Florida Department of
TRANSPORTATION

Location Hydraulics Report

Clearlake Road (SR 501)

From Michigan Ave. to Industry Rd.

FPID: 433605 1 22 01

ETDM: 13120

December 2016

LOCATION HYDRAULICS REPORT

Clearlake Road (SR 501) Project Development and Environment (PD&E) Study

From Michigan Avenue to Industry Road

MP 2.235 to MP 3.358

Brevard County, Florida

Financial Project ID No. 433605-1-22-01

Federal Aid Project No.: N/A

Efficient Transportation Decision Making (ETDM) No. 13120

December 2016

Prepared for:

Florida Department of Transportation, District 5

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Florida.

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EXECUTIVE SUMMARY

The Florida Department of Transportation (FDOT), District Five, is conducting a Project Development and Environment (PD&E) Study to determine the engineering and environmental effects of the proposed widening of Clearlake Road (SR 501) from Michigan Avenue to Industry Road. A project location map is shown in **Figure 1**. This PD&E Study documented the need for the roadway improvements, and presents the procedures utilized to develop and evaluate various alternatives. Information relating to the engineering and environmental characteristics essential for development of alternatives and analytical decisions was collected. Design criteria was established and preliminary alternatives were developed. The comparison of alternatives was based on a variety of parameters utilizing a matrix format. This process was utilized to identify the Preferred Alternative that minimizes natural, physical, and socio-economic impacts, while providing the necessary future transportation improvements. The study also solicited input from the community and users of the facility. The design year for the analysis is 2043. The PD&E Study also satisfied the requirements of FDOT and follows the process for a State Environmental Impact Report (SEIR) outlined in the FDOT Project Development and Environment (PD&E) Manual. The PD&E Study process was developed in compliance with the National Environmental Policy Act (NEPA), and other applicable federal and state regulations.

The *Location Hydraulics Report* is one of many documents that are assembled as part of the PD&E Study process of developing various alternatives for the proposed roadway improvements. The purpose of this *Location Hydraulics Report* is to address 100-year floodplain encroachments resulting from the roadway improvements evaluated in the PD&E Study for Clearlake Road. Protection of floodplains and floodways is required by Executive Order 11988 “Floodplain Management”, USDOT Order 5650.2, “Floodplain Management Protection”, and Federal-Aid Policy Guide 23 CFR 650A. Location hydraulic studies are required by the Federal-Aid Policy Guide 23 CFR 650A (Sec. 650.111). As per Chapter 24 of the FDOT PD&E Manual (January 2008), “the intent of these regulations is to avoid or minimize highway encroachments within the 100-year (base) floodplains, where practicable, and to avoid supporting land use development which is incompatible with floodplain values. Where encroachment is unavoidable, the regulations require the department to take appropriate measures to minimize impacts”. The magnitude of this study is consistent with the Degree of Effect from the ETDM No. 13120 Programming Screen (Agency Degree of Effort – None; FDOT Summary Degree of Effort – Minimal).

Floodplain impacts are not anticipated as part of this widening study. The nearest floodplains lie approximately 0.10 miles to the east of the Clearlake Road corridor. No floodplain storage exists within existing FDOT right-of-way, since Clearlake Road is located above the 100-year flood zone.

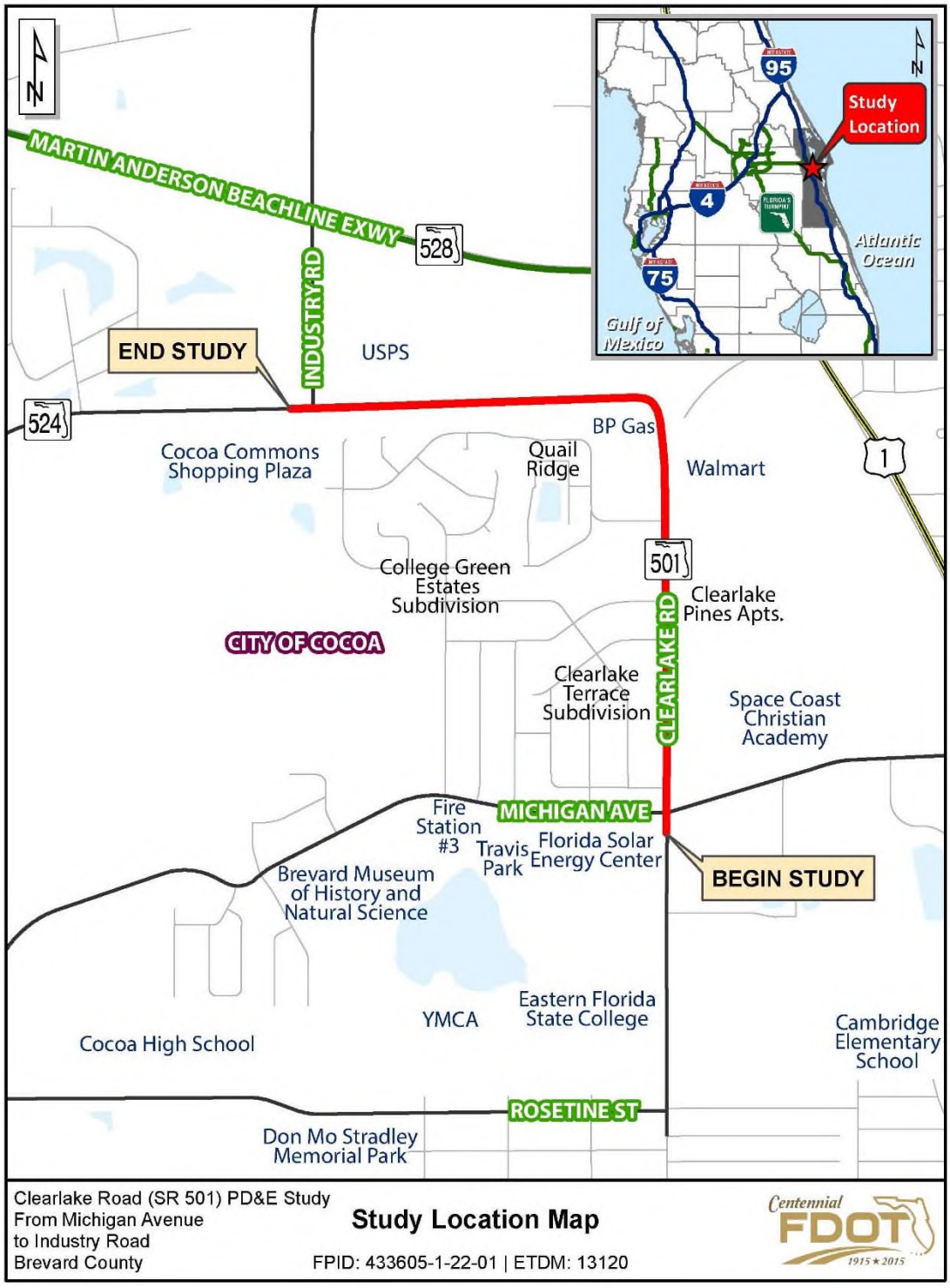


FIGURE 1: STUDY LOCATION MAP

EXISTING DRAINAGE CONDITIONS

Stormwater runoff from Clearlake Road right-of-way is collected predominantly within closed conveyance systems along the north/south roadway segment and completely within open conveyance systems (i.e., roadside ditches) along the east/west segment. The north/south roadway segment, which consists of two local drainage sub-basins (no. 1 and 2), ultimately outfalls to the east into the existing preserve situated between Clearlake Road and Florida East Coast (FEC) railway right-of-way. The east/west segment, which predominantly outfalls into the aforementioned preserve, consists of two local drainage sub-basins, as well (no. 3 and 4).

Clearlake Road, from south of Michigan Avenue to west of Industry Road, is divided into four local drainage sub-basins for stormwater management. Between south of Michigan Avenue and north of La Marche Drive (Basin No. 1), roadway runoff is conveyed to Michigan Avenue, via roadside swales and interconnected curb inlets located within the roadway footprint, and then east along Michigan Avenue to an existing, wet, detention pond (located west of the FEC railway R/W). Between La Marche Drive and the northern Walmart entrance (Basin No. 2), roadway runoff is conveyed to the north via connected curb inlets and discharged into an existing, wet, detention pond ("Walmart" Pond) located northeast of the described basin limits. Roadway runoff within Basin No. 3, which extends from the 90° roadway bend near the Walmart shopping center to Industry Road, is collected in shallow, adjacent roadside ditches and ultimately conveyed east around the Walmart pond and into the preserve located behind Walmart. West of Industry Road (Basin No. 4), a similar open stormwater management system as the existing system, consisting of large roadside ditches, will be established. These interconnected ditches convey runoff to the west, into either an existing wet detention pond located within the Coventry of Cocoa residential community (north side) or existing wetlands (south side). Project drainage basin maps, that detail the sub-basin boundaries, are included in **Appendix C**.

There are two existing ponds (Michigan Avenue pond and Walmart pond) that currently provide treatment and attenuation for most of Clearlake Road from south of Michigan Avenue to the 90° bend (Basin Nos. 1 and 2, respectively). No information, to date, is available on the Michigan Avenue pond. The Walmart pond, as detailed in St. Johns River Water Management District's (SJRWMD) permit no. 95213-1, was designed to collect and treat additional runoff created from future Clearlake Road roadway improvements within Basin No. 2. However, it is anticipated that this pond will not be expanded to provide additional treatment beyond what is already permitted. Basin Nos. 3 and 4 do not have any water quality measures, besides shallow un-permitted ditches, built into their stormwater management systems.

The historical flow pattern through this area is from west to east, mainly through overland sheet flow. Offsite runoff that contributes to the mainline runoff is predominantly from adjacent residential parcels scattered along the north/south roadway segment, along with undeveloped uplands and wetlands located adjacent to the east/west segment.

Stormwater management is regionally managed by the SJRWMD (Basin: Northern Indian River Lagoon). The project is located between the St. Johns River and the Indian River Lagoon, both of which are classified as Class III waterbodies, per Florida Department of Environmental Protection (FDEP). Additional treatment volume will not be required for this project since it ultimately outfalls into a section of the Indian River Lagoon that is not classified as an Outstanding Florida Waters (OFW). A conservation easement, owned and maintained by SJRWMD, exists north of the east/west roadway segment. There are no local drainage districts within the project limits. FDOT currently maintains and operates the drainage systems within the Clearlake Road right-of-way.

Two (2) cross drains (18″ diameter) were identified within the project limits, and are anticipated to be replaced to accommodate the future roadway widening. Preliminary inspection indicates both culverts are in good working condition.

Existing land use is predominantly residential and commercial. The southern portion (Basin No. 1) is predominantly residential, the central portion (Basin No. 2) is predominantly commercial, and the western portion (Basin Nos. 3 and 4) is predominantly residential (south) with a large, undeveloped area reserved for conservation (north).

PROPOSED DRAINAGE CONDITIONS

The existing drainage boundaries and local drainage basins will be maintained in the proposed conditions. Basin No. 1 (south of Michigan Avenue to north of La Marche Drive) will be comprised of interconnected curb inlets that convey runoff to two, offsite, interconnected stormwater ditches proposed to be located west of and immediately adjacent to Clearlake Road. Treatment and attenuation will be provided within these dry, retention ditch areas prior to discharging to the east along Michigan Avenue to an existing, wet detention pond (located west of the FEC railway R/W). Stormwater runoff within Basin No. 2 (north of La Marche Drive to the 90° roadway bend) will be collected by interconnected curb inlets, and predominantly discharged into the existing "Walmart" Pond, located northeast of the described Basin No. 2 limits. Treatment and attenuation for most of Basin No. 2 will be provided within this existing, unmodified "Walmart" Pond. A small segment of Basin No. 2 (portions of southbound side of Clearlake Road) is proposed to be conveyed to a wet, detention pond located on the current BP gas station site where water quality and quantity will be provided. The stormwater management systems within Basin No. 3 (Industry Road to the 90° roadway bend) and No. 4 (west of Industry Road) will be comprised of interconnected, roadside ditches, similar in nature to the existing conditions. For Basin No. 3, stormwater treatment and attenuation is anticipated to be achieved within three interconnected dry, retention ditches, located north and south of the new roadway alignment and within existing FDOT right-of-way. For Basin No. 4, stormwater treatment and attenuation is anticipated to be achieved within the slightly modified, dry ditches located adjacent to SR 524. The ultimate outfall locations for all four drainage basins will remain the same as the existing conditions (i.e., Michigan Avenue pond).

Existing drainage patterns will be maintained in the future condition. Water quality will be achieved through the construction of a new wet stormwater pond, continued use of the existing stormwater pond ("Walmart" Pond), and a collection of interconnected roadside ditches. Exfiltration trench will not be needed. Additional right-of-way is only anticipated to be required for the proposed stormwater treatment ditches and pond located in Basins No. 1 and No. 2, respectively. The project will have no adverse impacts to the area's water quality. Treatment and attenuation will be provided based on SJRWMD's rules and regulations.

The stormwater management systems proposed by this study meet existing water quality standards, as set forth in the SJRWMD Stormwater Management Plan (October 2013). SJRWMD requires the post-development discharge rates generated by the 25-year/24-hour design storm event to be equal to or less than the pre-development discharge rates. Ponds and ditches were sized to attenuate the difference between post-development runoff volume and pre-development runoff volume.

FDEP has adopted Total Maximum Daily Loads (TMDL) for both nitrogen and phosphorus for the Indian River Lagoon. As a result, the proposed stormwater management systems are required to demonstrate nutrient load reductions for both nitrogen and phosphorus. Preliminary pre-development and post-development annual mass loadings for both nitrogen and phosphorus have been calculated for three of the four sub-basins that ultimately discharge into the Indian River Lagoon. The annual mass loadings were calculated based on FDEP's *Environmental Resource Permit Stormwater Quality Applicant's Handbook* (March 2010). Refer to the *Pond Siting Report* for more details regarding TMDL analysis.

The limits of the proposed drainage basins along Clearlake Road begin and end at the same locations as the existing conditions in order to maintain existing drainage patterns. The locations of the outfalls in the proposed condition are similar in nature to the existing conditions. Refer to the *Pond Siting Report*, included as part of the project file, for descriptions of the sub-basins and proposed stormwater management facilities.

FLOODPLAIN IMPACTS

The Federal Emergency Management Agency (FEMA) website was reviewed to locate the latest Flood Insurance Rate Maps (FIRM) for the Clearlake Road project area. FIRM Community Panel Number 12009C0320G, dated March 17, 2014, indicates that the entire existing right-of-way is above the 100-year floodplain. See **Figure 5 (FEMA FIRM Maps)**.

The project corridor lies within the SJRWMD's Indian River Lagoon Basin. There are no anticipated impacts to the 100-year base floodplain (including locations where preferred offsite stormwater treatment facilities are proposed) and calculations for compensation are not needed. Most impacts are associated with zones classified as "Other Flood Areas" (i.e., Zone X) and are located above the 500-year floodplain, as per the FEMA FIRM Maps.

There are no regulated floodways within the project limits. There will be no floodplain involvement with federally defined floodways.

No adverse impacts are anticipated to the floodplains, as required by the agencies to be evaluated and confirmed. SJRWMD and FDOT criteria require replacement of floodplain storage lost as a result of floodplain encroachment. There is no change in flood "Risk" associated with this project; the encroachments are classified as "no impacts".

Given the limited right-of-way and linear nature of this project, coordination with SJRWMD indicates that floodplain compensation, if necessary, may be provided in neighboring floodplain basins as long as the areas are geographically close and hydraulically connected.

I. INTRODUCTION

The Florida Department of Transportation (FDOT), District Five, is conducting a Project Development and Environment (PD&E) Study to determine the engineering and environmental effects of the proposed widening of Clearlake Road from Michigan Avenue to Industry Road. The project length is approximately 1.3 miles. The proposed improvements involve adding additional lane capacity by widening to a 4-lane, divided roadway section. The roadway is located within Sections 18 and 19 of Township 24S, Range 36E.

The *Location Hydraulics Report* is one of many documents that are assembled as part of the PD&E Study process of developing various alternatives for the proposed roadway improvements. The purpose of this *Location Hydraulics Report* is to address 100-year floodplain encroachments resulting from the roadway improvements evaluated in the PD&E Study for Clearlake Road. Protection of floodplains and floodways is required by Executive Order 11988 "Floodplain Management", USDOT Order 5650.2, "Floodplain Management Protection", and Federal-Aid Policy Guide 23 CFR 650A. Location hydraulic studies are required by the Federal-Aid Policy Guide 23 CFR 650A (Sec. 650.111). As per Chapter 24 of the FDOT PD&E Manual (January 2008), "the intent of these regulations is to avoid or minimize highway encroachments within the 100-year (base) floodplains, where practicable, and to avoid supporting land use development which is incompatible with floodplain values. Where encroachment is unavoidable, the regulations require the department to take appropriate measures to minimize impacts". The magnitude of this study is consistent with the Degree of Effect from the ETDM No. 13120 Programming Screen (Agency Degree of Effort – None; FDOT Summary Degree of Effort – Minimal).

See **Appendix A (Figures 1 and 2)** for the Project Location Map and USGS Quadrangle Map, respectively.

II. PROJECT DESCRIPTION

The existing roadway consists of three typical sections: 1) Clearlake Road from Michigan Avenue to approximately 720′ north (semi-urban typical), 2) Clearlake Road from approximately 720′ north of Michigan Avenue to the 90° bend (urban typical) and 3) Clearlake Road from the 90° bend, west, to Industry Road (rural typical).

The first existing typical section, Clearlake Road from Michigan Avenue to approximately 720′ north, consists of five travel lanes that are comprised of two northbound lanes, two southbound lanes and a bi-directional middle turn lane. Lane widths range from 10′ to 12′. Curb and gutter, and sidewalk, exists only along the east side of the roadway.

The second existing typical section, Clearlake Road from approximately 720′ north of Michigan Avenue to the 90° bend, consists of four travel lanes that are comprised of two northbound lanes, one southbound lane and a left turn lane. Lane widths range from 10′ to 12′. Curb and gutter, and sidewalk, exists predominantly along both sides of the roadway.

The third existing typical section, Clearlake Road from the 90° roadway bend to Industry Road, consists mainly of two travel lanes consisting of a single westbound lane and a single eastbound lane. Right and left turn lanes exist at the Industry Road signalized intersection. Existing pavement width ranges from 36′ to 67′ along this section of SR 501, due to the lengthy merge lanes that extend along both directions of travel.

Two proposed typical sections for the widening of Clearlake Road from Michigan Avenue to Industry Road have been evaluated. The first typical section (urban) consists of four 11-foot wide travel lanes, a 22-foot wide median, 7-foot wide buffered bike lanes, curb and gutter, and 6-foot wide sidewalks along both sides. The second typical section (suburban) consists of four 11-foot wide travel lanes, a 12-foot wide two-way left turn lane, 7-foot wide buffered bike lanes, curb and gutter, and 6-foot wide sidewalks along both sides.

See **Existing and Proposed Typical Sections** in **Appendix B**.

III. DATA COLLECTION

The PD&E Team collected and reviewed data from the following sources:

- FDOT Drainage Manual (January 2016)
- FDOT Stormwater Management Facility Handbook (May 2004)
- FDOT Culvert Handbook (2004)
- SJRWMD Environmental Resource Permit Applicant's Handbook Volume I (General and Environmental) (October 2013)
- SJRWMD Permit Information Manual (October 2013)
- FDEP Environmental Resource Permit Manual Draft (March 2010)
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for Brevard County and incorporated areas (Community Panel Number 12009C0320G, dated: March 17, 2014)
- Natural Resources Conservation Service (NRCS) Soil Survey of Brevard County, Florida
- United States Geological Survey (USGS) Maps for Cocoa
- Existing SJRWMD Permits, including:
    - Walmart, Cocoa, Clearlake Road Phase II Offsite Roadway Improvements (Permit No. 40-009-95213-1)
    - Tenzel Commercial Site (Permit No. 40-009-16872-1)
- Existing Plans, including:
    - Clearlake Road Improvements – Walmart Phase 2 (City of Cocoa) (2004)
- Field Reviews (August 2015)

- Geotechnical Subsurface Exploration (RADISE International)
- Cultural Resource Assessment Survey
- Contamination Screening Evaluation Report
- Wetland / Protected Species Assessment Report

IV. EXISTING SITE CONDITIONS

4.1 TOPOGRAPHY & HYDROLOGIC FEATURES

A review of the existing cross drains within the project corridor was performed. For the purposes of this review, culverts crossing the roadway were considered as cross drains if the culverts were conveying offsite runoff beneath or into the study corridor. Other culverts which crossed the roadway but conveyed onsite runoff were considered as equalizers or part of the internal stormwater management. Within the study corridor, two cross drains were identified that convey both onsite and offsite runoff. Both cross drains are located within Basin No. 3 (east/west roadway segment), near the BP gas station, and are detailed in **Table 1 (Summary of Existing Cross Drains)**. Both existing cross drains are anticipated to be replaced with a single cross drain (CD). The new equalizer CD, to be installed west of the BP gas station (near Sta. 73+75), is anticipated to consist of a larger pipe diameter and be used to maintain canal connectivity under the anticipated preferred Clearlake Road (BP Gas) alignment.

Table 1: Summary of Existing Cross Drains

Cross Drain	Basin No.	Station (BL of Survey)	Culvert Description	Replacement Required (Y/N)
CD-1	3	73+75	1 – 18″ Reinforced Concrete Pipe	Y
CD-2	3	75+00	1 – 18″ Reinforced Concrete Pipe	Y

4.2 SOILS DATA & GEOTECHNICAL INVESTIGATIONS

An inventory of the existing soils in the vicinity of Clearlake Road from south of Michigan Avenue to west of Industry Road was obtained from the United States Department of Agriculture (USDA) and Soil Conservation Services (SCS) Brevard County Soil Survey and Natural Resources Conservation Service (NRCS) website. According to the database, both upland and hydric soil types are present along the project corridor (see the attached **Figure 3 – USDA NRCS SCS Soils Map**). The most common types of upland soils found within the corridor include: Immokalee sand, Paola-Urban land complex (0 to 8 percent slopes), Pomello sand, Satellite sand (0 to 2 percent slopes), St. Johns sand, St. Johns sand (depressional), St. Lucie fine sand (0 to 5 percent slopes, and 5 to 12 percent slopes). According to a listing provided by the Florida Department of Environmental Regulation to the Florida Soil Characterization Data Retrieval System Florida maintained by the University of Florida, Tomoka muck, undrained, is a hydric soil type that exists within the project corridor. Considering the developed nature of the corridor, it is important to note that artificial berms and other artificially elevated areas are not always represented accurately in soils data.

A general description of the dominant soil units located along the project corridor, as described by USDA, is provided in the *Pond Siting Report.*

Table 2: USDA NRCS Soil Survey Information (continued on following page)

Soil Map Number	Brevard County Map Unit Name	Season High Ground Water Depth (inches)	Hydrologic Soil Group	Depth (inches)	Soil Classification	
					USCS	AASHTO
28	**Immokalee sand**	0 - 10	A/D	0 - 33	SP, SP-SM	A-3
				33 - 65	SM, SP-SM	A-2, A-3
				65 - 80	SP, SP-SM	A-3
45	**Paola-Urban land complex, 0 to 8 percent slopes**	>120	A	0 - 90	SP	A-3
49	**Pomello sand**	30 - 40	A	0 - 50	SP, SP-SM	A-3
				50 - 62	SM, SP-SM	A-3, A-2
				62 - 80	SP, SP-SM	A-3
53	**Satellite sand, 0 to 2 percent slopes**	10 - 40	A/D	0 - 84	SP	A-3
54	**St. Johns sand**	0 - 10	B/D	0 - 11	SP, SP-SM	A-3
				11 - 19	SP, SP-SM	A-3
				19 - 31	SP-SM, SM	A-2, A-3
				31 - 70	SP, SP-SM	A-3
55	**St. Johns sand, depressional**	0 - 10	B/D	0 - 11	SP, SP-SM	A-3
				11 - 19	SP, SP-SM	A-3
				19 - 31	SP-SM, SM	A-2, A-3
				31 - 70	SP, SP-SM	A-3
56	**St. Lucie fine sand, 0 to 5 percent slopes**	>120	A	0 - 120	SP	A-3
57	**St. Lucie fine sand, 5 to 12 percent slopes**	>120	A	0 - 120	SP	A-3
67	**Tomoka muck, undrained**	0 - 10	A/D	0 - 27	Pt	Organic
				27 - 35	SP, SP-SM	A-3
				35-55	SM-SC, SC, SM	A-2

4.3 ENVIRONMENTAL CHARACTERISTICS

4.3.1 LAND USE DATA

Existing land use is mainly residential with some commercial sites near the 90° bend. There is also a conservation easement on the north side of Clearlake Road between the Cocoa Post Office and the 90° bend. Future land uses in the project area will not be altered. See **Figure 4 – Future Land Use Map** for additional details.

4.3.2 CULTURAL FEATURES

Cultural features preserve and enhance the cultural nature of a community and include parks, schools, religious institutions, archaeological sites, and neighborhood gathering places. Community services include facilities that provide necessary services such as fire stations, police stations, public and private schools, hospitals, cemeteries, The following is a list of sites in or near the project area:

- Brevard State College
- Bethel Baptist Church

Additional information regarding cultural features can be found in the *Cultural Resource Assessment Survey (CRAS)* performed by Southeastern Archaeological Research, Inc.

4.3.3 NATURAL AND BIOLOGICAL FEATURES

The project corridor was evaluated for the presence of potentially-occurring species. The proposed project has the potential to involve several State and/or Federally-listed wildlife species. Please refer to the *Natural Resource Evaluation Report (NRER)*, performed by Quest Ecology, and included as part of the project file.

Wetlands, regulated by the state and federal governments, have been investigated and identified adjacent to the corridor between Industry Road and the 90° bend. Wetland impacts are expected within the aforementioned limits, based on the preferred BP Gas alternative. Please refer to the *Natural Resource Evaluation Report (NRER)*, performed by Quest Ecology, and included as part of the project file.

Stormwater treatment alternatives will be based on avoidance of wetlands, wherever possible.

4.4 EXISTING DRAINAGE CONDITIONS

Stormwater runoff from Clearlake Road right-of-way is collected predominantly within closed conveyance systems along the north/south roadway segment and completely within open conveyance systems (i.e., roadside ditches) along the east/west segment. The north/south roadway segment, which consists of two local drainage sub-basins (no. 1 and 2), ultimately outfalls to the east into the existing preserve situated between Clearlake Road and Florida East Coast (FEC) railway right-of-way. The east/west segment, which predominantly outfalls into the aforementioned preserve, consists of two local drainage sub-basins, as well (no. 3 and 4).

Clearlake Road, from south of Michigan Avenue to west of Industry Road, is divided into four local drainage sub-basins for stormwater management. Between south of Michigan Avenue and north of La Marche Drive (Basin No. 1), roadway runoff is conveyed to Michigan Avenue, via roadside swales and interconnected curb inlets located within the roadway footprint, and then east along Michigan Avenue to an existing, wet, detention pond (located west of the FEC railway R/W). Between La Marche Drive and the northern Walmart entrance (Basin No. 2), roadway runoff is conveyed to the north via connected curb inlets and discharged into an existing, wet, detention pond ("Walmart" Pond) located northeast of the described basin limits. Roadway runoff within Basin No. 3, which extends from the 90° roadway bend near the Walmart shopping center to Industry Road, is collected in shallow,

adjacent roadside ditches and ultimately conveyed east around the Walmart pond and into the preserve located behind Walmart. West of Industry Road (Basin No. 4), a similar open stormwater management system as the existing system, consisting of large roadside ditches, will be established. These interconnected ditches convey runoff to the west, into either an existing wet detention pond located within the Coventry of Cocoa residential community (north side) or existing wetlands (south side). Project drainage basin maps, that detail the sub-basin boundaries, are included in **Appendix C**.

Table 3: Summary of Existing and Proposed Drainage Basins

Basin #	From Sta. (BL of Survey)	To Sta. (BL of Survey)	Ultimate Outfall Location
1	154+10	179+75	Indian River
2	179+75	199+25	Indian River
3	50+00	74+00	Indian River
4	31+00	50+00	St. Johns River

The historical flow pattern through this area is from west to east, mainly through overland sheet flow. Offsite runoff that contributes to the mainline runoff is predominantly from adjacent residential parcels scattered along the north/south roadway segment, along with undeveloped uplands and wetlands located adjacent to the east/west segment.

Stormwater management is regionally managed by the SJRWMD (Basin: Northern Indian River Lagoon). The project is located between the St. Johns River and the Indian River Lagoon, both of which are classified as Class III waterbodies, per Florida Department of Environmental Protection (FDEP). Additional treatment volume will not be required for this project since it ultimately outfalls into a section of the Indian River Lagoon that is not classified as an Outstanding Florida Waters (OFW). A conservation easement, owned and maintained by SJRWMD, exists north of the east/west roadway segment. There are no local drainage districts within the project limits. FDOT currently maintains and operates the drainage systems within the Clearlake Road right-of-way.

Two (2) cross drains (18″ diameter) were identified within the project limits, and are anticipated to be replaced to accommodate the future roadway widening. Preliminary inspection indicates both culverts are in good working condition.

4.5 FLOODPLAINS / FLOODWAYS

The Federal Emergency Management Agency (FEMA) has developed Flood Insurance Rate Maps (FIRM) for Brevard County. FIRM Community Panel Number 12009C0320G, dated March 17, 2014, was reviewed in detail. The map indicates the entire existing right-of-way is located above the 100-year floodplain. See **Figure 5** of **Appendix A (FEMA FIRM Maps)**.

4.6 FLOODING HISTORY AND MAINTENANCE CONCERNS

According to Brevard Operations, which oversees roadway maintenance for Brevard County, there are no flooding concerns along Clearlake Road within the project limits.

V. PROPOSED DRAINAGE CONDITIONS

5.1 PROPOSED TYPICAL SECTIONS

There are three (3) proposed typical section alternatives being evaluated for this PD&E Study.

The preferred alternative typical section from Michigan Avenue to Industry Road incorporates the FDOT's criteria for a four lane, divided, urban facility. It is comprised of two, 11-foot travel lanes in each direction with a 22-foot median and type E curb and gutter. In each direction, seven foot bicycle lanes are proposed adjacent to type F curb and gutter, along with six foot sidewalks on both sides. This typical section will require a minimum of 104 feet in order to accommodate mainline improvements. Therefore, right-of-way for the mainline is required under this alternative at the south end of the project where only 73 feet of existing right-of-way is available. Offsite ponds requiring additional right-of-way are also included in order to help accommodate drainage.

See **Appendix B (Existing and Proposed Typical Sections)** for additional details regarding the roadway alternatives.

5.2 LONGITUDINAL AND TRANSVERSE FLOODPLAIN IMPACTS

This project will not impact the 100-year floodplain, regardless of the preferred roadway alternative selection.

5.3 PROJECT CLASSIFICATION

The project is located in a high density, residential and commercial area, and the encroachments are classified as "no involvement". No involvement means that there are no floodplains in the vicinity of the proposed alternatives.

5.4 RISK EVALUATION

There is no change in flood "risk" or adverse floodplain or floodway impacts associated with the proposed roadway project. The following "Floodplain" Statement No. 1, as detailed in the FDOT PD&E Manual (Ch. 24, Figure 24.1), applies to this project:

"Although this involves work within the horizontal limits of the 100-year floodplain, no work is being performed below the 100-year flood elevation and, as a result, this project does not encroach upon the base floodplain."

"It has been determined, through consultation with local, state, and federal water resources and floodplain management agencies that there is no regulatory floodway involvement on the proposed project and that the project will not support base floodplain development that is incompatible with existing floodplain management programs."

5.5 PD&E MANUAL REQUIREMENTS WITH NO INVOLVEMENT

Chapter 24 (Floodplains) of FDOT's PD&E Manual (Part 2) defines four categories of encroachments as they pertain to base floodplain involvement – significant, minimal, none, and no involvement. FDOT has different requirements based on the category of encroachment. This proposed Clearlake Road widening study was determined to have no involvement based on an overlay review of the roadway alternatives with the FIRM's floodplain boundaries. As such, this report, which details the existing floodplain findings, serves as documentation for the project's file.

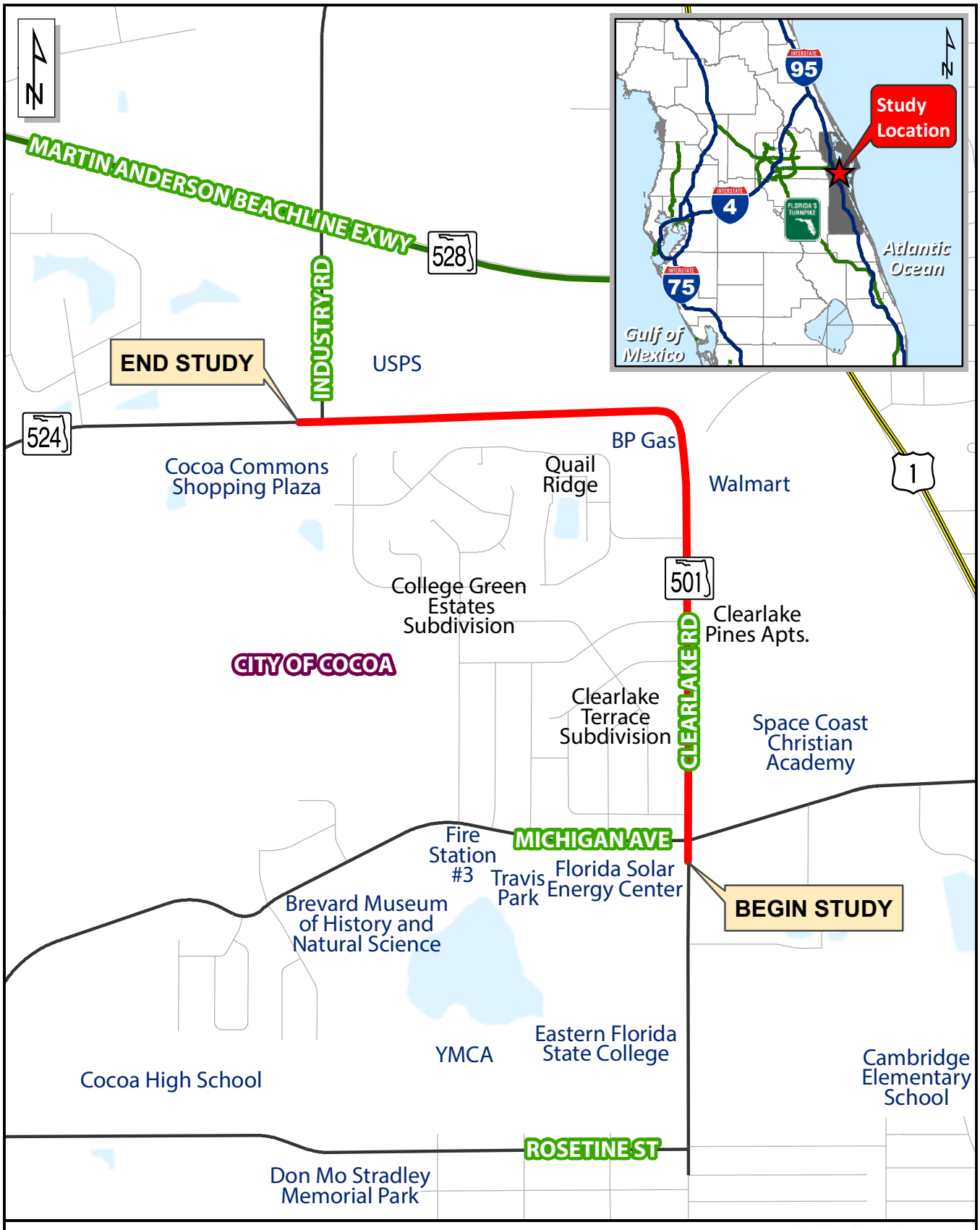
VI. CONCLUSION

There are no anticipated impacts to the 100-year base floodplain (including locations where preferred offsite stormwater treatment facilities are proposed); therefore, floodplain compensation will not be required for this roadway widening project. Also, the potential realignment of Clearlake Road from Industry Road to the 90° bend will not increase the flood risk for the area.

Lastly, the proposed drainage culverts for this project will be designed such that they perform hydraulically in a manner equal to or greater than the existing structures; as such, backwater surface elevations are not expected to increase.

APPENDIX A

FIGURES



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From Michigan Avenue
to Industry Road
Brevard County

Study Location Map

FPID: 433605-1-22-01 | ETDM: 13120

Centennial FDOT 1915 ★ 2015

FIGURE 1 - STUDY LOCATION MAP

FIGURE 2 - USGS QUADRANGLE MAP

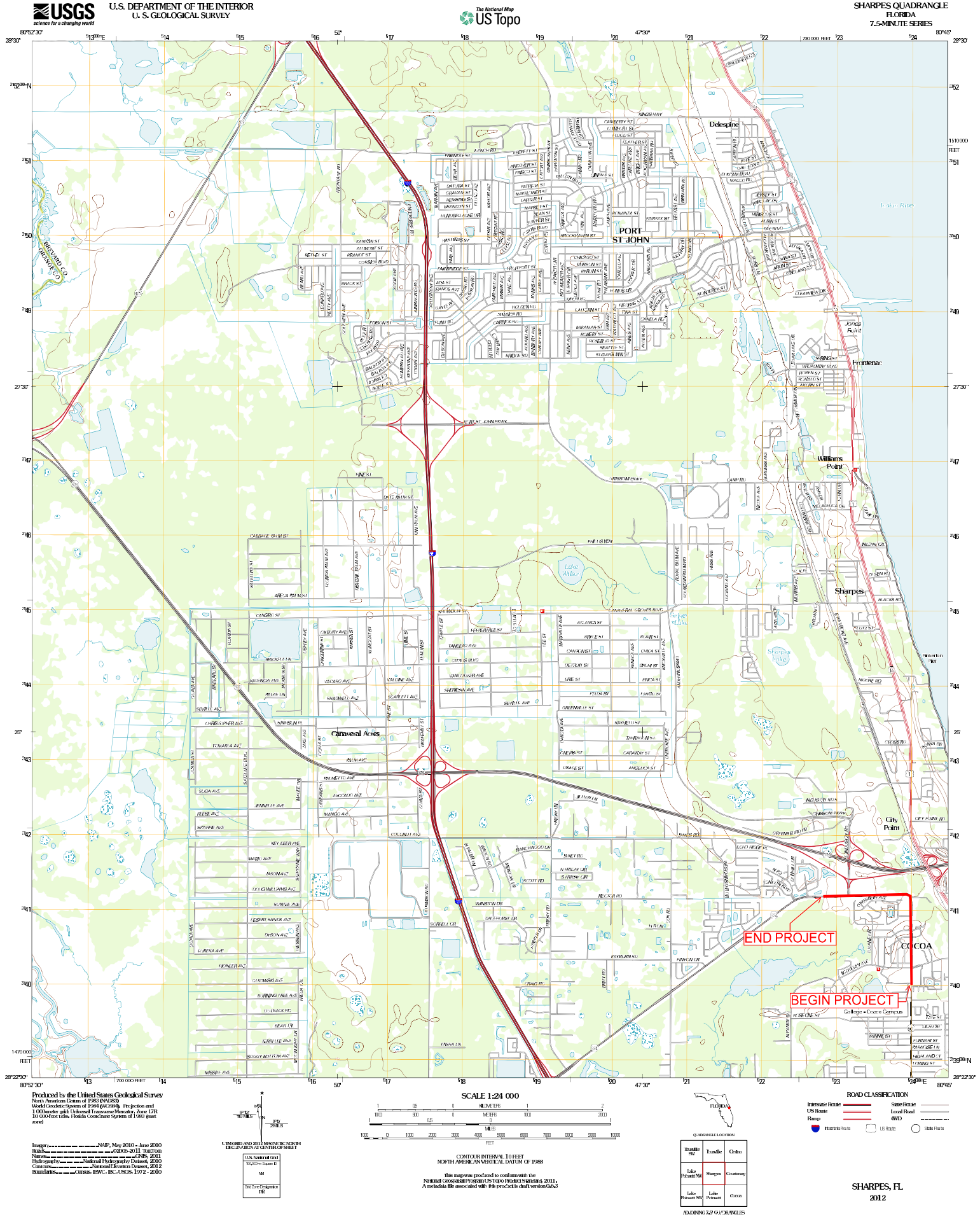


FIGURE 3 - USDA NRCS SOILS MAP

Soil Map—Brevard County, Florida
(SR 501 (Clearlake Road) from Michigan Ave to Industry Rd)

Map Scale: 1:9,920 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 450 900 1800 2700

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

FIGURE 3 - USDA NRCS SOILS MAP

Soil Map—Brevard County, Florida
(SR 501 (Clearlake Road) from Michigan Ave to Industry Rd)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Brevard County, Florida
Survey Area Data: Version 12, Sep 10, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

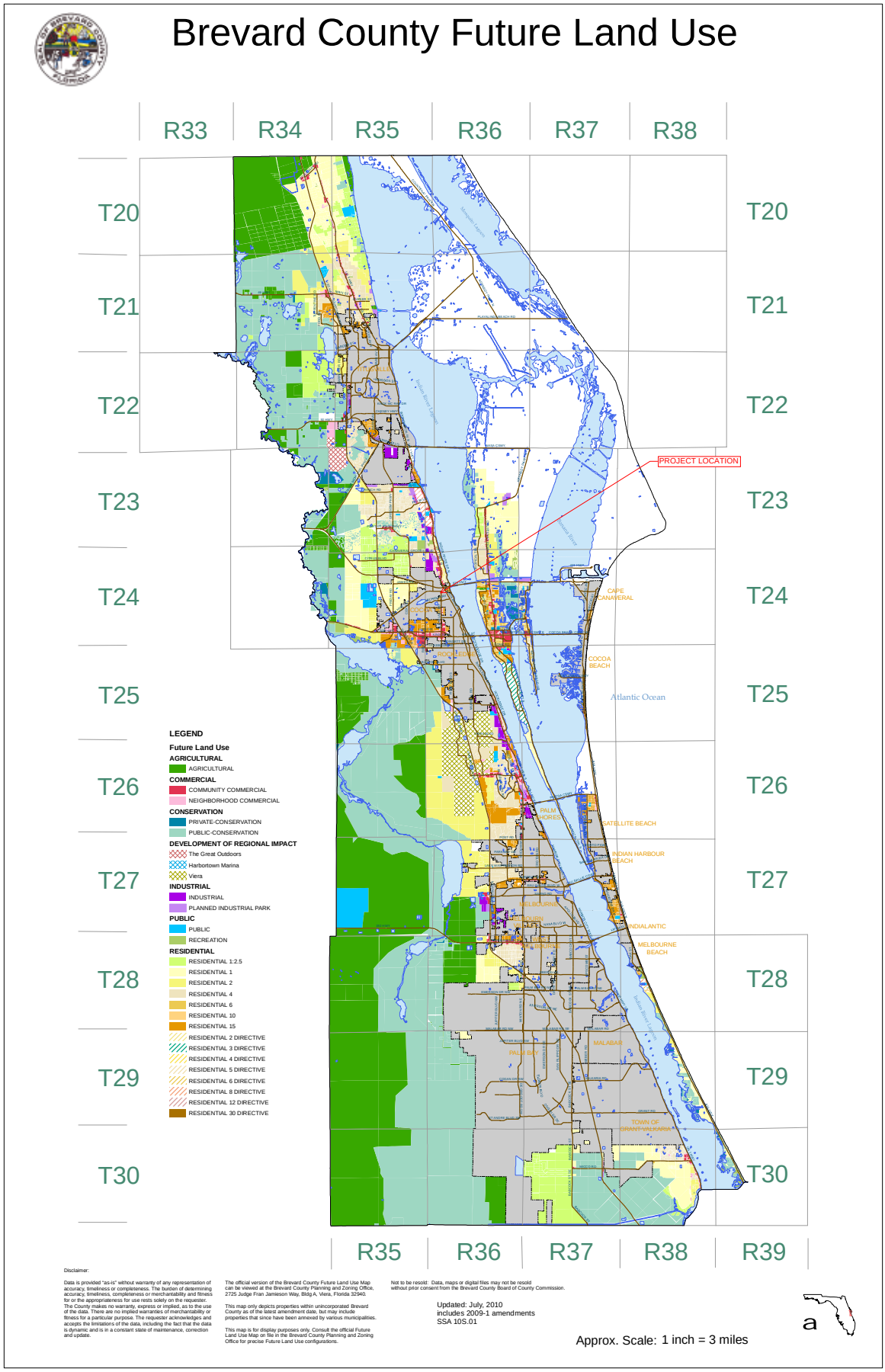
Date(s) aerial images were photographed: Mar 12, 2011—Mar 13, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Brevard County, Florida (FL009)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
28	Immokalee sand	0.7	1.3%
45	Paola-Urban land complex, 0 to 8 percent slopes	25.6	47.8%
49	Pomello sand	0.3	0.6%
53	Satellite sand, 0 to 2 percent slopes	0.7	1.4%
54	St. Johns sand	1.0	1.9%
55	St. Johns sand, depressional	0.3	0.5%
56	St. Lucie fine sand, 0 to 5 percent slopes	13.2	24.6%
57	St. Lucie fine sand, 5 to 12 percent slopes	5.1	9.6%
67	Tomoka muck, undrained	6.6	12.3%
Totals for Area of Interest		**53.6**	**100.0%**

Figure 4 - Future Land Use Map



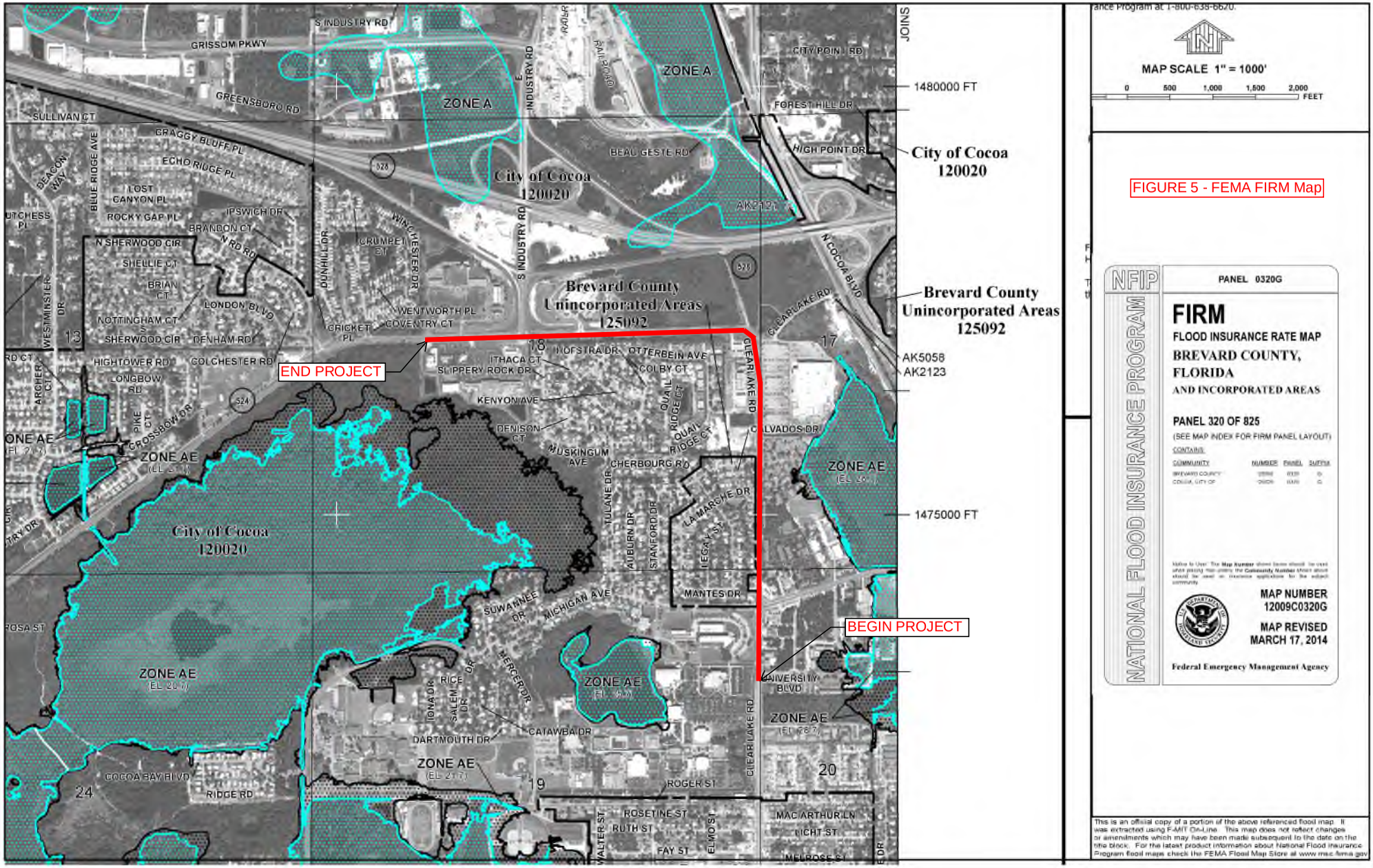
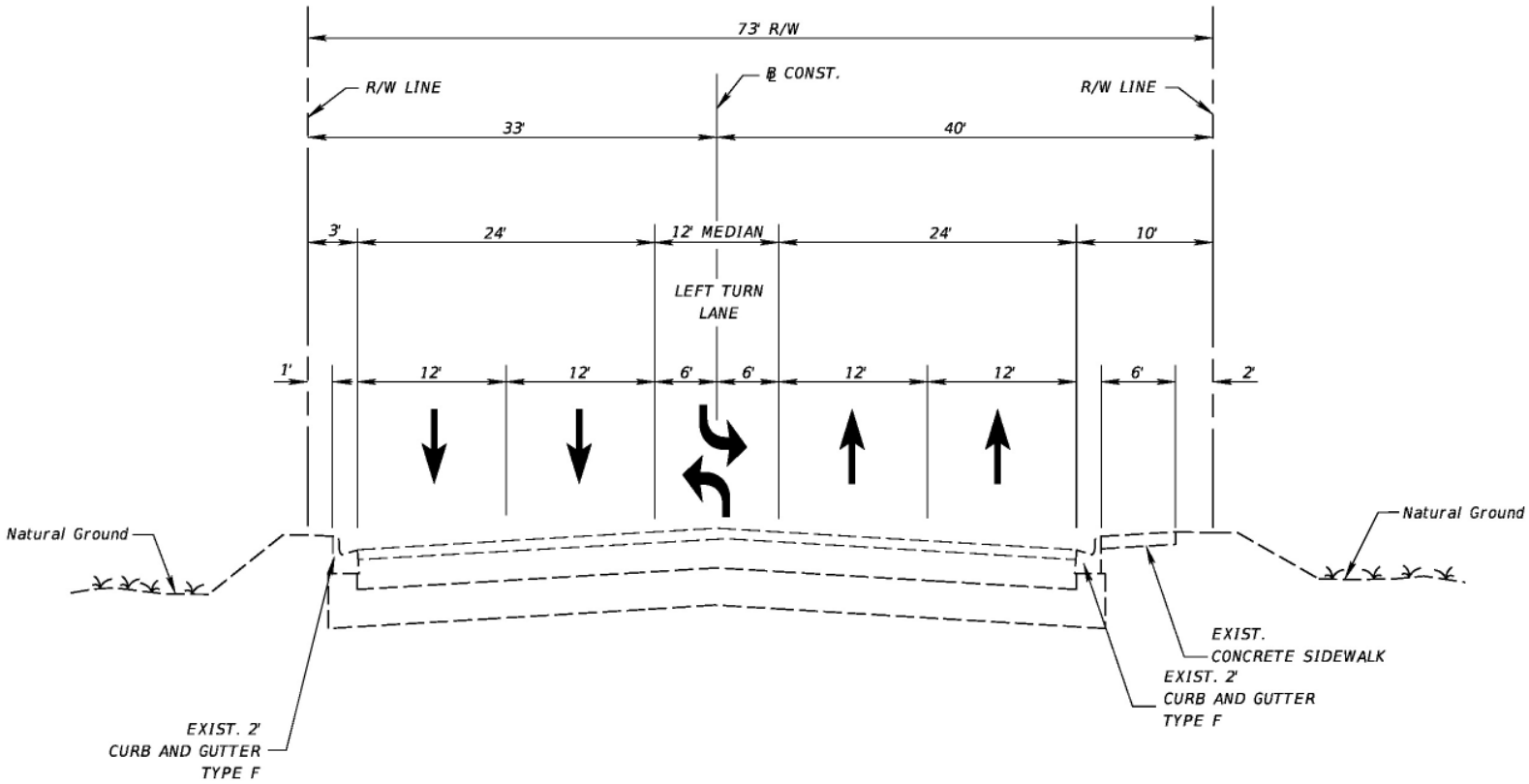


FIGURE 5 - FEMA FIRM Map

APPENDIX B

EXISTING AND PROPOSED TYPICAL SECTIONS



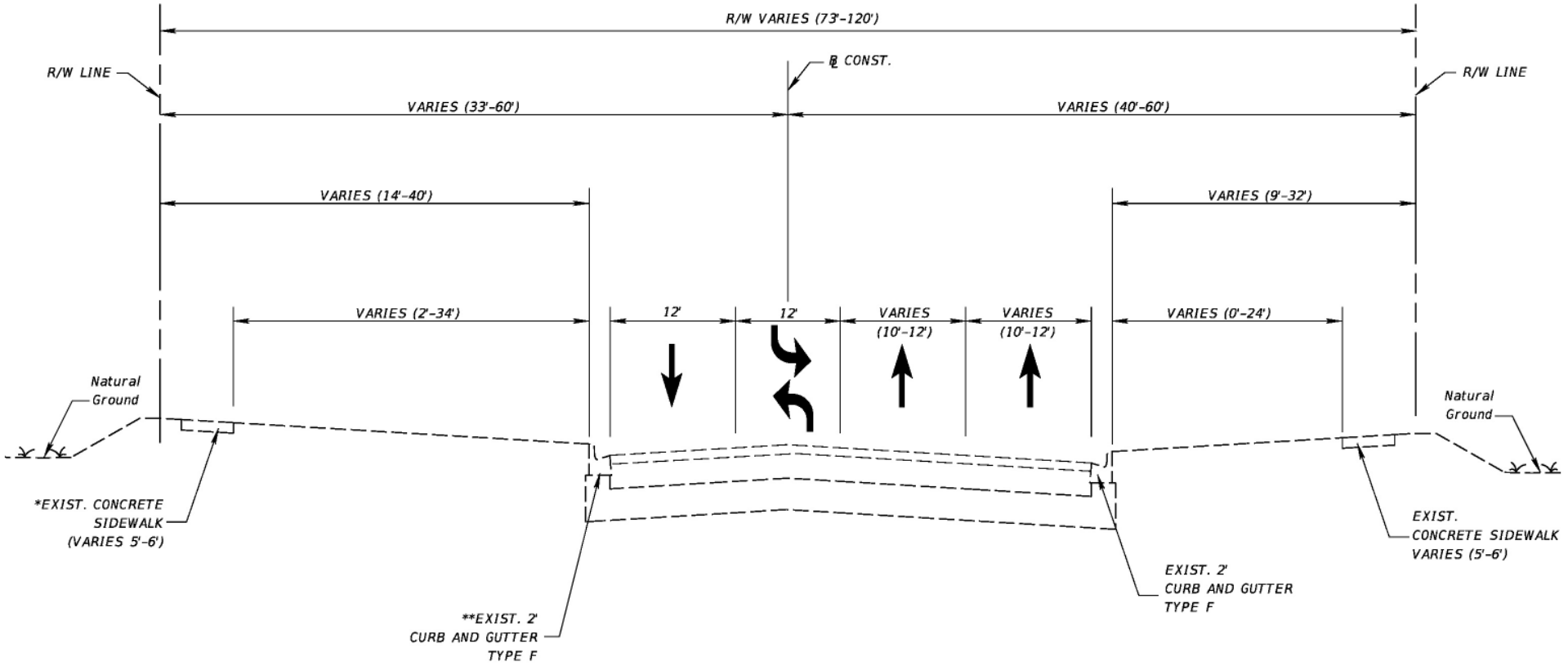
EXISTING TYPICAL SECTION NO. 1

CLEARLAKE ROAD (SR 501)

FROM MICHIGAN AVENUE TO APPROX. 720' NORTH

REVISIONS				STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			EXISTING TYPICAL SECTION	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
				501	BREVARD	433605-1-22-01		

$USER$ $DATE$ $TIME$ $FILE$



EXISTING TYPICAL SECTION NO. 2

CLEARLAKE ROAD (SR 501)

FROM APPROX. 720' NORTH OF MICHIGAN AVENUE

TO NORTH OF WAL-MART

*SIDEWALK IS ONLY PRESENT FROM NORTH OF OTTERBEIN AVENUE TO JUST SOUTH OF WAL-MART OF TYPICAL SECTION

**FROM APPROX. 720' NORTH OF MICHIGAN AVENUE TO NORTH OF CALVADOS DRIVE REPLACES C&G WITH 2' GRASS SHOULDER

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

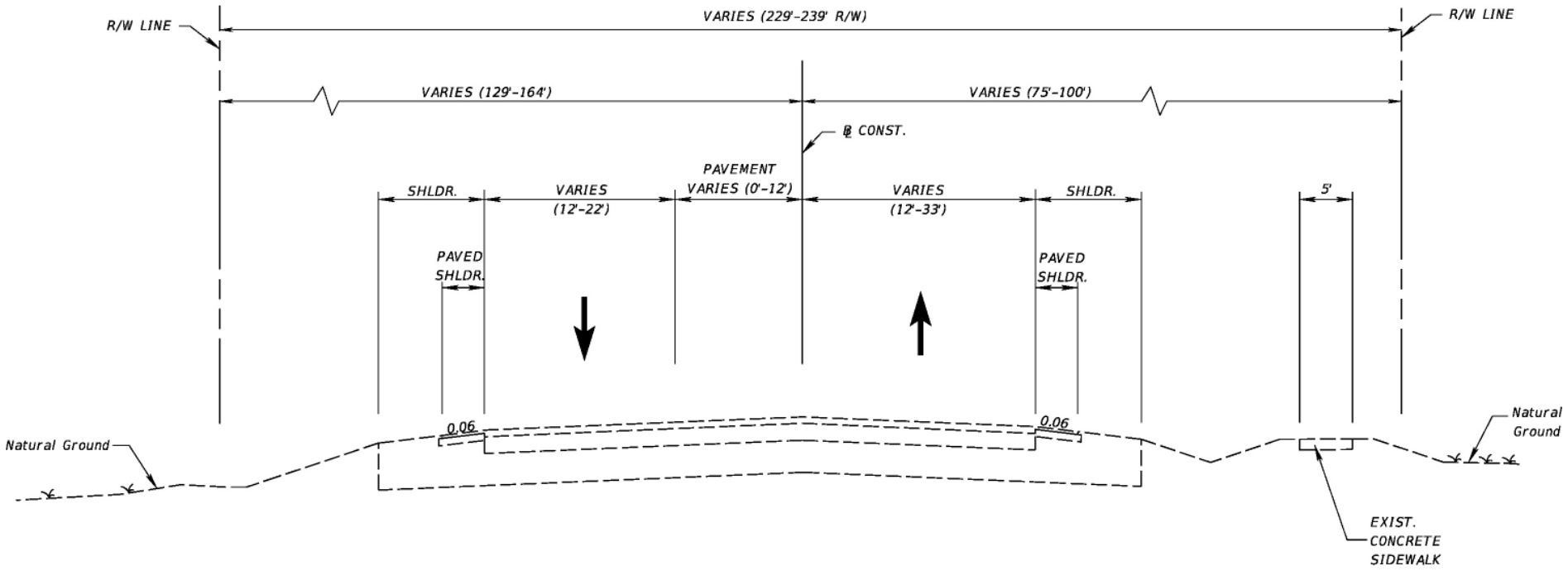
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
501	BREVARD	433605-1-22-01

EXISTING TYPICAL SECTION

SHEET NO.

$USER$ $DATE$ $TIME$ $FILE$



EXISTING TYPICAL SECTION NO. 3

CLEARLAKE ROAD (SR 501)

FROM NORTH OF WAL-MART TO INDUSTRY ROAD

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
501	BREVARD	433605-1-22-01

$USER$ $DATE$ $TIME$ $FILE$

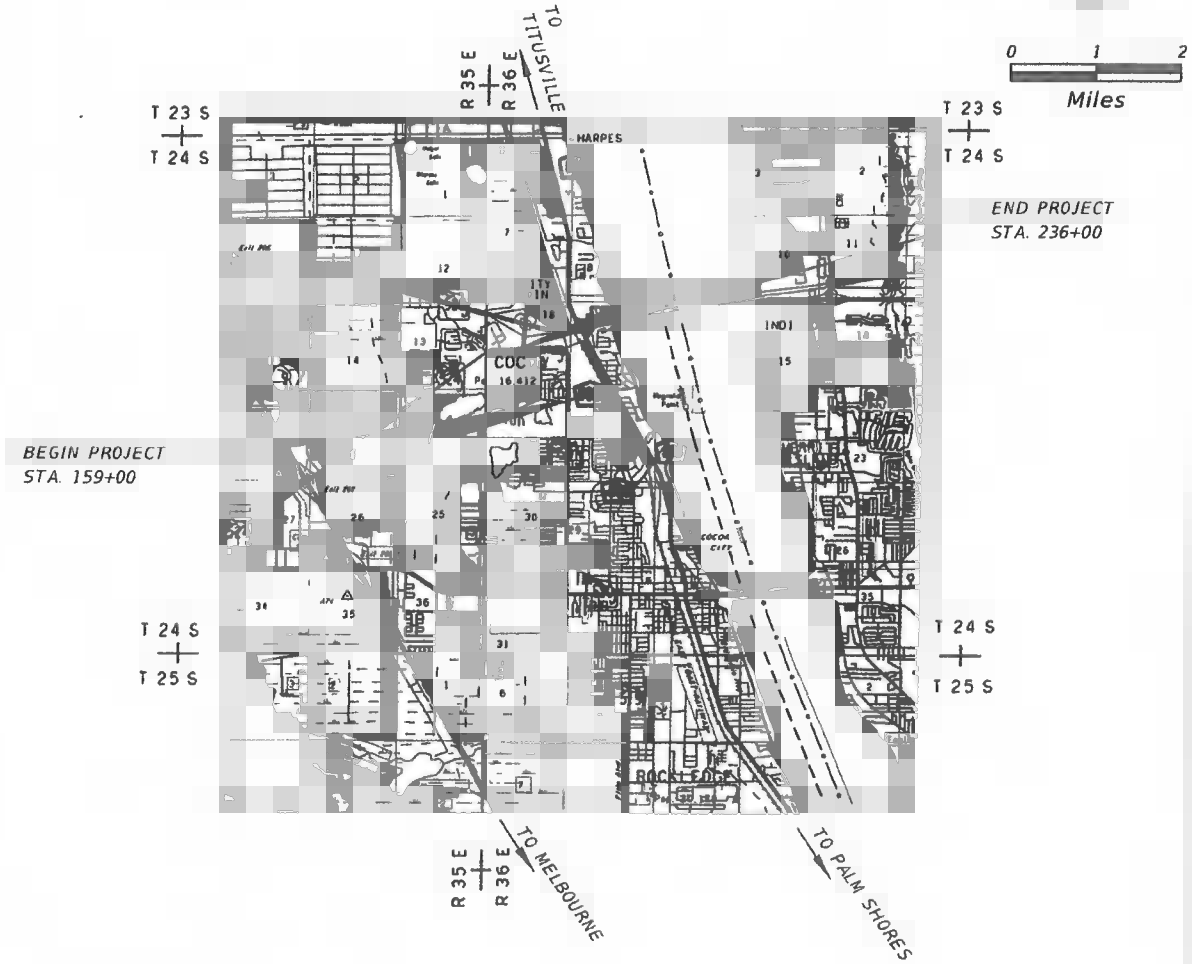
EXISTING TYPICAL SECTION

SHEET NO.

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

TYPICAL SECTION PACKAGE

FINANICAL PROJECT ID: 433605-1-52-01
BREVARD COUNTY (70011)
SR 501 (CLEARLAKE ROAD)



LENGTH OF PROJECT SR 501	(FEET)	(MILES)
ROADWAY	7,700.00	1.458
BRIDGES	0.00	0.000
NET LENGTH	7,700.00	1.458
EXCEPTIONS	0.00	0.000
GROSS LENGTH	7,700.00	1.458

SCALAR CONSULTING GROUP INC.
4152 W. BLUE HERON BOULEVARD, SUITE 119
RIVIERA BEACH, FL 33404
TEL. NO. (561) 429-5065
CERTIFICATE OF AUTHORIZATION NO. 29560
CONTRACT NO. C-9H54
VENDOR NO. 451909667002
ENGINEER OF RECORD: ANIRUDDHA GOTMARE, P.E.
FL P.E. NO. 54801

PROJECT IDENTIFICATION

FINANCIAL PROJECT ID 433605-1-52-01 COUNTY (SECTION) BREVARD (70011)

PROJECT DESCRIPTION SR 501 (CLEARLAKE ROAD) WIDENING FROM SOUTH OF MICHIGAN AVE. TO WEST OF INDUSTRY ROAD.

PROJECT CONTROLS

FUNCTIONAL CLASSIFICATION

( ) RURAL

(X) URBAN

( )	FREEWAY/EXPWY.	( )	MAJOR COLL.
(X)	PRINCIPAL ART.	( )	MINOR COLL.
( )	MINOR ART.	( )	LOCAL

HIGHWAY SYSTEM

Yes	No	
(X)	( )	NATIONAL HIGHWAY SYSTEM
( )	(X)	STRATEGIC INTERMODAL SYSTEM
(X)	( )	STATE HIGHWAY SYSTEM
( )	(X)	OFF STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY

( ) 2 - RESTRICTIVE w/Service Roads

( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing

( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing

(X) 5 - RESTRICTIVE w/440 ft. Connection Spacing

( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing

( ) 7 - BOTH MEDIAN TYPES

CRITERIA

(X) NEW CONSTRUCTION / RECONSTRUCTION

( ) RRR INTERSTATE / FREEWAY

( ) RRR NON-INTERSTATE / FREEWAY

( ) TDLC / NEW CONSTRUCTION / RECONSTRUCTION

( ) TDLC / RRR

( ) MANUAL OF UNIFORM MINIMUM STANDARDS (FLORIDA GREENBOOK) (OFF-STATE HIGHWAY SYSTEM ONLY)

TRAFFIC

	YEAR	AADT
CURRENT	2016	20,000
OPENING	2023	22,000
DESIGN	2043	26,000

DESIGN SPEED

STA. 159+00 TO STA. 188+50	45
STA. 188+50 TO STA. 208+00	35
STA. 208+00 TO STA. 236+00	45

POSTED SPEED

STA. 159+00 TO STA. 188+50	45
STA. 188+50 TO STA. 208+00	35
STA. 208+00 TO STA. 236+00	45

DISTRIBUTION

K	9%
D	55.3%
T_{24}	7.1%

DESIGN SPEED APPROVALS

A K Brennan — DISTRICT DESIGN ENGINEER — 2/9/2016 DATE

Robert B. Moore — DISTRICT TRAFFIC OPERATIONS ENGINEER — 3/8/16 DATE

LIST ANY POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION ELEMENTS:

N/A

LIST MAJOR STRUCTURES LOCATION/DESCRIPTION - REQUIRING INDEPENDENT STRUCTURE DESIGN:

N/A

LIST MAJOR UTILITIES WITHIN PROJECT CORRIDOR:

BREVARD COUNTY PUBLIC WORKS ENGINEERING
CITY OF COCOA
FLORIDA CITY GAS
FLORIDA GAS TRANSMISSION - MELBOURNE
FLORIDA POWER & LIGHT
MCI
AT&T DISTRIBUTION
TRANSCORE
BRIGHT HOUSE NETWORKS, LLC

LIST OTHER INFORMATION PERTINENT TO DESIGN OF PROJECT:

DESIGN SPEED CHANGES FROM 45 MPH TO 35 MPH TO ACCOMODATE THE CURVE AND R/W IMPACTS.

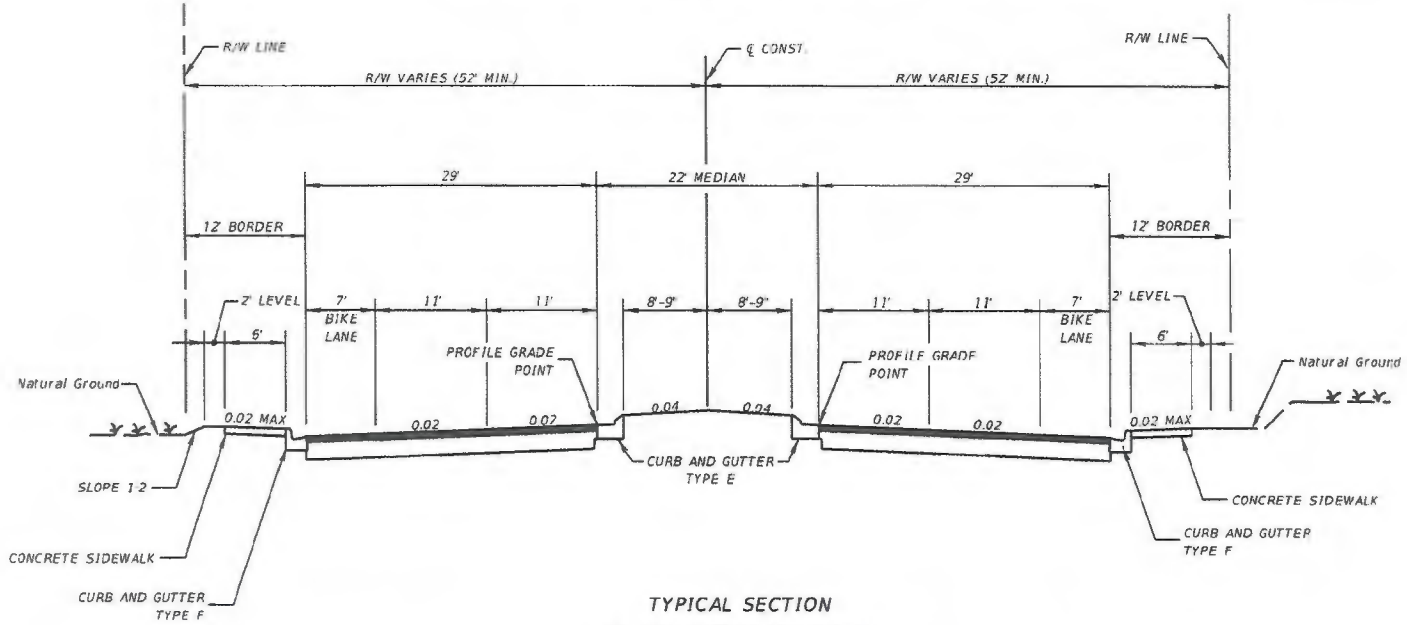
PROJECT IDENTIFICATION

FINANCIAL PROJECT ID 433605-1-52-01 FEDERAL AID PROJECT NO. N/A COUNTY NAME BREVARD

SECTION NO. 70011 ROAD DESIGNATION SR 501 LIMITS/MILEPOST SOUTH OF MICHIGAN AVE. (MP 2.235) TO WEST OF INDUSTRY ROAD (MP 3.358)

PROJECT DESCRIPTION SR 501 (CLEARLAKE ROAD) WIDENING FROM SOUTH OF MICHIGAN AVENUE TO WEST OF INDUSTRY ROAD

PROPOSED ROADWAY TYPICAL SECTION



TYPICAL SECTION
SR 501 (CLEARLAKE ROAD)
STA. 159+00 TO STA. 188+50

DESIGN SPEED = 45 MPH

APPROVED BY: ANIRUDDHA GOTMARE, P.E.	FDOT CONCURRENCE	RECOMMENDED BY
Engineer of Record Scalar Consulting Group, Inc 4152 W. Eau Gallie Boulevard, Suite Riviera Beach, FL 33404	1/25/2016 Date	Annette K. Brennan, P.E. FDOT District Design Engineer 2/9/2016 Date	Amy Sirmans, P.E. D-5 Project Development Engineer Date

ANIRUDDHA S. GOTMARE LICENSE NO. 54801 STATE OF FLORIDA PROFESSIONAL ENGINEER

swilliams 1/25/2016 4:45:59 PM P:\2014\SP14D5001 (SR 501 PD&E Study)\43360512201\roadway\TypPack.dgn

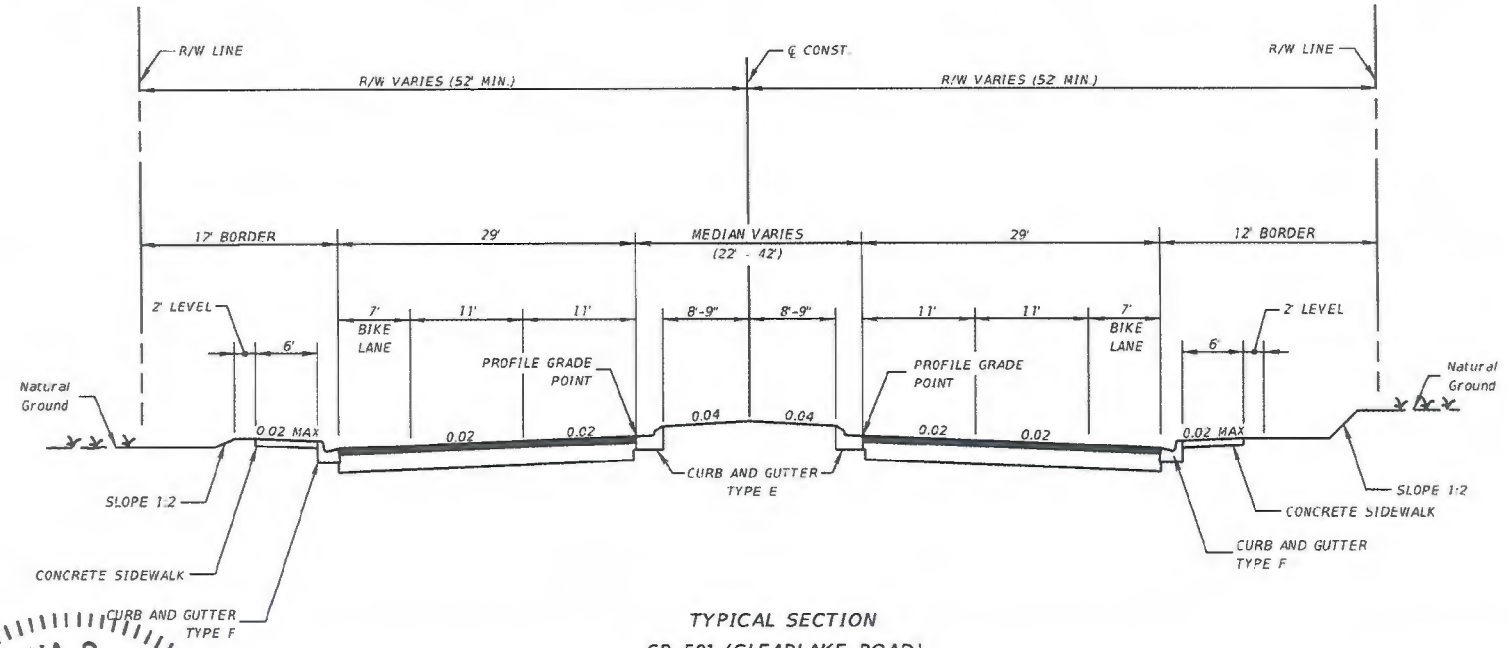
PROJECT IDENTIFICATION

FINANCIAL PROJECT ID 433605-1-52-01 FEDERAL AID PROJECT NO. N/A COUNTY NAME BREVARD

SECTION NO. 70011 ROAD DESIGNATION SR 501 LIMITS/MILEPOST SOUTH OF MICHIGAN AVE (MP 2.235) TO WEST OF INDUSTRY ROAD (MP 3.358)

PROJECT DESCRIPTION SR 501 (CLEARLAKE ROAD) WIDENING FROM SOUTH OF MICHIGAN AVENUE TO WEST OF INDUSTRY ROAD.

PROPOSED ROADWAY TYPICAL SECTION



TYPICAL SECTION
SR 501 (CLEARLAKE ROAD)
STA. 188+50 TO STA. 236+00

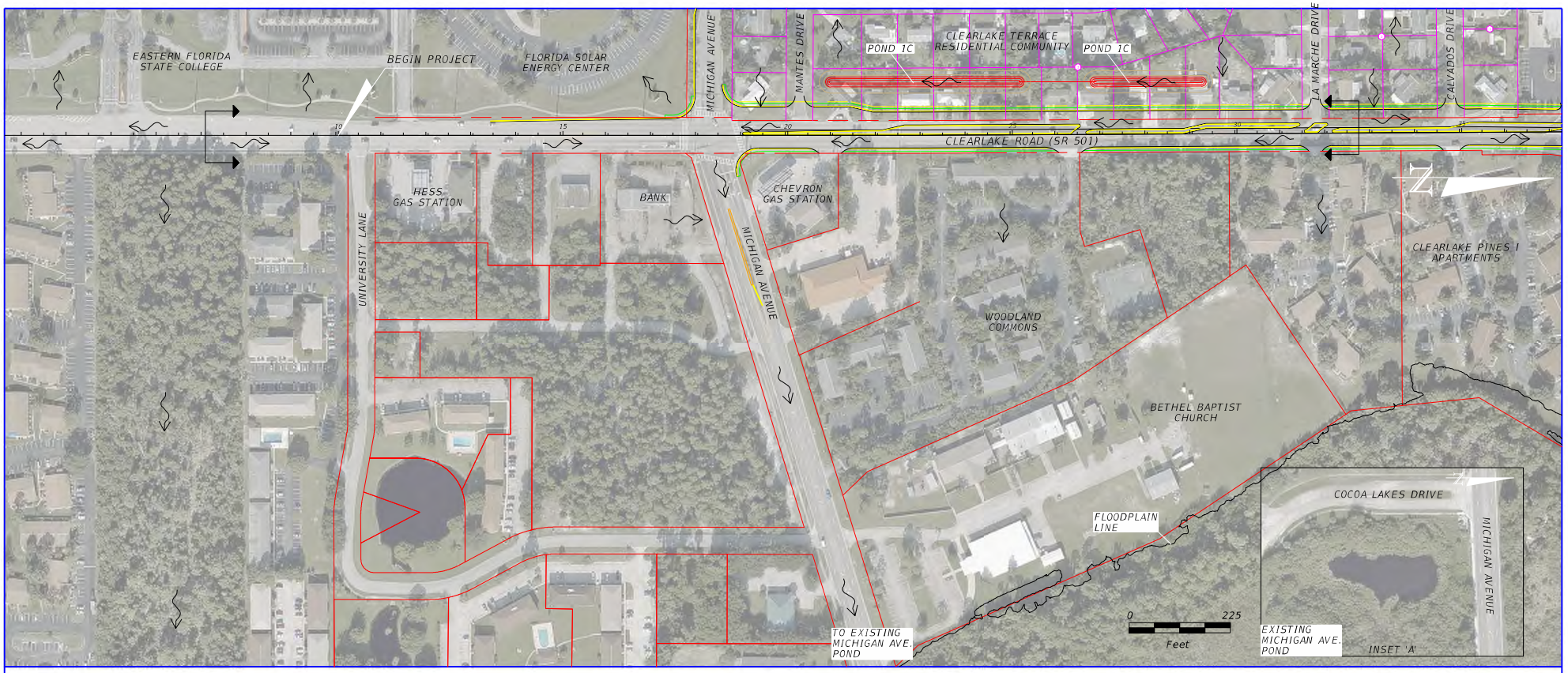
DESIGN SPEED = 35 MPH / 45 MPH

APPROVED BY: ANIRUDDHA GOTMARE, P.E.	FDOT CONCURRENCE	RECOMMENDED BY
STATE OF FLORIDA PROFESSIONAL ENGINEER ANIRUDDHA S. GOTMARE LICENSE No. 54801 Engineer of Record Scalar Consulting Group, Inc. 4152 W. Blue Heron Boulevard, Suite 1 Riviera Beach, FL 33404 1/25/2016 Date	AK Brennan Annette K. Brennan, P.E. FDOT District Design Engineer 2/9/2016 Date	Amy Sirmans, P.E. D-5 Project Development Engineer Date

swilliams 1/25/2016 4:46:11 PM P:\2014\SP14DS001 (SR 501 PD&E Study)\43360512201\roadway\TypPack.dgn

APPENDIX C

PROJECT DRAINAGE MAPS



REVIEWER NOTES

DATE	REVIEWER	DISCIPLINE	POND ID	COMMENT

LEGEND

- SYSTEM LIMITS
- POTENTIAL POND SITES
- INDIVIDUAL PARCELS
- EXISTING R/W LINE
- PROPOSED R/W LINE
- DRAINAGE FLOW ARROW

POND ID	BASIN	POND SIZE	PARCEL ID	COMMENT
1C	1	0.83 ACRES	-	10 PARCELS IMPACTED; 2 PROP. DRY RETENTION DITCHES

NOT FOR CONSTRUCTION

SR 501 PD&E STUDY FROM MICHIGAN AVENUE TO INDUSTRY ROAD

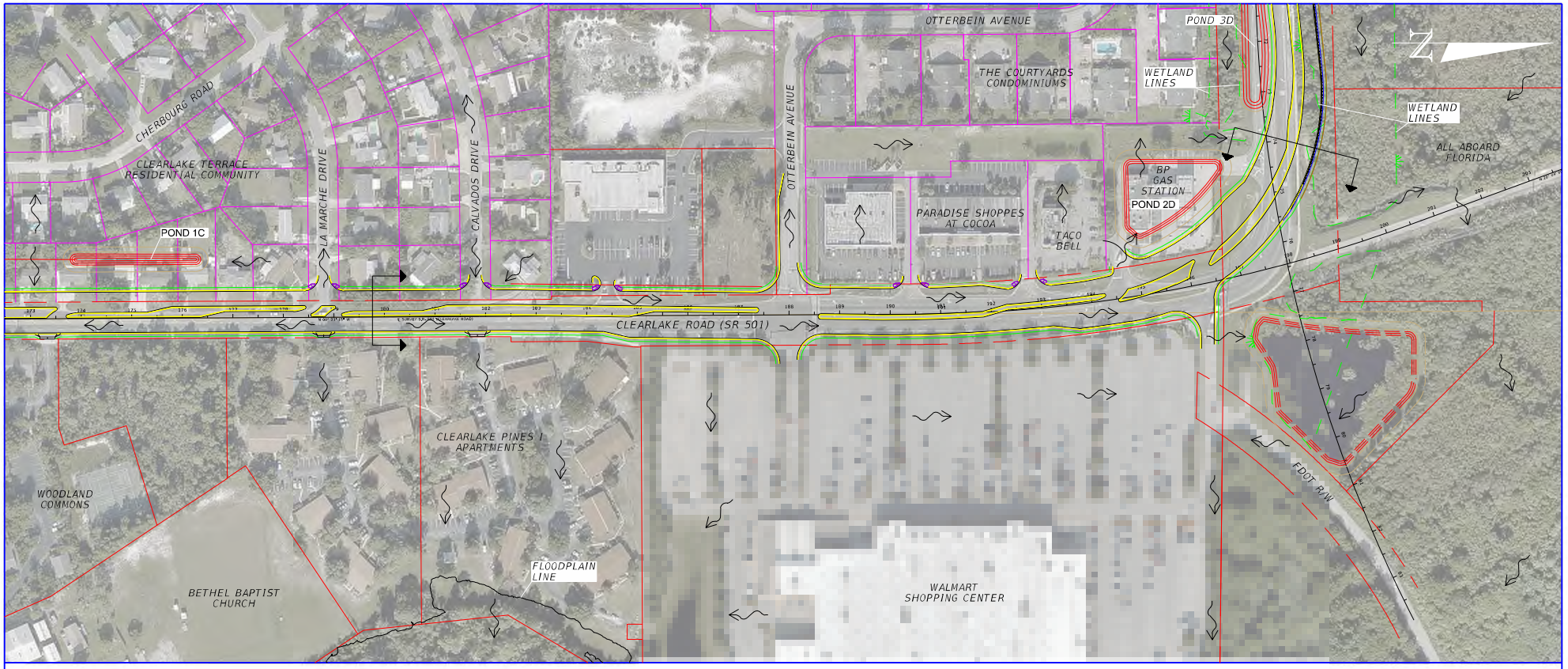
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

DATE	ROAD NO.	COUNTY	FINANCIAL PROJECT ID
10/18/16	501	BREVARD	433605-1-22-01

$USERS $DATES $TIMES $FILES

DRAINAGE SYSTEM 1
BP Gas Alternative

BASIN NO. 1



REVIEWER NOTES

DATE	REVIEWER	DISCIPLINE	POND ID	COMMENT

LEGEND

- SYSTEM LIMITS
- POTENTIAL POND SITES
- INDIVIDUAL PARCELS
- EXISTING R/W LINE
- PROPOSED R/W LINE
- DRAINAGE FLOW ARROW

0 50 200
Feet

POND ID	BASIN	POND SIZE	PARCEL ID	COMMENT
2D	2	0.78 ACRES	24-36-18-00-766	POND "FOOTPRINT" LOCATED ON GAS STATION

NOT FOR CONSTRUCTION

SR 501 PD&E STUDY
FROM MICHIGAN AVENUE
TO INDUSTRY ROAD

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

DATE	ROAD NO.	COUNTY	FINANCIAL PROJECT ID
10/18/16	501	BREVARD	433605-1-22-01

$USERS $DATES $TIMES $FILES

DRAINAGE SYSTEM 2
BP GAS ALTERNATIVE

BASIN NO. 2

REVIEWER NOTES

DATE	REVIEWER	DISCIPLINE	POND ID	COMMENT

LEGEND

- SYSTEM LIMITS
- POTENTIAL POND SITES
- INDIVIDUAL PARCELS
- EXISTING R/W LINE
- PROPOSED R/W LINE
- DRAINAGE FLOW ARROW

0 50 200
Feet

POND ID	BASIN	POND SIZE	PARCEL ID	COMMENT
3A	3	1.50 ACRES	-	FDOT R/W
3D	3	0.52 ACRES	-	FDOT R/W
3E	3	1.74 ACRES	-	FDOT R/W

NOT FOR CONSTRUCTION

SR 501 PD&E STUDY
FROM MICHIGAN AVENUE
TO INDUSTRY ROAD

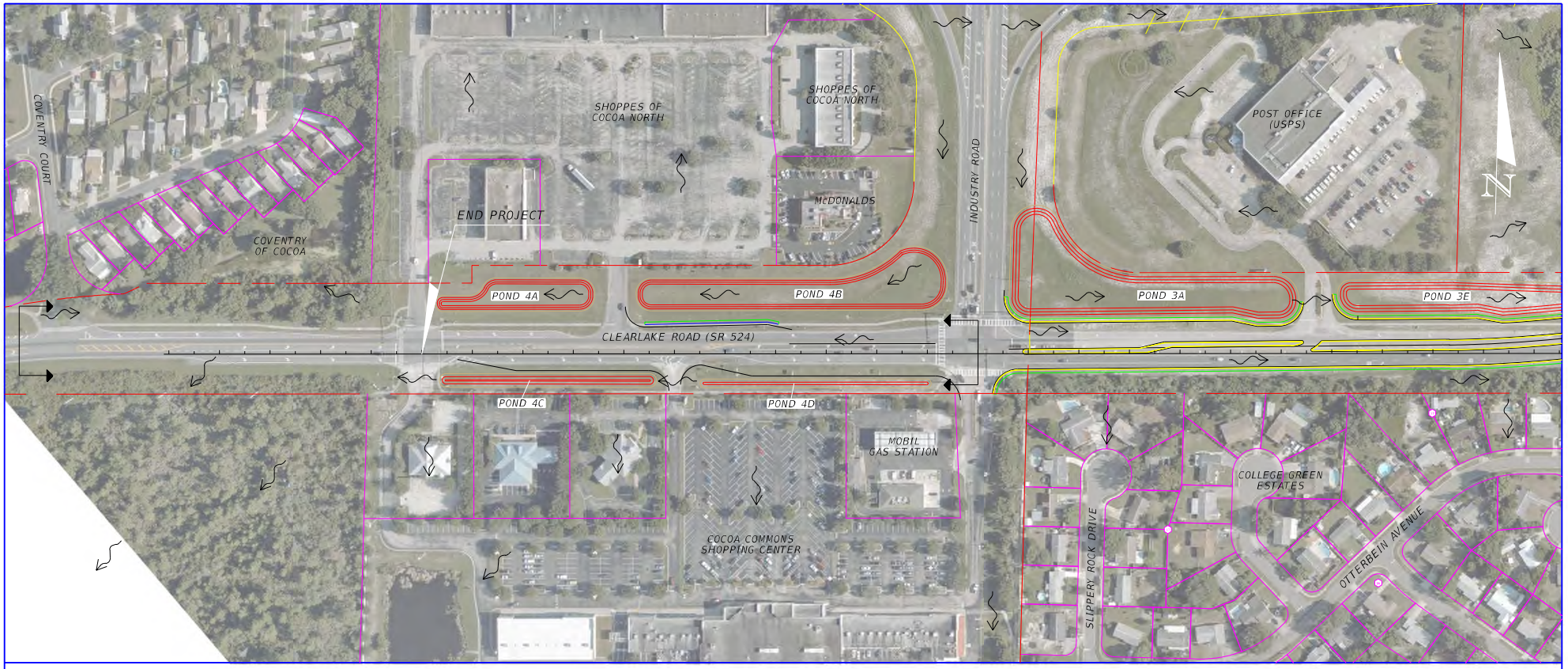
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

DATE	ROAD NO.	COUNTY	FINANCIAL PROJECT ID
10/18/16	501	BREVARD	433605-1-22-01

$USERS $DATES $TIMES $FILES

DRAINAGE SYSTEM 3
BP GAS ALTERNATIVE

BASIN NO. 3



REVIEWER NOTES

DATE	REVIEWER	DISCIPLINE	POND ID	COMMENT

LEGEND

- SYSTEM LIMITS
- POTENTIAL POND SITES
- INDIVIDUAL PARCELS
- EXISTING R/W LINE
- PROPOSED R/W LINE
- DRAINAGE FLOW ARROW

0 50 200
Feet

POND ID	BASIN	POND SIZE	PARCEL ID	COMMENT
4A	4	0.40 ACRES	-	FDOT R/W
4B	4	1.05 ACRES	-	FDOT R/W
4C	4	0.25 ACRES	-	FDOT R/W
4D	4	0.20 ACRES	-	FDOT R/W

NOT FOR CONSTRUCTION

SR 501 PD&E STUDY
FROM MICHIGAN AVENUE
TO INDUSTRY ROAD

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

DATE	ROAD NO.	COUNTY	FINANCIAL PROJECT ID
10/18/16	501	BREVARD	433605-1-22-01

$USERS $DATES $TIMES $FILES

DRAINAGE SYSTEM 4
BP GAS ALTERNATIVE

BASIN NO. 4