high speed urban typical section with frontage roads has the largest footprint of the three typical sections considered.

Figure 4.7.1: SIS High Speed Urban Typical Section with Frontage Roads



4.7.1 Design Criteria

Table 4.7.1 summarizes the design criteria utilized in applying the SIS high speed urban typical section with frontage roads, which has a mainline design speed of 50 mph. This typical section requires a minimum of 166 feet, which does not include additional right-of-way for drainage elements or utilities behind the sidewalk. Refer to Appendix C (Typical Sections Considered and Typical Section Package) to view a detailed version of this typical section.

Table 4.7.1: SIS High Speed Urban with Frontage Roads Roadway Design Criteria

Ellis Road – SIS High Speed Urban with Frontage Roads		
Design Element	**Design Value**	**Source**
Facility Type	Urban Minor Arterial	FDOT
Design Speed	50 mph	PPM Table 1.9.1
Minimum Lane Widths	12' - travel lane	PPM, Table 2.1.1
Shoulders	Inside: 4' paved (w/ curb & gutter) Outside: 8' (5' paved w/o c & g)	PPM Vol. II, Exhibit Typ-18
Median Width	30'	PPM, Figure 2.16.1
Minimum Border Width	29' (mainline); 10' (frontage road);	PPM, Table 2.5.2; PPM Figure 2.16.1;
Grades	6% max (urban arterial, flat terrain)	PPM, Table 2.6.1
Max. Change in Grade w/o VC	0.60	PPM, Table 2.6.2
Pavement Cross Slopes	2% (inside 2 lanes); 3% outside lane;	PPM, Figure 2.1.1
Minimum Grade	0.3%	PPM, Table 2.6.4
Roadway Base Clearance	1' above D.H.W.	PPM, Table 2.6.3
Min. Stopping Sight Distance	425' (flat terrain)	PPM, Table 2.7.1
Horizontal Curves		PPM, Ch. 2.8
Min. Length of curve	50 mph: 15V (min. 400')	PPM, Table 2.8.2a
Max. Curvature	6 deg 30'	PPM, Table 2.8.3
Max. Curvature w/o Superelev	2 deg 00' 00" (e max = 0.05)	PPM, Table 2.8.4
Superelevation	80% of super trans. in tangent	PPM, Table 2.9.2 Design Standard 511
	Superelevation Transition Rate - 1:200	PPM Table 2.9.3
Max. Deflection w/o curve	1 deg 00' 00"	PPM, Table 2.8.1a
Crest Vertical Curve	50 mph: K=136;	PPM, Table 2.8.5
	Min. L = 300'	
	L=KA (where A=Algebraic Dif in Grades in %)	
Sag Vertical Curve	50 mph: K = 96;	PPM, Table 2.8.6
	Min. L = 200'	
Minimum Vertical Clearance	16' 6" Roadway Over Roadway	PPM, Table 2.10.1
Clear Zone = 50 mph	24' Travel Lanes; 14' Aux Lanes;	Design Standard 700
Left Turn Lane Length	240' deceleration length + queue	Design Standard 301
Notes:		
PPM = Plans Preparation Manual (Volume 1 & 2 - Revised January 2014), Florida Department of Transportation ; Design Standards = 2015 FDOT Design Standards		

4.7.2 Alternative Alignment Comparison

Appendix A contains the concept plan sheets for the Hold North Right-of-Way, Hold South Right-of-Way and Best Fit alternatives. The following is a segment-by-segment comparison of the alternatives based on the SIS high speed urban typical section with frontage roads:

I-95 to John Rodes Boulevard

There is a 60-foot right-of-way section for the L-15 Canal between the M-1 Canal and John Rodes Boulevard. There is no development in this segment to determine the horizontal location of the roadway. Moving east from the interchange each alternative will transition to its preferred alignment using normal crown curves. There are no frontage roads in this section.

John Rodes Boulevard to East Drive

The frontage roads begin just east of John Rodes Boulevard and extend to Wickham Road. The eastbound frontage road begins as a 4-degree taper-type terminal, while the westbound frontage road terminates as a "jug handle" intersection. Buildings potential impacted in this segment include seven on the north side of the road and four on the south side of the road. This segment is the least densely developed segment on Ellis Road with more land undeveloped than developed. Thereby, there are two vacant parcels on the north and five on the south. The existing north right-of-way decreases by 27 feet for a distance of approximately 1,150 feet in the middle of this segment.

Due to this indentation in the north right-of-way, the Hold North Right-of-Way alternative transitions to the south via curves with radii no less than 12,000 feet. This alignment does not eliminate right-of-way take from the northern parcels, but it does eliminate business impacts to the parcels on the north side. The resulting minor impacts to the north are frontage to the two vacant parcels and the parcels containing the two warehouses. All of the buildings and vacant parcels on the south are affected.

The Hold South Right-of-Way has no curves in the segment except for the curve emanating from the interstate to the east. The Hold South Right-of-Way impacts all the structures on the north side of the road and vacant parcel. No impacts occur to the south.

The Best Fit alternative through this section resembles the Hold North Right-of-Way alternative, since there are fewer buildings on the south, with the exception of one. Where the right-of-way decreases by 27 feet, the Best Fit alternative continues straight instead of adding two reverse curves. Therefore, all of the buildings and parcels are impacted to the south and frontage is needed from the two vacant parcels and the parcels containing the two warehouses on the north.

East Drive to Technology Drive (East)

This segment is more developed than the previous segment, with the Downtown Produce Market being a significant business in the area due to the customer parking fronting the business. Existing right-of-way is approximately 100 feet throughout this segment. Proposed right-of-way is reduced when the canal section ends at the L-11 Canal and again when the ditch section ends just west of Technology Drive (east). Both of these proposed right-of-way reductions occur on the north side.

Hold North Right-of-Way has impacts to seven buildings (Structural Composites Inc.; the vacant building for lease; Habitat for Humanity; American Door & Mill Work; Laundry Delivered.com; Brooks Enterprise and one of the Hills Inc.) and four parking lots (AT&T, Medicomp, Hills, Inc parcels and Tempstor Heating & Cooling). There is also a small right-of-way take on the north side on the ECAS business parcel, although the business is not impacted. This right-of-way take is a result of the curve through this section and the reduction in proposed right-of-way due to the end of the canal section.

The Hold South Right-of-Way alternative impacts all four structures (ECAS; Future Home of DTL Melbourne; Classic Floors; and Ferguson Water Works) and approximately 45 parking spaces from Downtown Produce Market. No impacts occur to the south.

The Best Fit alternative splits the middle of the existing right-of-way and thereby having a least a minor effect on every parcel. There are impacts to three structures (Structural Composites Inc., one vacant building for lease and Ferguson Water Works) and parking impacts to seven lots (Downtown Produce Market; Florida Power and Light; Medicom; one vacant building for lease; Habitat for Humanity; American Door & Mill Work; and Classic Floors). The parking impacts to Downtown Produce Market results in approximately five parking spaces remaining. The alignment was shifted as far north as possible via a 12,000-foot radius curve without physically impacting the building of Ferguson Water Works. This configuration minimizes parking impacts for the businesses along the south side.

Technology Drive (East) to Lake Ibis

The right-of-way width in this segment is 80 feet, with the exception of the western 310 feet of the segment, which has a right-of-way width of 100 feet. This segment has the only residential area on Ellis Road. There are 18 single family dwellings, with one additional parcel with a structure on the north side of the road. The only other building on the north side is the Secureway Self Storage. On the south side of the roadway the parcels and building associated with them commercial in nature.

The Hold North Right-of-Way alternative impacts seven structures (five buildings of the Cleve Craft Complex; J. W. Industries; and Mark's Body Shop) and the parking the remaining three parcels (AT&T; Hot Cars Auto Service Center; and Buckman's Auto Body) on the south side. All residential parcels on the north side are impacted, although only a single home is directly affected by the proposed right-of-way.

The Hold South Right-of-Way impacts 16 structures including 14 residential units. The two non-residential are Secureway Self Storage on the north and Mark's Body Shop on the south. Three parcels have impacts to their frontage onto Ellis Road (Cleve Craft Complex; J. W. Industries; Hot Cars Auto Service Center) and one with parking impacts (Buckman's Auto Body). The Best Fit alternative is coincident with the Hold South alternative in this location by using a 12,000-foot radius curve to transition from the north side to match a consistent bearing with NASA Boulevard. An alternative centered down the middle of the right-of-way was examined but discounted due to the impacts to buildings on both sides of the roadway.

Lake Ibis Drive to Wickham Road

All three alternatives are the same through this segment. The centerline of each alternative is coincident with the alignment from the NASA Boulevard realignment on the east side of Wickham Road. Ten buildings are impacted (on the south side: the warehouse; Dependable Air Supply; two buildings of the Magic Movers Storage; Tony's Upholstery; and the vacant gas station; On the north side: two buildings of the M&L Auto; Shell Stone Tile; and the Oil & Lube Express), and three have parking or circulation impacted (Walkers Ellis Road Auto Repair; Goodman A/C Heat; and Dal-Tile).

4.7.3 Results of Traffic Analysis

As indicated in Section 3.5, the SIS high speed urban typical section with frontage roads does not provide acceptable LOS D standard through Design Year 2034 for both the arterial and intersection operations with the optimal lane configuration provided. Due to the increased right-of-way footprint compared to the 45 and 50 mph alternatives and the lack of acceptable LOS, this alternative is not carried forward for comparison to the 45 and 50 mph alternatives. As a result, a comparison matrix was not developed for the Hold North Right-of-Way, Hold South Right-of-Way, and Best Fit versions of the SIS high speed urban with frontage roads typical section.

4.8 Tie-In to Existing Ellis Road (East End)

On the east end of the project all of the alternatives terminate by tying into the existing roadway just east of Lake Ibis Drive. Carrying the typical sections forward and ending it at Wickham Road was analyzed however Lake Ibis Drive presented a better terminating point. The section of Ellis Road between Lake Ibis Drive and Wickham Road was widened from two lanes to four in 2010 by the FDOT as part of the NASA Boulevard relocation project. Although the existing typical section does not meet SIS criteria, it is a 4-lane roadway with a left turn lane and traffic separator (see Figure 2.2.4). There are ten structures within this approximately 1000-foot segment, of which six are within 20 feet of the existing right-of-way line. Dal-Tile, a business that does not lie within 20 feet of the existing right-of-way and the largest of the businesses in this segment, would be significantly impacted by any right-of-way acquisition. This is due to their limited parking that lies adjacent to the existing right-of-way. Therefore the decision to end the proposed typical section just east of Lake Ibis Drive was made for the following reasons:

- Existing section was widened to four lanes by FDOT in 2010;
- The large impact to businesses; and
- Additional right-of-way costs

4.9 Standard Urban (45 mph) vs. SIS High Speed (50 mph) Urban Comparison

4.9.1 Standard Urban vs. SIS Urban Typical Section

Operationally the SIS High Speed (50 mph) Urban typical section is superior to the Standard Urban 45 mph alternative due to the higher posted speed limit (50 mph vs. 45 mph) and a more restrictive access management class (Class 3 vs. Class 5), which reduces conflict from turning vehicles. The SIS Urban alternative also has a lower travel time through the corridor (see Table 4.9.1). The intersections of the SIS Urban alternative also generally operate at a higher LOS.

The pros and cons of the Standard Urban and SIS Urban typical sections can be summarized as follows:

Standard Urban Pros

- Less costly to construct;
- Less right-of-way cost;
- Less business and residential impacts;
- Less wetland impacts; and,
- More conducive to Class 5 access management and consequently more full and directional median openings.

SIS Urban Pros

- Higher operating speed;
- Lower corridor travel time;
- Meets SIS criteria;
- Wider bike lane;

- More readily accommodates future widening to 6 lanes, if required;
- More conducive to access management Class 3 due to higher operating speed;
- Recommended by traffic study; and
- Preferred by Melbourne International Airport

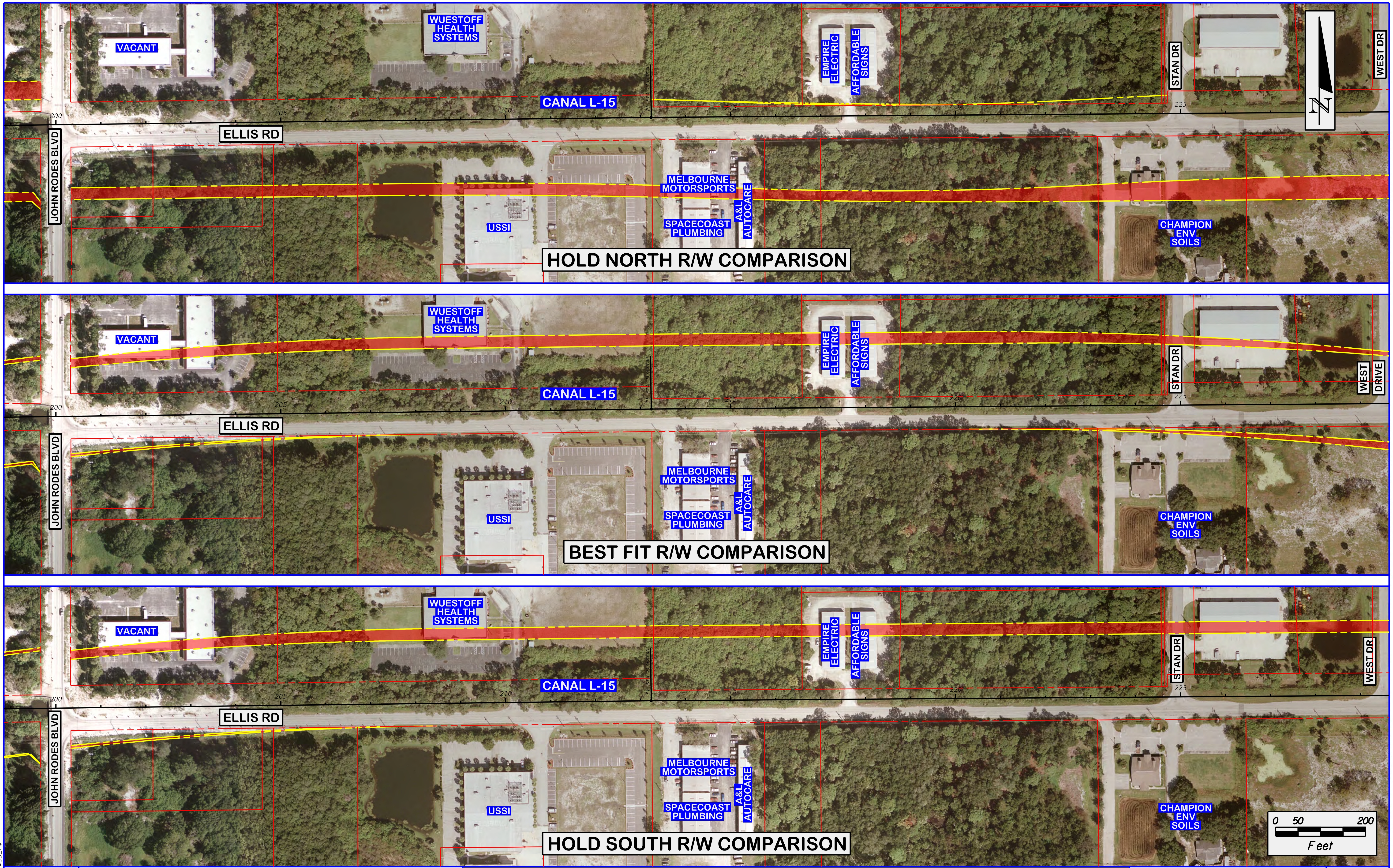
Chapter 3 shows the LOS and the travel time for vehicles to pass through various segments of Ellis Road based on different design year, time of day and direction of travel (Tables 3.3.4, 3.3.5). For a corridor distance of approximately 2 miles, the design year 2034 travel times pertaining to the Standard Urban 45 mph and SIS Urban 50 mph alternatives are as follows:

Table 4.9.1: Ellis Road Corridor Travel Times

		Standard Urban 45mph		SIS Urban 50mph	
		Speed (mph)	Time (min)	Speed (mph)	Time (min)
Eastbound	AM	23.4	5.54	25.2	5.14
	PM	23.2	5.59	24.3	5.33
Westbound	AM	21	6.17	24.2	5.36
	PM	22.5	5.76	27.3	4.75

4.9.2 Standard Urban vs. SIS Urban Right-of-way

Figures 4.9.1 (A through C) display a graphical comparison of the Standard Urban 45 mph and SIS Urban 50 mph right-of-way requirements for the Best-Fit alternatives. The red transparent shading represents the additional right-of-way required for the SIS 50 mph alternatives compared to the Urban 45 mph right-of-way requirements. The blue transparent shading represents the additional right-of-way required for the Urban 45 mph alternatives compared to the SIS 50 mph right-of-way requirements.



FDOT

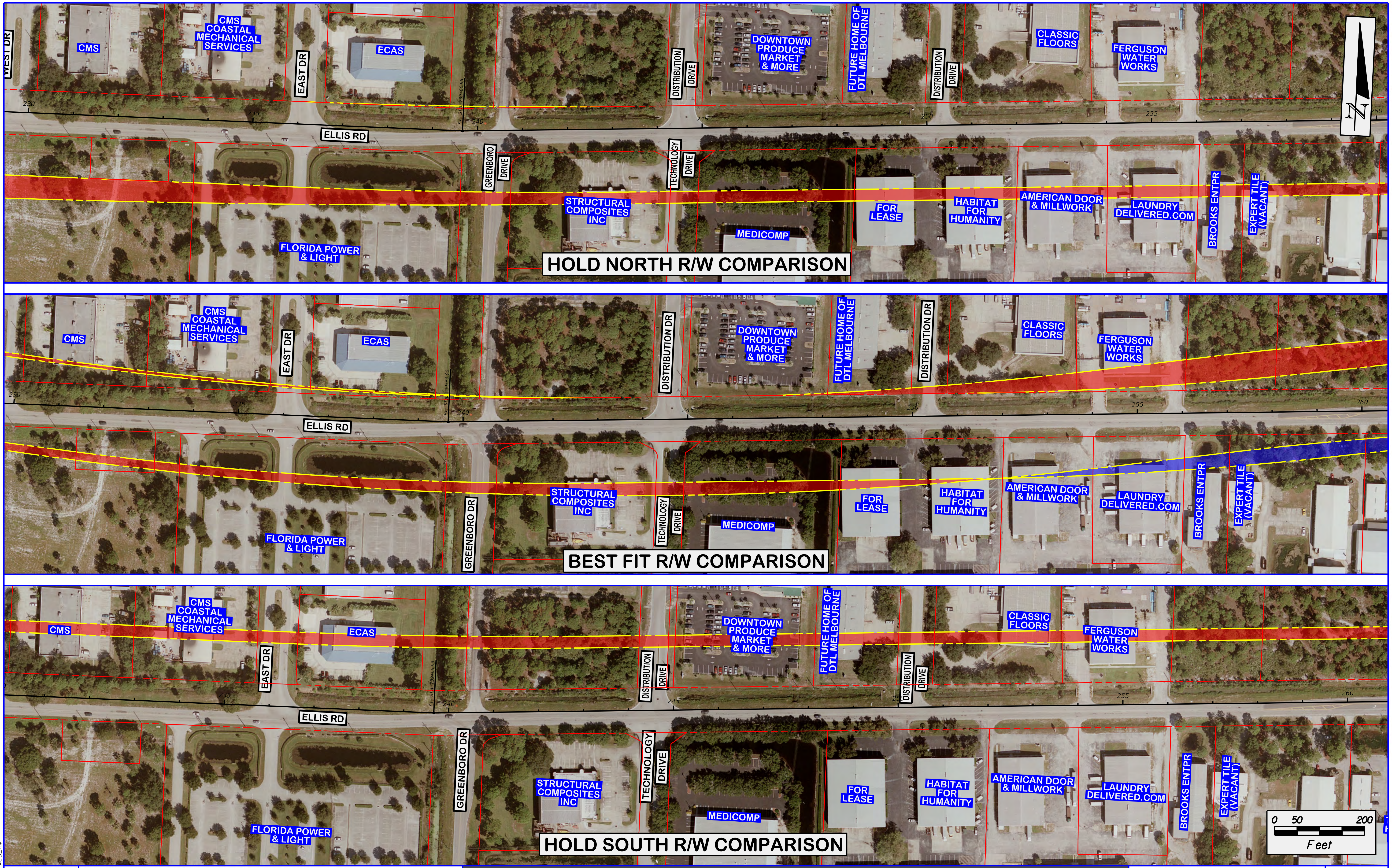
I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W
PROPERTY LINE

ADDITIONAL R/W REQUIRED FOR SIS 50 MPH OVER URBAN 45 MPH
ADDITIONAL R/W REQUIRED FOR URBAN 45 MPH OVER SIS 50 MPH

R/W COMPARISON
STANDARD URBAN 45 MPH
VS.
HIGH SPEED SIS 50 MPH

FIGURE NO.
4.9.1A



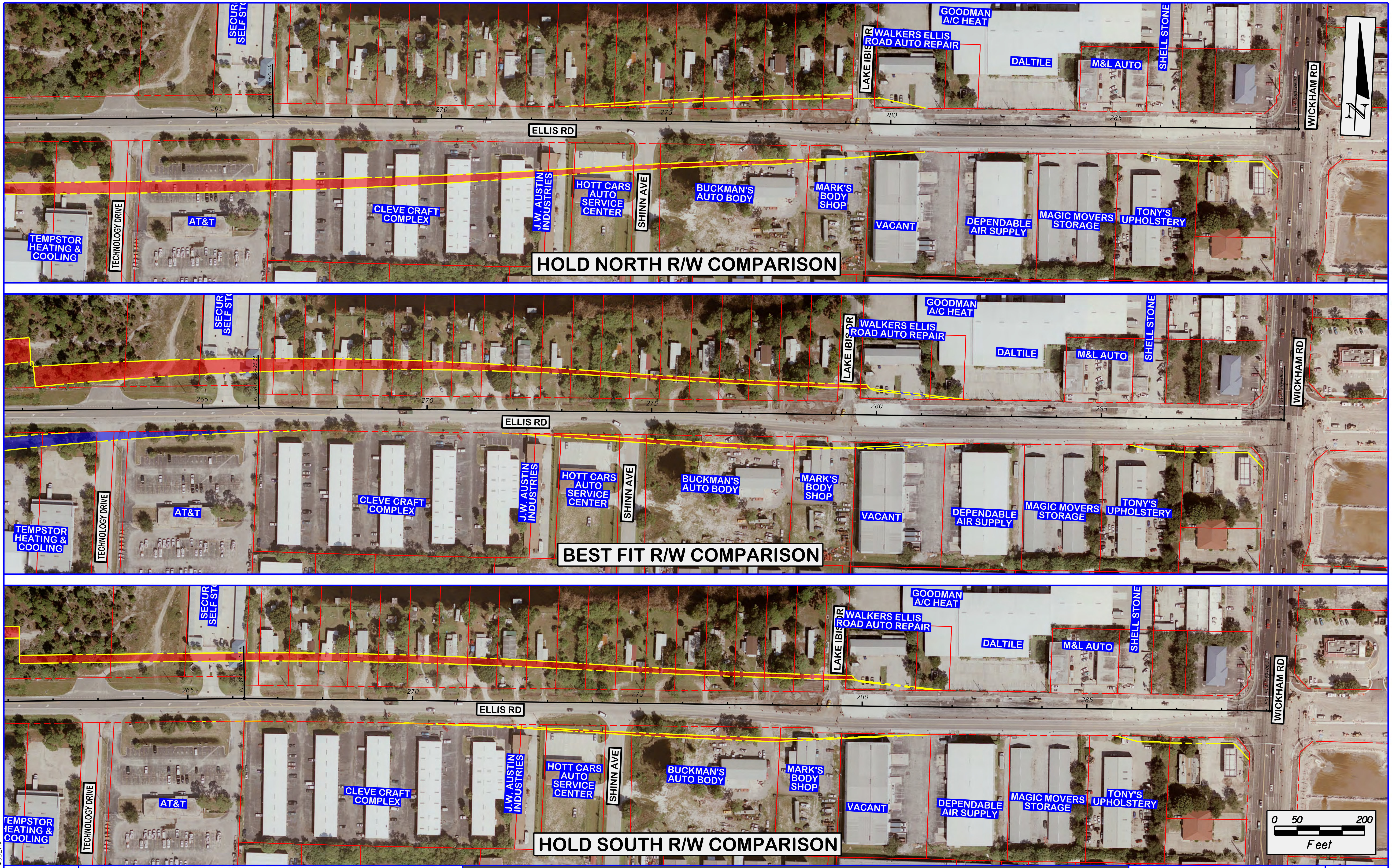
FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W
PROPERTY LINE
ADDITIONAL R/W REQUIRED FOR SIS 50 MPH OVER URBAN 45 MPH
ADDITIONAL R/W REQUIRED FOR URBAN 45 MPH OVER SIS 50 MPH

R/W COMPARISON
STANDARD URBAN 45 MPH
VS.
HIGH SPEED SIS 50 MPH

FIGURE NO.
4.9.1B



EXISTING R/W	ADDITIONAL R/W REQUIRED FOR SIS 50 MPH OVER URBAN 45 MPH
PROPERTY LINE	ADDITIONAL R/W REQUIRED FOR URBAN 45 MPH OVER SIS 50 MPH

FDOT

I-95 AT ELLIS ROAD

PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

R/W COMPARISON
STANDARD URBAN 45 MPH
VS.
HIGH SPEED SIS 50 MPH

FIGURE NO.

4.9.1C

4.9.3 Summary Evaluation Matrix

Table 4.9.2 displays a summary evaluation matrix of the Best Fit Urban 45 mph and Best Fit SIS 50 mph alternatives considered. The SIS 50 mph with frontage roads are dropped from further consideration. The narrower footprint of the Best Fit Urban 45 mph produces a lower construction cost of $9.80 million, while the construction cost of the Best Fit SIS 50 mph alternative is $10.4 million. The right-of-way cost is roughly three times the cost of construction for either alternative. The right-of-way costs for the Best Fit Urban 45 mph and the Best Fit SIS 50 mph are $36.07 million and $43.26 million respectively. Total cost of construction, right-of-way, engineering and construction management are $47.34 million for the Best Fit Urban 45 mph and $55.24 million for the Best Fit SIS 50 mph.

Based on an evaluation of comments from the Alternatives Public Meeting, discussions with District staff, and consideration of the existing operating speed, the Standard Urban 45 mph typical section in conjunction with the Best Fit Urban 45 mph alternative alignment has been chosen as the preferred alternative. The interchange utilizes a tight ramp configuration recommended by the Value Engineering Study (see Section 5.1) in conjunction with alignment Alternative 2, which is the southerly alignment that eliminates impacts to the conservation easement in the northwest quadrant and the need for a retaining wall in the northeast quadrant along Ellis Road in the vicinity of Lamplighter Village.

Chapter 5 presents the preferred alternative in detail.

Table 4.9.2 - Ellis Road Urban 45 mph vs. SIS 50 mph Evaluation Matrix of Potential Impacts		
	Best Fit Alternatives	
Resource	Urban 45 mph	SIS 50 mph
Right-of-way		
Number of Parcels		
Business	28	31
Residential	18	18
Unimproved	16	18
Total	62	67
Number of Relocates		
Business	10	10
Residential	18	18
Total	28	28
Environment		
Wetlands Impacts (ac)	1.05	1.17
Contamination	Low	Low
Historical & Cultural Resources	Low	Low
Utility Involvement	Major	Major
Estimated Costs (in millions)		
[(1)]Right of Way	$ 36.07	$ 43.26
Construction	$ 9.80	$ 10.42
Engineering & Construction Management	$ 1.47	$ 1.56
Grand-Total	***$ 47.34***	***$ 55.24***

(1) Does not include right-of-way costs for ponds

4.10 Canal Accommodations and Effect on Typical Section

As previously mentioned in section 2.2.6, The Ellis Road corridor includes the L-15 Canal, which is located on the north side of Ellis Road primarily between the M-1 Canal and the L-11 Canal, including an extension to the east of the L-11 Canal. The L-15 Canal is an "equalizer canal" connecting the M-1 and L-11 Canals. Together, the M-1 and L-11 Canals drain a surface area of approximately 1,600 acres.

The original examination of the three proposed typical sections, Urban 45 mph, SIS High Speed Urban 50 mph and the SIS High Speed Urban with Frontage, included the standard canal criteria was utilized as described in the Volume I, Section 4.2.1 of the 2012 *Plans Preparation Manual.* As part of the alternatives analysis for the Ellis Road PD&E Study, a preliminary examination regarding the accommodation of the L-15 Canal was undertaken. This effort was determine and demonstrate potential cost savings associated with the canal treatment. Between the M-1 and the L-11 Canals, the canal treatment and accommodations examined are as follows:

- Canal relocated into a trapezoidal channel consisting of 1:2 backslope, 1:3 foreslope, and 6.5-foot ditch bottom; Offset of canal from roadway is according to Plans Preparation Manual (PPM) Chapter 4.2 without guardrail;
- Canal relocated into a trapezoidal channel consisting of 1:2 backslope, 1:3 foreslope, and 6.5-foot ditch bottom; Offset of canal from roadway is according to PPM Chapter 4.2 utilizing guardrail at the top of canal fore-slope;
- Canal relocated into a trapezoidal channel consisting of 1:2 backslope, 1:3 foreslope, and 6.5-foot ditch bottom; Guardrail is placed behind sidewalk in accordance with PPM Chapter 4.3.5; Canal is located at the toe of the roadway foreslope;
- Canal enclosed in 7'x11' box culvert using normal trapezoidal trench construction and buried under fill;
- Canal enclosed in 7'x11' box culvert using trapezoidal trench modified with sheet piling and buried under fill; and,
- Canal within a rectangular channel consisting of 14-foot bottom, 6-foot depth, and vertical sides of permanent sheet piling and an open top and natural bottom;

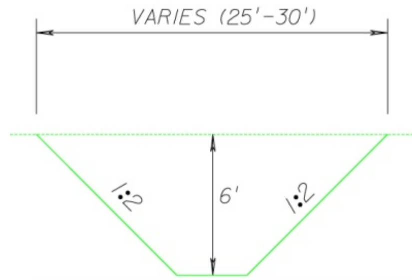
The following is a discussion of the existing drainage conditions followed by a detailed description of the canal features of each typical section and staging considerations.

4.10.1 Crane Creek Canal System

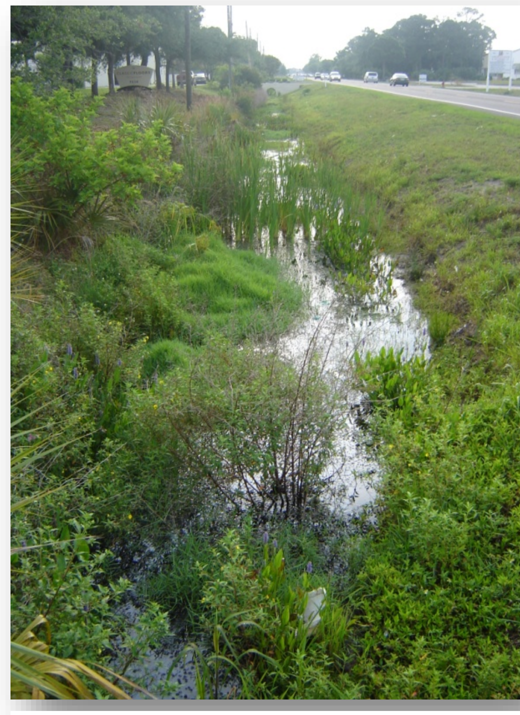
The Crane Creek Canal System is a network of canal and ditch segments that serve as the main storm water conveyance for the City of West Melbourne and surrounding areas. Three associated canal segments intersect the project corridor. These segments are the L-11, L-15, and M-1 Canal. The L-11 and M-1 Canals cross the project corridor while the L-15 Canal runs along the north boundary of the project corridor for approximately two-thirds of its length as displayed in Figure 4.10.1. These canal segments convey flow southward through the project corridor from a drainage area of approximately 1,600 acres.

Figure 4.10.1: Limits of L-15 Canal

4.10.2 Existing L-15 Canal



The L-15 Canal begins as a large ditch in the vicinity of Technology Drive (east) and drains westward along the project corridor until it empties into the M-1 Canal located approximately 500 feet east of I-95. Historic aerial photography shows canals as having been constructed within the project area by middle portion of the 20th century. Drainage and irrigation canals are common features in Florida. Since the mid-1800's, canal systems have been constructed to reclaim swamps and marshes for farming.

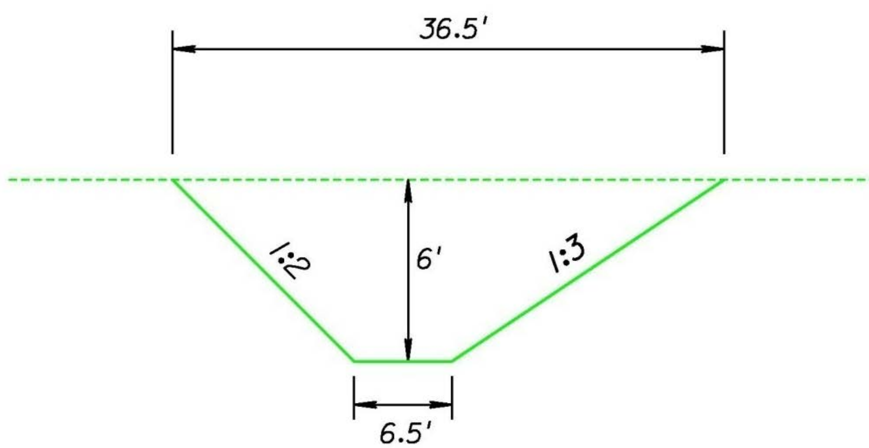


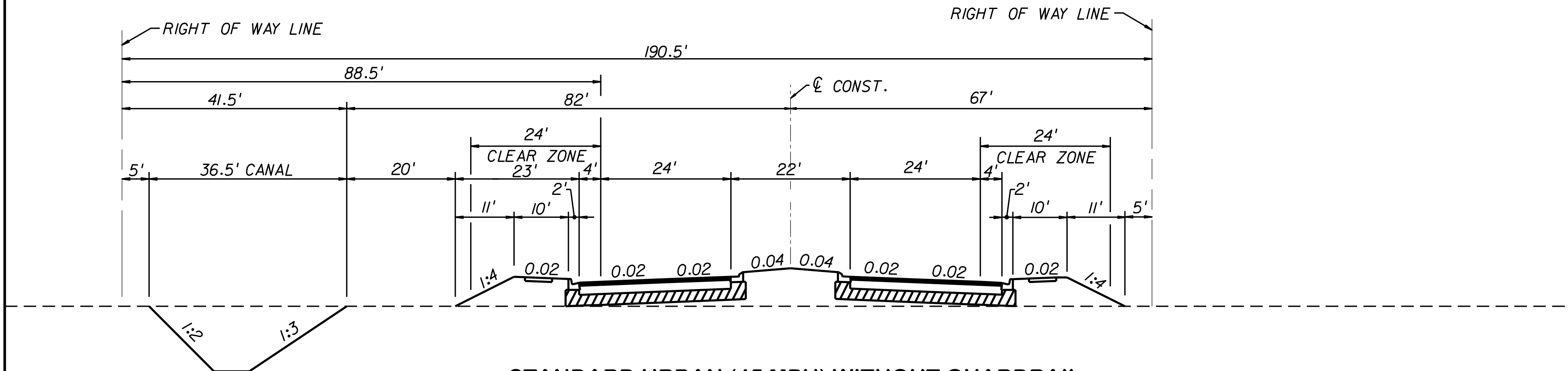
Existing L-15 Canal

The L-15 Canal exhibits a top-of-bank width ranging from 25 feet to 30 feet wide throughout its length. The existing section also varies greatly in side slope. Embankment slopes exist with vertical-to-horizontal ratio ranging from 1:1 to 1:8. The shallower embankment slopes are typically exhibited closer to the canal top of bank, with the slope steepening as the embankment approaches the canal bottom. For the purposes of this Study, a constant 1:2 was assumed as the existing ditch embankment slope. Based on the permitted Crane Creek Master Stormwater Model, the depth of the L-15 Canal is approximately 6 feet. The assumed typical section is based on LiDAR data, field reviews, and unconfirmed storm water modeling data. **The typical section is adequate for planning level purposes only. An in-depth inventory of the geometric properties of the L-15 Canal (including field survey) will provide a better understanding of the existing physical properties of the canal.**

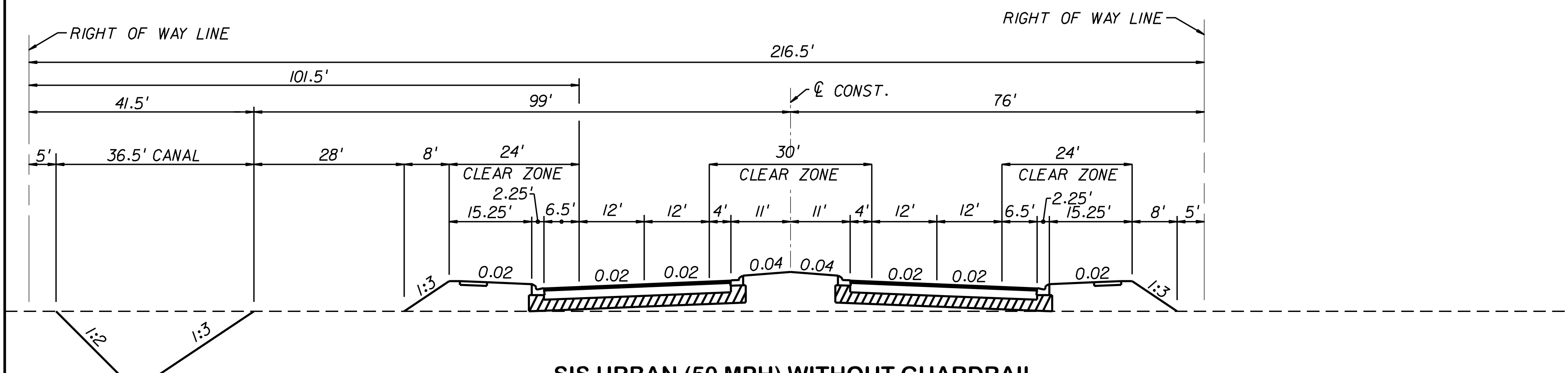
4.10.3 L-15 Contained in a Trapezoidal Channel

The proposed alignments and widened roadway section require that the canal be reconstructed. As a trapezoidal channel, a reconstructed canal requires consideration of side slopes that are stable and minimize the need for geotechnical reinforcement. Recent project experience has shown that reinforcement may be required if slopes are steeper than 1:3. A preliminary analysis determined that the required bottom width of the canal section is 6.5 feet if a 1:2 backslope and 1:3 foreslope are used. This preliminary analysis determined the required bottom width in order to provide the same conveyance factor as the assumed existing typical section. This analysis was performed for planning level purposes only. No storm water modeling, flow calculations, or flooding analysis was performed to determine the proposed width. Any alternative that involves modification to the existing canal section will require verification with a detailed hydraulic analysis involving the Crane Creek Master Stormwater Model. The resulting proposed trapezoidal canal typical section is shown below. Figures 4.10.2, 4.10.3, and 4.10.4 display three methods of accommodating the L-15 Canal as a trapezoidal channel in conjunction with a four-lane roadway typical section.





STANDARD URBAN (45 MPH) WITHOUT GUARDRAIL

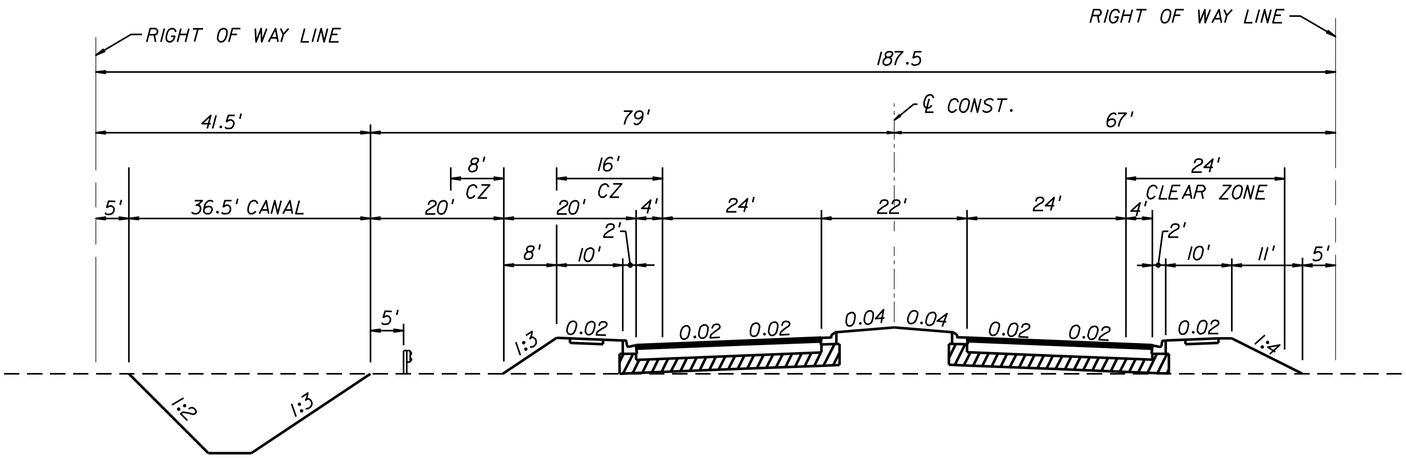


SIS URBAN (50 MPH) WITHOUT GUARDRAIL

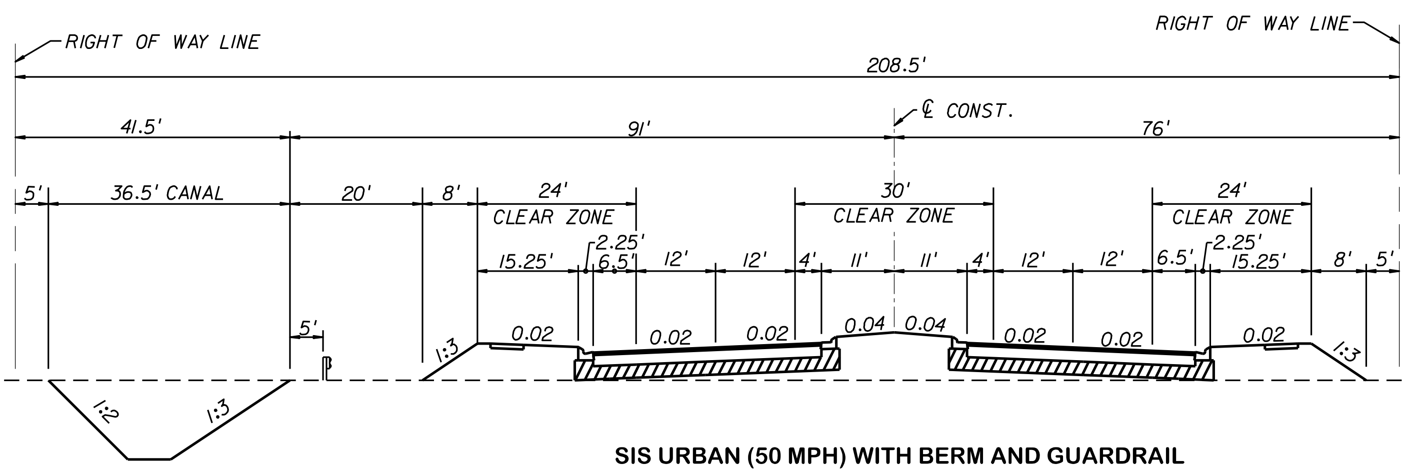
JOHN RODES BLVD TO L-11 CANAL

NOTE: VERTICAL SCALE IS ENLARGED BY A FACTOR OF TWO

FDOT	I-95 AT ELLIS ROAD PD&E STUDY PROJECT DEVELOPMENT SUMMARY REPORT	STANDARD 45 mph URBAN VS. HIGH SPEED SIS 50 mph URBAN *WITHOUT GUARDRAIL*	FIGURE NO. 4.10.2



STANDARD URBAN (45 MPH) WITH BERM AND GUARDRAIL

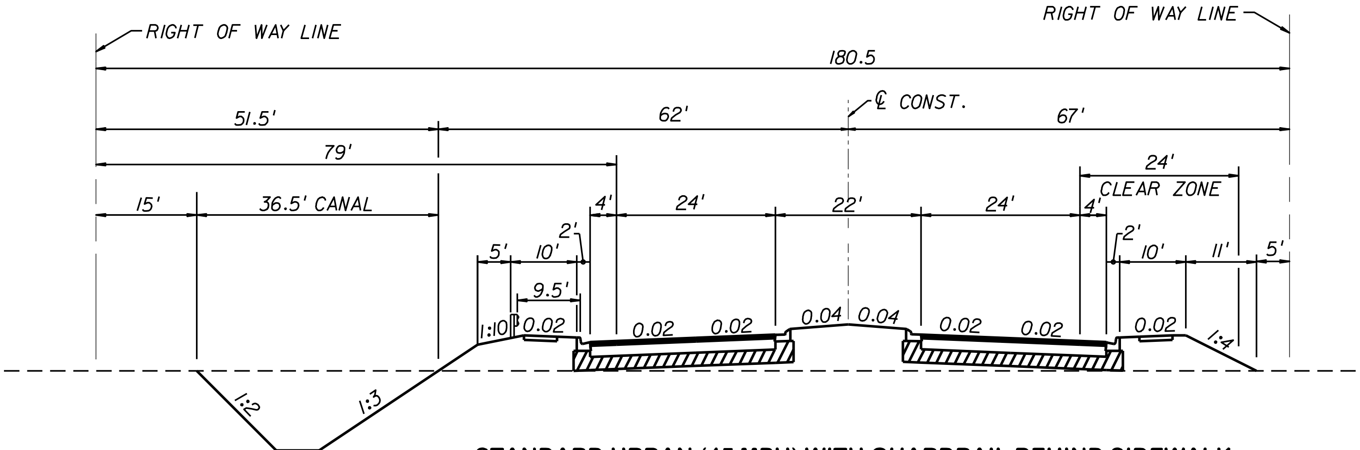


SIS URBAN (50 MPH) WITH BERM AND GUARDRAIL

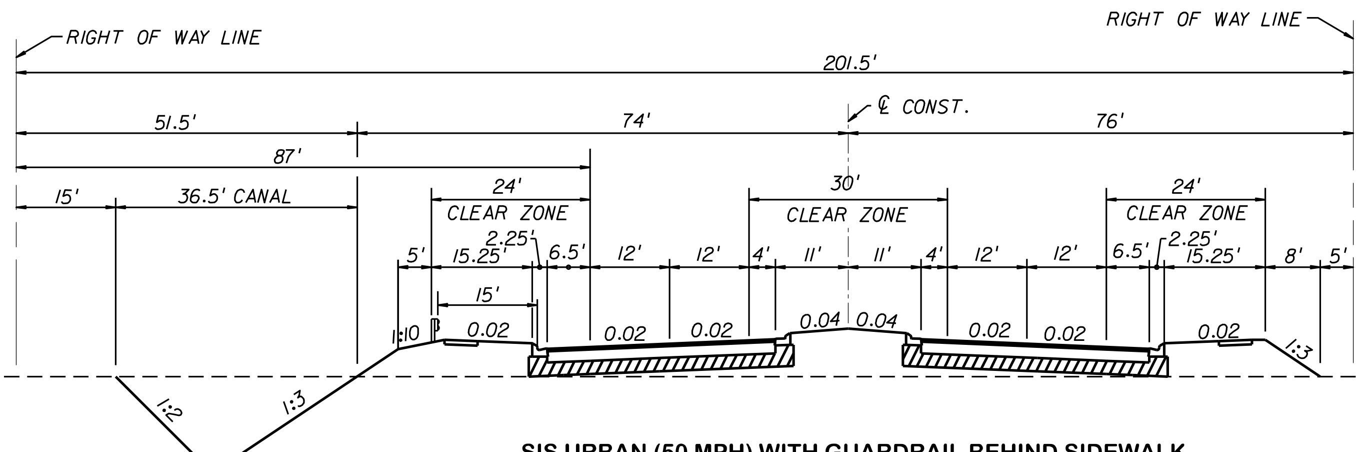
JOHN RODES BLVD TO L-11 CANAL

NOTE: VERTICAL SCALE IS ENLARGED BY A FACTOR OF TWO

FDOT	I-95 AT ELLIS ROAD PD&E STUDY PROJECT DEVELOPMENT SUMMARY REPORT	STANDARD 45 mph URBAN VS. HIGH SPEED SIS 50 mph URBAN *WITH BERM & GUARDRAIL*	FIGURE NO. 4.10.3



STANDARD URBAN (45 MPH) WITH GUARDRAIL BEHIND SIDEWALK



SIS URBAN (50 MPH) WITH GUARDRAIL BEHIND SIDEWALK

JOHN RODES BLVD TO L-11 CANAL

NOTE: VERTICAL SCALE IS ENLARGED BY A FACTOR OF TWO

FDOT	**I-95 AT ELLIS ROAD PD&E STUDY** **PROJECT DEVELOPMENT SUMMARY REPORT**	**STANDARD 45 mph URBAN VS.** **HIGH SPEED SIS 50 mph URBAN** ***GUARDRAIL BEHIND SIDEWALK***	FIGURE NO. **4.10.4**

The typical sections shown in Figures 4.10.2 and 4.10.3 are based on the canal protection criteria described in Section 4.2 of Volume I of the *2012 Plans Preparation Manual*. Figure 4.10.2 displays the canal protection criteria for an urban condition at 45 and 50 mph. At 45 mph, the top of the canal foreslope must be a minimum of 40 feet from the edge of traveled way. At 50 mph, the separation distance between the traveled way and the top of canal fore-slope increases to 60 feet. Both scenarios require the top of canal foreslope to be a minimum of 20 feet from the toe of the roadway foreslope, which is assumed to terminate at the theoretical existing ground line. Based on the assumed seasonal high water level, the fill height at the hinge point behind the sidewalk is assumed to be 2.7 feet and 2.8 feet for the 45 and 50 mph design speeds, respectively. Due to clear zone requirements, the 45 mph typical section requires a 1:4 foreslope, which occupies a distance of 11 feet compared to 8 feet (using a 1:3 slope) with the 50 mph typical section. The total right-of-way widths for 45 and 50 mph are 190.5 feet and 216.5 feet, respectively.

Figure 4.10.3 is similar to Figure 4.10.2, except that the typical sections utilize guardrail near the top of the canal fore-slope. This configuration is shown in Section 4.2 of the *Plans Preparation Manual* as an alternate treatment when the minimum separation distances cannot be achieved. The guardrail section is primarily applicable to the 50 mph section only. The back of guardrail is required to be located 5 feet from the top of canal foreslope, which must be located at least 20 feet from the toe of roadway foreslope, which is assumed to occur at the intersection with the theoretical existing ground line.

As seen in the 45 mph typical section in Figure 4.10.3, the distance between the edge of pavement and the toe of foreslope is 24 feet. When the required 20 feet is added between the top of canal foreslope and toe of roadway foreslope, a total distance of 44 feet is achieved (assuming a 1:3 roadway foreslope). Since this distance exceeds the minimum 40 feet required in Section 4.2, there is effectively no right-of-way reduction by using guardrail with this configuration. In Figure 4.10.2, a slight right-of-way savings could be achieved by using a 1:3 instead of a 1:4 foreslope, but the 1:4 slope is preferred for ease of maintenance and continuity of clear zone.

Since the existing right-of-way width varies between 73 feet to 100 feet, the right-of-way impacts for these typical sections require a number of commercial and residential relocations. In an attempt to reduce the right-of-way footprint, the typical section shown in Figure 4.10.4 was developed. This typical section retains the trapezoidal channel of Figures 4.10.2 and 4.10.3 but places the canal behind the guardrail, which is located immediately behind the proposed sidewalk. The basis for this typical section is the text at the end of Section 4.2.1 of the *Plans Preparation Manual*, which states,

> *"If the minimum standards for canal hazards cannot be met, then the standard guardrail treatments as provided in the Design Standards should be used."*

Based on *Plans Preparation Manual* Section 4.3.5, guardrail used with barrier curb must be located 8.2 feet and 13.1 feet from the curb face for design speeds of 45 and 50 mph, respectively. With the 45 mph design speed, the right-of-way is reduced from an ultimate width of 190.5 feet to 180.5 feet, a savings of 10 feet. Similarly, with the 50 mph design speed, the right-of-way width is reduced from an ultimate width of 216.5 feet to 201.5 feet, a savings of 15 feet.

While the reduction in typical section width for both design speeds is significant, this configuration does not provide a dedicated space for canal maintenance between the curb and gutter and the canal fore-slope. Any maintenance excavation of the canal would have to be performed using the space occupied by the bike lane / shoulder, grass strip, and sidewalk. The guardrail location would complicate canal maintenance and may necessitate a large backhoe with a long-reaching arm for channel excavation. Maintenance equipment may also damage the sidewalk and utilities placed between the sidewalk and curb. Figure 4.10.4 alleviates this issue by dedicating a 15-foot space between the canal backslope and right-of-way line.

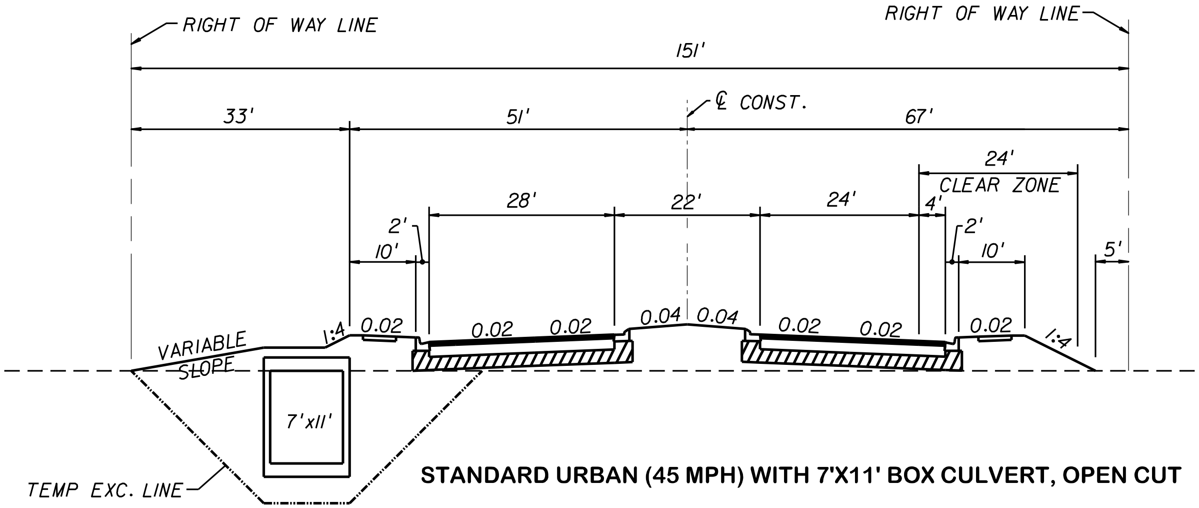
4.10.4 L-15 Contained in a Box Culvert or Rectangular Channel

Based on comments received at meetings with Melbourne International Airport and the SCTPO, a series of alternate canal treatments have been examined in an attempt to further reduce the right-of-way footprint. The alternate canal treatments are based on fully or partially enclosing the canal. Figures 4.10.5, 4.10.6, and 4.10.7 display the following typical sections on the subsequent pages:

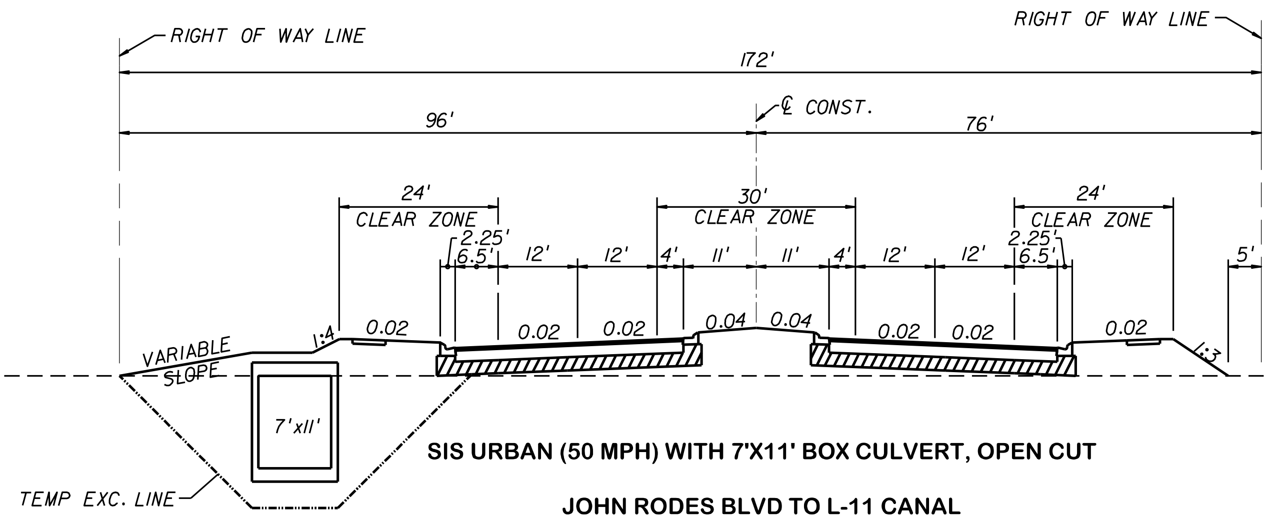
- **Figure 4.10.5** – Canal contained in 7' x 11' box culvert with open cut installation;
- **Figure 4.10.6** – Canal contained in 7' x 11' box culvert with temporary sheet piling on outside; and,
- **Figure 4.10.7** – Canal within a 7' x 14' rectangular channel with vertical sheet piling bulkhead on both sides

The channel dimensions listed above are required to match the conveyance factor (K) of the assumed existing canal typical section with a 6-foot deep channel. The bulk-headed rectangular channel requires a slightly wider bottom due to a higher roughness coefficient associated with increased vegetation on the channel bottom in comparison with what would be expected in an enclosed concrete box culvert. As mentioned in Section 4.10.3, a detailed hydraulic analysis is required in order to verify these dimensions. The primary advantage of enclosing the canal inside of a box culvert is that the structure could be located just outside of the proposed sidewalk and covered with fill. For the purpose of these typical sections, the outside edge of the box culvert is assumed to be coincident with the hinge point located behind the proposed sidewalk.

To install the box culvert, excavation limits are based on a 1:3 temporary slope and a 2-foot depth below the outer bottom of the box culvert. Taking into account the temporary excavation limits, the right-of-way width of a typical section with the canal in a box culvert is 151 feet and 172 feet for 45 and 50 mph, respectively, as shown in Figure 4.10.5. If temporary sheet piling is utilized on the outside of the box culvert in lieu of a 1:3 slope, the right-of-way is reduced to 141 feet and 162 feet for 45 and 50 mph, respectively, as shown in Figure 4.10.6.



STANDARD URBAN (45 MPH) WITH 7'X11' BOX CULVERT, OPEN CUT



SIS URBAN (50 MPH) WITH 7'X11' BOX CULVERT, OPEN CUT

JOHN RODES BLVD TO L-11 CANAL

NOTE: VERTICAL SCALE IS ENLARGED BY A FACTOR OF TWO

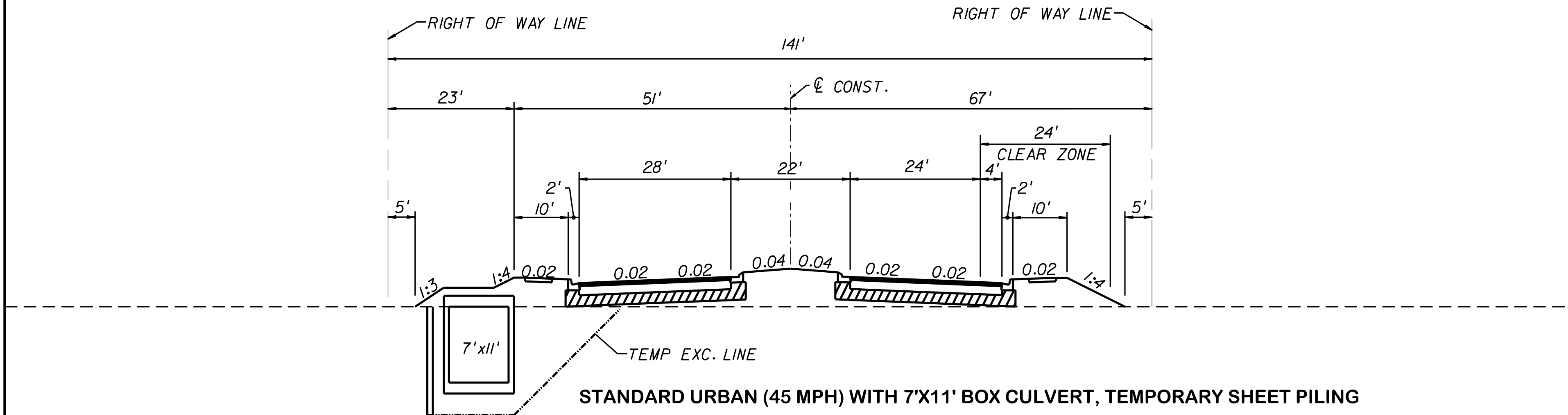
FDOT

I-95 AT ELLIS ROAD PD&E STUDY
PROJECT DEVELOPMENT SUMMARY REPORT

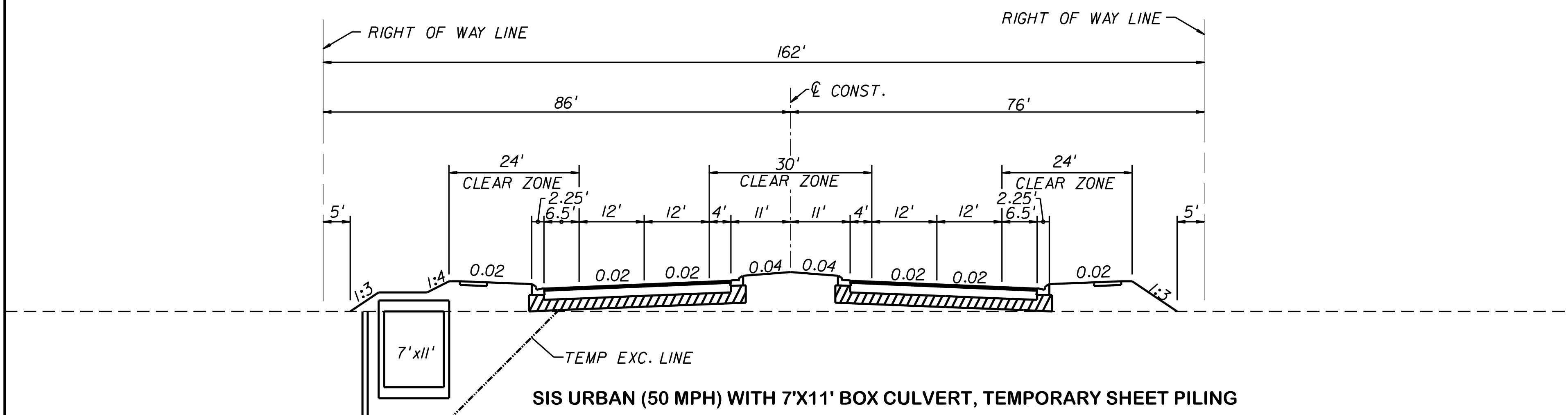
STANDARD 45 mph URBAN VS.
HIGH SPEED SIS 50 mph URBAN

BOX CULVERT, OPEN CUT

FIGURE NO.
4.10.5



STANDARD URBAN (45 MPH) WITH 7'X11' BOX CULVERT, TEMPORARY SHEET PILING

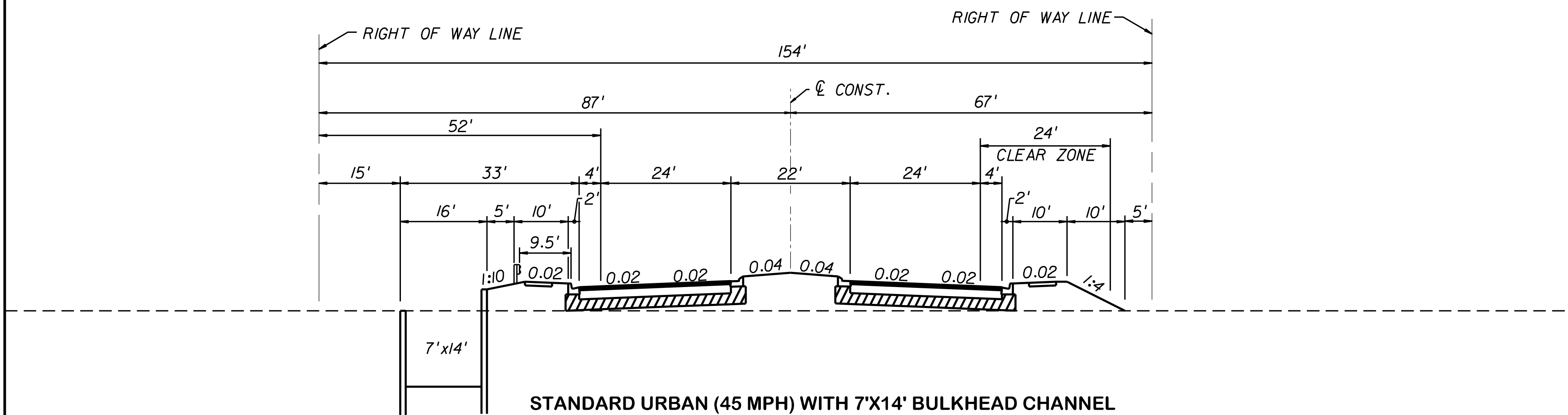


SIS URBAN (50 MPH) WITH 7'X11' BOX CULVERT, TEMPORARY SHEET PILING

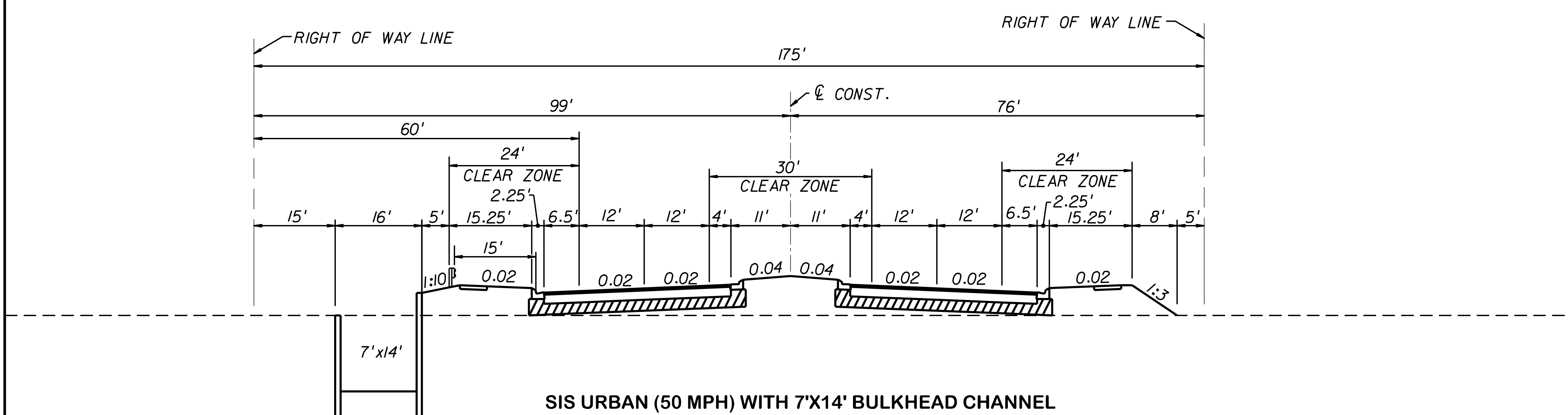
JOHN RODES BLVD TO L-11 CANAL

NOTE: VERTICAL SCALE IS ENLARGED BY A FACTOR OF TWO

FDOT	I-95 AT ELLIS ROAD PD&E STUDY PROJECT DEVELOPMENT SUMMARY REPORT	STANDARD 45 mph URBAN VS. HIGH SPEED SIS 50 mph URBAN *BOX CULVERT, SHEET PILING*	FIGURE NO. 4.10.6



STANDARD URBAN (45 MPH) WITH 7'X14' BULKHEAD CHANNEL



SIS URBAN (50 MPH) WITH 7'X14' BULKHEAD CHANNEL

JOHN RODES BLVD TO L-11 CANAL

NOTE: VERTICAL SCALE IS ENLARGED BY A FACTOR OF TWO

FDOT

I-95 AT ELLIS ROAD PD&E STUDY

PROJECT DEVELOPMENT SUMMARY REPORT

STANDARD 45 mph URBAN VS.
HIGH SPEED SIS 50 mph URBAN

BULKHEADED CHANNEL

FIGURE NO.

4.10.7

4.10.5 Staging of Canal Construction

As part of the box culvert analysis, consideration must be given to accommodating the water in the existing canal during installation of the box culvert or open channel. A temporary canal may have the effect of increasing the overall parcel impacts, even though any interim canal relocation may be constructed via a temporary easement. To analyze the effect of a temporarily relocated canal, the best-fit alternatives for 45 and 50 mph were analyzed with respect to the overall staging plan of the entire improvement.

The 45 and 50 mph alternatives have similar best-fit alignments. Between John Rodes Boulevard and Stan Drive, the southern right-of-way line is held, placing all impacts on the north side of the roadway. Between Stan Drive and West Drive, the best-fit alignments transition to a location that places most of the impacts on the south side of the roadway. East of the L-11 Canal, the best-fit alignment holds the north existing right-of-way line for approximately 1,000 feet before shifting away from the south side of the roadway near Distribution Drive and again placing most of the right-of-way impacts on the north side. With the transition of the alignment from the north side of Ellis Road to the south and back, the construction staging plan requires that portions of the westbound and eastbound lanes be constructed simultaneously.

To construct segment of Ellis Road from John Rodes Boulevard to the L-11 Canal in phases, the following approach was considered:

- Construct the proposed westbound lanes and canal between John Rodes Boulevard and Stan Drive while retaining traffic on the existing roadway. Likewise, construct the future westbound lanes between Technology Drive (east) and Lake Ibis Drive while retaining traffic on the existing roadway;
- Temporarily widen the north side of the existing roadway (Stan Drive to Technology Drive (east)). Construct the proposed eastbound lanes south of the existing roadway while placing traffic on the existing Ellis Road / temporary widening;
- Shift traffic onto the newly-constructed westbound lanes (John Rodes Boulevard to Stan Drive and Technology Drive (east) to Lake Ibis Drive) and the eastbound lanes between Stan Drive and Technology Drive (east). Utilize temporary crossovers to convey traffic from the ultimate westbound to eastbound lanes and back;

- Between Stan Drive and Technology Drive (east), remove existing Ellis Road and construct a temporary channel with sheet piling where the existing pavement is currently located. Tie the temporary channel into the existing channel at Stan Drive. Under this configuration, a temporary channel could be located to the south of the future channel and not require additional right-of-way during construction; and,
- Construct the proposed box culvert between Stan Drive and the L-11 canal while tying in to the newly-constructed box culvert between John Rodes Boulevard and Stan Drive.

With this type of conceptual staging plan, any additional frontage for temporary accommodations of the canal would be reduced or eliminated. However, the geometry of this staging plan has not been developed and would require additional study, particularly the constructability of the crossovers, accommodation of side roads and driveway entrances, and the anticipated elevation differences between the existing and proposed ground.

4.10.6 Hydraulic Issues Due to Enclosing Canal L-15 in a Box Culvert

Enclosing the L-15 Canal presents a number of hydraulic issues as described below.

- Existing culverts along Ellis Road convey the L-15 flow between the M-1 and L-11 Canals. These culverts are 48 - 60 inches in diameter and act as side drains beneath driveways. Pipes of this size can carry adequate flow under intense storm events due to high pressure head from the elevated stage of the upstream canal segment. If, for example, there was a single continuous 60-inch pipe to carry the canal flow, the increased pressure head would result in staging impacts to the upstream canal network and cause offsite flooding. For this reason the culvert would have to be sufficiently large to carry the canal flow without pressure flow conditions. Preliminary calculations indicated that the required culvert size for non-pressure flow conditions would be a 7-foot high x 11-foot wide box culvert;

- The open channel configuration of the outfall currently allows for flood relief. Excess staging from extreme storm events can currently spill over the top of bank and occupy adjacent low-lying areas until flooding subsides. The Crane Creek master storm water model demonstrates this occurrence. Review of model output shows that the L-15 Canal overtops its banks throughout its length for the 100 year, 24 hour SCS storm event. A box culvert configuration would not allow for this relief and the extreme storm events would increase upstream flooding impacts. To mitigate flood relief, the "box culvert" canal could be directly connected to a surge pond sized to accept the surcharge flow, but this additional pond would increase right-of-way requirements. Similarly, enclosing the portion of the canal that is located within the flood plain would result in additional flood plain compensation for the project. This compensation will have to be provided in the form of a flood plain compensation pond, which also increases right-of-way requirements. Additionally, the extent of flood mitigation design required to compensate for enclosing the canal as described above could not be estimated without an extensive analysis of the canal system;

- Enclosing the L-15 Canal significantly changes the hydraulic nature of the Crane Creek Canal system. This network is interconnected and acts as an equalized system. Flow discharge to any segment of the canal results in impacts to the flow and staging of the entire system. This system has had a history of flooding issues, particularly in the region just north of the project corridor, where Lamplighter Village is located. A storm water master plan has been recently developed and permitted by Brevard County with an associated list of capital improvements and a master storm water model of the canal system. A detailed analysis and modification to the storm water permit for the system will have to be performed in order to enclose the canal within the project corridor. There is a high degree of risk and potential liability involved with changing the hydraulic nature as described for a system with a 1,600-acre upstream basin;

- The L-15 Canal exhibits a length of approximately 1.4 miles. The structural aspects of constructing such a long segment of a large concrete box culvert need to be taken into consideration. If the soils do not provide an adequate bearing capacity for a heavy structure such as a box culvert, pile supports may be required in order to provide an adequate foundation; and,

- There are maintenance considerations related to enclosing the canal with a box culvert. The existing longitudinal slope of the canal is observed to be nearly level and is likely too shallow to allow for a self-cleaning velocity during low intensity storm events. Due to this lack of grade, sedimentation will occur and periodic de-silting of the canal will be required throughout its length. An open channel configuration will also likely require periodic de-silting, but the sedimentation could be accessed from the canal top of bank and make the sediment removal considerably less labor-intensive. Monitoring the sedimentation occurring in the canal by roadside inspection is relatively easy, whereas the box culvert must be accessed by manholes placed throughout its length in order to assess the degree of sedimentation.

4.10.7 Benefits of Permanent Sheet Piling

The typical sections shown in Figure 4.10.7 were developed to alleviate the flood relief concerns due to completely enclosing the canal in a box culvert. The Figure 4.10.7 alternatives convert the concept of an enclosed box culvert to a bulk-headed channel with a 7-foot depth and 14-foot bottom dimension. The bulk-headed system has a natural bottom and open air top. There are a number of advantages to this alternative:

- The vertical walls of the bulk-heads will decrease the canal footprint compared with its existing section, which exhibit 1:1 maximum embankment slopes;
- The vertical walls of the bulk-head will save right-of-way by eliminating the need for a temporary excavation back-slope;
- A rectangular channel section will preserve the characteristics of the open channel configuration and will preserve the flood relief properties of the existing canal;
- The required floodplain compensation for the project will not increase;
- The overall hydraulic nature of the L-15 Canal is preserved, and the concern for resultant upstream flooding is eliminated, as the vertical-walled section can be designed to provide the same flow conveyance capabilities as the existing canal section;

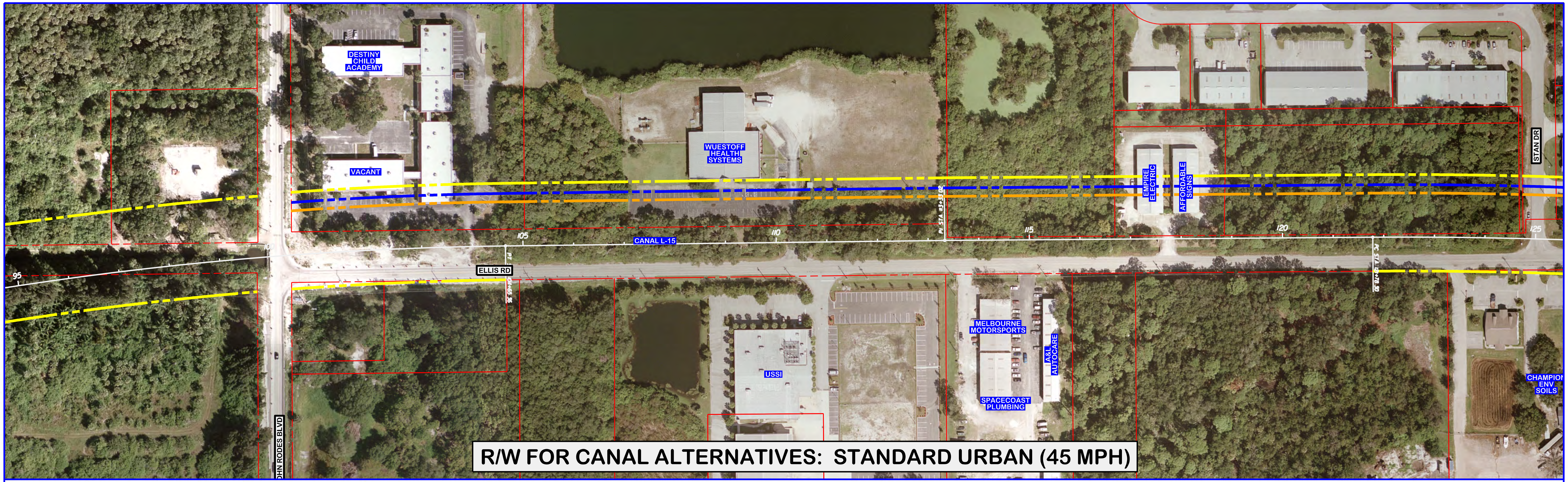
- The need for a temporary canal is eliminated, as the permanent sheet piling can be installed even where the existing and proposed canals are coincident. Once the piling is installed, channel excavation can occur while simultaneously accommodating the existing water flow. However, this type of work should be completed during the dry season such as late winter or spring; and,
- A dedicated 15-foot envelope for canal maintenance is shown between the canal back-slope and right-of-way line.

4.10.8 L-15 Canal Alternative Comparison

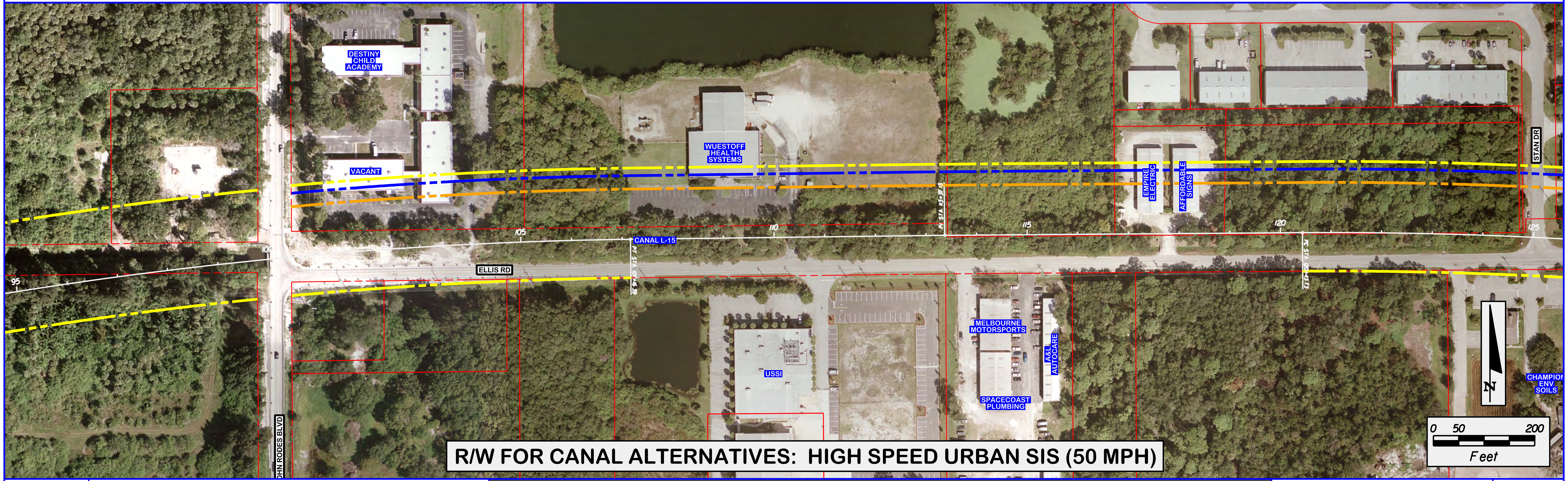
The twelve canal options evaluated in this PD&E Study have varying construction costs and right-of-way impacts associated with each canal treatment. Table 4.10.1 summarizes the relative costs for each alternative along with a comparison of the right-of-way impacts, which are portrayed in terms of right-of-way width, acreage of required right-of-way acquisition, and number of business impacts based on qualitative categories of "full take," "major impact," "moderate impact," "minor impact," and "no impact."

While the width of the typical section is beneficial to visualize the difference between the typical sections, it does not reflect the total associated right-of-way impact, which is also influenced by such factors as land use, functionality of the impacted area, and the amount of residual usable property. All of these influences will ultimately, be reflective in the right-of-way cost. Quantifying the right-of-way impacts into dollars is best performed by the District Right-of-way personnel. Therefore, an examination of the right-of-way cost produced by the District for the previously discussed roadway typical sections and alternatives will provide insight into the Ellis Road corridor as it relates to potential right-of-way costs.

Figures 4.10.8A and C demonstrate the right-of-way impacts associated with three of the twelve canal options; the no guardrail (full canal criteria found in the PPM), the guardrail behind the sidewalk and the bulk-head option. It should be noted that the bulk-head option and the box culvert with open cut have only a 3-foot difference in right-of-way width.



R/W FOR CANAL ALTERNATIVES: STANDARD URBAN (45 MPH)



R/W FOR CANAL ALTERNATIVES: HIGH SPEED URBAN SIS (50 MPH)

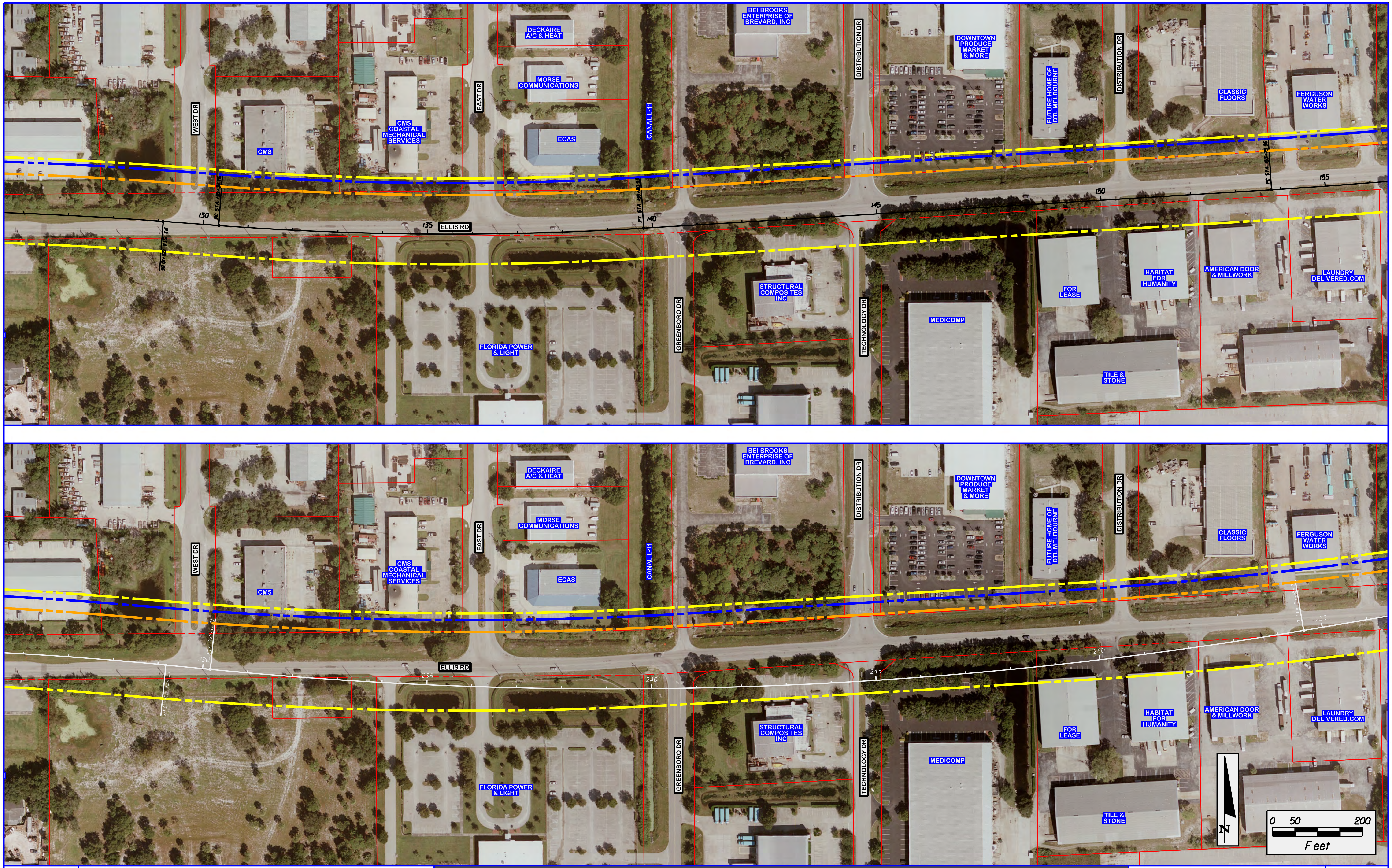
FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W
PROPERTY LINE
R/W WITHOUT GUARDRAIL
R/W WITH GUARDRAIL BEHIND SIDEWALK
R/W WITH BULKHEAD CHANNEL

R/W COMPARISON OF CANAL ALTERNATIVES 45 MPH VS. 50 MPH

FIGURE NO. 4.10.8A



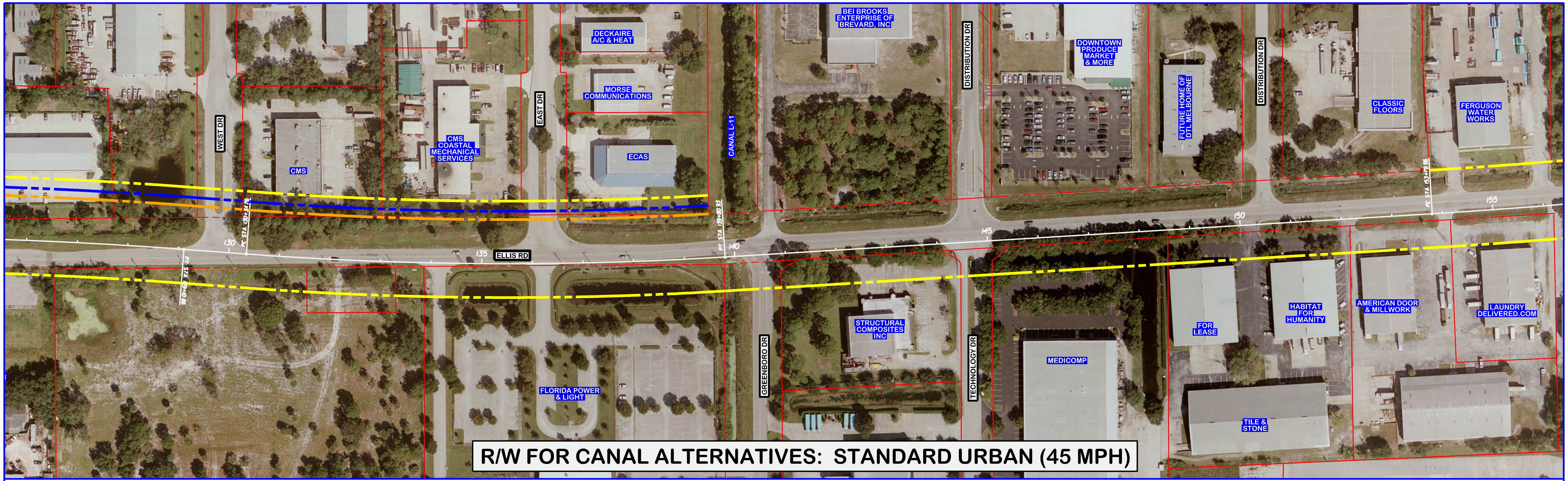
FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

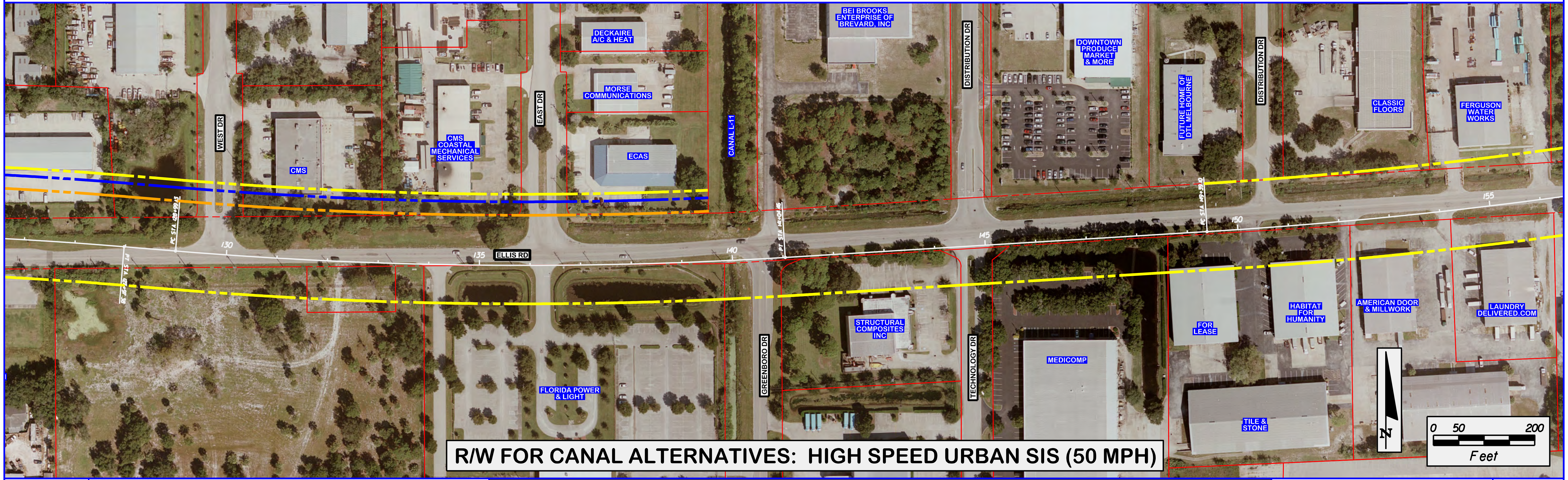
- EXISTING R/W
- PROPERTY LINE
- R/W WITHOUT GUARDRAIL
- R/W WITH GUARDRAIL BEHIND SIDEWALK
- R/W WITH BULKHEAD CHANNEL

R/W COMPARISON OF CANAL ALTERNATIVES 45 MPH VS. 50 MPH

FIGURE NO. 4.10.8B



R/W FOR CANAL ALTERNATIVES: STANDARD URBAN (45 MPH)



R/W FOR CANAL ALTERNATIVES: HIGH SPEED URBAN SIS (50 MPH)

FDOT	I-95 AT ELLIS ROAD PROJECT DEVELOPMENT AND ENVIRONMENT STUDY	EXISTING R/W PROPERTY LINE	R/W WITHOUT GUARDRAIL R/W WITH GUARDRAIL BEHIND SIDEWALK R/W WITH BULKHEAD CHANNEL	R/W COMPARISON OF CANAL ALTERNATIVES 45 MPH VS. 50 MPH	FIGURE NO. 4.10.8C

With regard to the canal accommodation along Ellis Road, a consequence of narrowing the typical section width to reduce right-of-way and business impacts is increased construction cost. The box culvert section has a significantly higher construction cost compared to the bulk-head or open channel section ($15.1 million vs. $8.2 million and $91,400, respectively). So the question becomes, is this additional construction cost outweighed by the potential savings in right-of-way costs. From Table 4.10.1, it can be determined that the Urban (45 mph) no guardrail and the SIS (50 mph) no guardrail, which followed similar alignments had an approximate difference in right-of-way width of 26 feet and a difference in right-of-way cost of $8.0 million with the SIS (50 mph) being the higher in both areas. Another examination of Table 4.10.1, it can also be determined that the difference in right-of-way width between the SIS (50 mph) no guardrail and the SIS (50 mph) bulkhead and Urban (45 mph) bulkhead is 41.5 feet and 62.5 feet respectively. One would conclude that since these differences in width are greater than that of the Urban (45 mph) versus the SIS (50 mph) no guardrail, then the savings in right-of-way cost would also be greater than the $8.0 million in savings found between the Urban (45 mph) and SIS (50 mph) no guardrail. If that conclusion were to be true, the right-of-way cost savings would outweigh the increased cost of construction. In order to confirm this conclusion to be further analysis of the bulkhead alignment would need to be performed. It is recommended that, when funds become available, additional investigation into the viability and cost saving of the bulkhead system be performed.

Table 4.10.1 - Canal Treatment Comparison Matrix						
	Preliminary Alternatives					
Resource	**No Guardrail**	**Berm & Guardrail**	**Guardrail Behind Sidewalk**	**Box Culvert, Open Cut**	**Box Culvert, Sheet Piling**	**Rectangular Channel (Bulkhead)**
Urban Alternatives (45 mph)						
Right-of-way						
Width (ft)	190.5	187.5	180.5	151	141	154.0
Acquisition Required (Acres)	8.83	8.56	7.93	5.29	4.40	5.56
Acquisition Cost*	$36,070,000.00	TBD	TBD	TBD	TBD	TBD
Number of Business Impacts						
Full Take	4	4	4	3	3	3
Major	2	2	0	1	0	1
Moderate	0	0	1	0	1	0
Minor	1	1	2	2	2	2
None	0	0	0	1	1	1
SIS Alternatives (50 mph)						
Right-of-way						
Width (ft)	216.5	208.5	201.5	172	162	175
Acquisition Required (Acres)	11.17	10.45	9.82	7.18	6.28	7.45
Acquisition Cost*	$44,070,000.00	TBD	TBD	TBD	TBD	TBD
Number of Business Impacts						
Full Take	4	4	4	4	3	4
Major	2	2	2	0	1	0
Moderate	0	0	0	0	0	0
Minor	1	1	1	3	2	3
None	0	0	0	0	1	0
Canal Construction Cost						
Excavation	$ 91,429	$ 91,429	$ 91,429	$ 304,763	$ 212,625	$ 59,535
Guardrail		$ 92,826	$ 92,826			$ 92,826
Bulkhead					$ 2,369,250	$ 6,631,349
Cap						$ 1,432,485
Box Culvert**				$ 12,509,640	$ 12,509,640	
Grand-Total	**$ 91,429**	**$ 184,255**	**$ 184,255**	**$ 12,814,403**	**$ 15,091,515**	**$ 8,216,195**

* Acquisition cost to be determined by district 5 right-of-way personnel

** Includes 10% contigency for bedding, muck removal, and other support for box culvert

4.11 Access Management

Existing Ellis Road from John Rodes Boulevard to Wickham Road is classified as an urban minor arterial and has a posted speed limit of 35 mph. The proposed design is a four-lane roadway that will become a SIS facility and increase the posted speed limit to at least 45 mph.

As explained in Chapter 3, two access scenarios, Class 3 and Class 5, were examined as part of this PD&E Study. Either access management class can be applied to the 45 mph or 50 mph alignment alternatives examined in the previous sections of this chapter. However, Class 5 is more conducive to the 45 mph design speed, while the Class 3 classification is more conducive to the higher 50 mph design speed and meets the requirements for SIS roadways.

Table 4.11.1 contains a summary of access management criteria according to the FDOT *Plans Preparation Manual* (PPM), Volume I, Table 1.8.2. The connection spacing in Table 4.11.1 is based on the posted speed limit rather than the design speed, according to Florida Statute 14-97.

Table 4.11.1: Access Management Standards for Arterial Roadways

Access Class	Speed Limit (mph)	Median Type	Connection Spacing	Median Spacing		Signal Spacing
				Directional	Full	
3	≤45	Restrictive	440	1,320	2,640	2,640
3	>45	Restrictive	660	1,320	2,640	2,640
5	≤45	Restrictive	245	660	1,320	1,320
5	>45	Restrictive	440	660	2,640	2,640

Note: All dimensions shown in feet.

4.11.1 Class 3 Access Management

4.11.1.1 Median Openings

Full median openings are evaluated at the two interchange ramp locations along with the major north south roads (John Rodes Boulevard and Wickham Road). In between John Rodes Boulevard and Wickham Road, spacing is adequate for full median openings at both East Drive and Technology Drive. Table 4.11.2 displays a summary of the Class 3 median locations and related distances to adjacent median openings for this scenario.

Greenboro Drive provides a major access to a residential community of roughly 150 houses and two apartment complexes. Between John Rodes Boulevard and Wickham Road, East Drive and Greenboro Drive have the highest number of projected left turn movements along the project corridor for vehicles emanating from the sideroad. For these reasons a full median opening at Greenboro Drive is also evaluated and is depicted in Table 4.11.3, which summarizes the Class 3 median locations and related distances to adjacent median openings.

An important point to note is that both the full and directional median opening spacing for Class 3 access management is independent of the posted speed.

Traffic volumes from the 2011 DTTM, which was reviewed and approved by the District in March of 2011, was used to determine the significance of the various sideroads.

Refer to Appendix G containing the Access Management Study Report for figures showing the various median opening spacing for the access management configurations considered.

Table 4.11.2: Class 3 Median Openings (Full Median Opening at East Drive)

Feature	Station	Access	Spacing (ft)	% over/under Requirement	Feature Measured To	Note
John Rodes Blvd.	100+25	Full		33%	Empire	
			1,063			
American Print	110+88	WB Split Directional		8%	Stan Dr.	1
			691			
Empire	117+79	EB Split Directional		33%	John Rodes Blvd.	1
			729			
Stan Dr.	125+08	Directional		-16%	East Dr.	2
			1,115			
East Dr.	136+23	Full		-16%	Stan Dr.	3
			426			
Greenboro Dr.	140+49	None		N/A		4
			426			
Distribution Dr. West	144+75	None		N/A		4
			577			
Distribution Dr. East	150+52	Directional		-5%	Technology Dr.	5
			1,252			
Technology Dr. East	163+04	Full		-5%	Distribution Dr. East	5
			1,165			
Shinn Ave.	174+69	WB Split Directional		10%	Wickham Rd.	6
			483			
Lake Ibis Dr.	179+52	EB Split Directional		25%	Technology Dr. East	6
			973			
Wickham Rd.	189+25	Full		-1%	Technology Dr.	

For an arterial roadway, Class 3 is the most restrictive type of access management. The results of Class 3 along Ellis Road are listed in the following notes to Table 4.11.2:

1. A split directional median opening at these two locations allows left turn movements into two business entrances (American Print, and Empire Electric) while meeting

Class 3 directional median opening spacing. This configuration also minimizes U-turn movements from John Rodes Boulevard and Stan Drive. For a standard directional median opening to meet Class 3 spacing, the opening would have to be placed between the two business entrances and would provide only U-turn movements. Also with a standard directional median opening, vehicles wishing to turn left to enter the two businesses would perform U-turn movements at John Rodes Boulevard and Stan Drive.

2. Placing a directional median opening at Stan Drive would require a design variation to the Class 3 standards. Stan Drive is 1,117 feet from the full median opening at East Drive, making the distance 15% under the required 1,320 feet. This design variation is being recommended because Stan Drive is the main access to 26 buildings of which several have multiple businesses.
3. The sum of the projected left turn movements for both the AM and PM peak hours for East Drive were 887, justifying the full median opening.
4. No left turn movements can be made at Greenboro Drive and Distribution Drive (west) due to the full median opening at Technology Drive.
5. The distance between a directional median opening at Distribution Drive (east) and a full median opening at Technology Drive (1,252 feet) is within 10% of the required distance (1,320 feet). Therefore, no design variation is required.
6. A split directional median opening allows left hand turn movements onto Shinn Avenue and Lake Ibis Drive while meeting Class 3 criteria.

Table 4.11.3: Class 3 Median Openings (Full Median Opening at Greenboro Drive)

Feature	Station	Access	Spacing (ft)	% over/under Requirement	Feature Measured To	Note
John Rodes Blvd.	100+25	Full		33%	Empire	
			1,063			
American Print	110+88	WB Split Directional		8%	Stan Dr	1
			691			
Empire	117+79	EB Split Directional		33%	John Rodes Blvd	1
			729			
Stan Dr.	125+08	Directional		8%	American Print	2
			1,115			
East Dr.	136+23	None		N/A		3
			426			
Greenboro Dr.	140+49	Full		17%	Stan Dr	4
			426			
Distribution Dr. West	144+75	None		N/A		5
			577			
Distribution Dr. East	150+52	None		N/A		5
			1,252			
Technology Dr.	163+04	Directional		25%	Lake Ibis Dr	6
			1,165			
Shinn Ave.	174+69	WB Split Directional		10%	Wickham Rd	7
			483			
Lake Ibis Dr.	179+52	EB Split Directional		25%	Technology Dr. East	7
			973			
Wickham Rd.	189+25	Full		99%	Technology Dr. East	

The results of Class 3 Access Management in median openings with a full median opening at Greenboro Drive are listed in the following notes to Table 4.11.3:

1. A split directional median opening at these two locations allows left turn movements into two business entrances (American Print, and Empire Electric) while meeting

Class 3 directional median opening spacing. This configuration also minimizes U-turn movements from John Rodes Boulevard and Stan Drive. For a standard directional median opening to meet Class 3 spacing, the opening would have to be placed between the two business entrances and would provide only U-turn movements. Also with a standard directional median opening, vehicles wishing to turn left to enter the two businesses would perform U-turn movements at John Rodes Boulevard and Stan Drive.

2. A directional median opening at Stan Road meets Class 3 criteria.
3. East Road has no left turn access due to its close proximity to the full median opening at Greenboro Drive.
4. Greenboro Drive is one of two major access roads to a residential neighborhood and two apartment complexes. Therefore, Greenboro Drive has a full median opening.
5. Distribution Drive (west and east) has no left turn access due to its close proximity to the full median opening at Greenboro Drive.
6. Technology Drive (East) has a directional median opening.
7. A split directional median opening allows left hand turn movements onto Shinn Avenue and Lake Ibis Drive while meeting Class 3 criteria.

4.11.2 Class 5 Access Management

4.11.2.1 Median Openings

The full median opening, signal, and connection spacing for Class 5 access management are dependent on the posted speed limit, while the directional opening is not.

The minimum distance between a full and a directional median openings or between two directional openings is 660 feet. For posted speeds greater than 45 mph, the minimum distance between full median openings is 2,640 feet (see Table 4.11.1). For posted speeds of 45 mph or less the minimum distance between full median openings is 1,320 feet.

Full median openings are evaluated at the two interchange ramp locations along with the major north south roads (John Rodes Boulevard and Wickham Road) and at both East Drive and Technology Drive East. For a posted speed greater than 45 mph, Table 4.11.4 displays a summary of the Class 5 median locations and related distances to adjacent median openings for this scenario. Table 4.11.6 provides similar information for a posted speed less than or equal to 45 mph.

As discussed previously, Greenboro Drive provides a major access to a residential community of roughly 150 houses and two apartment complexes, with the most projected left turn movements beside East Drive. For a full median opening at Greenboro Drive and a posted speed greater than 45 mph, Table 4.11.5 displays a summary of the Class 5 median locations and related distances to adjacent median openings for this scenario. Table 4.11.7 provides similar information for a speed limit less than or equal to 45 mph.

Table 4.11.4: Class 5 Median Openings - Speed Limit > 45 mph (Full Median Opening at East Drive)

Feature	Station	Access	Spacing (ft)	% over/under Requirement	Feature Measured To	Note
John Rodes Blvd	100+25	Full		36%	East Dr.	
			1,063			
American Print	110+88	Directional		5%	Empire	1
			691			
Empire	117+79	Directional		5%	American Print	1
			729			
Stan Dr.	125+08	Directional		10%	Empire	2
			1,115			
East Dr.	136+23	Full		29%	Distribution Dr. West	3
			426			
Greenboro Dr.	140+49	None				4
			426			
Distribution Dr. West	144+75	Directional		44%	Ferguson Water	5
			577			
Distribution Dr. East	150+52	None				
			376			
Ferguson Water	154+28	Directional		33%	Technology Dr.	5
			876			
Technology Dr.	163+04	Full		-1%	Wickham Rd.	6
			1,165			
Shinn Ave	174+69	WB Split Directional		121%	Wickham Rd.	7
			483			
Lake Ibis Dr.	179+52	EB Split Directional		150%	Technology Dr.	7
			973			
Wickham Rd.	189+25	Full		-1%	Technology Dr.	

Class 5 criteria with a posted speed limit greater than 45 mph is less stringent than Class 3. The results of a Class 5 classification with a posted speed limit greater than 45 mph are listed in the following notes to Table 4.11.5:

1. Each business entrance (Empire Electric and American Print) receives its own directional median opening.
2. A directional median opening at Stan Drive meets class 5 criteria.
3. The sum of the projected left turn movements for both the AM and PM peak hours for East Drive were 887, justifying the full median opening.
4. No left turn movements can be made at Greenboro Drive due to the full median opening at East Drive.
5. There is enough space for two directional median openings between East Drive and Technology Drive. These are placed at Distribution Drive (West) and a business entrance (Ferguson Water Works).
6. The distance from a full median opening at Technology Drive (East) to a full median opening at Wickham Road (2,621 feet) is less than 10% of the required distance (2,640 feet). Therefore, no design variation is required.
7. An EB / WB split directional median opening allows left hand turn movements onto Shinn Avenue and Lake Ibis Drive, respectively, while meeting Class 3 criteria.

Table 4.11.5: Class 5 Median Openings - Speed Limit > 45 mph (Full Median Opening at Greenboro Drive)

Feature	Station	Access	Spacing (ft)	% over/under Requirement	Feature Measured To	Note
John Rodes Blvd	100+25	Full		52%	Greenboro Dr.	
			1,063			
American Print	110+88	Directional		5%	Empire	1
			691			
Empire	117+79	Directional		5%	American Print	1
			729			
Stan Dr.	125+08	Directional		10%	Empire	2
			773			
Mid-Block	132+81	Directional		117%	Stan Dr.	
			342			
East Dr.	136+23	None				3
			426			
Greenboro Dr.	140+49	Full		52%	Distribution Dr. Esst	4
			426			
Distribution Dr. West	144+75	None				
			577			
Distribution Dr. East	150+52	Directional		52%	Greenboro Dr.	5
			376			
Ferguson Water	154+28	None				
			876			
Technology Dr.	163+04	Directional		90%	Distribution Dr. Esst	6
			1,165			
Shinn Ave	174+69	WB Split Directional		121%	Wickham Rd.	7
			483			
Lake Ibis Dr.	179+52	EB Split Directional		150%	Technology Dr.	7
			973			
Wickham Rd.	189+25	Full		85%	Technology Dr.	

The results for Class 5 > 45 mph, with a full median opening at Greenboro Drive are listed in the following notes to Table 4.11.5:

1. Each business entrance (Empire Electric and American Print) receives its own directional median opening.
2. A directional median opening at Stan Drive meets Class 5 criteria.
3. No left turn movements can be made at East Drive due to the full median opening at Greenboro Drive.
4. Greenboro Drive is one of two major access roads to a residential neighborhood and two apartment complexes. Therefore, Greenboro Drive has a full median opening;
5. Distribution Drive (East) receives a directional median opening.
6. Technology Drive receives a directional median opening.
7. An EB / WB split directional median opening allows left hand turn movements onto Shinn Avenue and Lake Ibis Drive, respectively, while meeting Class 3 criteria.

Table 4.11.6: Class 5 Median Openings - Speed Limit ≤ 45 mph (Full Median Opening at East Drive)

Feature	Station	Access	Spacing (ft)	% over/under Requirement	Feature Measured To	Note
John Rodes Blvd	100+25	Full		61%	American Print	
			1,063			
American Print	110+88	Directional		5%	Empire	1
			691			
Empire	117+79	Directional		5%	American Print	1
			729			
Stan Dr.	125+08	Full		-16%	East Dr.	2
			1,115			
East Dr.	136+23	Full		-16%	Stan Dr.	3
			426			
Greenboro Dr.	140+49	None				4
			426			
Distribution Dr. West	144+75	None				4
			577			
Distribution Dr. East	150+52	Full		-5%	Technology Dr.	5
			376			
Ferguson Water	154+28	None				
			876			
Technology Dr. East	163+04	Full		-5%	Distribution Dr East	6
			1,165			
Shinn Ave.	174+69	WB Split Directional		121%	Wickham Rd.	7
			483			
Lake Ibis Dr.	179+52	EB Split Directional		150%	Technology Dr. East	7
			973			
Wickham Rd.	189+25	Full		99%	Technology Dr. East	

Class 5 criteria with a posted speed limit 45 mph or less is the most accommodating for the existing intersections and entrances within the project limits. The results of Class 5, 45 mph or less, classification are listed in the following notes to Table 4.11.6:

1. Each business entrance (Empire Electric and American Print) receives its own directional median opening.
2. Placing a full median opening at Stan Drive would require a design variation to the Class 5 standards for a posted speed of 45 mph or less. Stan Drive is 1,115 feet from the full median opening at East Drive making it 16% under the required 1,320 feet. This design variation is being recommended because Stan Drive is the main access to 26 buildings of which several have multiple businesses.
3. The sum of the projected left turn movements for both the AM and PM peak hours for East Drive were 887, justifying the full median opening.
4. No left turn access is allowed at Greenboro Drive and Distribution Drive (west) due to the full median opening at East Drive.
5. The distance between a full median opening at Distribution Drive (East) and a full median opening at Technology Drive (East) (1,252 feet) is within 10% of the required distance (1,320 feet). Therefore, no design variation is required.
6. Technology Drive receives a full median opening.
7. An EB / WB split directional median opening allows left hand turn movements onto Shinn Avenue and Lake Ibis Drive, respectively, while meeting Class 5 criteria.

Table 4.11.7: Class 5 Median Openings - Speed Limit ≤ 45 mph (Full Median Opening at Greenboro Drive)

Feature	Station	Access	Spacing (ft)	% over/under Requirement	Feature Measured To	Note
John Rodes Blvd	100+25	Full		61%	American Print	
			1,063			
American Print	110+88	Directional		5%	Empire	1
			691			
Empire	117+79	Directional		5%	American Print	1
			729			
Stan Dr.	125+08	Full		17%	Greenboro Dr.	2
			773			
Mid-Block	132+81	Directional		117%	Stan Dr.	
			342			
East Dr.	136+23	None				3
			426			
Greenboro Dr.	140+49	Full		17%	Stan Dr.	4
			426			
Distribution Dr. West	144+75	None				
			577			
Distribution Dr. East	150+52	Directional		52%	Greenboro Dr.	5
			376			
Ferguson Water	154+28	None				
			876			
Technology Dr. East	163+04	Full		90%	Distribution Dr. East	6
			1,165			
Shinn Ave	174+69	WB Split Directional		121%	Wickham Rd.	7
			483			
Lake Ibis Dr.	179+52	EB Split Directional		150%	Technology Dr.	7
			973			
Wickham Rd.	189+25	Full		99%	Technology Dr.	

The results of Class 5, 45 mph or less, classification with a full median opening at Greenboro Drive are listed in the following notes to Table 4.11.7:

1. Each business entrance (Empire Electric and American Print) receives its own directional median opening.
2. Stan Drive receives a full median opening.
3. No left turn movements can be made at East Drive due to the full median opening at Greenboro Drive.
4. Greenboro Drive is one of two major access roads to a residential neighborhood and two apartment complexes. Therefore, Greenboro Drive has a full median opening.
5. Distribution Drive (East) receives a directional median opening.
6. Technology Drive receives a full median opening.
7. An EB / WB split directional median opening allows left hand turn movements onto Shinn Avenue and Lake Ibis Drive, respectively, while meeting Class 5 criteria.

Effect of Access Management Class on Interchange

Due to the configuration of the interchange, the ramp intersections are located less than 1,000 feet apart. Given the modified diamond design of the ramps, achieving a 2,640-foot spacing, which is the required Class 3 distance between full median openings, between the ramp intersections is not feasible. In fact, the position of the ramp intersections does not allow the Class 5 requirement of 1,320-foot between full median openings to be met. A design variation will be required for the distance between the ramp intersections, regardless of which access management class is selected.

The distance between the eastern ramp intersection and John Rodes Boulevard is approximately 1,250 feet. This distance requires a design variation for Class 3 criteria and Class 5 criteria if the posted speed is greater than 45 mph. For posted speeds of 45 mph or less, the Class 5 criteria of 1,320 feet between full median openings would not require a design variation.

4.11.3 Access Management Classification Comparison

Class 5 Access Management is more permissive than Class 3 and accommodates several intersections and existing entrances that would require a median closure or relocation under Class 3. Of the two Class 5 categories, the criteria for entrances and median openings for posted speed limits less than 45 mph is the most accommodating. Regarding the accommodation of existing side roads, the quarter-mile versus half-mile spacing for full openings has significant implications. Table 4.11.8 summarizes these issues.

Table 4.11.8: Access Management Classification Comparison

Feature	Full Median Opening at East Drive			Full Median Opening at Greenboro Drive		
	Class 3	Class 5 > 45	Class 5 < 45	Class 3	Class 5 > 45	Class 5 < 45
John Rodes Blvd	Full	Full	Full	Full	Full	Full
American Print	Split Directional	Directional	Directional	Split Directional	Directional	Directional
Empire Electrical	Split Directional	Directional	Directional	Split Directional	Directional	Directional
Stan Dr	Directional*	Directional	Full*	Directional	Directional	Full
East Dr	Full	Full	Full	None	None	None
Greenboro Dr	None	None	None	Full	Full	Full
Distribution Dr W	None	Directional	None	None	None	None
Distribution Dr E	Directional	None	Full	None	Directional	Directional
Ferguson Water	None	Directional	None	None	None	None
Technology Dr	Full	Full	Full	Directional	Directional	Full
Shinn Ave	EB Split Directional	EB Split Directional	EB Split Directional	EB Split Directional	EB Split Directional	EB Split Directional
Lake Ibis Dr	WB Split Directional	WB Split Directional	WB Split Directional	WB Split Directional	WB Split Directional	WB Split Directional
Wickham Rd	Full	Full	Full	Full	Full	Full

4.12 Summary of Pond Siting Analysis

The following is a summary of the pond siting analysis for this project. The complete study can be found in the *Preliminary Drainage and Pond Siting Report*.

4.12.1 Pond Sizing: Roadway Ponds Alternative

Pond sizing analyses were performed for this PD&E Study with 3 possible treatment design options: wet detention only, stormwater harvesting pond, and combination wet detention / dry retention. The wet detention only option determines the required pond size that will meet all current governing criteria of the St. Johns River Water Management District (SJRWMD). Pond sizes for the latter two treatment options were estimated from the corresponding design methodologies contained in the FDEP draft statewide rule handbook. The pending statewide FDEP criteria are not complete, and the process to finalize these criteria is currently on hold. There is no time table for the new stormwater rule to become effective. In light of these uncertainties, pond design for the roadway ponds were performed based on current SJRWMD rule criteria only. Storm water management facility (SWMF) sizing was performed pursuant to the pending statewide criteria in order to estimate how much SWMF requirements might increase in the event the statewide rule is completed and comes into effect. The calculations performed for this analysis can be found in Appendix A of the *Preliminary Drainage and Pond Siting Analysis*. A brief description of each option is provided below.

4.12.2 Wet Detention Only

This option determines the required size of wet detention ponds to serve the project based on current SJRWMD treatment criteria. Wet detention is a feasible method to provide stormwater treatment for this project due to the shallow depths to groundwater that are exhibited along the corridor. The pond site sizes determined for this option are adequate to meet all stormwater treatment requirements for the project as long as the project is permitted before the pending FDEP statewide criteria are in place. Refer to Appendix A.2 of the *Preliminary Drainage and Pond Siting Analysis* for the calculations performed for this treatment option.

4.12.3 Stormwater Harvesting Pond

Stormwater harvesting ponds are included as an approved treatment methodology in the statewide rule handbook. This facility will function as a wet detention pond but will provide additional treatment by irrigating vegetated area. Additional nutrient removal occurs through percolation and plant uptake of water. The required pond size for this option is the same as that for wet detention. The calculations included in Appendix A of the *Preliminary Drainage and Pond Siting Analysis* also determine the required irrigated area to meet statewide rule nutrient removal requirements. This type of treatment facility was intended for use in situations where adjacent development exists in close proximity to the pond site that requires a water source for irrigation. Typical examples of this configuration would be most types of private development such as commercial facilities, residential developments or parks. This pond configuration allows stormwater designs to meet the more restrictive statewide criteria without requiring stormwater management facility footprints that exceed what is typically expected to meet current SJRWMD criteria. For this pond siting report, staff was directed to determine the required amount of irrigated area needed to meet treatment requirements and assume that the area will be located as a grassed field adjacent to the wet detention pond and included with the required stormwater management facility area for the basin. This scenario results in a stormwater management facility footprint that is restrictively high. Refer to Appendix A.4 of the *Preliminary Drainage and Pond Siting Analysis* for the calculations performed to determine stormwater management facility sizes for this treatment option.

4.12.4 Combination Wet Detention / Dry Retention

This treatment facility configuration is referred to as a treatment train in the Draft Applicant's Handbook of the statewide rule. A dry retention facility will be located just upstream of the wet detention pond in order to provide enough pre-treatment so that the remainder of required nutrient removal can be provided by the downstream wet detention pond along with the required amount of peak flow attenuation. With the shallow groundwater depths reported for the project by the National Resources Conservation Service (NRCS) soils maps, proposed dry retention basins may need to be elevated by 0.5 to 1.0 foot in order to ensure an adequate depth to the groundwater table. In some instances, underdrains could be placed to depress the groundwater level below the retention area. The stormwater management facility footprint determined for this option assumes that the pond site will include both a dry retention basin and a wet detention pond. This option will provide a treatment facility that meets the more stringent treatment criteria of the statewide rule, while requiring a much smaller footprint than that of the stormwater harvesting pond. The calculations performed to determine the stormwater management facility sizes for this treatment option are provided in Appendix A.5 of the *Preliminary Drainage and Pond Siting Analysis.*

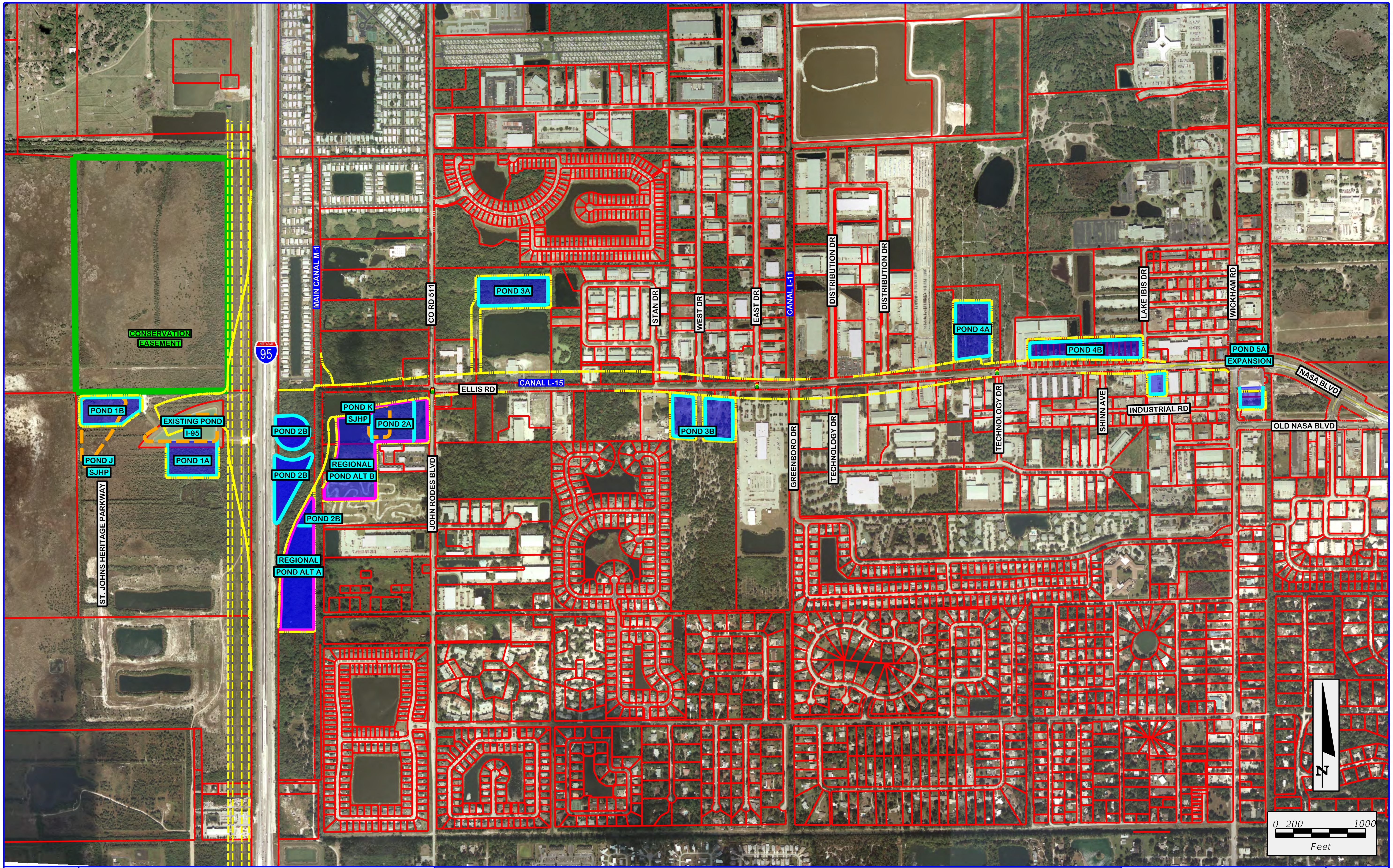
4.12.5 Regional Pond Alternative

One possible treatment alternative for the project is to route a portion of flow from the M-1 Canal into a wet detention pond. Treated stormwater from the wet detention pond would then discharge back into the M-1 Canal. This pond is proposed to be located near the location where M-1 crosses the project corridor. While the regional pond would provide all required stormwater treatment, it would not be able to meet the peak flow attenuation requirements for the project. In order to prevent adverse flooding impacts to the culverts, canals and ditches upstream from the regional pond, peak flow attenuation must be provided at each roadway drainage basin divide as explained in Section 4.0. Consequently, the Regional Pond Alternative also includes smaller attenuation-only stormwater ponds located in each roadway drainage basin. The calculations performed to determine the required size of these attenuation-only ponds is provided in Appendix B.7 of the *Preliminary Drainage and Pond Siting Analysis*.

A regional pond located near I-95 and adjacent to the M-1 Canal would be located within the 100-Year floodplain. Should the regional pond alternative be selected as the preferred alternative, the regional pond could also serve a dual purpose as a floodplain compensation area to mitigate for proposed floodplain impacts.

4.12.6 Pond Siting Analysis

A total of twelve pond sites were analyzed using aerial photographs and field verification and all available research data for the five project drainage basins. Refer to Figure 4.12.1 the location of the pond sites.



FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W
EXISTING L/A
EXISTING EASEMENT
PROPERTY LINE
PROPOSED R/W
PROPOSED L/A
PROPOSED POND SITE

PROPOSED POND SITES

FIGURE NO.
4.12.1

The selected parcels were evaluated based on:

- Right of Way
- Land Use
- Zoning, future use
- Drainage
- Contamination Risk
- Utilities Involvement
- Cultural Resources
- Threatened / Endangered Species
- Involvement
- Wetland Considerations
- Construction / Maintenance /
- Accessibility
- Community Impacts
- Wellfields

In general, the pond sites share many of the same qualities, which are desirable for a stormwater pond location. All sites are hydraulically accessible, have similar distances to a receiving water body, and are in the same proximity to the project improvements. Threatened endangered species and cultural resource assessments reveal that no concerns related to the project area. The pond sites discussed in this report are all suitable candidates from a hydraulic standpoint. Appendices C & D of the *Preliminary Drainage and Pond Siting Analysis* contain the pond siting alternative matrices and parcel information.

4.12.6.1 <u>Basin 1</u>

Basin 1 extends from the western project limit to the high point of the proposed overpass above I-95 (refer to Figure 2.2.6). Proposed stormwater management facilities in this basin must meet additional requirements associated with Class I waters and nutrient-impaired waters. In order to meet nutrient loading requirements, the calculations for Basin 1 show that 0.73 acres of dry retention must be incorporated to supplement the wet detention pond. Dry retention could likely be provided in the infields of the interchange. This configuration would also be able to meet the requirements associated with Class I waters for Basin 1.

Pond Site 1A (PS-1A) is a proposed expansion of the existing FDOT pond located south of the overpass and is currently serving I-95. Pond Site 1B is located on undeveloped property and coincides with Pond J LT of the SJHP project. Pond J LT is designed to function as an interconnected system with Pond J RT, which is located on the southern side of the proposed alignment. Both pond sites are viable alternatives, but PS-1A is preferred because its location is closer to proposed improvements. If SJHP is constructed first, then the preferred treatment alternative would be to expand Pond J LT, which is PS-1B of this study. An expansion of Pond J LT would allow proposed drainage to tie into the existing collection system and minimize required conveyance for the project. The proposed alignment for Ellis Road and SJHP requires that the existing FDOT pond be reconstructed and shifted south. If this pond has not yet been constructed, then the Basin 1 Pond design should include this reconstruction with the intention to minimize pond reconfiguration. Coordination with the St. Johns Heritage Parkway project is required to ensure that the Basin 1 Pond is consistent with this proposed concept.

4.12.6.2 Basin 2

Basin 2 begins at the highpoint of the overpass and ends at the intersection with John Rodes Boulevard (refer to Figure 2.2.6). Pond 2A shares the same location as St. Johns Heritage Parkway Pond K. Brevard County may have an opportunity to purchase the entire parcel as part of the St. Johns Heritage Parkway right-of-way acquisition process, thereby creating an ideal location for a pond pertaining to Ellis Road and the interchange ramps. Pond 2B would function as a series of 3 interconnected ponds. These ponds are located within the infields of the proposed interchange and along the northbound exit ramp. The preferred option for this basin would be to utilize Pond 2A (Pond K) as a joint use pond with St. Johns Heritage Parkway to serve both projects.

4.12.6.3 Basin 3

Pond 3A is part of a 35.5-acre tract of undeveloped commercial property (refer to Figure 2.2.6). The pond site is located just north of an existing borrow pit pond. The option of converting the borrow pit into a pond was considered but was not chosen as an alternative since it would likely involve significant earthwork and wetland impacts in order to convert it to a stormwater management facility that meets wet detention pond depth requirements. Pond 3A is located 714 feet north of the project corridor and therefore requires an associated 100-foot wide drainage easement to convey runoff to and from the pond site. Pond 3B is located south of Ellis Road at the intersection with West Drive. The pond site requirement represents 6.48 acres of the 43.6-acre wooded parcel. The preliminary pond site layout is divided into two separate interconnected pond areas. The ponds are separated by an 80-foot wide buffer to preserve future access to the southern portion of the commercial parcel. Pond 3B does not require an access easement and is therefore the preferred option in this basin.

4.12.6.4 Basin 4

Pond 4A is an undeveloped industrial tract located on the north side of Ellis Road just East of Technology Drive (east) (refer to Figure 2.2.6). Proceeding east along the corridor, Pond 4B is encountered on the north side of the road and is comprised of fourteen inhabited residential properties. This residential block of property is impacted by the proposed roadway widening. The extent of impacts is significant enough to likely require that FDOT purchase the entire parcels of all fourteen properties. The excess remainder of these properties is sufficient to meet the stormwater management facility requirements of Basin 4. Therefore, Pond 4B is the preferred alternative to minimize required right-of-way for the project.

4.12.6.5 Basin 5

This segment of Ellis Road has recently been reconstructed and converted to an urban roadway section (refer to Figure 2.2.6). The decision was made by FDOT to shift the reconstruction limit of Ellis Road from Wickham Road to the approximate vicinity of the Basin 4/Basin 5 boundary. This new reconstruction limit is where the proposed widening ties into the recently reconstructed segment. Should it be determined that this segment still needs to be addressed, Basin 5 pond site alternatives are included in the *Preliminary Drainage and Pond Siting Analysis*. Pond 5A is an expansion to the existing stormwater management facility serving the recently completed roadway improvements discussed in the previous paragraph. Pond 5A is located adjacent to the L-7 Canal, which is the outfall for Basin 5. Pond 5B is located on two industrial warehouses with associated parking. The recently constructed collection system would only require minor modification to convey proposed improvements to Pond 5A. This location, as well as its proximity to the outfall, make Pond 5A the preferred pond site of Basin 5.

4.12.7 Regional Pond Alternative Pond Siting Analysis

Two alternatives were considered for the regional pond option and are depicted on Figure 4.12.1. Regional Pond A is a narrow wooded tract of vacant industrial land. The property is located between the I-95 corridor and the M-1 Canal. Option B is located along the opposite bank of M-1 and is composed of a dirt race track and undeveloped residential land. Regional Option B coincides with Pond 2A and St. Johns Heritage Parkway Pond J. The regional option also requires attenuation only ponds. The preferred attenuation-only pond site in each basin corresponds to the preferred alternative for each basin with the exception that attenuation-only ponds are smaller than their roadway pond alternative counterparts. Similar to Pond Site 2A, Option B is the preferred regional treatment pond alternative because it contains the parcel with the willing seller as explained in the Basin 2 pond siting section. Option B also shares the added benefit of providing the required flood plain compensation.

5.0 Preferred Alternative

The following is a summary of the design components of the Preferred Alternative.

5.1 Summary of Value Engineering Study

A Value Engineering (VE) Study was conducted between April 23 and 27, 2012. A draft report was submitted to the District on June 15, 2012, and a VE resolution meeting was held on July 5, 2012. The VE Team consisted of individuals representing the following areas:

- District 5 (eight people representing six areas of expertise)
    - Right-of-Way
    - Drainage
    - Structures
    - Structures Maintenance
    - Roadway Design
    - VE Coordinator
- Brevard County Public Works (Roadway Design)
- Traffic Engineering Solutions (Traffic Operations)

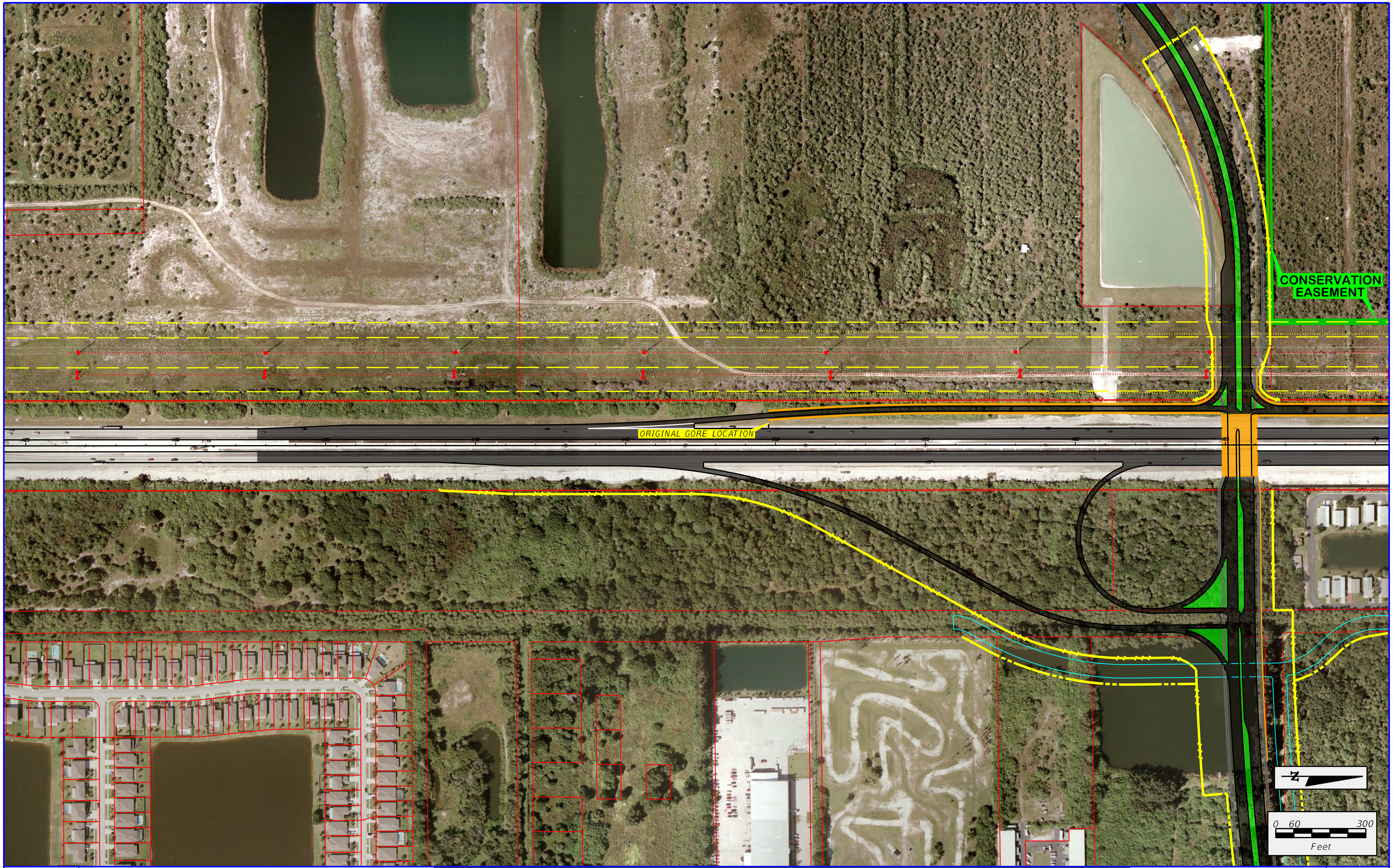
The VE concepts examined and carried forward as formal recommendations can be found in the *Interstate 95 Interchange and Ellis Road PD&E Study Value Engineering Study Report*. Out of 17 ideas generated, six were recommended for the designers to consider, and a seventh was added as a design suggestion. Table 5.1.1 summarizes the recommendations from the VE study, the corresponding savings and the District's resolution. The formal recommendations from the VE Study and the VE Memorandum from the VE Resolution Meeting are contained in Appendix H.

Table 5.1.1: VE Recommendations and Design Suggestions

Recommendation No.	Description of Savings	Savings ($ Millions)	District 5 Resolution
2	Consider ramps on MSE Walls and pull it tight within the right-of-way for the southbound exit and entrance.	$4.172	Accept
5	Construct the 45 mph concept and use a concrete box culvert drainage system.	$5.791	Reject
7	Construct a five-lane typical section with center bi-directional left turns.	$2.279	Reject
10	Consider adding right turn lanes for NB and SB traffic at John Rodes Blvd., NB at West Drive, East Drive, Greenboro Drive, and Distribution Drive (west).	($0.120)	Reject
11	Construct the 45 mph concept with guardrail along the canal.	$7.045	Consider in Final Design
12	Reduced section with sheet wall canal.	TBD	Consider in Final Design
Design Suggestion No. 1	Revisit the Alternative 2 with Alternative C ramps (Parclo) to minimize utility impacts.	TBD	Consider in Final Design

As seen in Recommendation No. 2, the VE Team recommended a ramp configuration that is a variation of the "MSE Wall" ramp concept shown in Figures 4.3.3A and B. Figures 5.1.1 A through D display this configuration, which seeks to minimize impacts to the existing utilities and minimize or eliminate right-of-way acquisition west of I-95. For the purposes of comparison of impacts, all four of these figures utilize Alternative 1 for the mainline Ellis Road alignment crossing I-95. However, the ramp geometry can also be applied to Alternative 2. Figures 5.1.1 A and B show a tight western ramp configuration based on locating the base of the MSE wall 12' from the existing limited access right-of-way line. This 12-foot distance is sufficient to accommodate future wall inspections and maintenance but will require a design variation from the required 94-foot border width. The ramp tangent sections are transitioned into the entrance and exit ramp terminals via normal crown reverse curves each with radii of 8,337 feet. By contrast, the concepts displayed in Figures 5.1.1 C and D show a similar tight ramp configuration but with no reverse curvature to transition the ramp parallel to the existing right-of-way. In this scenario, the ramps continue on a taper until intersecting the crossroad, thereby requiring right-of-way in the vicinity of the crossroad. Compared to the ramp configuration shown in Figures 5.1.1 A and B, this ramp geometry encroaches into the utility easement containing the 8" gas main, while the ramps shown in Figure 5.1.1 A and B avoid encroachment into the FGT easement (and consequently the gas main).

The ramp geometry shown in Figures A and B has been incorporated into the Preferred Alternative, which utilizes Alignment 2 as the crossing over I-95. This ramp configuration avoids impacts to the 8” gas main and eliminates right-of-way acquisition.



I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W	PROPOSED R/W	OVERHEAD ELECTRIC
EXISTING L/A	PROPOSED L/A	UTILITY POLES
EXISTING EASEMENT	BURIED GAS	RETAINING WALL
PROPERTY LINE	BURIED FIBER OPTIC	BRIDGE

ALIGNMENT ALT 1
W/ MSE WALL RAMPS
REVERSE CURVE ALIGNMENT
VE STUDY CONCEPT

FIGURE NO.
5.1.1A

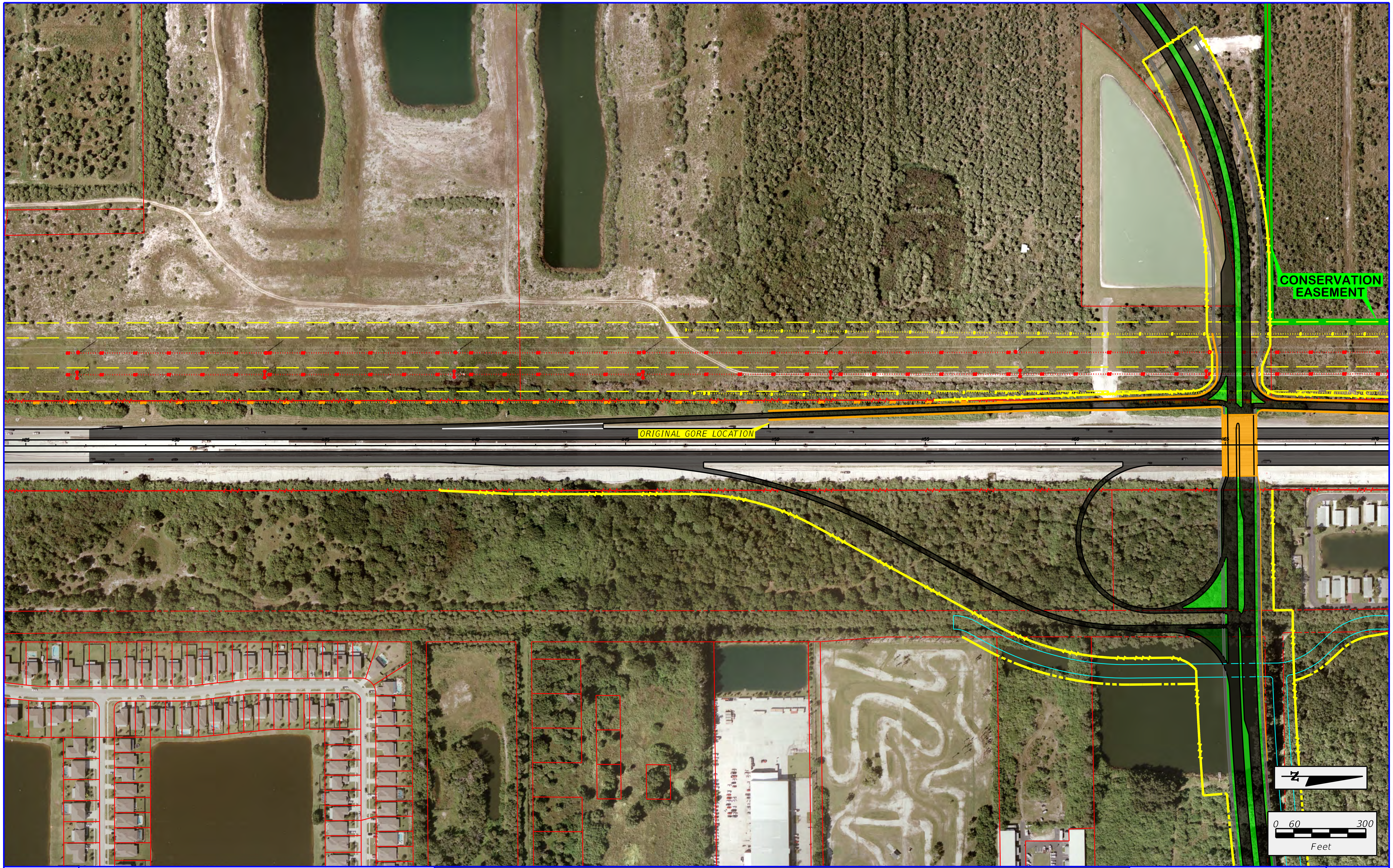
FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W	PROPOSED R/W	OE	OVERHEAD ELECTRIC
EXISTING L/A	PROPOSED L/A		UTILITY POLES
EXISTING EASEMENT	G G BURIED GAS		RETAINING WALL
PROPERTY LINE	BFO BURIED FIBER OPTIC		BRIDGE

ALIGNMENT ALT 1
W/ MSE WALL RAMPS
REVERSE CURVE ALIGNMENT
VE STUDY CONCEPT

FIGURE NO.
5.1.1B



EXISTING R/W		PROPOSED R/W		OVERHEAD ELECTRIC	
EXISTING L/A		PROPOSED L/A		UTILITY POLES	
EXISTING EASEMENT		BURIED GAS		RETAINING WALL	
PROPERTY LINE		BURIED FIBER OPTIC		BRIDGE	

FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

ALIGNMENT ALT 1
W/ MSE WALL RAMPS
STRAIGHT ALIGNMENT
VE STUDY CONCEPT

FIGURE NO.
5.1.1C

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W	PROPOSED R/W	OVERHEAD ELECTRIC
EXISTING L/A	PROPOSED L/A	UTILITY POLES
EXISTING EASEMENT	BURIED GAS	RETAINING WALL
PROPERTY LINE	BURIED FIBER OPTIC	BRIDGE

ALIGNMENT ALT 1
W/ MSE WALL RAMPS
STRAIGHT ALIGNMENT
VE STUDY CONCEPT

FIGURE NO. 5.1.1D

5.2 Typical Section

The preferred typical section package is included in Appendix C and consists of a series of four typical sections, all featuring four through lanes:

St. Johns Parkway – Western project limits to structure over I-95

- 50 mph design speed;
- 30' median with 4-foot inside shoulder and 5-foot paved outside shoulder;
- Curb & gutter along inside edge of pavement; Swale section outside of shoulder;
- 8-foot sidewalk;

Bridge over I-95

- 50 mph design speed;
- 30-foot median with left turn lane
- 8-foot shoulder;
- 8-foot covered sidewalk envelope;

I-95 to John Rodes Boulevard

- 50 mph design speed;
- 30-foot median with 4-foot inside shoulder and 6.5-foot outside shoulder;
- Curb and gutter on inside and outside edges of shoulder;
- Uses FDOT canal protection criteria (28 feet from top of canal to toe of roadway slope);
- 8-foot sidewalk;

John Rodes Boulevard to Technology Drive

- 45 mph design speed;
- Standard FDOT urban typical section (22-foot median, 4-foot bicycle lane, 5-foot sidewalk);
- Uses FDOT canal protection criteria (20 feet from top of canal to toe of slope)

Technology Drive to just west of Wickham Road

- 45 mph design speed;
- Standard FDOT urban typical section (22-foot median, 4-foot bicycle lane, 5-foot sidewalk);

This 45 mph design speed does not meet SIS criteria and will require a design variation and approval from the District.

5.3 Horizontal and Vertical Alignment

5.3.1 Horizontal Alignment

The following is a description of the preferred horizontal alignment beginning just west of I-95 and extending to just west of Wickham Road. The Preferred Alternative is a combination of Alternative 2 described in Section 4.3.5 and the Standard 45 mph Urban Best Fit concept described in Section 4.5.2.

The preferred alignment begins near the profile touchdown point located approximately 1,350' west of the I-95 centerline. This point is also the beginning of the limited access right-of-way, which extends to the intersection John Rodes Boulevard. Through the interchange area, the Preferred Alternative utilizes alignment Alternative 2 in conjunction with the western ramp configuration recommended by the VE Study. The Preferred Alternative avoids impacts to the conservation easement in the northwest quadrant and eliminates the need for a retaining wall on the north side of Ellis Road in the vicinity of Lamplighter Village. By avoiding the conservation easement, this alignment demonstrates avoidance and minimization of environmental issues and will lessen the complexity of the permitting process and mitigation in future final design phases. The alignment location is also consistent with Design Suggestion No.1 of the VE Study (see Table 5.1.1). An added benefit is that this alignment is farther away from Lamplighter Village compared to Alternative 1. Both the owner and manager of Lamplighter Village, as well as a number of residents, expressed their desire for Alternative 2 at the informational meeting held on March 24, 2011 in Lamplighter Village.

The use of Alternative 2 as the Preferred Alternative will require rework of the Brevard County plans for St. Johns Heritage Parkway. Because the preferred crossing of I-95 is approximately 82 feet south of alignment shown in the 90% St. Johns Heritage Parkway plans, the roadway design through the curve will require modifications by Brevard County. However, the original radius of 1,432 feet approaching I-95 was also used in the Preferred Alternative.

The west-side ramps are aligned so that the main portion of the ramp is parallel to the existing limited access right-of-way line. The ramps were positioned such that a distance of 12 feet occurs between the limited access right-of-way and the base of the MSE wall in order to accommodate future inspection and maintenance. For each of these two ramps, normal crown curves with radii of 8,337 feet transition the ramps into the parallel-type entrance and exit terminals, which have lengths of 580 feet and 340 feet, respectively, based on Exhibit 10-70 and 10-73 of the 2004 AASHTO Green Book. This tight ramp configuration will accommodate a future additional lane and 12-foot shoulder along I-95.

The bridge consists of four through lanes, a westbound left-turn lane, an eastbound deceleration lane for the loop ramp, an 8-foot shoulder on the north side, a 5-foot eastbound bicycle lane, parapet walls, and an 8-foot envelope for pedestrians and bicyclists. Design Standard 525 recommends a deceleration distance of 315 feet when slowing from 50 mph to 30 mph in a parallel-type exit ramp. Based on this standard, the deceleration lane is extended westward across the bridge, despite its close proximity to the western ramp intersection. While the deceleration lane across the bridge is full-width, a 50-foot taper for the deceleration lane is delineated with pavement markings. If a 50-foot taper is used, a deceleration distance of 346 feet is achieved from the end of the taper to the point of curvature of the loop ramp.

Both ramp intersections are signalized, and a left turn lane of approximately 315 feet long is provided to accommodate westbound vehicles turning south to access the interstate. At the eastern ramp intersection, the southbound loop ramp and the northbound exit ramp are separated by a 40' median, which will assist in preventing left-turning motorists from inadvertently turning into the oncoming (northbound) exit ramp.

East of the structure, the alignment begins to transition northward via an 8,400-foot radius (normal crown) curve on a fill section (PC=84+19.34 / PT=92+75.58). A crossing over the M-1 Canal occurs immediately east of the eastern ramp intersection. While the size of the crossing has not been determined as part of this PD&E study, the preliminary recommendation is to utilize a single span or arch configuration in order to minimize the constraints within the channel. The L-15 Canal requires relocation and is shown as flaring northward in order to accommodate the increase in roadway fill as the roadway is raised to meet the structure over I-95. East of the profile touchdown point, the L-15 Canal is located an offset of 38 feet from the back of sidewalk (28 feet from toe of roadway slope) in accordance with Chapter 4 criteria of the Plans Preparation Manual.

A 392-foot tangent section separates the curve just east of the structure from another normal crown (8,400-foot radius) curve, which transitions the Preferred Alternative across John Rodes Boulevard. At this intersection, the typical section changes from a high speed urban (50 mph) section west of John Rodes Boulevard to a standard 45 mph urban section east of John Rodes Boulevard. Across the intersection, the 30-foot median is reduced to 22 feet, and the 6.5 outside shoulder is reduced to a 4-foot bicycle lane. Since this difference in typical sections occurs on opposite sides of the intersection, no roadway transition is proposed. The slight shift that a motorist would experience as the 4-foot inside shoulder is created or eliminated while traversing the intersection meets the requirements for allowable deflection at an intersection (PPM, Table 2.8.1b).

East of John Rodes Boulevard, the alignment continues to curve via the 8,400-foot radius normal crown curve (PC=96+67.62 / PT=107+86.24) such that the right-of-way impacts are on the north side of Ellis Road. Between John Rodes Boulevard and Stan Drive, the south right-of-way is utilized as the constraint in positioning the alignment. A total right-of-way width of 190.5-foot is required to accommodate the standard urban 45 mph typical section and canal relocation. As with the segment east of John Rodes Boulevard, PPM Chapter 4 canal protection criteria is applied, yielding a 20-foot offset between the proposed toe of slope and top of canal foreslope (PPM Chapter 4, Exhibit 4-B). This configuration has substantial right-of-way impacts to the vacant building in the northeast corner of John Rodes Boulevard and Ellis Road, Wuestoff Health Systems, Empire Electric, and Affordable Signs, all located along the north side of Ellis Road. These properties are likely displacements or relocations. As the Preferred Alternative transitions across the John Rodes Boulevard intersection, the commercial property in the southeast intersection quadrant is also impacted, although the impacts are not expected to require a displacement.

Roughly halfway between John Rodes Boulevard and Stan Drive, a 17-minute deflection occurs in the alignment at STA 113+31.53. This deflection (0 deg 17' 29") transitions the alignment in the southeasterly direction and is followed by a normal crown (9,000'-radius) curve (PC=121+76.82 / PT=129+77.89), which further transitions the Preferred Alternative towards the south side of existing Ellis Road. A tangent length of 162 feet separates this curve from another 8,400-foot radius curve (PC=131+40.08 / PT=143+39.42), which straightens the alignment to be roughly parallel to the existing roadway between East Drive and Distribution Drive. Within this segment, the right-of-way impacts are primarily on the south side of the roadway.

Through the roadway transition between West Drive and East Drive, the Preferred Alternative impacts the CMS business on the north side of the roadway. The adjacent CMS Coastal Mechanical Services to the east experiences a partial acquisition, which does not directly impact the existing building or parking. The ECAS business experiences a partial acquisition, but parking impacts are avoided. East of this parcel, impacts to several parcels are avoided, including Downtown Produce Market. Along the south side of the roadway between East Drive and Distribution Drive (east), the Preferred Alternative impacts the existing retention ponds and landscaping for Florida Power and Light, the existing parking for Structural Composites, and existing parking and landscaping for Medicomp.

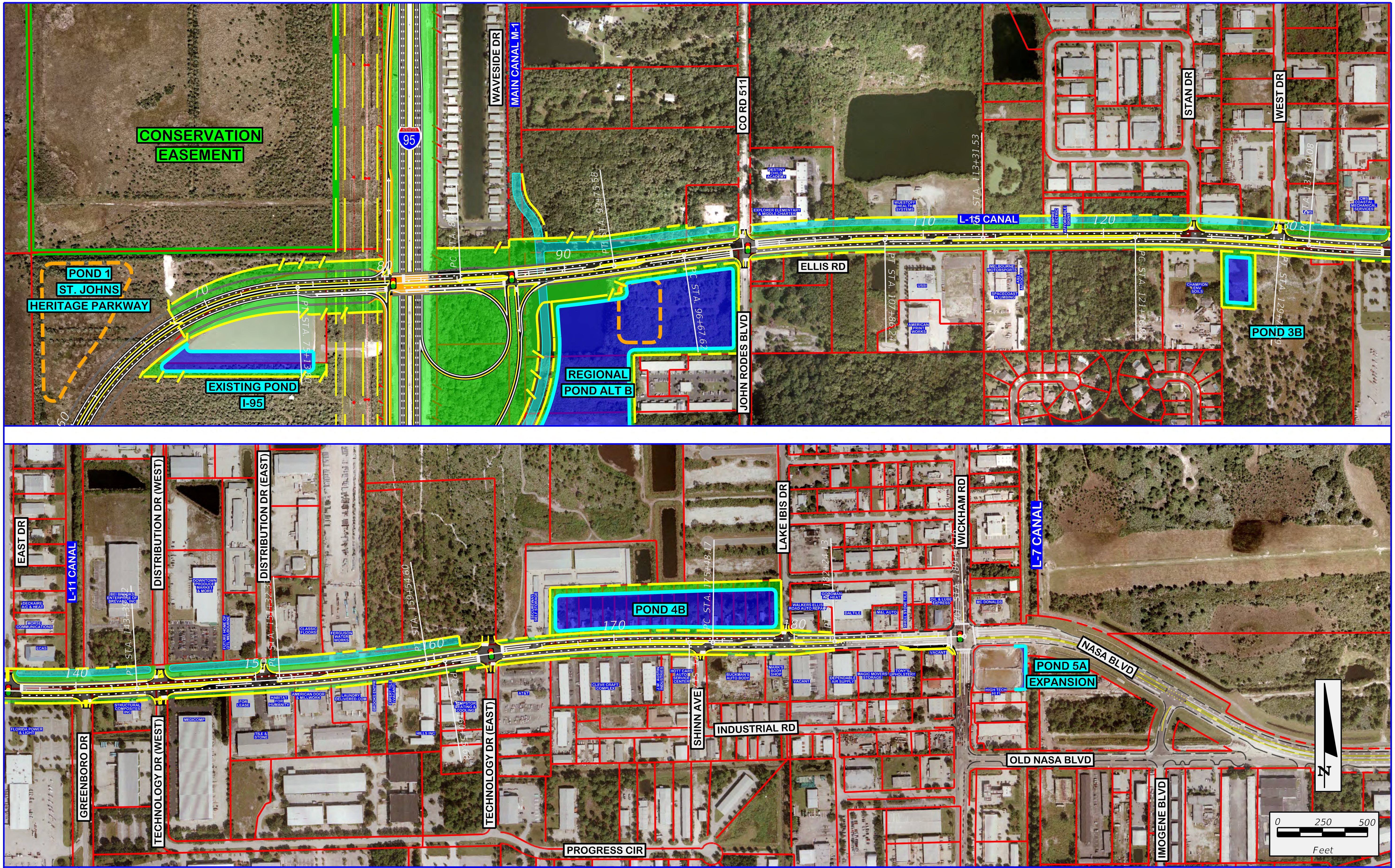
Between Distribution Drive (east) and Technology Drive (east), the Preferred Alternative experiences a series of normal crown reverse curves with radii of 8,400 feet (PC=151+32.33 / 159+54.60) and 8,000 feet (PC=160+55.68 / PT=174+17.64) separated by a 101-foot-long tangent. These curves transition the alignment from the south side of the roadway to the north side. Through this transition, commercial displacements on the south side of the roadway include a vacant building, Habitat for Humanity, American Door and Millwork, and Laundry Delivered.com. Partial right-of-way impacts on the south side include Brooks Enterprise, Hills Inc., and Tempstor Heating and Cooling. Partial impacts on the north side include Classic Floors and Ferguson Water Works. Just west of Technology Drive (east), the L-15 Canal ends, and the typical section includes a 1:4 slope that matches into the existing ground behind the back of proposed sidewalk. The termination of the canal reduces the right-of-way width from 190.5 feet to 134 feet, a reduction of 56.5 feet.

East of Technology Drive (east) the impacts are primarily located on the north side of the roadway, thereby impacting all 19 residential properties. The residences on 9 of these properties are located 10' or less from the proposed right-of-way. For right-of-way cost estimating purposes, the homes are considered damaged if they suffer a setback loss of 25% or more. A total of 18 residential relocations are assumed for the Preferred Alternative.

Between Shinn Avenue and Wickham Road, the Preferred Alternative matches into the recently constructed four lane section completed as part of the NASA Boulevard realignment via a 14,000-foot-radius normal crown curve (PC=175+48.17 / PT=182+24.13). Partial business impacts on the south side of the roadway include Hott Cars Auto Service Center, Buckman's Auto Body, Mark's Body Shop, a vacant building, and Dependable Air Supply. On the north side, Walker's Ellis Road Auto Repair and Goodman A/C Heat are partially impacted by the transitioning typical section.

A portion of the recently constructed four lane section requires removal to tie into the Preferred Alternative. The current four-to-two lane transition and approximately 300 feet of four lane pavement will require removal and replacement. A short section of bi-directional turn lane is proposed to be replaced in a similar configuration as the existing roadway. An eastbound right-turn lane is proposed at the Wickham Road intersection in order to optimize the level of service of the intersection.

An overview of the Preferred Alternative is shown in Figure 5.3.1. Concept plan sheets and a detailed description of the proposed centerline are located in Appendix B.



FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W	PROPOSED R/W	CONCRETE MEDIAN
EXISTING L/A	PROPOSED L/A	CANAL
EXISTING EASEMENT	SIDEWALK	RETAINING WALL
PROPERTY LINE	GRASSED AREA	

PREFERRED ALTERNATIVE OVERVIEW

FIGURE NO. 5.3.1

5.3.2 Vertical Alignment

A proposed profile was not developed as part of the PD&E Study. For the crossing over I-95, the profile proposed for St. Johns Heritage Parkway was evaluated in conjunction with the interchange geometry. This profile is symmetrical above the interstate centerline and features 3% grades on the east and west approaches, a vertical curve length of 1,110 feet, and a K value of 185. This profile will accommodate ramp intersections while meeting intersection sight distance requirements.

Along Ellis Road, the vertical profile will be relatively flat and will require a "sawtooth" profile of alternating 0.3% grades. A noteworthy point is that the 2002 Preliminary Engineering Report completed for Brevard County for the reconstruction of Ellis Road as a 5-lane section includes conceptual plan and profile sheets with this type of a profile.

5.4 Drainage

A Pond Siting Report has been prepared as part of this project in order to identify and evaluate potential stormwater management facility locations to serve the proposed roadway widening and provide a recommended pond location for each proposed drainage basin. The FDOT *Stormwater Management Facility Handbook, Drainage Manual, Plans Preparation Manual and PD&E Manual*, and FDOT District 5 Drainage QC Checklist for Pond Siting Reports are the basis for the pond alternative evaluation. Other items considered in the evaluation of pond alternatives are land acquisition, pond access, floodplain impacts, land use, utility conflicts, environmental impacts, social impacts, cost and property owner input.

The Preferred Alternative will utilize curb and gutter and storm sewer systems to convey the runoff to retention ponds. Two potential pond sites were identified for each of the five proposed drainage basins. Based on the evaluation described in detail in the *Pond Siting Report*, one preferred pond was selected per basin. The preferred pond sites are based on a study of the proposed right-of-way and environmental impacts in conjunction with evaluation of the existing land use and comments received from the public. Pond sizing calculations were completed for each typical section to determine the area required to treat and attenuate the drainage basin in accordance with FDOT and SJRWMD requirements. The preferred pond sites are summarized on Figure 5.4.1 and are displayed in detail on the concept plan sheets in Appendix B. The preferred pond configuration includes Regional

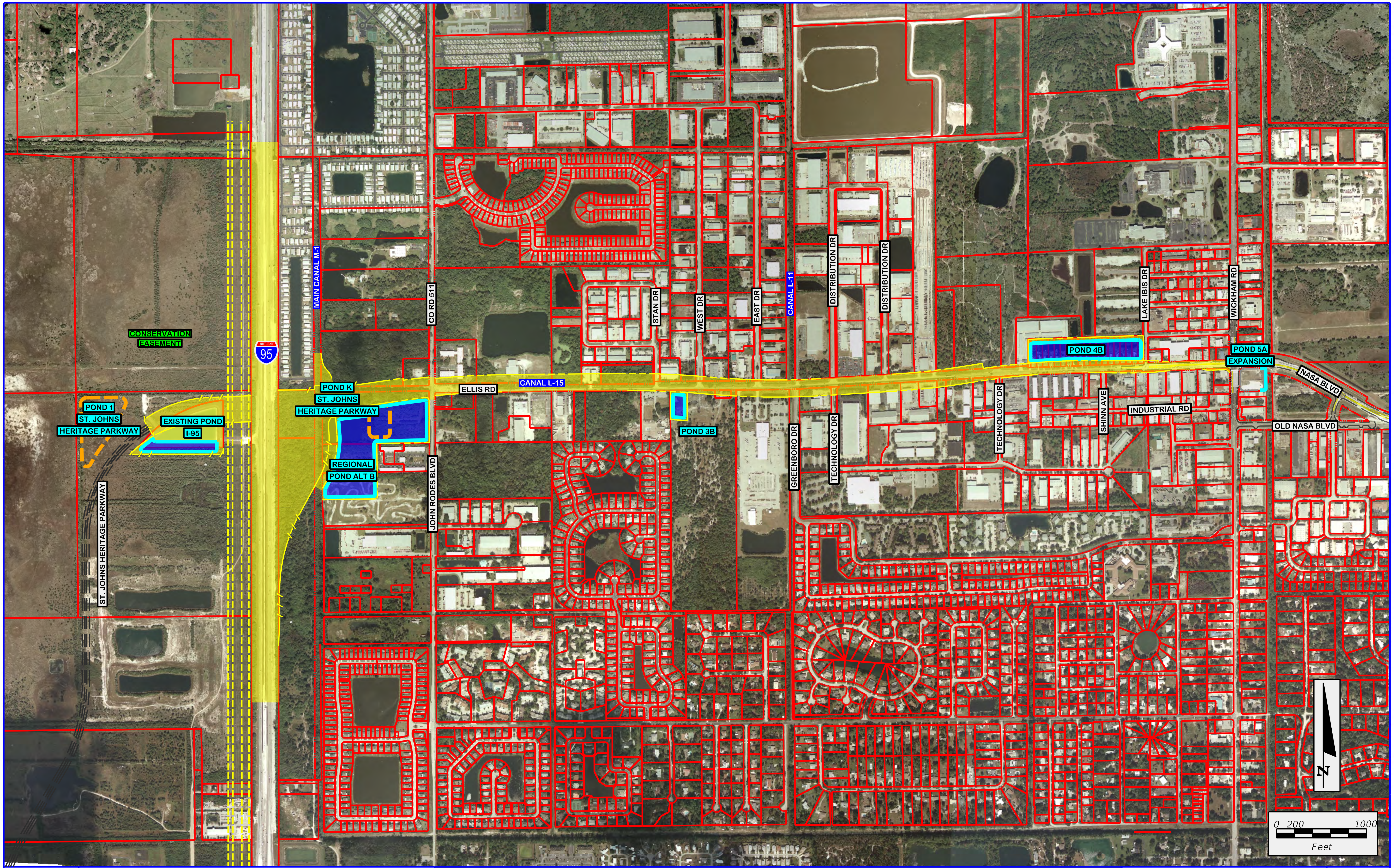
Pond Alternative B in conjunction with individual basin ponds sized for attenuation at the following sites:

- Expansion of existing pond west of I-95;
- Pond Site 3B;
- Pond Site 4B; and,
- Expansion of existing pond 5A west of Wickham Road.

As stated in the *Pond Siting Report*, the regional pond option will meet the multiple drainage needs of the corridor and minimize the individual pond sites in the developed urban areas along Ellis Road. Although both regional pond options will function equally well, Regional Pond Alternative B is preferred because most of the site was originally preferred by Brevard County and featured a cooperative property owner. Pond Site 3B is preferred because the property is currently vacant and could be a point of negotiation in any future development.

Pond 4B is the preferred site in Basin 4 and is located within the limits of the remaining portion of the residential properties. Although the Preferred Alternative impacts each residential property differently, the District right-of-way estimate has considered these impacts to require 18 residential relocations due to the proximity of the roadway to the structures and the remaining land available on each parcel. As a result, Pond 4B is shown as encompassing the entire area of the remaining residential lots and existing Lake Ibis. While this size is larger than the required attenuation size, additional capacity will be available within this pond to mitigate the nearby flooding in the vicinity of the Wickham Road intersection. Since 18 of the parcels are deemed to be residential displacements, the District will purchase the property, which can then be converted to roadway right-of-way and a retention pond.

Pond 5A constructed as part of the NASA Boulevard realignment can accommodate a relatively small eastward expansion if the attenuation-only size is applied. The existing L-7 Canal is located just east of the pond but can be avoided, although sheet piling may be required.



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EXISTING R/W
EXISTING L/A
EXISTING EASEMENT
PROPERTY LINE
PROPOSED R/W
PROPOSED L/A
PREFERRED POND SITE
FOOTPRINT OF PREFERRED ALTERNATIVE

PREFERRED POND SITES

FIGURE NO.
5.4.1

5.5 Design Traffic Volumes

Section 3.6 of this PDSR describes the 2040 design year traffic for Build Alternative 2, which is based on a 45 mph design speed and a Class 5 access management treatment. This projected traffic reflects the configuration of the Preferred Alternative. Table 3.6.2 summarizes the queue lengths for each turning movement in the 2040 design year. Figure 3.6.7 displays the peak hour volumes, level of service, and geometry of each intersection in the 2040 design year.

5.6 Intersection Concepts and Signal Analysis

As shown on Figure 3.6.7, signals are proposed in the 2040 design year at the following locations:

- Johns Rodes Boulevard (existing signal);
- East Drive;
- Technology Drive (east); and,
- Wickham Road (existing signal).

All remaining intersections are two-way stop-controlled with stop signs on the cross roads.

5.7 Access Management Designation

Upon completion of improvements to Ellis Road and the interchange at I-95, Ellis Road will be designated as a "SIS Connector" for the Melbourne International Airport.

Since Ellis Road is to become an SIS connector roadway upon improvement, consideration is given to applying the same design criteria as for an actual SIS facility. The following excerpt is from Section 2.6.2 of the Department's procedure entitled *Strategic Intermodal System (SIS) Highway Component Standards and Criteria (effective September 14, 2011):*

> **2.6.2 Access Management Standards for Controlled Access Facilities for Planning and Design**
> **(A) Standards**
> The access management standards for controlled access segments of the SIS highway component shall be those contained in Access Class 2 or 3 as defined in Department ***Rule Chapter 14-97, F.A.C.***

Given the urban nature of this project corridor and the comments related to access management from the Alternatives Public Meeting held on March 29, 2012 and the Public Hearing on October, 25, 2012, applying a Class 3 access management policy along the corridor is deemed to be too disruptive in regards to accessing existing sideroads and entrances that serve commercial establishments. A number of public comments received are related to the placement of full median openings and truck delivery access. Class 5 access management for a posted speed of 45 mph or less is the preferred access management designation for reconstruction and extension of Ellis Road as an SIS facility for the following reasons:

1. Class 5 is more suitable to the existing land use and location of existing sideroads and commercial developments accessed via sideroads connecting to Ellis Road.
2. Ellis Road connects to NASA Boulevard east of the project area, which features a bi-directional turn lane. This section will ultimately be part of the SIS connector to Melbourne International Airport as well as the reconstructed Ellis Road.
3. The Ellis Road improvement will be constructed and maintained by Brevard County. Therefore, the preferred Class 5 access management policy will be enforced by Brevard County, who has not expressed a preference to a more restrictive Class 3 configuration.
4. The Class 5 category will provide virtually the same operating characteristic as the Class 3 category with only several seconds difference in total travel time for the entire length of the project.
5. The Class 5 category is exceeds the existing access management characteristics of NASA Boulevard, which utilizes a 5-lane section east of the NASA Boulevard S-curve and a barrier median with full median openings spaced approximately 800 feet to 1,200 feet apart in the vicinity of Melbourne International Airport.

The Department recognizes that the selection of a Class 5 access management policy for a posted speed of 45 mph or less is the most permissive type of access management for a controlled access facility. A design variation is required for utilizing the Class 5 access management in lieu of the Class 3, which is the requirement stated in the *SIS Component Standards and Criteria*. Class 5 access management for a posted speed of 45 mph or less is proposed for the entire project corridor, including the interchange area beginning just west of I-95 and continuing to John Rodes Boulevard as well as the Ellis Road corridor. A design variation is also required for the reduction in design speed from 50 mph, which is the SIS standard, to 45 mph. Appendix D contains the documents for these design variations.

The final preferred access management configuration is based on Table 5.7.1 (Class 5, 45 mph or less) assuming East Drive (as opposed to Greenboro Drive) receives a full median opening. Placing a median opening at Greenboro Drive was rejected due to the required realignment of East Drive on the north side of Ellis Road. The preferred access management configuration has the following noteworthy points:

1. Based on comments received from Downtown Produce Market and the adjoining commercial development park (Distribution Drive East and West), a full median opening was deemed to be necessary to this commercial complex. While the preference of some members of the business community is to locate the median opening at Distribution Drive West, this location would place a median opening too close (852 feet) to East Drive. As a result, the full median opening at Distribution Drive East has been chosen as the preferred full median opening location. Distribution Drive East and West are connected as a continuous roadway, so vehicles and delivery trucks wishing to turn left across Ellis Road will have a choice of using the full median opening at Distribution Drive East or making a right-hand turn and a U-turn at East Drive, the next downstream median opening.
2. A full median opening at Lake Ibis was added in lieu of a split directional median opening with Shinn Drive in order to accommodate the significant number of businesses with sideroad access to Lake Ibis Drive.

The Class 5 (45 mph or less) restrictive access management configuration requires the following design variations:

1. A design variation is required for the for the 646-foot distance between the proposed full median openings ramp intersections within the interchange, as the distance is 51% over the allowable 1.320' full median opening distance.

2. A design variation is required for the for the 1,120-foot distance between the proposed full median openings of Stan Drive and East Drive, as the distance is 15% over the allowable 1,320' full median opening distance.
3. A design variation is required for the 483' distance between the proposed westbound split directional median opening at Shinn Avenue and the full median opening at Lake Ibis Drive, as the distance is 27% over the allowable 660' directional median opening distance.
4. A design variation is required for the 973-foot distance between the proposed full median openings of Lake Ibis Drive and Wickham Road, as this distance is 26% over the allowable 1,320' full median opening distance.

Based on the 2011 DTTM (approved by the District in March of 2011), traffic signals are anticipated in the design year (2034) at the following intersections:

- Western ramp intersection
- Eastern ramp intersection
- John Rodes Boulevard (existing signal)
- East Drive
- Wickham Road (existing signal)
- Technology Drive (east)

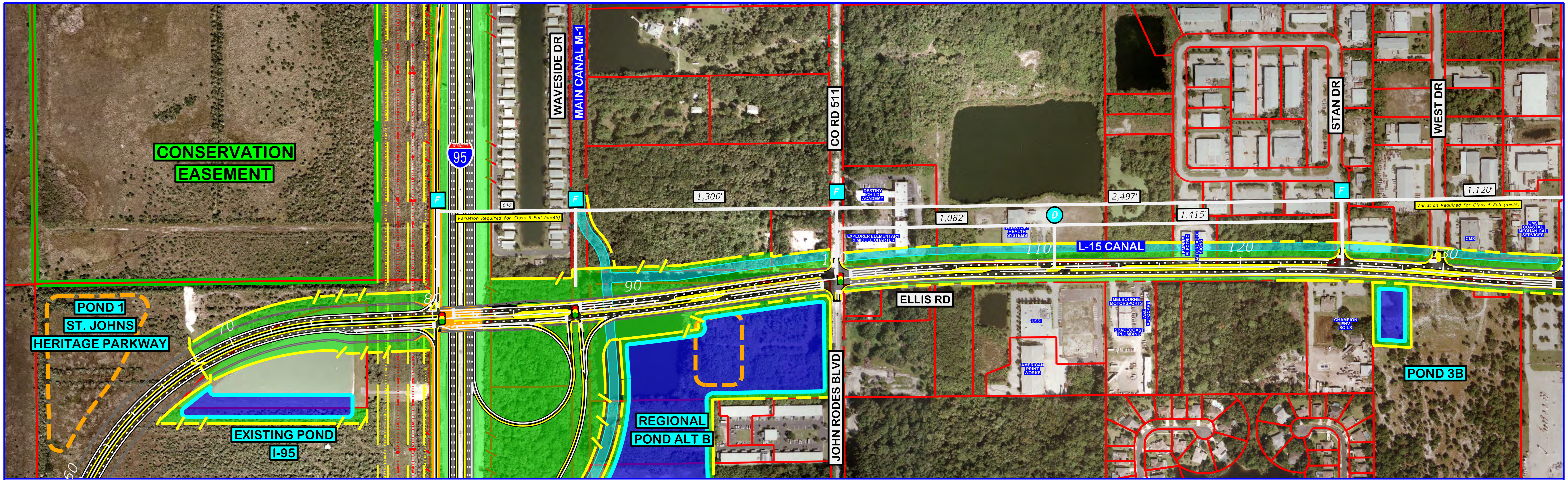
Table 5.7.1 summarizes the median openings under the preferred Class 5 configuration of 45 mph or less posted speed.

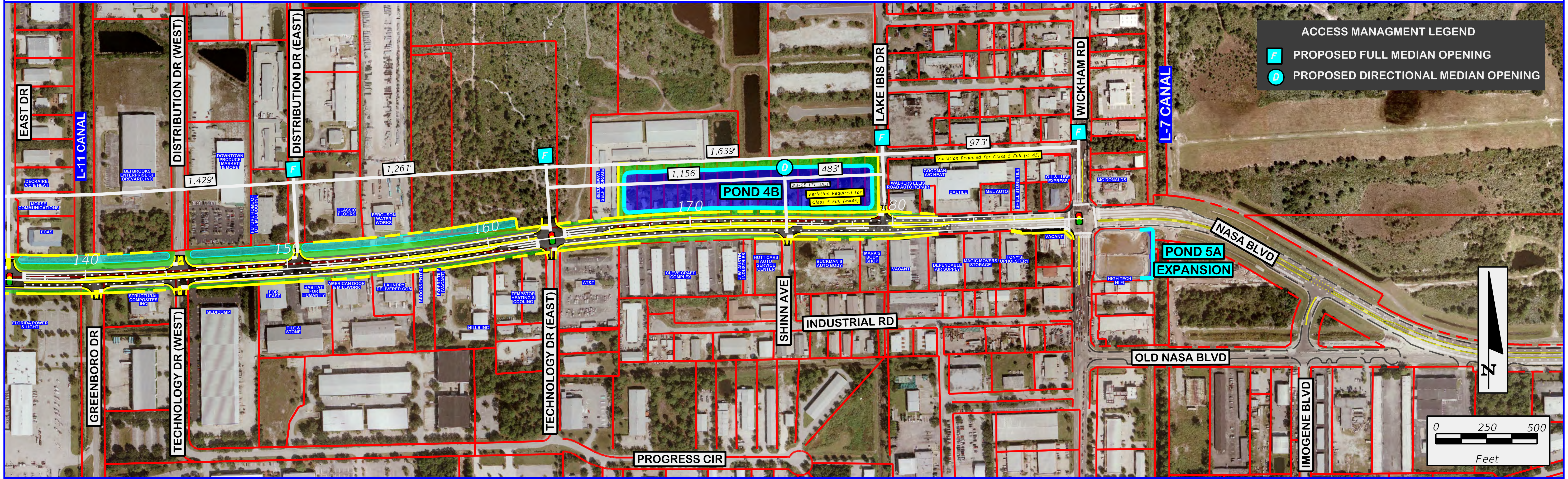
Table 5.7.1: Class 5 Median Openings 45 mph or Less

(Full and Directional – Final Preferred Configuration)

Feature	Station	Access	Spacing (ft)	Required Distance	% over/under Require-ment	Design Variation?
Ramp Intersection (West)	80+60	Full				
			646	1,320	-51%	Yes
Ramp Intersection (East)	87+06	Full				
			1,300	1,320	-2%	
John Rodes Blvd	100+06	Full				
			1,082	660	64%	
American Print	110+88	Directional				
			1,415	660	114%	
Stan Dr.	125+03	Full				
			1,120	1,320	-15%	Yes
East Dr.	136+23	Full				
			1,429	1,320	8%	
Distribution Dr. East	150+52	Full				
			1,261	1,320	-4%	
Technology Dr. East	163+13	Full				
			1,156	660	75%	
Shinn Ave.	174+69	WB Directional				
			483	660	-27%	Yes
Lake Ibis Dr.	179+52	Full				
			973	1,320	-26%	Yes
Wickham Rd.	189+25	Full				

Figure 5.7.1 summarizes the preferred access management configuration.





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EXISTING R/W	PROPOSED R/W	CONCRETE MEDIAN
EXISTING L/A	PROPOSED L/A	CANAL
EXISTING EASEMENT	SIDEWALK	RETAINING WALL
PROPERTY LINE	GRASSED AREA	TRAFFIC SIGNAL

PREFERRED ACCESS MANAGMENT OVERVIEW

FIGURE NO. 5.7.1

5.8 Pedestrian and Bicycle Facilities

The Preferred Alternative features the following elements:

Pedestrian Accommodations

- To the outside of each direction of travel an 8-foot sidewalk from western project limits to John Rodes Boulevard (matches St. Johns Heritage Parkway typical section);
- To the outside of each direction of travel a 5-foot sidewalk from John Rodes Boulevard to tie-in just west of Wickham Road;

Bicycle Accommodations

- 5-foot paved shoulder from western project limits to bridge over I-95;
- 8-foot shoulder on bridge across I-95;
- 6.5-foot shoulder / bicycle lane from east end of I-95 structure to John Rodes Boulevard;
- 4-foot bicycle lane from John Rodes Boulevard to tie-in just west of Wickham Road;

These proposed pedestrian and bicycle features are consistent with the existing facilities located at the existing tie-in to NASA Boulevard and the pedestrian and bicycle elements proposed for St. Johns Heritage Parkway. The pedestrian and bicycle features proposed in the Preferred Alternative will provide continuity for these facilities.

5.9 Right of Way Requirements, Relocations, and Cost

Section 4.5.2, which compares the three standard urban 45 mph alternatives considered in this study, includes an evaluation matrix. Table 4.5.2 contains the number of anticipated business and residential relocations and right-of-way costs. Table 5.9.1 displays the total number of parcels impacted on the Ellis Road section between John Rodes Boulevard and just west of Wickham Road. Table 5.9.2 displays the right-of-way cost estimate for the entire Preferred Alternative, including the interchange. A Conceptual Stage Relocation Plan (CSRP) has been prepared for this project and is available under separate cover.

Table 5.9.1: Ellis Road Parcels Impacted and Number of Relocations

Component	Number
<u>Number of Parcels Impacted</u>	
Business	36
Residential	18
Unimproved	16
Total	**70**
<u>Number of Relocations</u>	
Business	10
Residential	18
Total	**28**

Table 5.9.2: Preferred Alternative Right-of-Way Cost Estimate

Component	Cost
Interchange to John Rodes Boulevard	$11.01 million
John Rodes Boulevard to just west of Wickham Road	$40.99 million
Total Right-of-Way Cost	**$52.00 million**

5.10 Utilities and Lighting

Due to the ramp configuration adapted from the VE Study, major utility impacts west of I-95 are avoided, as the west-side ramps are located within the existing limited access right-of-way. The crossing of Ellis Road and its tie-in into St. Johns Heritage Parkway will directly impact single and dual-pole FPL towers. The proposed roadway will also require fill atop the 8-inch and 26-inch gas mains owned by Florida Gas Transmission. There has been considerable discussion regarding the need to span these gas mains, as seen in Section 4.3.9. The next phase will require thorough coordination with Florida Gas Transmission. Currently, the Preferred Alternative assumes that these two gas mains will not require a span opening over each utility.

Most utility companies have the capability to adjust their services without causing major inconveniences to the customers. As a result, mitigation measures to the maximum extent feasible will include the following:

- Provide advanced coordination during design and construction phases
- Maintaining utility connection in temporary location;
- Minimizing the time without service,
- Installing alternative or new service before disconnecting the existing services; and
- Allowing service disruption only during periods of non-usage or minimum usage.

Utility impacts resulting from the proposed widening and relocation of Ellis Road will impact the following utilities:

- Florida City Gas
- Florida Power and Light (electric and fiber optic)
- Level 3 Communications
- City of Melbourne
- AT&T
- Bright House Networks
- City of West Melbourne

Coordination with the utility agencies will be required through final design and construction stages.

Appendix L contains the Utility Impact Assessment Report. The cost of relocating these facilities within the proposed right-of-way is estimated to be $3.2 million.

5.11 Aesthetics and Landscaping

The Department has not committed to specific aesthetic or landscaping treatments as part of this study. No public comments were related to landscaping, which will be designed in accordance with Chapter 9 of the Plans Preparation Manual as well as any additional Department policies in effect at the time of final design.

5.12 Special Features

Mechanically stabilized earth walls are proposed along the southbound exit and entrance ramps located on the west side of I-95. These walls are set such that the base of the retaining wall is located 12 feet from the existing right-of-way line, thereby providing sufficient distance for future maintenance and inspection.

5.13 Preliminary Traffic Management Plan

The Preferred Alternative requires complete removal and replacement of Ellis Road. The relocation of the L-15 Canal will be particularly challenging, since the footprint of the proposed canal is entirely or partially atop the existing canal location. Retaining two open lanes of traffic throughout the project is a prerequisite for any traffic management plan considered in the next phase. Section 4.10.5 includes a possible stage construction scenario for the L-15 Canal relocation. Because of the advantages of a bulkhead canal section in regards to staging and constructability, the bulkhead option is recommended for further detailed study in the final design phase. The staging plan considered in final design must include provisions for retaining two open lanes of through traffic for the duration of the project.

Between John Rodes Boulevard and Stan Drive, the southern right-of-way line is held, placing all impacts on the north side of the roadway. Between Stan Drive and West Drive, the best-fit alignment transitions to a location that places most of the impacts on the south side of the roadway. East of the L-11 Canal, the best-fit alignment holds the north existing right-of-way line for approximately 1,000 feet before shifting away from the south side of the roadway near Distribution Drive and again placing most of the right-of-way impacts on the north side. With the transition of the alignment from the north side of Ellis Road to the south and back, the construction staging plan requires that portions of the westbound and eastbound lanes be constructed simultaneously.

To construct a segment of Ellis Road from John Rodes Boulevard to the L-11 Canal in phases, the following approach was considered:

- Construct the proposed westbound lanes and canal between John Rodes Boulevard and Stan Drive while retaining traffic on the existing roadway. Likewise, construct the future westbound lanes between Technology Drive (east) and Lake Ibis Drive while retaining traffic on the existing roadway;
- Temporarily widen the north side of the existing roadway (Stan Drive to Technology Drive (east)). Construct the proposed eastbound lanes south of the existing roadway while placing traffic on the existing Ellis Road / temporary widening;
- Shift traffic onto the newly-constructed westbound lanes (John Rodes Boulevard to Stan Drive and Technology Drive (east) to Lake Ibis Drive) and the eastbound lanes between Stan Drive and Technology Drive (east). Utilize temporary crossovers to convey traffic from the ultimate westbound to eastbound lanes and back;
- Between Stan Drive and Technology Drive (east), remove existing Ellis Road and construct a temporary channel with sheet piling where the existing pavement is currently located. Tie the temporary channel into the existing channel at Stan Drive. Under this configuration, a temporary channel could be located to the south of the future channel and not require additional right-of-way during construction; and,
- Construct the proposed box culvert between Stan Drive and the L-11 canal while tying in to the newly-constructed box culvert between John Rodes Boulevard and Stan Drive.

With this type of conceptual staging plan, any additional frontage for temporary accommodations of the canal would be reduced or eliminated. However, the geometry of this staging plan has not been developed and would require additional study, particularly the constructability of the crossovers, accommodation of side roads and driveway entrances, and the anticipated elevation differences between the existing and proposed ground.

5.14 Construction and Engineering Costs

Appendix E contains the FDOT long range estimates (LRE) for the interchange and Ellis Road. The LRE for the interchange reflects the configuration shown in the Preferred Alternative and extends from just west of I-95 to John Rodes Boulevard. The Ellis Road LRE includes the portion of the project beginning at John Rodes Boulevard and extending to Wickham Road. Appendix E contains two LREs for Ellis Road – High Speed Urban 50 mph and Standard Urban 45 mph. All three of the LREs contained in Appendix E were updated on October 2, 2012. Engineering and construction inspection (CEI) costs are estimated to be 15% of the construction cost. Table 5.14.1 displays the cost estimate for the Preferred Alternative separated between the interchange portion and the Ellis Road portion. Utility costs are totaled separately, as the responsibility of relocating utilities may be the responsibility of the utility company, depending on the agreement between the utility company and the municipality. The utility costs for the interchange include the relocation of two FPL poles but assume that the gas mains west of I-95 remain in place.

Table 5.14.1: Preferred Alternative Cost Estimate

Roadway Segment	Cost (in millions)
I-95 Interchange to John Rodes Boulevard	
Construction	$ 21.81
Engineering	$ 3.27
Right-of-Way	$ 11.01
Utility Relocations	$ 0.05
Sub-Total	$ 36.13
Ellis Road from John Rodes Boulevard to Wickham Road	
Construction	$ 9.80
Engineering	$ 1.47
Right-of-Way	$ 40.99
Utility Relocations	$ 3.14
Sub-Total	$ 55.39
Grand-Total	**$ 91.5**

6.0 Summary of Environmental Impacts

6.1 Social Impacts

6.1.1 Land Use Changes

As described in Chapter 2, the existing land use is comprised of primarily commercial property with scattered vacant parcels, industrial property, and a residential block featuring 19 parcels. The expansion of Ellis Road as a 4-lane facility with a direct connection to I-95 is expected to facilitate the continued commercial and industrial use of the adjacent property.

6.1.2 Community Cohesion

This project includes reconstruction of Ellis Road from 2 lanes to 4 lanes through a predominately commercial area with some residential development. A small block of residential development is located within this commercial setting and will also be impacted by the proposed roadway construction. The existing land along Ellis Road is generally zoned industrial with some commercial zoning and is characterized by various businesses, industrial use, and vacant lots. Nineteen residential lots are clustered just west of Wickham Road. With the exception of the recently constructed improvements at Wickham Road, Ellis Road does not include sidewalks or other means for safe pedestrian use of the roadway. All of the typical sections examined include sidewalks and bicycle lanes. The addition of these facilities will provide increased connections between businesses located within the project corridor and act as a multi-modal connection.

The Lake Ibis residential development consists of 19 lots with frontage along the north side of Ellis Road. Lake Ibis, an east /west-oriented, linear borrow pit, is situated along the northern edge of these lots. Mobile homes are the type of dwelling characterizing this residential development. Eighteen of the mobile homes are occupied. This residential development is surrounded by either developed commercial property or vacant land zoned for commercial/industrial development. The proposed improvement displaces 18 residences due the required right-of-way limits for the proposed roadway and pond site 4B. The other residential community, Lamplighter Village located east of I-95 and north of Ellis Road, is not affected by the proposed roadway. No other residential communities are present within the project corridor.

6.1.3 Relocation Potential

The reconstruction of Ellis Road has a high relocation potential for both residential and commercial properties.

The acquisition and relocation program will be conducted in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended; and relocation resources are available to all residential and business relocates without discrimination.

Comparable replacement housing for sale and rent is available in Melbourne and West Melbourne. However, there may be some last resort rent supplements and last resort replacement housing payments necessary. Last resort housing payments would be used in order to place the relocatees in decent, safe, and sanitary housing, if necessary. Should last resort housing be constructed, the housing would be available before the displacees are required to vacate their dwellings. There are numerous residential lots available for new construction within the Melbourne and West Melbourne area.

In order to minimize the unavoidable effects of Right of Way acquisition and displacement of people, the Florida Department of Transportation will carry out a right-of-way and relocation program in accordance with Florida Statute 339.09 and the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646 as amended by Public Law 100-17).

The Florida Department of Transportation provides advance notification of impending right-of-way acquisition. Before acquiring right-of-way, all properties are appraised on the basis of comparable sales and land use values in the area. Owners of property to be acquired will be offered and paid fair market value for their property rights.

No person lawfully occupying real property will be required to move without at least 90 days written notice of the intended vacation date, and no occupant of a residential property will be required to move until decent, safe and sanitary replacement housing is made available. "Made available" means that the affected person has either by himself obtained and has the right of possession of replacement housing, or that the Florida Department of Transportation has offered the relocatee decent, safe and sanitary housing which is within his financial means and available for immediate occupancy.

At least one relocation specialist is assigned to each highway project to carry out the relocation assistance and payments program. A relocation specialist will contact each person to be relocated to determine individual needs and desires, and to provide information, answer questions, and give help in finding replacement property. Relocation services and payments are provided without regard to race, color, religion, sex, or national origin.

All tenants and owner-occupant displacees will receive an explanation regarding all options available to them, such as (1) varying methods of claiming reimbursement for moving expenses; (2) rental replacement housing, either private or publicly subsidized; (3) purchase of replacement housing; and (4) moving owner-occupied housing to another location.

Financial assistance is available to the eligible relocatee to:

1. Reimburse the relocatee for the actual reasonable costs of moving from homes, businesses, and farm operations acquired for a highway project.
2. Make up the difference, if any, between the amount paid for the acquired dwelling and the cost of a comparable decent, safe and sanitary dwelling available on the private market, as determined by the Department.
3. Provide reimbursement of expenses, incidental to the purchase of a replacement dwelling.
4. Make payment for eligible increased interest cost resulting from having to get another mortgage at a higher interest rate. Replacement housing payments, increased interest payments, and closing costs are limited to $22,500 combined total.

A displaced tenant may be eligible to receive a payment, not to exceed $5,250, to rent a replacement dwelling or room, or to use as down payment, including closing costs, on the purchase of a replacement dwelling.

The brochures that describe in detail the Florida Department of Transportation's Relocation Assistance Program and Right of Way acquisition program are "Residential Relocation Under the Florida Relocation Assistance Program", "Relocation Assistance Business, Farms and Non-profit Organizations", "Sign Relocation Under the Florida Relocation Assistance Program", "Mobile Home Relocation Assistance", and "Relocation Assistance Program Personal Property Moves". All of these brochures are distributed at all public hearings and made available upon request to any interested persons.

Title VIII of the Civil Rights Act of 1968 guarantees each person equal opportunity in housing. The community analyst, in working with District Relocation staff, can ensure that FDOT complies with this law.

Residential relocations include the 18 residences located just west of Lake Ibis Drive and bounded by Lake Ibis to the north and Ellis Road to the south.

Parcels with business impacts requiring relocations include the following:

1. Vacant building in northeast corner of Ellis Road / John Rodes Boulevard intersection;
2. Wuestoff Health Systems;
3. Empire Electric / Affordable Signs;
4. Malabar Products;
5. Coastal Mechanical Systems (CMS – west building);
6. For Lease / Habitat for Humanity;
7. American Door and Millwork;
8. Laundry Delivered.com;
9. Mark's Body Shop; and,
10. Secureway Self-Storage (office only).

6.1.4 Community Services

There are no public services such as libraries, police, fire, or emergency medical service providers along the project corridor. All parcels are privately owned. A school called the Explorer Elementary Middle and Charter School had plans to locate at the northeast corner of the intersection of John Rodes Boulevard and Ellis Road. However, in preparing the Noise Study Report and the mailing list for the public hearing (2012), this building was vacant. This building continues be vacant as of September 2014 per a telephone conversation with the property owner.

6.1.5 Title VI Considerations

This project was developed in accordance with the Civil Rights Act of 1964, as amended. Title VI provides that no person shall, on the grounds of race, color, religion, sex, national origin, marital status, handicap, or family composition, be excluded from participation in, or be denied the benefits of, or be otherwise subject to discrimination under any program of the Federal, State, or local government.

This project is not expected to adversely impact any minority, ethnic, elderly or handicapped groups. No person will be discriminated against or denied the opportunity to comment on the proposed project alternatives.

6.1.6 Controversy Potential

A public involvement plan was developed and has been implemented for this project. The purpose of the plan is to establish and maintain communication with individuals and agencies concerned with the project and its potential impacts. An Advance Notification (AN) package was submitted to the State Clearinghouse on December 10, 2009. Additionally, this project was entered into the FDOT's Efficient Transportation Decision Making (ETDM) process (#11460), which allows interested agencies to review the project information and post comments regarding various issues. The following are noteworthy comments expressed during the agency review of the ETDM Summary Report.

FDEP stated that GIS data indicates the presence of a brownfield area, two toxic release inventory sites and 18 Resource Conservation and Recovery Act (RCRA) facilities within the vicinity of the project site. The agency recommended that a Contamination Screening Evaluation be conducted.

FHWA expressed concern about potential contamination sites and recommended coordination with FDEP and local governments.

The NMFS commented that the project would impact low to moderate quality wetlands and that a major concern is the secondary impacts associated with the I-95/Ellis Road Interchange. The agency also stated that an Essential Fish Habitat Assessment would not need to be conducted as well as coordination with USFWS concerning protected wildlife species.

The USEPA indicated concerns about development within the 100-year floodplain. The agency recommended a thorough evaluation of alternatives as well as avoidance and minimization of floodplain impacts. The agency also recommended a survey of the area to confirm the location of current listed contaminated site features. Regarding water quality, the agency recommended including review of water quality standards in Crane Creek, potential sources of water quality impairment, and Total Maximum Daily Load (TMDL) requirements and how these regulations and/or requirements may affect the proposed project and environmental resource permits.

The USFWS indicated that the Audubon's crested caracara, wood stork and Florida scrub-jay could potentially be utilizing habits along the project corridor. The agency also noted that wetlands will be impacted and that a delineation and quality assessment needs to be conducted to determine the appropriate mitigation for unavoidable impacts.

The FFWCC commented on the potential loss of wildlife habitat and indicated that further study would be needed to document the presence or absence of listed species. The agency indicated that the Audubon's crested caracara, Florida scrub-jay, red-cockaded woodpecker, snail kite, and various state-listed species may utilize habitat along the project corridor. The agency also recommended the investigation of mitigation techniques for wildlife impacts.

The Florida Department of State commented on the potential for historical and archaeological resources to be present along the project corridor and recommended a CRAS be conducted. The Miccosukee Tribe of Indians of Florida requested to be notified if the cultural resources survey found that any archaeological sites would be impacted.

The majority of the Agency comments received through the ETDM process had degrees of effect of moderate or lower. A copy of the ETDM Summary Report is located in Appendix J.

As part of the public involvement program a series of public meetings were held in order to receive input from residents and the general public. A meeting with Lamplighter Village was held on March 24, 2011 followed by the Alternatives Public Meeting on March 29, 2012. The Public Hearing was held on October 25, 2012. These meetings presented an opportunity to listen to the questions and concerns of residents and the business community, thereby lessening the possibility of significant public controversy. A summary of the public involvement program is contained in Chapter 8. The Public Hearing transcript is included as Appendix K of the PDSR.

6.2 Cultural Impacts

6.2.1 Section 4(f)

Section 4(f) was enacted as federal law in 1966 as part of the Department of Transportation (DOT) Act {Title 49, USC, Section 1653(f)}. Section 4(f) is comprised of two categories that include:

1. Publicly owned parks, recreational areas, and wildlife and waterfowl refuges; and
2. Historical and archaeological sites.

A Florida Department of Environmental Projection conservation easement is located in the northwest quadrant of the I-95 / Ellis Road interchange. This easement is not a Section 4(f) resource because the property is not open to the public and is not a designated wildlife or waterfowl refuge. In addition, the Preferred Alternative avoids this conservation easement.

6.2.2 Historic Sites / District

A Cultural Resource Assessment Survey (CRAS) was conducted for this project in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended by Public Law 89-655; the Archaeological and Historic Preservation Act of 1966, as amended by Public Law 93-291; Executive Order 11593; Chapter 267, Florida Statutes, and Part 2, Chapter 12 of the FDOT *PD&E Manual*.

A Cultural Resource Assessment, conducted in accordance with the procedures contained in 36 CFR Part 800 and including background research and a field survey coordinated with the State Historic Preservation Officer (SHPO), was performed for the project. As a result of the assessment, three historic properties (8BR2781-2783) were identified. The Federal Highway Administration, after application of the National Register Criteria of Significance, found that the sites were not eligible for listing on the National Register of Historic Places (NRHP). The SHPO rendered the same opinion. Based on the fact that no additional archaeological or historical sites or properties are expected to be encountered during subsequent project development, the Federal Highway Administration, after consultation with the SHPO, has determined that no National Register properties would be impacted. The SHPO coordination letter is shown in Appendix I. Figure 6.2.2 summarizes the cultural resources considered in the CRAS.

6.2.3 Archaeological Sites

A Cultural Resource Assessment, conducted in accordance with the procedures contained in 36 CFR Part 800 and including background research and a field survey coordinated with SHPO, was performed for the project. As a result of the assessment, one archaeological site (8BR2784) was identified. The Federal Highway Administration, after application of the National Register Criteria of Significance, found that the site was not eligible for listing in the National Register of Historic Places. The SHPO rendered the same opinion. Based on the fact that no additional archaeological or historical sites or properties are expected to be encountered during subsequent project development, the Federal Highway Administration, after consultation with the SHPO, has determined that no National Register properties would be impacted. The SHPO coordination letter is shown in Appendix I. Figure 6.2.2 summarizes the cultural resources identified in the CRAS.

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I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

8BR27XX	CULTURAL RESOURCE	EXISTING R/W	EXISTING EASEMENT
		EXISTING L/A	PROPERTY LINE

CULTURAL RESOURCES

FIGURE NO.
6.2.2

6.3 Natural Environment

6.3.1 Wetlands

In accordance with Executive Order 11990, special considerations were taken in developing and evaluating the build alternative to minimize wetland impacts associated with this project. Nineteen wetland systems and nine surface water features were identified within the project limits.

Forested wetlands are dominant east of I-95 with wetland shrub, wet prairie and freshwater marsh the most common types west of I-95. The surface water features consist of canals and stormwater treatment ponds/borrow pits.

A discussion of the wetland delineation methodology, quality assessment technique and permitting issues including compensatory mitigation is included in the Environmental Report for this project.

Wetland impacts which will result from the construction of this project will be mitigated pursuant to Section 373.4137, F.S. to satisfy all mitigation requirements of Part IV. Chapter 373, F.S. and 33 U.S.C. s.1344.

If the project cannot be mitigated through S. 373.4137 F.S., then FDOT will develop a project-specific conceptual mitigation plan. Pursuant to USACE, SJRWMD, and FDEP policies, compensatory mitigation for unavoidable wetland impacts can be in the form of upland and/or wetland preservation, wetland restoration, wetland enhancement, wetland creation, or a combination of these methods. Additionally, if the project is located within the service area of a permitted wetland mitigation bank, then the purchase of credits from the bank may be acceptable. The specifics of a conceptual mitigation plan, if required, will be developed during the permitting phase of the project.

The total number of wetland impacts of the Preferred Alternative (for the entire project) is 8.37 acres. The Preferred Alternative will directly impact 4.17 of acres of forested wetlands and 4.20 acres of wet prairie/marsh. Additionally, 13.20 acres of surface waters will be directly impacted. The Preferred Alternative also avoids any direct impacts to the FDEP

Conservation Easement west of I-95. Table 6.3.1 and Figures 6.3.1 A through C summarize the wetland impacts for the Preferred Alternative.

Table 6.3.1: Wetland Impacts – Preferred Alternative

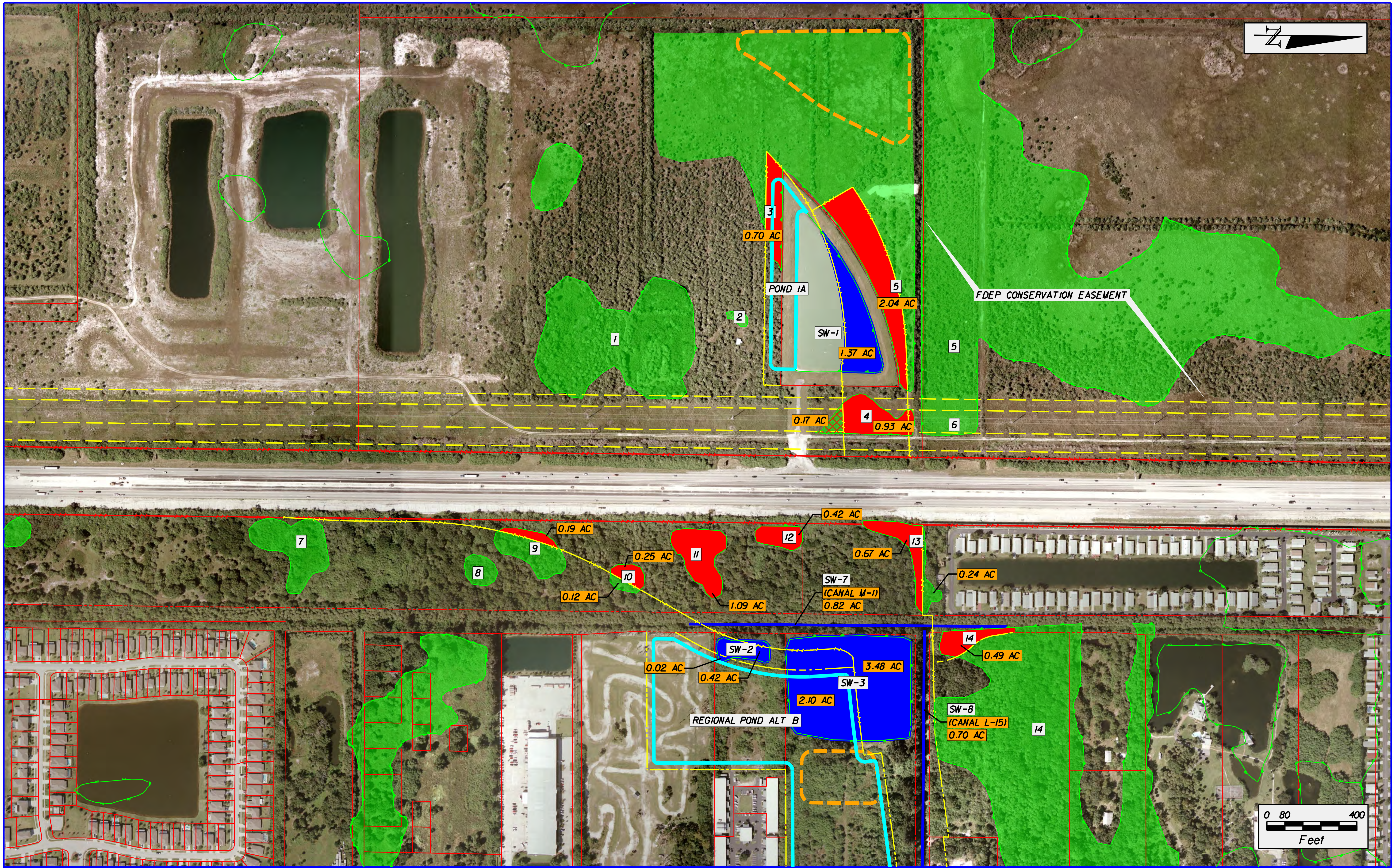
Wetland Number	Interchange	Ellis Road
	Acres	Acres
1		
2		
3	0.70 (3)	
4	1.11 (4)	
5 (1)	2.04	
5 (2)		
6		
7		
8		
9	0.19	
10	0.37 (4)	
11	1.09	
12	0.42	
13	0.91 (4)	
14	0.49	
15		
16		0.18
17		0.87 (4)
18		
19		
Total	**7.32**	**1.05**

(1) Non-Conservation easement portion of Wetland No. 5

(2) Conservation easement portion of Wetland No. 5

(3) Wetland impact due to expansion of existing FDOT pond (1A)

(4) Includes isolated wetland remnant less than one half acre not directly impacted by construction but requiring mitigation.



ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING ROW
PROPOSED ROW
SW-# / # SURFACE WATER/ WETLAND NUMBER
WETLAND IMPACT
SURFACE WATER IMPACT
EXISTING WETLANDS

WETLAND/SURFACE WATER IMPACTS
PREFERRED ALTERNATIVE
I-95 / ELLIS ROAD INTERCHANGE

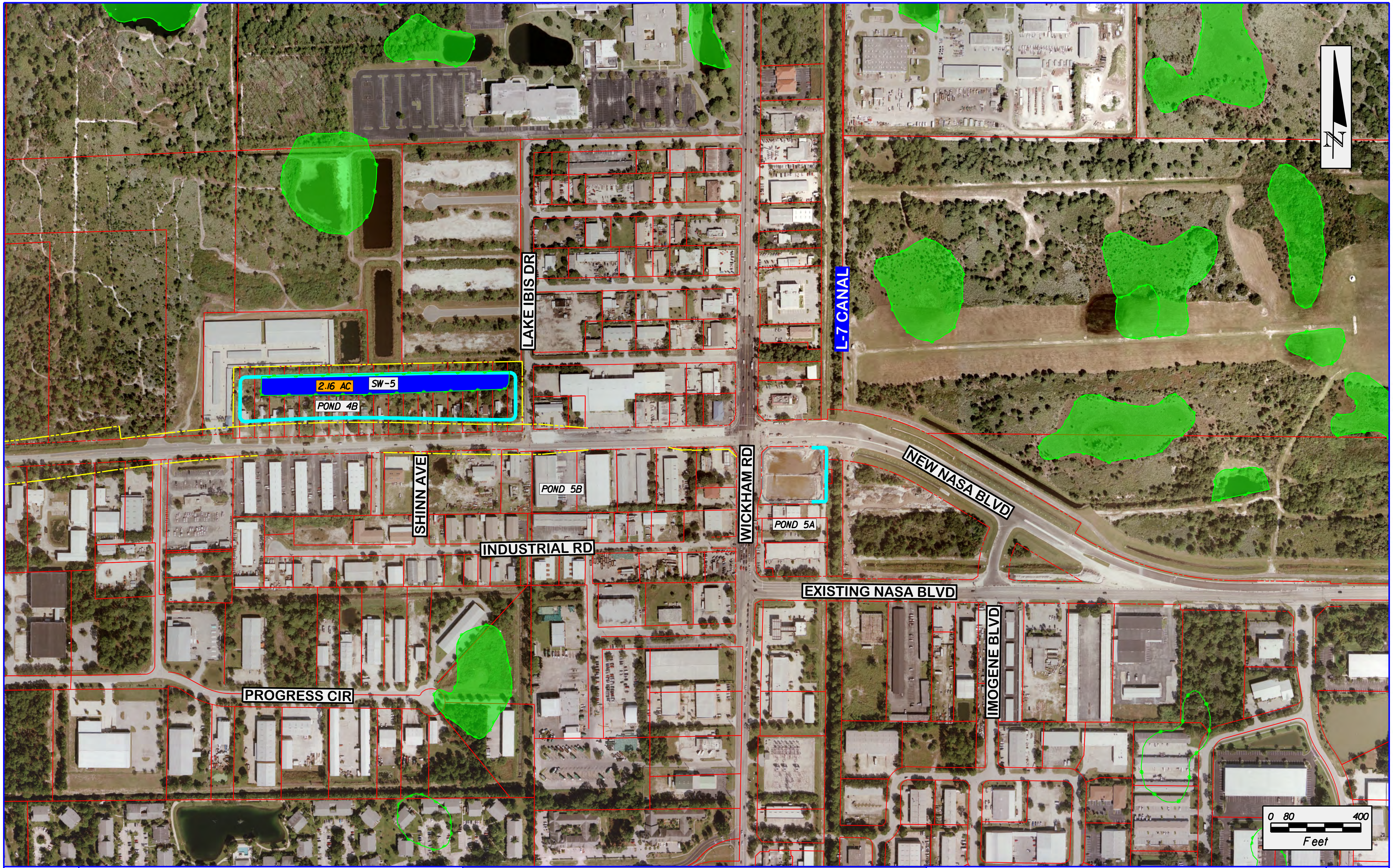
FIGURE NO.
6.3.1A

ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING ROW	WETLAND IMPACT
PROPOSED ROW	SURFACE WATER IMPACT
SW-# / # SURFACE WATER/ WETLAND NUMBER	EXISTING WETLANDS

WETLAND/SURFACE WATER IMPACTS
PREFERRED ALTERNATIVE
ELLIS ROAD

FIGURE NO.
6.3.1B



ELLIS ROAD PROJECT DEVELOPMENT AND ENVIRONMENT STUDY	EXISTING ROW PROPOSED ROW SW-# / # SURFACE WATER/ WETLAND NUMBER WETLAND IMPACT SURFACE WATER IMPACT EXISTING WETLANDS	WETLAND/SURFACE WATER IMPACTS PREFERRED ALTERNATIVE ELLIS ROAD	FIGURE NO. 6.3.1C

6.3.2 Water Quality

The proposed stormwater facility design will include, at a minimum, the water quantity requirements for water quality impacts as required by the SJRWMD in F.A.C. 40-C. A *Water Quality Impact Evaluation (WQIE)* checklist and a *Preliminary Pond Siting Report* have been completed for this project and are included in the project files.

6.3.3 Outstanding Florida Waters

Based on the definition of an Outstanding Florida Waters (OFW) under Florida Administrative Code (F.A.C.), Section 62-302.700, no such waterways appear to be within the study corridor. Final verification by the FDEP will occur during the permitting process during the permitting phase. The F.A.C. regulations afford the highest quality of protection to OFWs to protect against degradation of water quality. However, stormwater treatment systems and ponds have been located and designed to comply with all SJRWMD criteria.

6.3.4 Floodplains

The segment of the project located west of West Drive lies within FEMA Flood Zone AE. East of West Drive the project is located within Zone X. Refer to Figure 6.3.2 for a map which delineates the flood plain boundaries of the project corridor. Zone AE is described as areas that are inundated by the 100-year floodplain. Zone X refers to areas that are outside of the 100-year floodplain but within the 500-year floodplain. A base floodplain elevation (BFE) of 20-feet NGVD has been determined for the project area located within Zone AE.

FEMA maps show that flooding occurs up to elevation 20 during the 100-year event for the segment of the project that is within Zone AE. LiDAR elevations along this segment show that existing elevations along Ellis Road range from 16 to 24 feet in this segment. Roadway improvements within this segment will include elevating the roadway section from its current vertical alignment; therefore, the elevation change will result in impacts to the storage capacity of the floodplain. The impacts can be categorized as minimal floodplain encroachments. There are no impacts on emergency services, evacuation routes or regulatory floodways. Consistency with local floodplain development plans or land use elements in the comprehensive plan is not an issue, as the project is a modification to an existing road. No risk assessments were performed as part of this report.

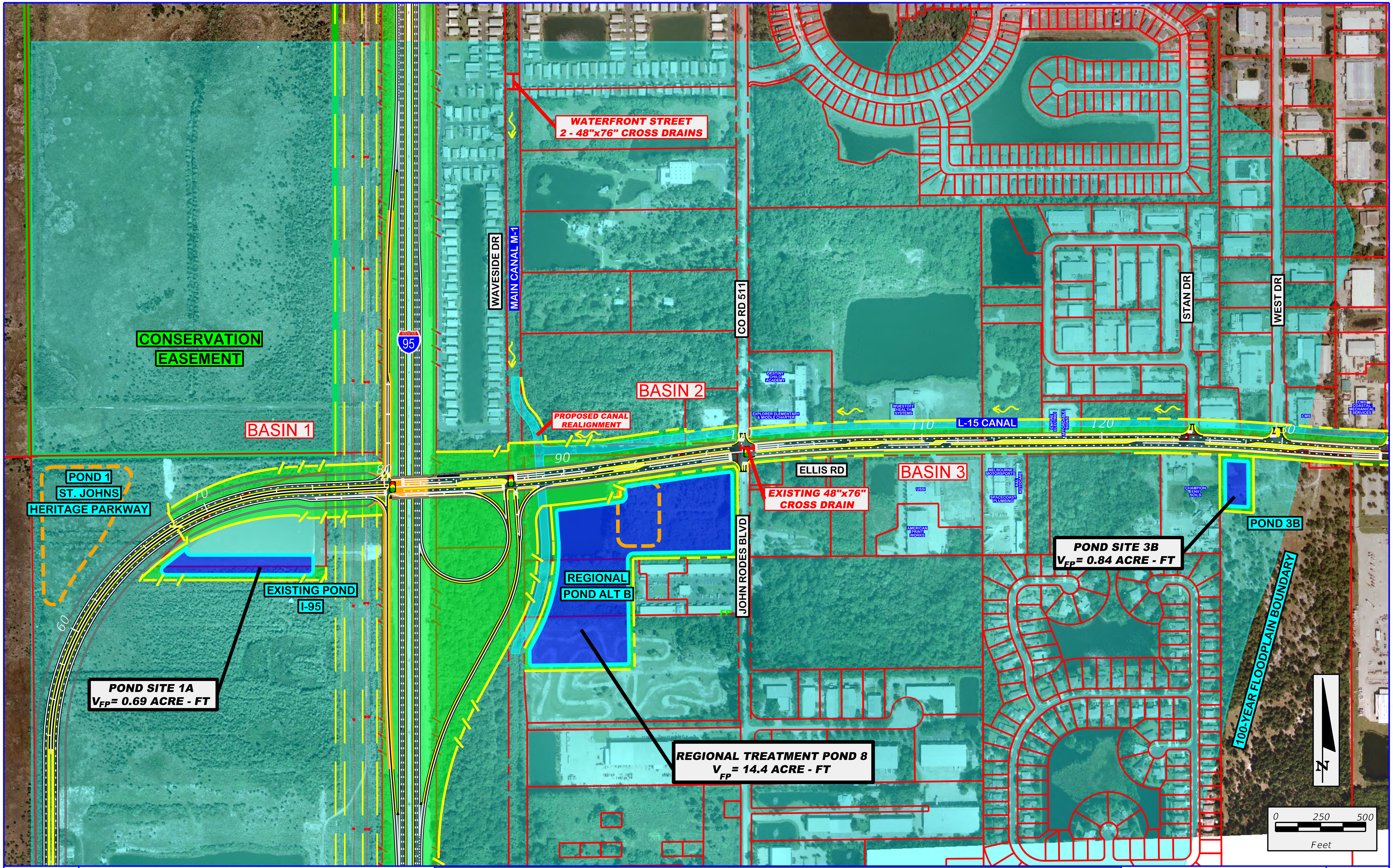
Analysis of cross sections generated for the preliminary roadway design for this project demonstrate that approximately 13 acre-feet of fill is proposed within Zone AE. Compensation for this reduced flood storage will be accommodated by providing compensating storage within the proposed stormwater treatment facilities that will be constructed within the floodplain. The pond sizing analysis done as part of the *Pond Siting Report* incorporates a 1-foot depth for free board within each proposed pond. This depth of storage will provide the required compensation.

The preferred pond configuration is comprised of a regional pond that meets the project's treatment requirements as well as a collection of smaller "attenuation-only" ponds that are placed along the project to provide peak flow attenuation. The regional pond would meet water quality requirements through compensatory treatment of offsite flows that pass through the M-1 Canal as it crosses the project corridor. The regional pond alternative exhibits an area of 14.4 acres at the top of the staging volume. This surface area exceeds floodplain compensation requirements.

The stormwater collection systems along Ellis Road are expected to provide the necessary drainage capabilities to convey stormwater along the corridor. These systems together with the proposed realignment to L-15 and M-1 Canals should eliminate the possibility of increased flooding due to the proposed widening of the roadway. The regional pond treatment alternative includes adequate floodplain compensation storage within the regional stormwater management facility.

The proposed drainage improvements will perform hydraulically in a manner equal to or greater than the existing system, and backwater surface elevations are not expected to increase. As a result, there will be no significant adverse impacts on natural and beneficial floodplain values. There will be no significant change in flood risk, and there will not be a significant change in the potential for interruption or termination of emergency service or emergency evacuation routes. Therefore, it has been determined that this encroachment is not significant.

Figure 6.3.2 shows the available sources of floodplain compensation provided under the regional alternative.



FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W
EXISTING L/A
EXISTING EASEMENT
PROPERTY LINE
PROPOSED R/W
PROPOSED L/A
SIDEWALK
GRASSED AREA
CONCRETE MEDIAN
CANAL
RETAINING WALL

PREFERRED ALTERNATIVE
100-YEAR FLOODPLAIN
& PROPOSED COMPENSATION

FIGURE NO.
6.3.2

6.3.5 Coastal Zone Consistency

In its response to the Advance Notification, the State of Florida determined that the proposed project is consistent with the Florida Coastal Zone Management Plan.

6.3.6 Wildlife and Habitat

The project was evaluated for potential impacts to threatened and endangered plant and animal species in accordance with 50 CFR 402.12, Section 7(c) of the Endangered Species Act of 1973 as amended by Rules 39-25.002, 39-27.002 and 39-27.011 of the Wildlife Code of the State of Florida (Chapter 39, FAC) and Part 2, Chapter 27 of the FDOT PD&E Manual.

State-listed species having the potential to occur with the Preferred Alternative include the American alligator, burrowing owl, southeastern American kestrel, Florida sandhill crane, listed wading birds (limpkin, little blue heron, snowy egret, tricolored heron and white ibis), gopher tortoises and associated commensals (gopher frog, Florida pine snake, and Florida mouse), and Sherman's fox squirrel. These species and/or their habitats will not likely be adversely affected by the construction of the Ellis Road improvements, because of the quality of the habitat present and with the implementation of recommended protection and mitigation measures.

If gopher tortoise burrows are found, all practicable design measures will be employed to avoid impacts to the burrows. For burrows which cannot be avoided, a permit will be obtained from FFWCC for relocation of gopher tortoises and commensals, and relocation will be performed at a time as close as practicable to the start of construction activities at the site of the burrows. As a result of the previously described actions, the proposed project is not anticipated to adversely affect the gopher tortoise.

Federally-listed species having the potential to occur within Preferred Alternative include the Everglade snail kite, eastern indigo snake, Florida scrub-jay, Audubon's created caracara, red-cockaded woodpecker and wood stork. In the January 2013 edition of the WEBAR, FDOT determined that the Preferred Alternative "may affect, but is not likely to adversely affect" (MANLAA) any federally-listed species. Refer to the WEBAR for a detailed assessment of listed species potentially occurring within the project area and possible impacts from the project. The U.S. Fish and Wildlife Service Standard Protection Measures for the Eastern Indigo Snake (included in Appendix N), which specify education of the construction contractor concerning avoidance of eastern indigo snakes and post-construction reporting, will be implemented during construction and are referenced in the project commitments.

In February 2013, the WEBAR was submitted to the USFWS along with a letter requesting their concurrence that this project may affect, but is not likely to adversely affect any federally listed species. In May 2013, USFWS responded stating that without surveys for listed species being completed, they could not concur with that determination. In response to the USFWS comments, in October 2013 FDOT commissioned a Florida scrub-jay survey to be completed and a single Florida scrub-jay was observed with potential Pond Site 4A. In December 2013, FDOT submitted the survey results to USFWS with request of a MANLAA concurrence for this species. Additionally, further coordination regarding the Florida scrub-jay and Audubon's crested caracara occurred with USFWS in January 2014. As a result of this coordination and coordination with FHWA regarding commitments to survey for these species during a future project phase, FDOT submitted a letter in January 2014 to USFWS requesting a MANLAA determination for all federally-listed species. In February 2014, USFWS responded to FDOT request stating that without additional information and surveys, they still could not concur with a MANLAA determination. They did, however, determine that there would be "no effect" on the Everglade snail kite. A copy of the USFWS response letter, dated February 25, 2014, is included in Appendix C of the WEBAR and in Appendix I of this report.

To satisfy this request, FDOT commissioned an Audubon crested caracara survey, a Florida scrub-jay survey, and an assessment for impacts to the eastern indigo snake for the project area. The Audubon's crested caracara survey was performed between January 2015 and April 2015. In March 2015, a habitat assessment and gopher tortoise survey were conducted to assist in determining the effects of the project on the Eastern indigo snake. Also in March 2015, FDOT requested that a second Florida scrub-jay survey be conducted to evaluate the area for any potential impacts to this species. The results of the surveys completed for these species, along with the request for concurrence with these determinations, were submitted to USFWS on May 27, 2015. USFWS has responded with their concurrence with these determinations in a letter dated July 29, 2015 (see Appendix I).

A search of the USFWS's database indicates no wood stork rookeries within the project corridor with the nearest nest site being located approximately 3.75 miles to the west near Lake Washington. However, the project is located within the CFA of six rookeries. Marginal foraging and nesting habitat exists at the project corridor. A lone wood stork was observed foraging in a ditch adjacent to Ellis Road in the central part of the project corridor. No nests were observed during the site surveys. The U.S. Fish and Wildlife Service *Wood Stork Effect Determination Key* was utilized to assess the impact of the project on the wood stork or its habitat. The ditches, shallow littoral zones of the ponds and the marshes of the project currently provide suitable foraging habitat for the species. All of these habitat types will remain after construction, but unavoidable wetland and surface water impacts in excess of one half acre will occur within multiple CFAs as a result of the proposed construction. Additionally, the appropriate compensatory mitigation will be provided for all unavoidable wetland impacts within a USFWS-approved mitigation bank. As a result of the previously described actions, a finding of "may affect, not likely to adversely affect" is appropriate for the wood stork. FDOT requested concurrence with this determination in a letter to USFWS dated October 1, 2015. FDOT received concurrence with this determination in a letter from USFWS dated October 9, 2015. (see Appendix C, Agency Coordination).

No suitable nesting or foraging habitat is present for the red-cockaded woodpecker (RCW) within the project corridor. The USFWS Red-cockaded Woodpecker South Florida Survey Protocol (USFWS 2003) states that "if no suitable foraging habitat is present within the project area (that is, no pines 60 years or older will be impacted), then further evaluation is unnecessary and the red-cockaded woodpecker can be presumed absent." Additionally, the USFWS ETAT reviewer did not identify this species as a species of concern in regards to this project. No RCWs were observed at the project corridor or on adjacent properties during the 2010 and 2011 surveys. No occurrences of the RCWs along the project corridor were found in the FNAI database. The closest documented occurrence of this species is approximately 5 miles north of the project corridor. The species is not expected to utilize the project corridor. Due to the lack of appropriate habitat, no documented occurrences, and direction provided in the survey protocol, this project was deemed to have a "no effect" determination for the red-cockaded woodpecker.

Although the bald eagle is no longer protected under state or federal threatened and endangered species regulations, they are protected under two other major federal laws: the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Protection zones with associated development restrictions are still maintained around active nests. A search of the FFWCC's Eagles Nest Locator database (2014) indicated that two bald eagle's nests are located within one mile of the project area. One is located approximately 0.8 miles to the southeast (ID BE058) and one located approximately one mile to the northeast (ID BE053) of the eastern terminus of the project area. In January 2015, an active bald eagle's nest was observed approximately 2,000 feet northwest of the western portion of the Preferred Alternative. The observed nest has not been identified by FFWCC as of 2014. As the project occurs farther than the 660 foot nest buffer of any of the nest sites, this project has been determined to have no adverse effects for this species.

Table 6.3.2 summarizes the likelihood of occurrence for listed species within the Ellis Road project limits.

Table 6.3.2: Likelihood of Occurrence of Listed Species Within the Ellis Road Project Limits

Scientific Name	Common Name	Status		Habitat Preference	Likelihood of Occurrence
		Federal	State		
Reptiles and Amphibians					
Alligator mississippiensis	American alligator	T (S/A)	FT (S/A)	Rivers, wetlands and open water bodies	Individual observed in existing pond adjacent to Pond Site 1A
Drymarchon corais couperi	eastern Indigo snake	T	FT	Mesic areas, xeric pinelands and scrub; typically winter in gopher tortoise burrows	Low
Gopherus polyphemus	gopher tortoise	C	T	Longleaf pine-xeric oak, sand pine scrub, hammocks, dry prairie, pine flatwoods and disturbed habitats	Individual observed at Pond Site 4A
Lithobates capito	gopher frog	-	SSC	Coastal xeric habitats and Lake Wales Ridge	Low
Pituophis melanoleucus mugitus	Florida pine snake	-	SSC	Longleaf pine-xeric oak, sand pine scrub, pine flatwoods and old field habitats	Low
Birds					
Aphelocoma coerulescens	Florida scrub-jay	T	FT	Oak scrub; low growing oaks with patches of bare sand; scrubby flatwoods	Individual observed at Pond Site 4A
Aramus guarauna	limpkin	-	SSC	Mangroves, freshwater marshes, swamps, springs and spring runs, and pond and river margins	High
Athene cunicularia	burrowing owl	-	SSC	Well-drained, open habitats with short herbaceous groundcover	Low

Table 6.3.2: Likelihood of Occurrence of Listed Species Within the Ellis Road Project Limits

Scientific Name	Common Name	Status		Habitat Preference	Likelihood of Occurrence
		Federal	State		
Egretta caerulea	little blue heron	-	SSC	Freshwater, brackish and saltwater wetlands	High
Egretta thula	snowy egret	-	SSC	Permanently and seasonally flooded wetlands, streams, lakes, swamps, and manmade impoundments and ditches	High
Egretta tricolor	tri-colored heron	-	SSC	Prefers coastal environments; permanently and seasonally flooded wetlands, tidal creeks, ditches and edges of ponds and lakes	High
Eudocimus albus	white ibis	-	SSC	Freshwater and brackish marshes, salt flats and salt marsh meadows, forested wetlands, wet prairies, swales, seasonally inundated fields, and manmade ditches	High
Falco sparverius paulus	southeastern American kestrel	-	T	Open pine habitats, sandhill, woodland edges, prairies, pastures	Low
Grus canadensis pratensis	Florida sandhill crane	-	T	Prairies, freshwater marshes, and pasturelands	Observed flying over proposed I-95/Ellis Road interchange site
Haliaeetus leucocephalus	bald eagle*	-	-	Areas close to coastal areas, bays, rivers, lakes, or other bodies of water that provide concentrations of food	Closest known nest greater than 2000 ft from the project site

Table 6.3.2: Likelihood of Occurrence of Listed Species Within the Ellis Road Project Limits

Scientific Name	Common Name	Status		Habitat Preference	Likelihood of Occurrence
		Federal	State		
				sources	
Mycteria americana	wood stork	T	FT	Inundated forested wetlands, freshwater marshes, swamps, lagoons, ponds, tidal creeks, and flooded pastures and ditches	Individual observed foraging in roadside ditch
Picoides borealis	red-cockaded woodpecker	E	FE	Open mature pine woodlands, forages in forested habitat types that include pines of various ages	Low
Polyborus plancus audubonii	Audubon's crested caracara	T	FT	Dry prairie and pasturelands with cabbage palm	Observed along the western terminus of the project area
Rostrhamus sociabilis plumbeus	Everglade snail kite	E	FE	Freshwater marshes interspersed with open water areas	Low
Sterna antillarum	least tern	-	T	Sandy upper beach, spoil islands; tidal mud flats	Low
Mammals					
Podomys floridanus	Florida mouse	-	SSC	Xeric upland communities with sandy soils; scrub, sandhill, and ruderal sites	Low
Sciurus niger shermani	Sherman's fox squirrel	-	SSC	Sandhills, pine flatwoods, and pastures	Low

Legend
C= Candidate for listing; E = Endangered; FE = Federally-designated Endangered; T = Threatened; FT = Federally-designated Threatened; SSC = Species of Special Concern; FT (S/A) = Federally-designated Threatened species due to similarity of appearance; T (S/A) = Threatened/Similarity of Appearance; * Protected by Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act.

6.4 Noise Impacts

6.4.1 Noise

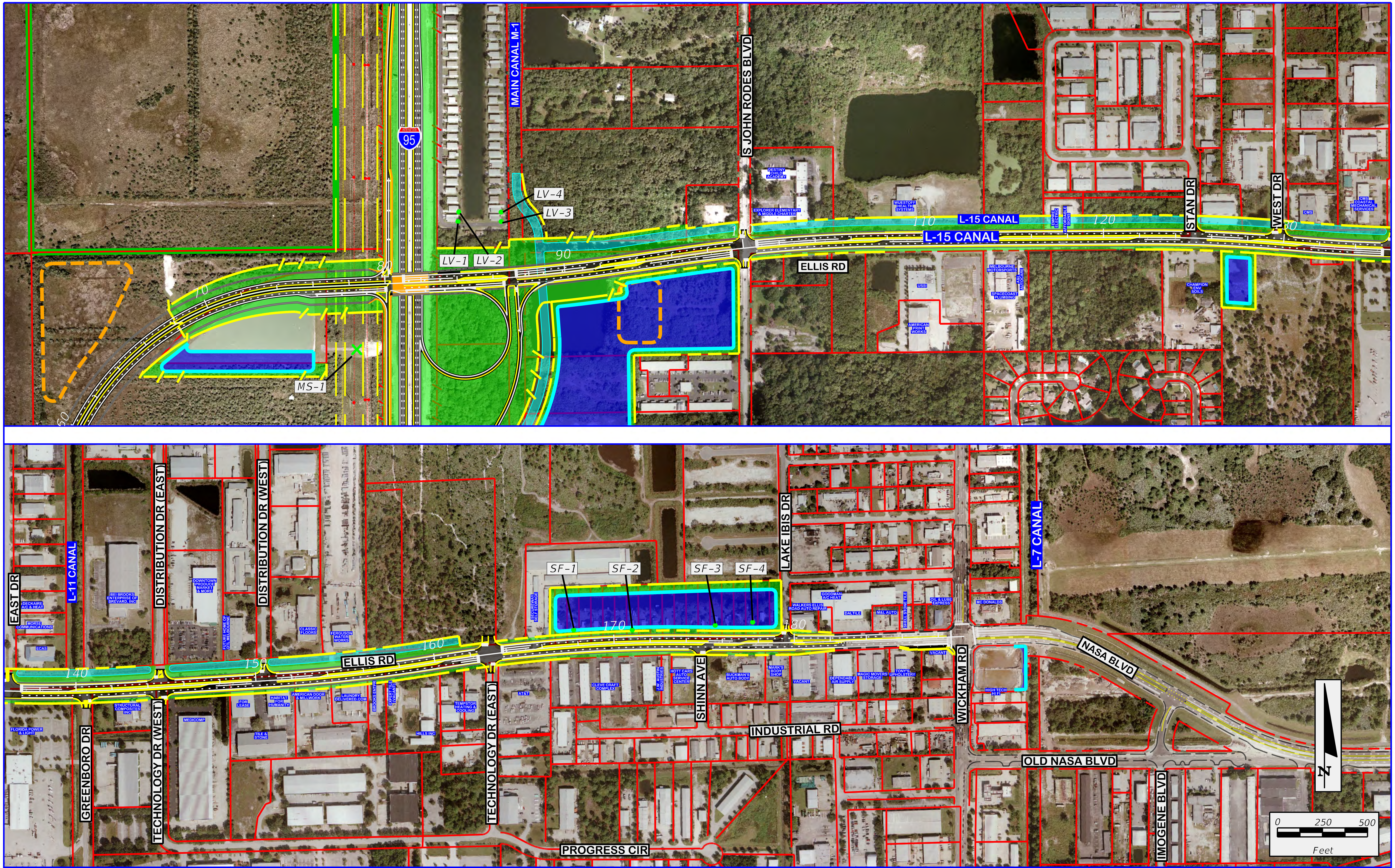
In accordance with the *Title 23 Code of Federal Regulations Part 772,* "Procedures for Abatement of Highway Traffic Noise and Construction Noise", and the procedures outlined in the *FDOT PD&E Manual (Part 2, Chapter 17)*, a study was conducted to assess the potential noise impacts associated with the proposed project. A separate Noise Study Report, which contains the detailed methodology and results of the study, has been prepared.

Eight noise sensitive receptor sites were identified – four residences located at the southern end of Lamplighter Village (LV-1 through LV-4) and four sites along the north side of Ellis Road just west of Lake Ibis Drive (SF-1 through SF-4). These eight sites represent 22 residences potentially affected by design year traffic noise from the proposed improvements. With the Preferred Alternative, design year traffic noise levels will approach or exceed the noise abatement criteria at three noise sensitive receptor sites representing 13 single family residences. These three sites are located within the residential properties just west of Lake Ibis Drive. A noteworthy point is that these residences are proposed to be relocated due to the right-of-way requirements of the roadway and Pond 4B.

Design year traffic noise levels for the other five representative receptor sites do not approach or exceed the noise abatement criteria nor does a substantial increase in noise levels [i.e., 15 dB(A)] occur. An existing 22-foot-tall ground-mounted noise barrier on the east side of I-95 in the vicinity of Lamplighter Village helps to minimize the potential for traffic noise impacts to this community. Because no noise sensitive sites within these areas are impacted by the proposed project, consideration of noise abatement measures is not warranted at these locations.

The initial feasibility assessment of site conditions indicates that construction of a long continuous barrier is not possible at the three impacted noise sensitive receptor sites due to access driveways. Access driveways to each of these residences must be maintained. Therefore, site conditions prevent the construction of a long continuous barrier at this location. Noise barriers reduce noise by blocking the sound path between a roadway and a noise sensitive area. To be effective, noise barriers must be long, continuous (i.e., with no intermittent openings), and have sufficient height to block the path between the noise source and the receptor site. FHWA's Analysis and Abatement Guidance (January 2011) indicates the ends of the noise barriers should, in general, extend in each direction four times as far as the distance from the receptor site to the barrier. Since noise barriers would not be able to block the sound path between Ellis Road and these residences, they were not considered feasible as a noise abatement measure and were eliminated from further consideration at this location.

Figure 6.4.1 displays the eight noise sensitive receptor sites in relation to the Preferred Alternative.



FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

●	RECEPTOR SITE LOCATION	EXISTING R/W	EXISTING EASEMENT
✕	MONITORING SITE LOCATION	EXISTING L/A	PROPERTY LINE

NOISE ANALYSIS
LOCATION MAP

FIGURE NO.
6.4.1

6.4.2 Air Quality

An Air Quality Technical Memorandum was prepared to determine whether project-related motor vehicle emissions would cause or contribute to an exceedance of the National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO). FDOT's Air Quality Screening Model (CO Florida 2004, released September 7, 2004) was used to evaluate the No Build and Build Alternatives. The CO Florida 2004 Model makes conservative worst-case assumptions about the project involving meteorology, traffic, and site conditions and provides an estimate of the 1-hour and 8-hour CO concentrations at a particular location.

The No Build and Build Alternatives were evaluated to determine which portion of the study area would have the highest CO concentrations. Based on the evaluation of traffic data and the proximity of the right of way line, the worst-case location is expected to occur at the intersection of Wickham Road and Ellis Road. FDOT's Air Quality Screening Model was used to predict future CO concentrations at the representative worst-case sites for the No Build and Build Alternatives. The results of the analysis indicated that the worst-case 1-hour and 8-hour CO concentrations are not predicted to exceed the NAAQS for CO. Therefore, the project passes FDOT's screening test and further air quality analysis is not required. In addition, the project will not have a significant adverse impact on air quality.

The project is located in an area which is designated attainment for all of the National Ambient Air Quality Standards under the criteria provided in the Clean Air Act. Therefore, the Clean Air Act conformity requirements do not apply to the project.

6.4.3 Construction

Construction activities for the Preferred Alternative will have air, noise, vibration, water quality, traffic flow, and visual impacts for those residents and travelers within the immediate vicinity of the project. The air quality impact will be temporary and will primarily be in the form of emissions from diesel-powered construction equipment and dust from embankment and haul road areas. Air pollution associated with the creation of airborne particles will be effectively controlled through the use of watering or the application of other controlled materials in accordance with FDOT's *Standard Specifications for Road and Bridge Construction* as directed by the FDOT Project Engineer.

Noise and vibrations impacts will be from the heavy equipment movement and construction activities such as pile driving and vibratory compaction of embankments. Noise control measures will include those contained in FDOT's *Standard Specifications for Road and Bridge Construction*. Adherence to local construction noise and/or construction vibration ordinances by the contractor will also be required where applicable.

Water quality impacts resulting from erosion and sedimentation will be controlled in accordance with FDOT's *Standard Specifications for Road and Bridge Construction* and through the use of Best Management Practices.

Maintenance of traffic and sequence of construction will be planned and scheduled so as to minimize traffic delays throughout the project. Temporary closure of sideroads is anticipated. Signs will be used as appropriate to provide notice of road closures and other pertinent information to the traveling public. The local news media will be notified in advance of road closings and other construction-related activities which could excessively inconvenience the community so that motorists, residents, and business persons can plan travel routes in advance. A sign providing the name, address, and telephone of a Department contact person will be displayed on-site to assist the public in obtaining immediate answers to questions and logging complaints about project activity.

Access to all businesses and residences will be maintained to the extent practical through controlled construction scheduling.

Traffic delays will be controlled to the extent possible where many construction operations are in progress at the same time. The contractor will be required to maintain two lanes of traffic in each direction on Ellis Road at all times and to comply with the Best Management Practices of FDOT. The existing 18 residences are being displaced as part of the Preferred Alternative, so any complaints from visually displeasing elements such as the materials stored for the project, are not anticipated to be significant. However, any negative aesthetics due to the project construction are a temporary condition and should pose no substantial problem in the short term.

Construction of the roadway and bridges requires excavation of unsuitable material (muck), placement of embankments, and use of materials, such as limerock, asphaltic concrete, and Portland cement concrete. Demucking is anticipated at most of the wetland sites and will be controlled by Section 120 of the FDOT Standard Specifications. Disposal will be on-site in detention areas or offsite. The removal of structures and debris will be in accordance with local and State regulation agencies permitting this operation. The contractor is responsible for his methods of controlling pollution on haul roads, in borrow pits, other materials pits, and areas used for disposal of waste materials from the project. Temporary erosion control features as specified in the FDOT's Standard Specifications, Section 104, will consist of temporary grassing, sodding, mulching, sandbagging, slope drains, sediment basins, sediment checks, artificial coverings, and berms.

6.4.4 Contamination

A Contamination Screening Evaluation Report (CSER) was prepared in May, 2011 in accordance with the FDOT's PD&E Manual, Part 2, Chapter 22. This effort included data collection from the FDEP, the USEPA and local government agencies to identify any known or potential contamination sites within the study area. Historic aerial photographs and an updated site reconnaissance were used to provide additional information and confirm the previous findings.

A total of 55 potential contaminated facilities were identified by file research and field reconnaissance along the roadway corridor. Out of the 55 potentially contaminated sites identified within or adjacent to the project vicinity, one was assigned a high risk assessment, four were assigned a medium risk assessment, 38 were assigned a low risk assessment and 12 were considered to have no risk of contamination.

For sites rated high, the CSER recommends that Level 2 Environmental Assessment be completed prior to construction. Some of the tasks would include site visits, interviews with the property owners, historical record research, and collecting water / soil samples for laboratory testing. Laboratory analysis is necessary to determine the presence and / or levels of contaminants at and in the vicinity of the site.

For sites ranked medium or low, the CSER recommends that the report be updated for those sites if construction will occur more than one year from the date of the CSER. Another review of public record and other pertinent data should be performed to obtain the latest information concerning assessment or remediation activities at these sites. The public record review and the roadway design plans should be evaluated to determine if additional assessment is warranted due to significant changes in status since this report was prepared. Recommendations for future activities would be made based on the results of the additional data reviews.

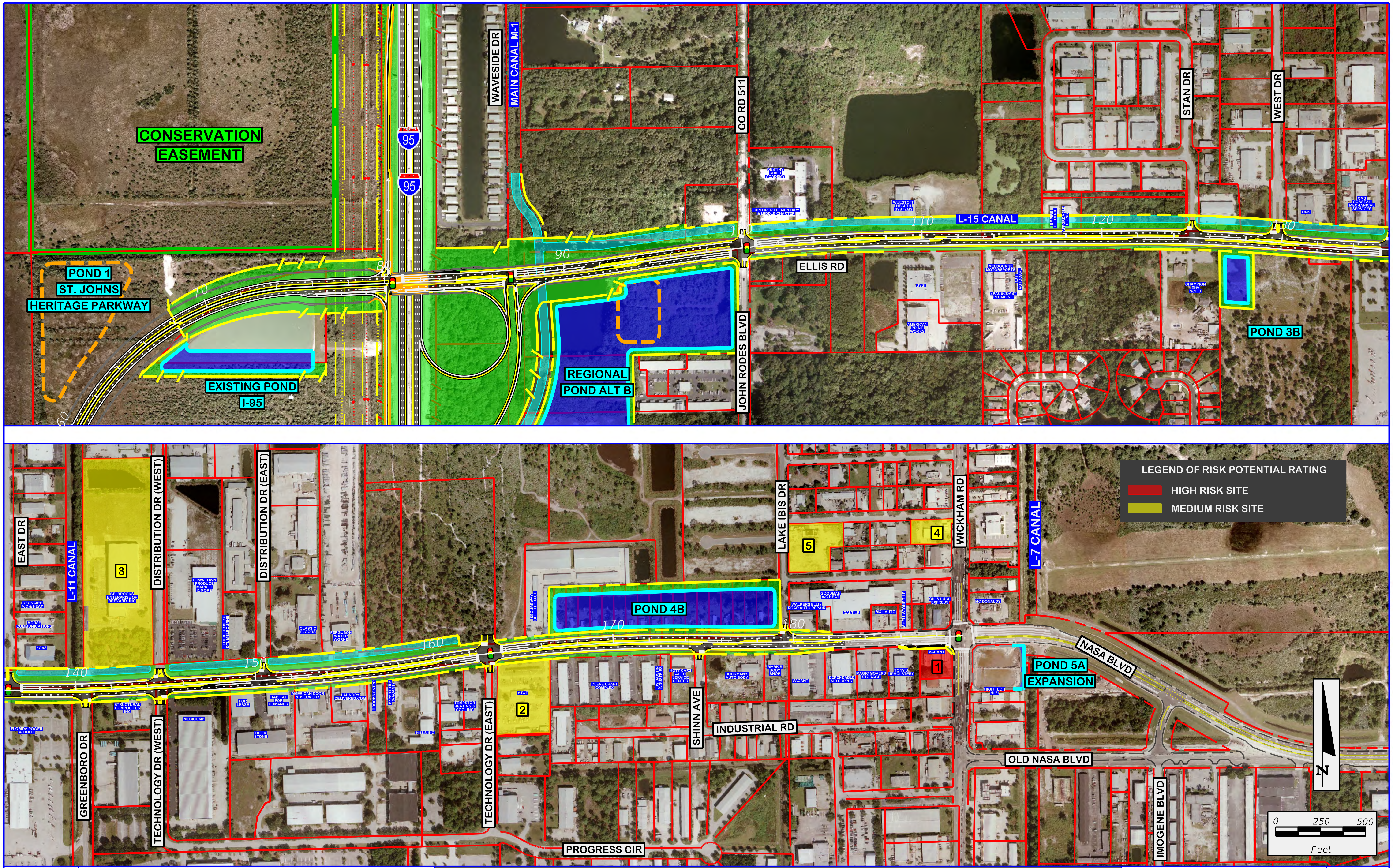
For all sites assigned a no-risk rating, the CSER further recommends that these sites be revisited prior to the roadway construction to determine if higher quantities or new types, if any, of hazardous material have been introduced to them or if recent incidents, such as a change in type business, may indicate a higher potential for encountering contamination.

This proposed project contains no known significant contamination.

Table 6.4.1 summarizes the five sites from the CSER rated high and medium, while Figure 6.4.2 shows them in relation to the Preferred Alternative. Additional information on these sites and the other 50 sites identified as low or no risk can be found in the CSER.

Table 6.4.1: Potential Contamination Sites

Site No.	Facility Name	Address	Distance	Potential Contam-inants	Facil-ity Type	Facility Status	Cleanup Efforts	Contam-ination Risk Potential Rating
1	Sunrise Food Mart #43	450 S. Wickham Rd., West Melbourne, FL 32904	50	Petroleum	Retail Station	Closes	Ongoing, pending petroleum cleanup	High
2	Southern Bell 33053	7747 Ellis Rd., Melbourne, FL 32904	220	Petroleum	Fuel user / non-retail	Closed	Completed as of 10/02/2010	Medium
3	Rayco Enterprises, Inc.	8000 Ellis Rd., Melbourne, FL 32904	50	No record	Agri-cultural	Closes	Completed as of 09/21/2008	Medium
4	Sam Discount Beverage	370 S. Wickham Rd., Melbourne, FL 32904	550	Petroleum	Retail Station	Open	Completed as of 02/03/2002	Medium
5	Auto Salvage Unlimited	7629 Coral Dr., West Melbourne, FL 32904	470	Petroleum, motor oil, ethylene glycol, ethyl-benzene, total xylene, 1-methyl-naphthalene, naphthalene, arsenic	Hazar-dous Waste	Conditionally, exempt small quantity generator-non-notifier as of 12/12/2001	Completed as of 10/15/2004	Medium



FDOT

I-95 AT ELLIS ROAD
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

EXISTING R/W
EXISTING L/A
EXISTING EASEMENT
PROPERTY LINE
PROPOSED R/W
PROPOSED L/A
SIDEWALK
GRASSED AREA
CONCRETE MEDIAN
CANAL
RETAINING WALL

PREFERRED ALTERNATIVE WITH HIGH & MEDIUM CONTAMINATION SITES

FIGURE NO.
6.4.2

6.5 Supporting Environmental Document List

The following documents were prepared for this PD&E Study and are available under separate cover:

- Project Development Summary Report (September, 2012);
- Wetland Evaluation and Biological Assessment Report (January, 2013);
- Pond Siting Report (January, 2013);
- Location Hydraulic Report (January, 2013);
- Cultural Resource Assessment Survey (August, 2012);
- Contamination Screening Evaluation Report (May, 2011);
- Air Quality Technical Memorandum (September, 2012);
- Noise Study Report (September, 2012); and,
- Conceptual Stage Relocation Plan (October, 2012).

Other supporting information including the Safety Analysis, Access Management Report, Long Range Estimate, and Utility Assessment Report can be found in the appendices of this report.

7.0 Summary of Permitting and Mitigation

Preliminary coordination with the relevant regulatory agencies, including USACE, USFWS, NMFS, USEPA, SJRWMD, FFWCC and FDEP was accomplished through the Environmental Screening Tool (EST) component of the Efficient Transportation Decision Making (ETDM) Process. In general, the comments received consisted of statements regarding the need for wetland delineation and functional value assessment, the need to acquire the appropriate permits, the need for avoidance and minimization of wetlands impacts and for the compensatory mitigation of unavoidable impacts, and the need for maintenance of existing water quality. The comments received assigned the degree of impact to wetlands ranging from minimal to moderate.

Copies of the ETDM agency comments are included in the ETDM Summary Report contained within Appendix J. Coordination with the permitting agencies will continue throughout the PD&E Study phase, the final design and permitting phases, and the construction phase of the project.

The following permits are anticipated for construction of this project:

- Environmental Resource Permit (ERP) – SJRWMD;
- Dredge and Fill Permit – USACE; and,
- National Pollutant Discharge Elimination System Permit (NPDES) – FDEP (USEPA).

8.0 Summary of Public Involvement

Public involvement for the project has been accomplished in a variety of methods targeted to secure the greatest degree of community involvement. These methods have included the following:

- Special interest group presentations;
- Web site (www.ellisroadpde.com);
- Direct mailings to all of the business establishments in the project vicinity;
- Meetings with the Melbourne International Airport;
- Several presentations were made to the Space Coast Transportation Planning Organization (TPO) board and its two committees – the Citizens Advisory Committee (CAC) and the Technical Advisory Committee (TAC);
- Meetings with Brevard County staff;
- Community meeting with Lamplighter Village (March 24, 2011);
- Alternatives Public Meeting (March 29, 2012);
- Public Hearing (October 25, 2012)

A list of meetings that were held for the Ellis Road PD&E Study can be found in Table 8.1.1:

Table 8.1.1: Summary of Public Involvement Meetings

Meeting	Date
Initial Kick-Off Meetings	
TAC / CAC	October, 11, 2010
TPO Board	October, 14, 2010
Melbourne International Airport	March 24, 2011
Lamplighter Village	March 24, 2011
TAC / CAC - Update	April 11, 2011
TPO Board - Update	April 14, 2011
Meetings Related to Public Alternative Meeting	
TAC / CAC	March 5, 2012
Brevard County Board of County Commissioners	March 20, 2012
TPO Board	March 8, 2012
Alternatives Public Meeting	March 29, 2012
Meetings Related to Public Hearing	
TAC / CAC	October 8, 2012
TPO Board	October 11, 2012

8.1 Summary of Comments from Agency Meetings

Comments received from the various agency meetings were generally supportive of the project. The comments can be summarized by the following topics:

- Project Schedule – interest in the overall project schedule and being prepared to receive future federal funding in a timely fashion;
- Business Impacts – reducing the right-of-way width to minimize impacts to businesses along the project corridor;
- L-15 Canal – Examining alternative treatments for accommodating the L-15 Canal; comments included questions regarding the use of FDOT canal protection criteria and its affect on right-of-way width. The consensus is to examine alternative canal options in the next phase of this project.

8.2 Community Meeting – Lamplighter Village

The project team was invited to present the project to residents of Lamplighter Village on March 24, 2012. The meeting was advertised by the Lamplighter Village management in the community newsletter. A slide show was presented, and the following display boards were available for viewing:

- Ellis Road / I-95 Interchange – Alternative 1 Alignment;
- Ellis Road / I-95 Interchange – Alternative 2 Alignment;
- SIS High Speed Urban (50 mph) - Hold Left, Hold Right, Best Fit;
- Standard Urban (45 mph) – Hold Left, Hold Right, Best Fit.

Approximately 44 individuals from the community attended the meeting. Comments focused on the following:

- Noise impacts from the proposed Ellis Road extension;
- Impacts regarding aesthetics and air pollution;
- Inclusion of visual screen in vicinity of Lamplighter Village, particularly if Alternative 1 is selected.
- Loss of privacy from vehicles traversing Ellis Road;
- Concern regarding the future roadway drainage plan and its impact on Lamplighter Village, which experienced significant flooding in 2005;
- Construction costs;
- Time frame until construction;
- Resulting changes to the County zoning plan;
- Impacts to property values.

Attendees were encouraged to submit additional questions and comments via the project website. Both the representative from the management company and the owner of Lamplighter Village indicated their preference for alignment Alternative 2 through the interchange area.

8.3 Alternatives Public Meeting

The Alternatives Public Meeting was held on Thursday, March 29, 2012 at the Veterans Memorial Complex in West Melbourne. The meeting was held between 5 and 7 PM and featured a continuously running slide show in the city council chambers and a display board arrangement in the large meeting room across the entryway. Approximately 90 individuals from the community attended the meeting. The following display boards were available for public viewing:

- Ellis Road / I-95 Interchange – Alternative 1 Alignment
- Ellis Road / I-95 Interchange – Alternative 2 Alignment
- SIS High Speed Urban (50 mph) - (Hold Left, Hold Right, Best Fit)
- Standard Urban (45 mph) – Hold Left, Hold Right, Best Fit)
- SIS High Speed Urban vs. Standard Urban Hold North Right-of-Way Comparison
- Ellis Road Retention Ponds
- Typical Sections
- Access Management

The display boards and slide show were placed on the project website for public viewing and comment after the Alternatives Public Meeting.

Twelve comment sheets were completed and submitted in the comment box or sent via mail. A letter and an e-mail were also received, bringing the total number of written comments to 14. Two of the comment forms did not include a return address. All other comments were responded to by the District by letter or e-mail. A total of ten letters were mailed to the individuals responding on the comment forms. The public comments focused on the following topics:

- Lack of a proposed full median opening on Distribution Drive (West) near Downtown Produce;
- Access to and from Downtown Produce by delivery trucks;
- Drainage and potential flooding during major storm events;
- Future viability of the Melbourne Airport;
- Impacts to and potential displacement of residences along north side of Ellis Road west of Lake Ibis Drive;

- Positive comment regarding the project and the number of jobs it will create or preserve;
- Concern regarding semi truck access to business and sideroads; ability to make a right turn followed by a U-turn where full median openings are not provided;
- Access to businesses during construction;
- Why make Ellis Road better than NASA Boulevard; preference for Best Fit 45 mph;

Comments from the Alternatives Public Meeting were considered in the selection of the Preferred Alternative.

8.4 Public Hearing

A public hearing was held on Thursday, October 25, 2012 at the Calvary Chapel Melbourne, 2955 Minton Road, West Melbourne. The public hearing began with an open house at 5 p.m. and ended at 7 p.m. A formal presentation was provided at 6 p.m. Members of the project team and FDOT were available to explain the project and answer questions. Prior to the public hearing and during the 10-day comment period following the hearing, project documents were available for public review on the project website (www.ellisroadpde.com) and at the West Melbourne Public Library, 2755 Wingate Boulevard, West Melbourne. Figure 8.4.1 displays the map that was included in the public hearing notices and advertisements.

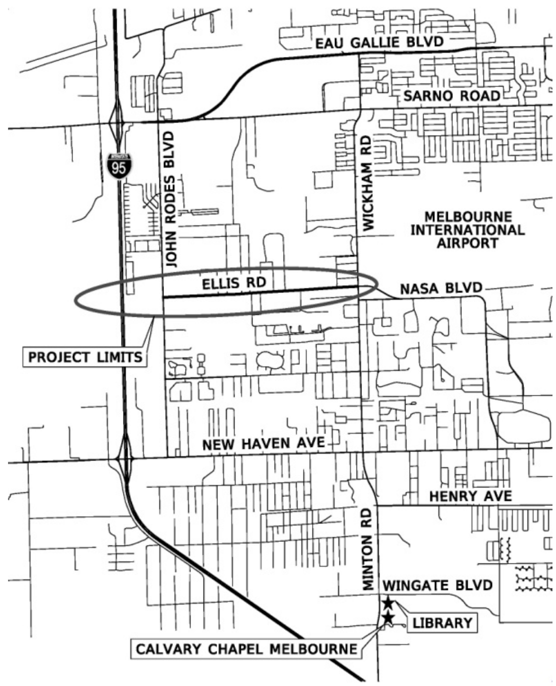


Figure 8.4.1: Public Hearing Map

The public hearing was advertised in the *Florida Today* newspaper on Thursday, October 11, 2012 and again on Thursday, October 18, 2012. The project was also advertised in the *Florida Administrative Weekly* on Friday, October 12, 2012. Public hearing notices were mailed to property owners and tenants within 300 feet of the project as well as elected and appointed officials.

Not including personnel involved with the project, 40 individuals signed the sign-in sheet. Sixteen written comments were received during the public hearing and the following 10-day comment period. Two comments provided orally and are included in the public hearing transcript, which is included as Appendix K. The written and verbal comments are summarized as follows:

Favor "Hold South" Alternatives With All Impacts on North Side

Four of the 16 written comments favor an alternative that holds the south right-of-way line, thereby placing all of the right-of-way impacts on the north side of Ellis Road. One of the five comments was from Mayor Hal Rose representing the City of West Melbourne. None of the four comments recommended a particular typical section. One of the two comments received via verbal testimony during the formal presentation portion of the public hearing also favored placing impacts on the north side. Representing the City of West Melbourne, Scott Morgan, the City Manager, indicated West Melbourne's support for an alternative that holds the south right-of-way line.

Favor Reducing Right-of-Way Impacts on North Side

Four of the 16 written comments favor utilizing a drainage system that reduces right-of-way needed on the north side of Ellis Road and involves acquiring vacant property on the opposite (south) side of the roadway. Alternate canal treatments are discussed in Chapter 4 and will be examined in more detail in the next phase of this study.

One comment received via verbal testimony expresses concern regarding the proposed north-side right-of-way impacting two commercial businesses. Specifically, the person is distressed that one of the commercial buildings impacted was thought to have been constructed with sufficient setback when approved by the City of Melbourne. The property in question is the commercial tract featuring Empire Electric and Affordable Signs, located just west of Stan Drive. The property owner requests an alternative that is centered along existing Ellis Road, thereby impacting each side of the road equally. Comments were expressed regarding displeasure with a restrictive median and the resulting U-turn movements, particularly for tractor-trailers.

A similar written comment received from a property owner expresses displeasure with the proposed north-side right-of-way line and resulting impacts to commercial properties. Specifically, the property owner is requesting a modification to the alignment of the Preferred Alternative to reduce north-side right-of-way impacts in this vicinity. The property in question is a currently vacant lot that is proposed for a development featuring a storage complex, which will provide supplemental retirement income to the property owner.

Favor Lighting and Signage at Interchange

Four of the sixteen written comments requested interstate signage with references to St. Johns Heritage Parkway. One of these comments also mentions lighted ramp intersections.

Favor Full Median Opening and Traffic Signal at Distribution Drive

Two of the 16 written comments expressed concern regarding the installation of a restrictive median at the Ellis Road / Distribution Drive intersection. The first comment mentions a high volume of traffic at the Downtown Produce market and displeasure with the proposed right-in / right-out movement for patrons of this site. The second comment is from the developer of the Distribution Drive area and expresses concern regarding the lack of a full median opening at this location and the effect on the future viability of the development. Both comments request a full median opening with traffic signal at Distribution Drive.

For / Against Project

One written comment indicates full support for the overall project, while another written comment notes that the project is a bad idea and will cause more traffic congestion onto Wickham Road. Table 8.4.1 summarizes the public hearing comments.

Table 8.4.1 – Summary of Public Hearing Comment

I-95 / Ellis Road Interchange and Ellis Road from I-95 to Wickham road (CR 509) Project Development and Environment Study
Summary of October 25, 2012 Public Hearing Summary

Comment No.	Name	Comments	Issue	Impacts on North Side	Impacts on South Side	Impacts on Both Sides	Lighting and Signage	Full MO or Signal at Distributio n	Against Project	In Favor of Project	
			Total	5	4	1	4	2	1	1	18
1	Rose	The City of West Melbourne hosted your March 29, 2012 public meeting on the alternatives for Ellis Road and the I-95 interchange in our City Council Chambers. As you know, approximately 70 percent of the parcels along the Ellis Road frontage are in the West Melbourne city limits. As such, we are aware that the City's recommendation as to the alternative to be selected carries much weight. As a result of your public meeting and our City Council meeting on June 5, 2012, we are sending you this letter supporting the "hold south" of either the SIS or "urban" alternative proposals for Ellis Road and the I-95 interchange. We believe the "hold south" is the best alternative because it requires the fewest number of whole and partial parcel acquisitions, because it minimizes utility relocations, and because it compels a cost effective solution to the stormwater challenges so as to further minimize property acquisitions.	Hold South	1							
2	Aker	I would like to request Brevard County and the DOT to reconsider a traffic signal at the West Distribution Drive and Ellis Road intersection. Downtown Produce has an average of over one thousand customers each day, and placing the light at East Drive, and the current requirements associated with it, would result in a traffic median at this intersection. A right in / right out traffic flow for West Distribution Drive would negatively impact not only Downtown Produce, but also other businesses in the Ellis Road area. The traffic we generate has helped other businesses in our area to develop larger customer bases and higher sales even in a sluggish economy. If the light were placed at West Drive instead of East Drive, there would be enough spacing to allow a signal at West Distribution also. This would also benefit businesses on Technology Drive.	Traffic signal at Distribution Drive					1			
3	Lutz	RE: Structural Composites building This building is east of the Medicomp structure. Dallas Lutz is the property owner. Dallas said "comment for me", so I am. "Hold the south property line." Parking is clipped with the Best Fit plan.	Hold South	1							
4	Ingram	Hold the south property line, please! The alledged best fit takes the front of Habitat for Humanity, 7815 Ellis, and Omicron Granite, 7835 Ellis Road, plus parking is lost in front of these buildings. The Best Fit takes water retention of the building to the west, 7845 Ellis Road, Medicomp.	Hold South	1							
5	Castronovo	Bad idea - too much traffic causing more congestion onto Wickham Road	Against project						1		
6	Anderson	My firm and partner hold equity in 7815 & 7835 Ellis Road and 7845 Ellis Road (referred to as Medicomp on the drawings). We are in support of the widening project only if the south right-of-way is held firm.	Hold South	1							
7	Holton	Please consider presenting appropriate signage on Interstate I-95, as well as exit ramps and lighted intersections referencing the "St. Johns Heritage Parkway".	Lighting & signage				1				
8	Ferrell	Signage on I-95, exit ramps, and intersection: At the new I-95 Ellis Road / NASA Boulevard interchange, please consider presenting appropriate signage on Interstate I-95, as well as exit ramps and lighted intersections referencing the "St. Johns Heritage Parkway".	Lighting & signage				1				
9	Davis	My name is Tom Davis. I am the developer of the Distribution Drive portion of the project. I own the eight of the buildings doing business on Distribution Drive. Our concern is the design showing a median through the intersection at the west intersection of Ellis and Distribution Drive, which inhibit ingress and egress. There is approximately 2,200 vehicles per day that uses that intersection. A traffic signal is a must at this location if the existing businesses are to succeed. This current design as shown will put this development out of business. Please redesign this concept to allow traffic flow in and out at this location for both directions.	No full median & no signal at Distribution Drive					1			
10	Baney	Excellent presentation. Questions I had were covered. Full speed ahead!! Thanks.	For Project							1	
11	Boyd	Please consider adding the words "St. Johns Heritage Parkway" to the signage for the new interchange.	Lighting & signage				1				
12	Greenoogh	It would be nice to have the "St. Johns Heritage Parkway" listed on the signs at the interchange.	Lighting & signage				1				
13	Altman	Please utilize a drainage system that reduces right-of-way needed on the north side of Ellis Road, thus reducing impacts to existing structures by acquiring vacant property on the opposite side of the road.	Reduce r/w on north side		1						
14	LaPete	Please utilize a drainage system that reduces right-of-way needed on the north side of Ellis Road, thus reducing impacts to existing structures by acquiring vacant property on the opposite side of the road.	Reduce r/w on north side		1						
15	Struck	Please utilize a drainage system that reduces right-of-way needed on the north side of Ellis Road, thus reducing impacts to existing structures by acquiring vacant property on the opposite side of the road.	Reduce r/w on north side		1						
16	O'Brien	I, Thomas E. O'Brien and Vera E. O'Brien own approximately 800 feet frontage on north side of Ellis Road starting from Affordable Sign co. and extending to the East to Stan Drive. We were planning to build a storage complex for our retirement. This would be impossible if "Preferred Alternative" plan is used. Four commercial businesses on North side Ellis will be destroyed. If the street was left straight instead of curving to North, it would only take "part of a parking lot" on South side. Curving the existing straight (road recently paved and new pipes for drainage) seems impractable cost-wise. Fewer landowners would be impacted. Thank you for your consideration.	Reduce r/w on north side		1						
Speaker Comments											
17	Vandiver	Shirley VanDiver. We own two properties on Ellis Road. Our home address is 2455 New York Street. It's in West Melbourne.We've owned one property on Ellis Road since 1985. We bought - - which we have retired from the business that we own, but we still own the property and building. We have rentals that provide our retirement income. We built a second property on Ellis Road at 495 Stan Drive, and that was also towards our retirement income. We have been self-employed previously for 30 years; thus, we had no other retirement income. This is our retirement income. We have been involved in this expansion of the roads for the last probably 15 or 20 years because we're a property owner, the first being at Melbourne Airport probably 15 years ago. At that time your drawings continued right straight down the middle of Ellis Road. And I have an objection to what you have done with the drawing at the present time. The one you are leaning towards is the best fit which comes right smack in the middle of our building, both buildings, even the new one. When we put the new building up approximately five-and-a-half years ago, I asked for enough setback so it wouldn't be affected at all, parking, building, whatsoever, and they approved the plans in the City of Melbourne at that time. I am not happy with the way you've done it. You keep insisting that it can't go down the middle. You're ripping up everything in there. Nothing is going to remain the same. The road isn't going to be located exactly. I see no reason whatsoever why you can't maintain the road down the middle and take a little bit off the north and a little bit off the south. That's my objection. It wouldn't affect -- it would affect everybody a little bit but nobody a lot. The explanations that you personally provided to us earlier in the evening make no sense to me whatsoever. As far as these limited access, it's an industrial area. We have lived in the area for approximately close to 40 years. And that four-laning of I-95 the engineers did and gave us limited access, to me it creates more of a problem than it did previously. This is an industrial area. Limiting access and having tractor trailers have to make U-turns in that road is ridiculous. Okay. Just one other thing real quick. I'd like to know if anybody's here from the City of Melbourne. I saw Stephanie Eley from the City of West Melbourne earlier. So, I assume she is still here. When I talked to City of Melbourne they said that the cities were supposed to be impartial. Nobody is supposed to tell what their favorite is or non-favorite is. We attended a meeting in the City of West Melbourne and they are recommending hold the south. Uhm. I wonder if it could be that's their tax base. They're taking all their property and wanting to keep it. City of Melbourne, really doesn't matter to them. That's my opinion.	Hold alignment along center of existing Ellis Road			1					
18	Scott Morgan	Scott Morgan, City Manager, City of West Melbourne, 2240 Minton Road, West Melbourne, representing the City. Back in June the West Melbourne City Council did go on record supporting the project. We think that it's a very important project, and so, certainly the interchange and the recommended alternative carrying that forward, the SIS alternative, alternative two is a very good alternative. It has less impact on Lamplighter Village, and we support that alternative for the interchange. With respect to the Ellis Road segment, we do support the hold the south, wide north alternative. We believe that will have less utility location. It has less total property acquisitions than the SIS alternative, and we believe it forces a solution for taking advantage of the right-of-way the county has for the drainage. And spending project dollars on drainage and fewer dollars on right-of-way acquisition is something that our city supports. So, I just want to go on record as we do support the hold south, wide north alternative. Again, the 45-mile an hour standard urban is certainly better because it also requires less acquisition of business properties. So, because you're carrying that forward, and it appears that the SWA's role will allow the 45-mile an hour standard urban as opposed to the SIS, that's a better project than the 50-mile an hour which requires more right-of-way. West Melbourne commented although we would support either. Certainly if FHW would approve the 45-mile an hour standard urban, that is better, less impactful for the environment, business community, and City of West Melbourne and FHA will approve the standard urban for that section. Thank you very much.	Hold South	1							

8.4.1 Disposition of Public Comments

As shown in Table 8.4.1, comments regarding right-of-way acquisition from the north versus south side of Ellis Road were roughly equal. A total of five comments (four written, one verbal) expressed support for holding the south right-of-way line, while a total of four comments (all written) favored reducing impacts to the north side. The two comments pertaining to a full median opening and traffic signal at Distribution Drive require further explanation.

A developed commercial corridor such as Ellis Road presents challenges with respect to finding an equitable distribution of right-of-way impacts. Right-of-way impacts have been minimized through the selection of the 45 mph Standard Urban typical section. The existing right-of-way width is approximately 100 feet, and the proposed right-of-way for the 45 mph typical section requires approximately 190 feet. Implementing a four lane expansion of Ellis Road while meeting FDOT standards for a 45 mph urban arterial requires unavoidable right-of-way impacts.

The Standard Urban 45 mph Best Fit Alternative is based on holding the south right-of-way line for approximately the eastern and western thirds of the project between John Rodes Boulevard and Wickham Road. The center third of the project is based roughly on holding the north right-of-way line. One factor in implementing alignment shifts from the Hold South position to roughly the Hold North position and back to the Hold South location is that the warehouse-type businesses on the south side of Ellis Road are more easily relocated or cured with respect to business damages.

The two comments referencing right-of-way impacts to specific parcels are located just west of Stan Drive, where the Preferred Alternative generally holds the south right-of-way line and impacts the northern properties. Based on these public comments, the Preferred Alternative was re-examined regarding the feasibility of reducing impacts to the parcel containing Empire Electric / Affordable Signs and the adjacent vacant parcel to the east. To eliminate right-of-way acquisition from these two parcels, any alignment must hold the north right-of-way line in the vicinity of these properties. Currently, the Preferred Alternative transitions to holding the north right-of-way line between West and East Drives, a location that is east of the parcels in question. Holding the north right-of-way line in the vicinity of these two parcels has significant commercial impacts to properties on the south side of the roadway, particularly the commercial businesses to the west. Based in part on these commercial impacts, the Hold North Alternatives were dropped from further study.

As an alternative to eliminating right-of-way impacts to these two parcels, an alignment modification was examined to reduce the required right-of-way acquisition. The Preferred Alternative alignment could be shifted southward to reduce frontage from the vacant parcel, although Empire Electric and Affordable Signs would continue to be displaced. This alignment shift reduces the width of acquisition to the vacant parcel by as much as 40 feet while impacting the parking lot but not the commercial building (Champion Environmental Soils) across Ellis Road. This alignment modification reduces the total width of right-of-way required from the parcel from the current 117 feet to between 70 and 95 feet. In terms of acreage, the total parcel surface area of 2.89 acres would require an acquisition of approximately 1.06 acres with the alignment shift instead of 1.56 acres with the current Preferred Alternative. While this alignment shift reduces the required right-of-way acquisition by approximately 0.5 acre, a sizable amount of frontage (over 1 acre) continues to be required and may not be sufficient to accommodate a future storage facility, which is the desire of the property owner.

Once the design phase has commenced, an opportunity will exist to re-examine the commercial land use and right-of-way impacts throughout the project corridor, including these two commercial parcels in question.

9.0 Commitments and Recommendations

Commitments

In order to assure that adverse impacts to the protected species within the vicinity of the project corridor will not occur, FDOT/Brevard County will abide by the following commitments:

- The design scope will include a survey during preparation of permit applications, of all suitable gopher tortoise habitat to be impacted by the roadway and the ponds. If the species is found, coordination will be initiated with the appropriate resource agency and required permits will be obtained. If gopher tortoise burrows cannot be avoided, a relocation permit would be obtained and mitigation implemented.
- To avoid any potential impacts to the eastern indigo snake, the *Standard Protection Measures for the Eastern Indigo Snake* (Appendix N) will be implemented during site preparation and construction. To ensure the implementation of the standard protection measures, the following will be added as a general plan note:

  Eastern indigo snake habitat has been identified within the project limits. Utilize the US Fish and Wildlife Service Standard Protection Measures for the Eastern Indigo Snake, at the US Fish and Wildlife Service Link: http://www.fws.gov/northflorida/IndigoSnakes/20130812_Eastern_indigo_snake_Standard_Protection_Measures.htm
- To ensure protection of the wood stork, FDOT/Brevard County will provide the appropriate compensatory mitigation for all unavoidable wetland impacts within a USFWS-approved mitigation bank.
- Level 2 Contamination Assessments will be conducted for the four potentially contaminated sites rated Medium and one potentially contaminated site rate High within the limits of this project during the design phase.
- All construction impacts will be minimized or controlled by adherence to measures set forth in the FDOT's Standard Specification for Road and Bridge Construction.
- FHWA and FDOT will continue to coordinate with St. Johns River Water Management District (SJRWMD) to address the final preferred stormwater pond

locations and any additional drainage concerns or issues during the design phase of project development.

Recommendation

Based on the analysis of the environmental impacts, the engineering considerations, and public input received during the course of this project, including the public hearing held on October 25, 2012, the Preferred Alternative contained in Appendix B and described in Chapter 5 of this document has been selected as the Recommended Alternative.