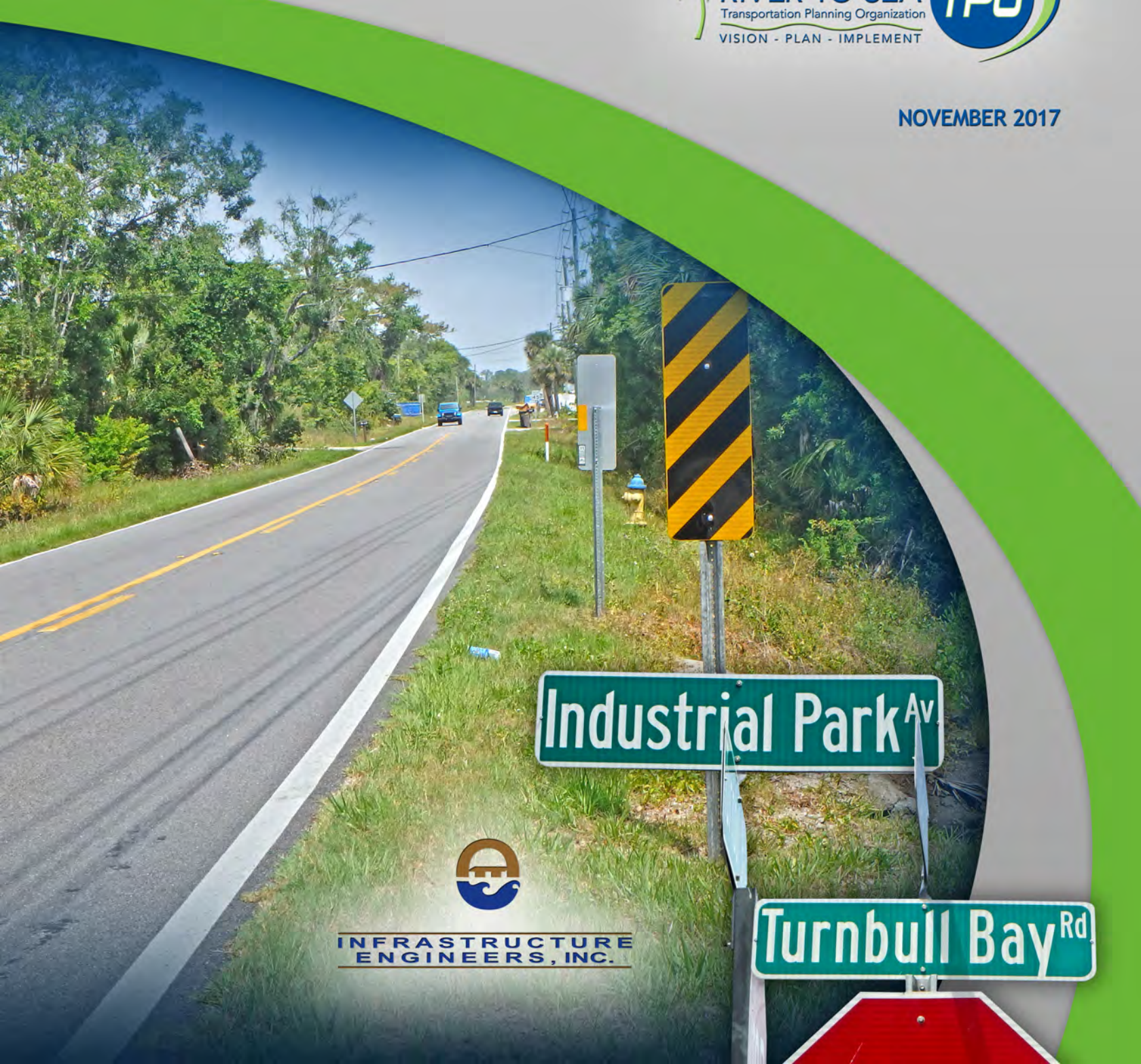
TURNBULL BAY ROAD
Trail Feasibility Study

RIVER TO SEA TPO
Transportation Planning Organization
VISION - PLAN - IMPLEMENT

NOVEMBER 2017



INFRASTRUCTURE ENGINEERS, INC.

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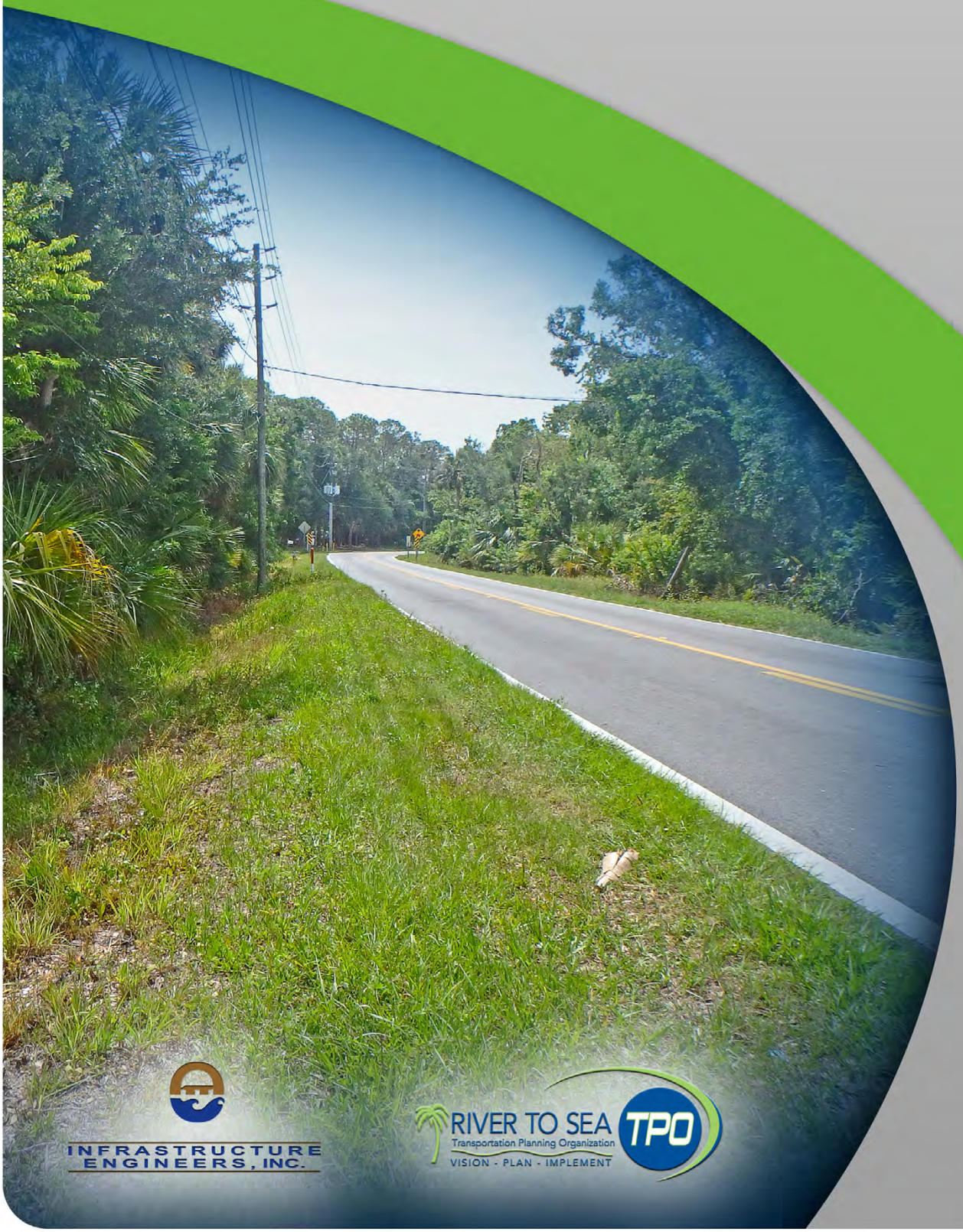

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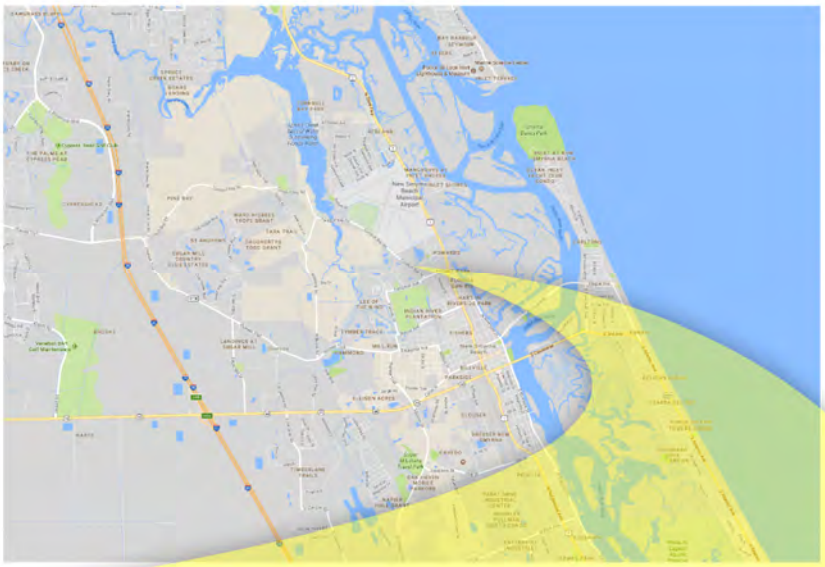
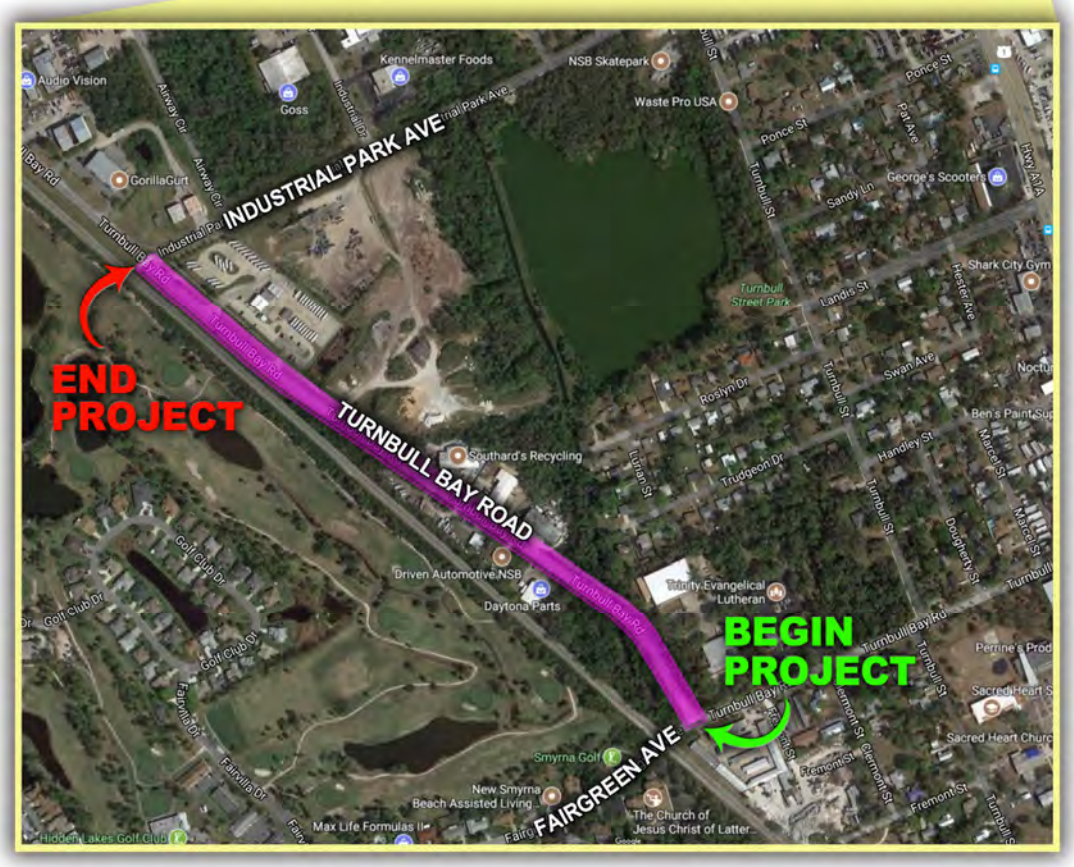
I. INTRODUCTION

The City of New Smyrna Beach submitted an application to the River to Sea Transportation Planning Organization (R2CTPO) for the review of a feasibility study for a new 2,780-foot multi-use trail. The intent is to provide a 12-ft. wide multi-use trail. The multi-use trail will follow along the north side of Turnbull Bay Road through New Smyrna Beach from Industrial Park Avenue to Fairgreen Avenue. This project will connect segments of an existing multi-use trail system as well as connect over ten public facilities. It will also enhance pedestrian and bicyclist safety. See Exhibit 1, Project Location Map.

The impetus for this project is based on the need to meet the City's goals and policies in New Smyrna Beach's Comprehensive Plan, which are to create bicycle and pedestrian facilities which tie the street system with greenway systems and major activity centers. The multi-use trail will comply with the pedestrian and bicycle standards set forth in New Smyrna Beach's Land Development Code, Florida Department of Transportation's (FDOT) Manual of Minimum Standards for Design, Construction and Maintenance for Streets and Highways (Florida Greenbook) and the 2010 ADA Standards for Accessible Design.

Exhibit 1 - Project Location Map





Purpose and Objectives

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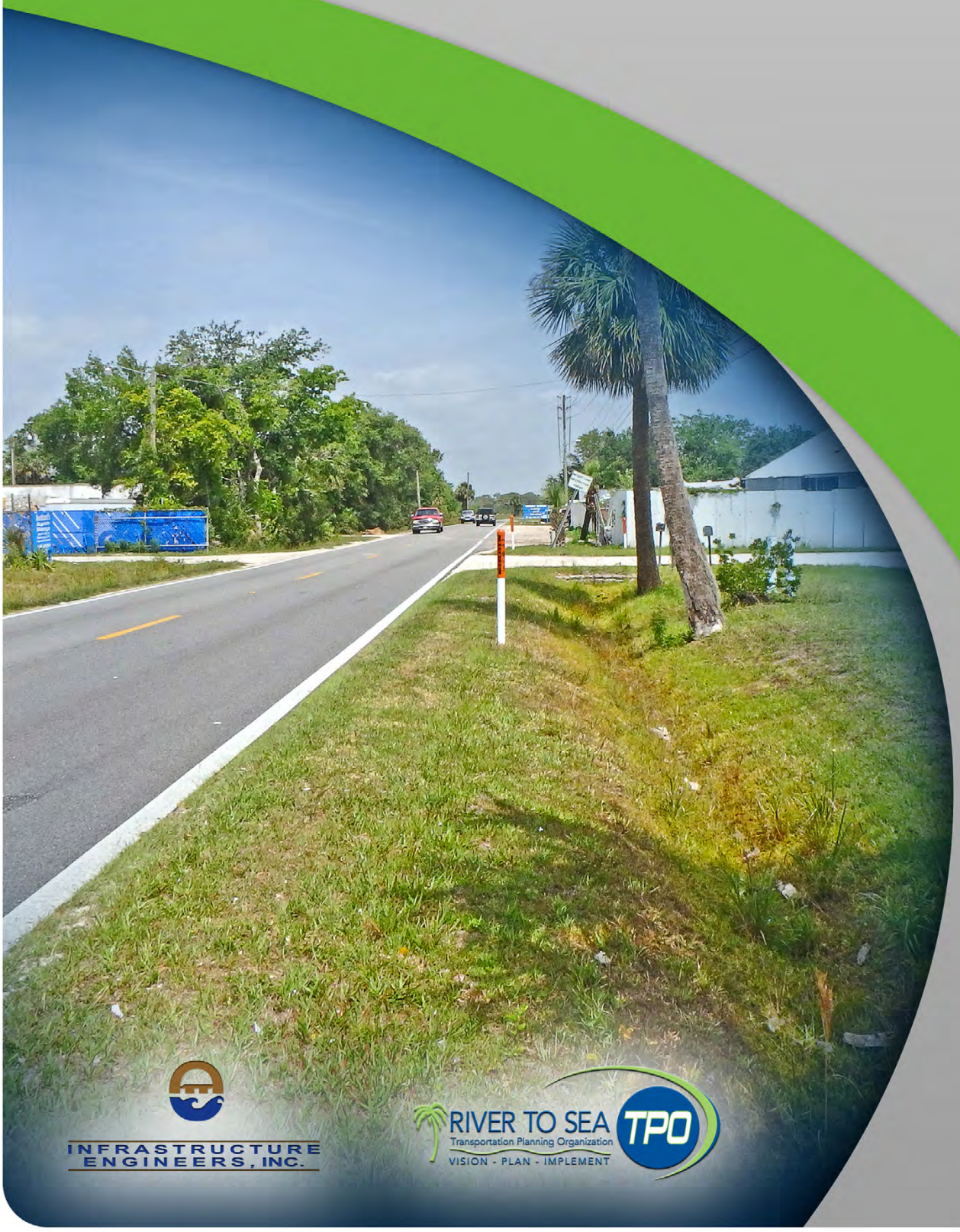
II. PURPOSE AND OBJECTIVE

The purpose of this project is to assess the feasibility of constructing a 12-ft. multi-use trail along Turnbull Bay Road from Industrial Park Avenue to Fairgreen Avenue. The objective of the study is to determine the conceptual alignment of the multi-use trail along Turnbull Bay Road given the many constraints that exist within the potential multi-use trail alignment. Providing a continuous multi-use trail along Turnbull Bay Road will connect over ten public recreation facilities, as well as the Fairgreen and North Mainland neighborhoods. More specifically, the multi-use trail will improve the safety for pedestrians and bicyclists using the Swoope Boat Launch, Rocco Park, the New Smyrna Golf Course and Beach Airport, the Garden Club, the Boy Scout Hut, the Lions Club, and the Municipal Sports Complex. This project will benefit not only those residents adjacent to the corridor, but also residents and businesses within the project area.

This study required coordination with several agency representatives and stakeholders that the study team would like to thank for their continuing interest in this project and their assistance:

Mr. Stephan Harris – River to Sea Transportation Planning Organization
Ms. Amye King – City of New Smyrna Beach
Ms. Nancy Maddox – City of New Smyrna Beach
Mr. Amir Asgarinik – FDOT District 5
Mr. Travis Terpstra – Volusia County

Study Methodology



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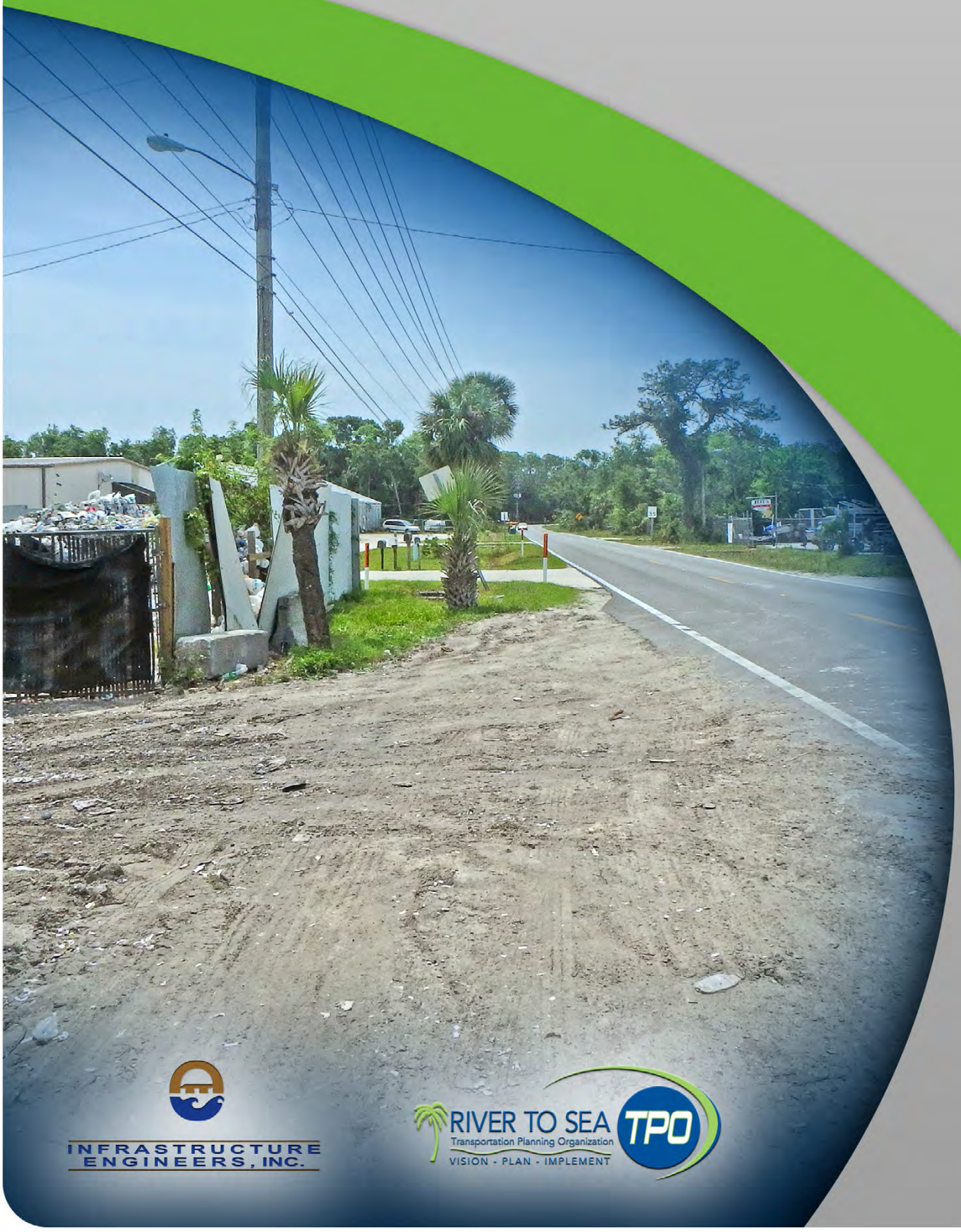
III. STUDY METHODOLOGY

The following tasks were completed so that a detailed feasibility report can be provided:

1. A project coordination meeting was held on May 30, 2017 with R2CTPO's project manager, Volusia County, FDOT and the City of New Smyrna Beach staff for the purpose of scoping the project and obtaining relevant project information.
2. Data collection consisted of reviewing the City's Comprehensive Plan, Land Development Code, and Bicycle and Pedestrian Master Plan. Additionally, aerial photography was obtained as well as apparent right-of-way and parcel lines from Volusia County's Geographic Information System (GIS). The team also reviewed Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), Map No. 12127C0540H, United States Soil Conservation Service Soil Survey maps, and the National Wetlands Inventory maps to gain a better understanding of the project.
3. Two site visits were conducted to assess current constraints. Photographs and aerial maps were used to document the items that would impact constructability such as power poles, guy wires, other utility features, fencing, drainage features, landscaping, mailboxes, etc. No topographic survey was performed for this study. All right-of-way lines shown are considered apparent right-of-way lines because, no right-of-way survey was performed for this study. The aerial photography and information collected from our site visits is the foundation for the conceptual design.
4. Concept plans were created from the information collected from the previous tasks. The design criteria used to develop the concept plans are as follows:
    a. 2017-18 Plans Preparation Manual, FDOT
    b. Manual on Uniform Traffic Control Devices, FHWA
    c. 2017-18 FDOT Design Standards
    d. 2013 Florida Green Book
    e. 2010 ADA Standards for Accessible Design
5. An Engineer's Opinion of Probable Costs (EOPC) to construct the conceptual design was prepared. The EOPC unit prices were obtained from the FDOT's historical statewide average costs.
6. Preparation of the final report will occur after receipt of comments from the City, R2CTPO, FDOT, and Volusia County.

Existing Conditions



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IV. EXISTING CONDITIONS

Existing conditions were noted during our site visits. The site visits began at Industrial Park Avenue and continued east for approximately 2,780-ft. to Fairgreen Avenue. Photographs from the site visits are in *Appendix A*.

The eastbound posted speed limit is 45 MPH from Industrial Park Avenue to the entrance to Station 112+25. The posted eastbound speed limit drops to 35 MPH at this location and continues to Fairgreen Avenue. The posted speed limit westbound is 45 MPH throughout the study limits.

There is approximately 780-ft. of existing sidewalk located on the north side of Turnbull Bay Road that starts from Industrial Park Avenue and ends just east of the Volusia County New Smyrna Beach Terminal, Student Transportation Services facility (Station 112+60).

Driveways and Side Streets

There are eleven driveways on the north side of Turnbull Bay Road and five on the south side. Nine of these are concrete or asphalt driveways while the other seven are unpaved dirt. There are two side street intersections that mark the begin and end of the study limits, Industrial Park Avenue and Fairgreen Avenue. None of the intersections within the study limits are signalized.

Apparent Right-of-Way

Table 1 below lists the apparent right-of-way along the project corridor. A corner clip is required at the northwest quadrant of the intersection of Turnbull Bay Road and Fairgreen Avenue to provide a connection from the multi-use trail to the existing sidewalk. The apparent right-of-way lines shown on the concept plans were obtained from the Volusia County Geographic Information System (GIS). Right-of-way survey was not a part of the scope of this study.

Table 1 – Apparent Right-of-Way

Industrial Park Avenue to 1292 Turnbull Bay Road	180-ft. – 190-ft.
1292 Turnbull Bay Road to Southard's Recycling Entrance	90-ft. – 100-ft.
Southard's Recycling Entrance to Vern's Insulation & Specialties Entrance	55-ft. – 65-ft.
Vern's Insulation & Specialties Entrance to Fairgreen Avenue	100-ft. – 120-ft.

Utilities

There are seven utilities located within the study corridor. They are as follows:

- Utilities Commission of New Smyrna Beach
- Florida Public Utilities
- AT&T Distribution
- Spectrum (Charter)
- Centurylink
- Sprint
- Sunesys

Drainage and Environmental Permitting

During the field assessment it was noted that, in general, roadway runoff drains to the existing grassed shoulder and then into roadside swales. Storm and roadway runoff generally sheet flows overland to these roadside swales and then flows from the west to the east to the ditch crossing located at Station 127+10 *(See Concept Plans, Appendix B)*. The majority of the existing roadside swales will not be impacted by the proposed multi-use trail. The existing roadside ditch from approximately Station 124+40 to Station 127+00, is impacted by the proposed multi-us trail. A proposed shallow swale along with modified Type C ditch bottom inlets, (commonly referred to as back of sidewalk inlets) and pipe is proposed to provide the necessary conveyance of roadway runoff within these limits. In addition, gravity wall is to be constructed along the back side of the multi-use trail to avoid wetland impacts. The topography is such that, offsite flows toward the north away from the gravity wall into the adjacent wetland. Despite this, the gravity wall will have to be designed to account for the wet soil conditions associated with wetland areas.

Based on the National Wetlands Inventory (NWI) data, there is one wetland area with a central cut ditch within the study limits. The NWI exhibit can be found in *Appendix C*. The wetland parallels the roadway for approximately 325-ft. and then turns north behind the industrial park developments along Turnbull Bay Road. Due to the adoption and implementation of the Statewide Environmental Resource Permitting (SWERP) rules, all potential direct and secondary wetland impacts must be addressed. However, the construction of pedestrian trails is considered an exempt activity, so long as there are no impacts to wetlands or surface waters. As the existing apparent right-of-way is mostly, cleared and maintained shoulder, minimal direct impacts are anticipated. Secondary impacts are anticipated and will likely need to be addressed. The roadside ditches are considered "other surface waters" and thus no mitigation is anticipated for work in, on or over the roadside ditches. However, the St. Johns Water Management District (SJRWMD) will require the surface water impacts to be quantified and engineering calculations must show that pre- and post- project water quality and quantity remain the same. These calculations will be provided during final design as they are outside of the scope of this study.

This wetland should be considered jurisdictional to the Army Corps of Engineers (ACOE). The project is located in the Northern Indian River Lagoon regulatory basin. At the time of this desktop wetland assessment was performed, there were no mitigation banks with credits available and therefore an alternative form of mitigation will be required to offset any wetland impacts. This could consist of wetland creation, enhancement or preservation of other wetland systems within the basin.

Based on this desktop assessment, it is anticipated that there will be approximately 0.25 acres of direct and indirect wetland impacts. This equates to approximately $10,000 from a mitigation bank, if one was available for this basin. This is about the same price for an alternative mitigation option, such as an exotic plant management plan, assuming a five-year plan and six treatments per year.

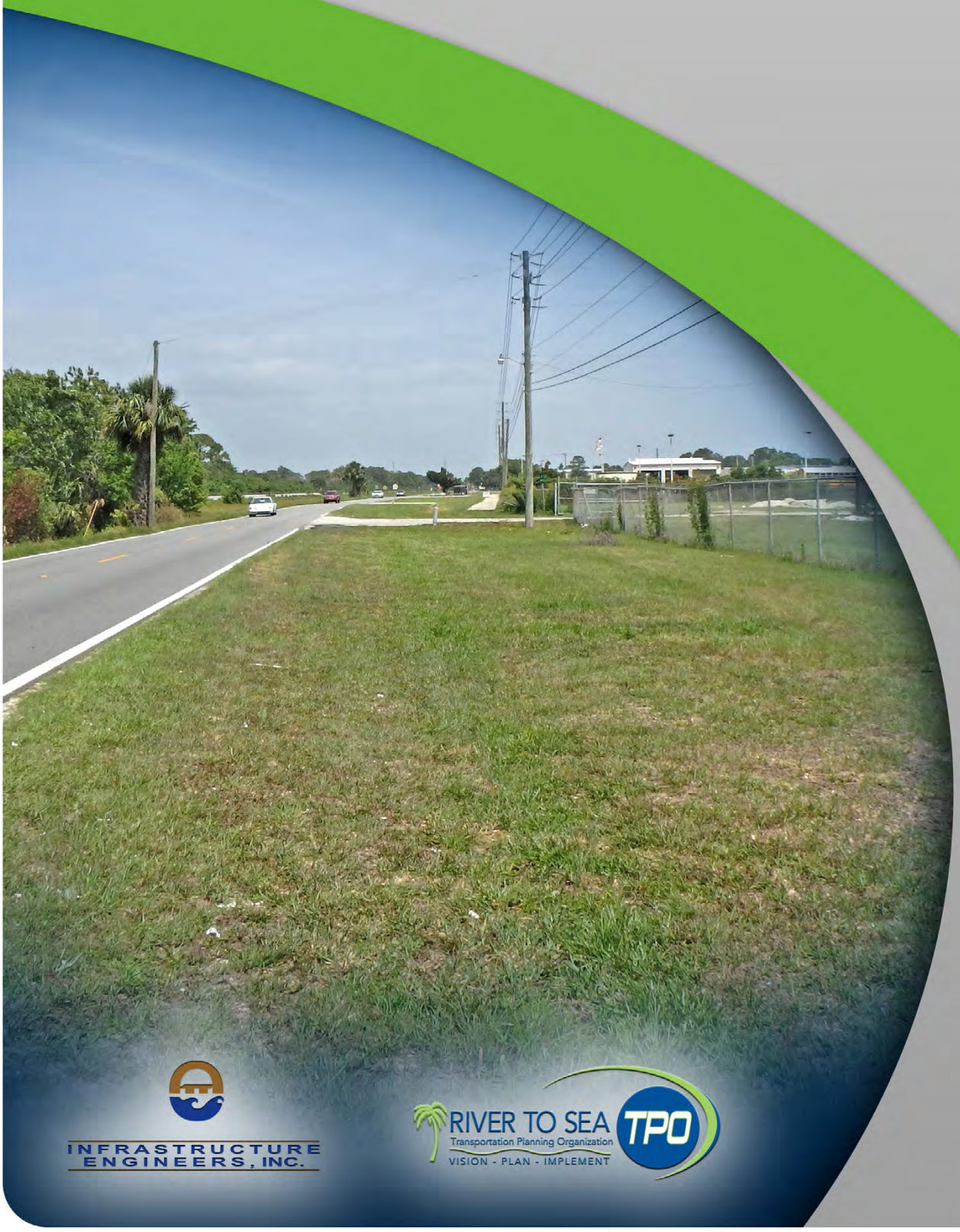
During design a formal wetland assessment and a Threatened and Endangered (T&E) Species Assessment must be performed.

Soils and Floodplains

The vast majority of the soils within the study area are Cassia fine sand (15.3%), Cocoa-Urban land complex (30.2%), Hydraquents (10.5%), and Myakka wet-fine sands (22.0%). The Cocoa-Urban land complex is well drained and has a depth of more than 80 inches to the water table. All the other soil types are somewhat poorly drained to poorly drained and the depths to the water table vary from 0 to 42 inches. The locations and types are depicted on the soils map found in *Appendix D*.

The majority of the project lies within a floodplain classified as Zone AE with base elevations determined at 5-ft. Portions also fall within Special Flood Hazard Areas subject to inundation by the 1% Annual Chance Flood. However, much of the corridor has been altered (filled) by the construction of Turnbull Bay Road and the surrounding commercial and industrial businesses. Addition of the multi-use trail within the study area should not require floodplain compensation. The Flood Insurance Rate Maps can be found in *Appendix E.*

Shared Use Trail Concept Plan Feasibility Analysis



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Shared Use Trail Concept Plan Feasibility Analysis

V. MULTI-USE TRAIL CONCEPT PLAN FEASIBILITY ANALYSIS

The concept for this project is to construct a 12-ft. multi-use trail along the north side of Turnbull Bay Road. The limits of the project, as submitted in the XU Bicycle/Pedestrian Project application, are from Industrial Park Avenue to Fairgreen Avenue. Based on discussions with the City of New Smyrna Beach and two site visits, it was determined that the 12-ft. multi-use trail should be constructed on the north, as this ties to the existing trail west of the study limits and mimics the existing sidewalk locations along Turnbull Bay Road. The Multi-use Trail Concept Plans are located in *Appendix B*.

The horizontal separation from the vehicular traffic was determined using the following general criteria from the May 2013 Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways (Florida Greenbook). The horizontal separation criteria are as follows:

- Outside of the apparent right-of-way in a separately dedicated corridor adjacent to the apparent right-of-way
- At or near the apparent right-of-way line (ideally, 3-ft. of width should be provided behind the sidewalk for above ground utilities)
- Outside of the minimum required clear zone (10-ft for a collector with a 35 MPH design speed and 14-ft for a collector with a 45 MPH design speed and ADT less than 1500)
- As far from the edge of the driving lane as practical

Additionally, multi-use trails should have a 4-ft. minimum separation from above ground hazards. The existing posted speed limit within the corridor is predominantly 45 MPH. For this study, the clear zone width will be based on a design speed of 45 MPH.

The following text describes the feasibility analysis as a "walk-through" of the project corridor.

The proposed asphalt 12-ft. multi-use trail will begin just west of Industrial Park Avenue connecting to the existing 12-ft. asphalt multi-use trail at Station 103+06.07 (see Photo 1). The existing trail crosses Industrial Park Avenue north or behind the stop bar on Industrial Park Avenue (see Photo 2). At side streets this creates a safety hazard as motorists are not anticipating pedestrians or cyclists to cross outside of the crosswalk limits. The proposed trail will be aligned to cross within the limits of the crosswalk in front of the stop bar. The proposed trail continues east of Industrial Park Avenue and connects to the existing 5-ft. sidewalk that runs along the east side of this side street connection (see Photos 3-4).

It then heads east down Turnbull Bay Road following the same alignment as the existing 8-ft. sidewalk adjacent to the north Turnbull Bay Road apparent right-of-way line. It continues adjacent to the north apparent right-of-way line until it reaches the easterly property line of the Volusia County Schools New Smyrna Beach Terminal Student Transportation Services site at approximately Station 112+60 (see Photos 5-10). Please note, that the alignment of the trail across the driveways to the Transportation Services Site keeps the trail adjacent to the apparent right-of-way line. The decision to keep the trail adjacent to the apparent right-of-way line rather that shift it towards the roadway so that it crosses in

front of the driveway stop bars was made based on several factors. First, it is safer to keep the trail as far away as possible from the roadway. Second, the existing 8-ft. sidewalk has followed the same location/alignment as the proposed trail for many years. Therefore, having pedestrians or cyclists cross at this location is not unexpected. Third, keeping the sidewalk adjacent to apparent right-of-way line minimizes impacts to the existing drainage patterns. Lastly, these are driveways rather than side street connections and on rural roadways it is not uncommon for sidewalks and trails to cross driveways at or near the right-of-way line. During the design phase it is recommended that traffic volumes be taken at each of these driveways and an analysis performed to determine whether the trail should cross closer to the roadway in front of the driveway stop bars. Traffic counts and the associated analysis is outside the scope of this feasibility study.

From the east side of the Transportation Services site at approximately Station 112+60, the trail swings back towards Turnbull Bay Road to avoid the sidedrain at the driveway to 1292 Turnbull Bay Road. It remains adjacent to the apparent right-of-way line until Station 114+75. At this location it transitions back to follow the north apparent right-of-way line to avoid impacting the roadside swales (see Photos 11-12).

The trail continues adjacent to the north apparent right-of-way line from approximately Station 115+35 to Station 118+20. From here it transitions south towards Turnbull Bay Road. It remains at this location for approximately 150-ft. There is existing fence in the apparent right-of-way that will need to be relocated as well as a power pole and existing wooden sign. The existing apparent right-of-way is also being used for parking (see Photos 13-15).

As the trail continues east past Southard's Recycling, it shifts back adjacent to the apparent right-of-way to avoid impacting the roadside ditch. As was discussed previously, there was no right-of-way survey and all right-of-way lines depicted in the concept plans are "apparent" right-of-way lines. This section (Station 122+40 to Station 123+60) is an example of where the apparent right-of-way lines do not seem to be accurate. It appears that the apparent right-of-way line may need to be shifted to the south to just behind the existing power pole located at Station 122+45. If, during design, this is determined to be the case, the trail will need to shift south toward the roadway and will result in additional impacts to the existing ditch. This shift will not result in a notable change to the construction cost estimate or permitting (See Photos 16-19). Two power poles within this section require relocation as will a section of existing chain link fence.

The trail continues east past the driveway located at Station 123+40. As it does so, it begins to impact the roadside ditch. This impact is unavoidable as the trail cannot shift to the north due to the wetlands located adjacent to the apparent right-of-way line. A shallow swale will be constructed between the roadway and the trail to convey roadway runoff to the modified Type C ditch bottom inlets, commonly referred to as back of sidewalk inlets. Please note that these back of sidewalk inlets will be placed on the front or road side of the trail to capture the roadway runoff. A gravity wall is required from Station 124+50 to Station 127+30 to show avoidance and minimization of wetland impacts. The gravity wall

will tie into the headwall for the extended cross drain and the headwall located at the at the back of sidewalk inlet at Station 126+80 (see Photos 20-23). The width of the trail from Station 123+60 to 127+80 was widened to 12-ft. to better the accommodate the handrail located on top of the gravity wall. Two power poles and a sign will require relocation.

The trail continues from Station 127+80 to the end of the project adjacent to the north apparent right-of-way line. It ties to the existing 5-ft. sidewalk that heads north on Turnbull Bay Road. A corner clip is required to connect the proposed trail to the existing sidewalk (see Photos 24-28). One power pole and an existing sign will be impacted by the trail construction and require relocation or replacement.

Based on the concept plan feasibility analysis, the Turnbull Bay Multi-use trail appears to be feasible based on the following information:

1. It is assumed that all utility relocations/adjustments will be at the expense of the utility since they are in the apparent right-of-way by permit.
2. Clearing and Grubbing is assumed to be from edge of pavement to the apparent right-of-way line.

Financial Feasibility

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VI. FINANCIAL FEASIBILITY

Table 2 provides the Engineer's Opinion of Probable Costs (EOPC) for the construction of the proposed multi-use trail.

The item numbers and units of measure are based on the Florida Department of Transportation (FDOT) Basis of Estimates Manual. The unit prices are derived from the FDOT Statewide Historical Average costs for each pay item. Pay items that have whole dollar values (i.e. - $1500.00) have been inflated due to the small quantity for that item. In addition, the cost of the asphalt was increased by 25% because of the required hand work to place the asphalt. The cost estimate also includes the cost of the right-of-way acquisition of the corner clip at the intersection of Turnbull Bay Road and Fairgreen Avenue. The cost was determined by obtaining the appraised value of the land from the Volusia County Property Appraiser's website. This value was used to determine a per square foot cost for the land within the impacted parcel. This value was inflated by fifty percent to account for fair market value and other associated acquisition fees.

To adjust for potential future increases in the project's cost estimate, an annual inflationary factor has been applied to the EOPC.

TURNBULL BAY ROAD TRAIL
ENGINEER'S OPINION OF PROBABLE COST
(ASPHALT)

Pay Item	Description	Unit	Quantity	Unit Price	Estimate
101-1	MOBILIZATION	LS	10.00%		$44,772
102-1	MAINTENANCE OF TRAFFIC	LS	5.00%		$22,386
104-10-3	SEDIMENT BARRIER	LF	2618	$1.46	$3,822
110-1-1	CLEARING & GRUBBING	AC	1.60	$11,741.86	$18,787
110-4-10	REMOVAL OF EXISTING CONCRETE	SY	898.00	$18.90	$16,972
110-7-1A	MAILBOX, RELOCATE	EA	6.00	$161.69	$970
120-1	REGULAR EXCAVATION	CY	1733	$10.00	$17,328
120-6	EMBANKMENT	CY	866	$12.00	$10,397
160-4	TYPE B STABILIZATION (12")	SY	4605	$4.54	$20,907
285-701	OPTIONAL BASE (BASE GROUP 1)	SY	3325	$13.03	$43,323
285-709	OPTIONAL BASE (BASE GROUP 9)	SY	933	$16.24	$15,158
327-70-6	MILLING EXISTING ASPHALT PAVEMENT (1 1/2")	SY	43	$2.88	$123
334-1-12	SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC B) (1 1/2")	TN	298.5	$130.00	$38,805
334-1-13	SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC C) (3")	TN	80.2	$110.00	$8,822
400-0-11	CONCRETE CLASS NS, GRAVITY WALL	CY	166	$622.81	$103,386
400-1-2	CONCRETE CLASS I, ENDWALLS	CY	5	$1,321.42	$6,369
425-1-531	INLETS, DITCH BOTTOM, TYPE C MODIFIED- BACK OF SIDEWALK, <10'	EA	5	$6,500.00	$32,500
430-174-118	PIPE CULVERT OPTIONAL MATERIAL, ROUND (18")	LF	903.4	$63.91	$57,737
430-984-125	MITERED END SECTION, OPTIONAL ROUND, 18" SD	EA	8.0	$2,000.00	$16,000
515-1-2	PIPE HANDRAIL - GUIDERAIL, ALUMINUM	LF	310.0	$38.25	$11,858
522-1	CONCRETE SIDEWALK 4" THICK	SY	46	$38.97	$1,773
527-2	DETECTABLE WARNINGS	SF	161	$27.93	$4,485
530-3-4	RIPRAP, RUBBLE, F&I, DITCH LINING	TN	20	$121.96	$2,421
0550-10-218	FENCING, TYPE B, 0.0-5.0', RESET EXISTING	LF	70	$11.49	$804
570-1-2	PERFORMANCE TURF (SOD)	SY	3047	$2.74	$8,349
700-1-40	SINGLE SIGN POST, INSTALL	AS	1	$110.00	$110
700-1-50	SINGLE SIGN POST (RELOCATE)	EA	8	$237.30	$1,898
711-11-123	THERMOPLASTIC, WHITE, SOLID, 12"	LF	126	$2.39	$301
711-11-125	THERMOPLASTIC, WHITE, SOLID, 24"	LF	100	$4.33	$433
1080-21-5	UTILITY FIXTURE - VALVE/METER BOX (ADJUST/MODIFY)	EA	6.000	$647.34	$3,884
			PROJECT SUB-TOTAL w/o MOT and Mobilization		$447,724
			PROJECT SUB-TOTAL w/ MOT and Mobilization		$514,882
N/A	WETLAND MITIGATION (ASSUMES .25 AC IMPACTS)		1.0	$10,000.00	$10,000
N/A	ENGINEERING DESIGN	LS	20.0%		$102,976
N/A	SURVEY (Includes R/W Survey)	LS	15.0%		$77,232
N/A	CEI	LS	10.0%		$51,488
N/A	RIGHT-OF-WAY ACQUISTION ($757,155/121,986sf) x 1521.7sf) x 1.5	LS	-		$14,168
				TOTAL COST	**$770,747**

FDOT INFLATION-ADJUSTED ESTIMATES	*FACTOR*	*ESTIMATE*
YEAR 1 INFLATION-ADJUSTED ESTIMATE (2017)	1	**$770,747**
YEAR 2 INFLATION-ADJUSTED ESTIMATE (2018)	1.027	**$791,557**
YEAR 3 INFLATION-ADJUSTED ESTIMATE (2019)	1.056	**$813,908**

Data Collection References

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VII. DATA COLLECTION REFERENCES

Data collection sources used in the report included the following:

- City of New Smyrna Beach, Florida Submittal of XU Bicycle/Pedestrian Project application
- National Resources Conservation Service, Web Soil Survey, http://websoilsurvey.nrcs.usda.gov/app/
- River to Sea TPO, http://www.r2ctpo.org/
- Volusia County Property Appraiser's Land Mapping System
- Google Maps, https://maps.google.com/
- Volusia County Geographic Information Services (GIS)
- FEMA Map Service Center
- 2012 FDOT Volusia County Aerials, http://www.dot.state.fl.us/surveyingandmapping/
- May 2013 Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways (Florida Greenbook)
- 2010 ADA Standards for Accessible Design
- FDOT Plans Preparation Manual

Appendix A

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Photo 1 – Looking west down Turnbull Bay Rd. at Industrial Park Ave.

Photo 2 – Looking south down Industrial Park Ave. at Turnbull Bay Rd.

Photo 3 – Looking south down Industrial Park Ave. at Turnbull Bay Rd.

Photo 4 – Looking northeast at Industrial Park/Turnbull Bay intersection

Photo 5 – Looking east along north side of Turnbull Bay Rd.

Photo 6 – Looking east down Turnbull Bay Rd.

Photo 7 – Looking west along north side of Turnbull Bay Rd.

Photo 8 – Looking west along north side of Turnbull Bay Rd.

Photo 9 – Looking east along north side of Turnbull Bay Rd.

Photo 10 – Looking west along north side of Turnbull Bay Rd.

Photo 11 – Looking west at 1292 Turnbull Bay Rd.

Photo 12 – Looking west at east side of 1292 Turnbull Bay Rd.

Photo 13 – Looking east just west of Southard's Recycling

Photo 14 – Looking west at Southard's Recycling

Photo 15 – Looking east at easterly Southard's Recycling driveway

Photo 16 – Looking west at approx. Station 121+60.

Photo 17 – Looking west at approx. Station 122+00

Photo 18 – Looking east at approx. Station 122+00

Photo 19 – Looking west at Station 124+00

Photo 20 – Looking east at Station 124+00

Photo 21 – Looking west at Station 127+00

Photo 22 – Looking north at cross drain, approx. Station 127+10

Photo 23 – Looking west at Station 127+20

Photo 24 – Looking west at Station 129+30

Photo 25 – Looking west at Station 130+60

Photo 26 – Looking east at Station 130+60

Photo 27 – Looking west at Station 132+20

Photo 28 – Looking south down Fairgreen Ave. at Station 132+60

Appendix B

INFRASTRUCTURE ENGINEERS, INC.

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COUNTY OF VOLUSIA
CITY OF DELTONA

RIVER TO SEA TPO
Transportation Planning Organization
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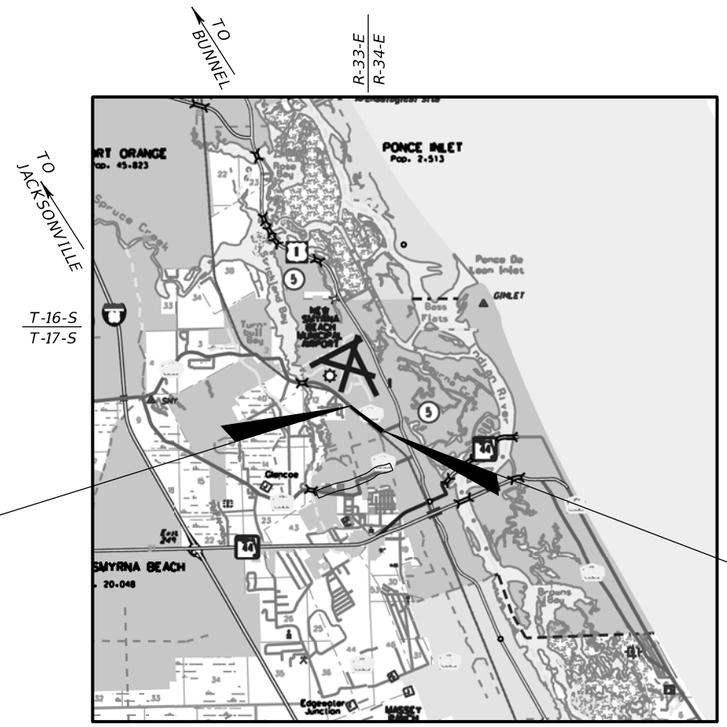
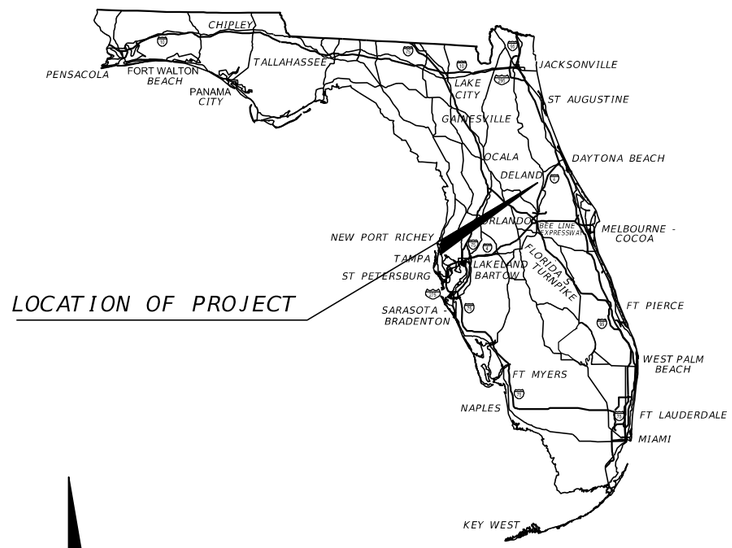
CONCEPT PLANS

TURNBULL BAY ROAD
TRAIL
FROM INDUSTRIAL PARK AVE. TO FAIRGREEN AVE.

INDEX OF ROADWAY PLANS

SHEET NO.	SHEET DESCRIPTION
1	KEY SHEET
2	TYPICAL SECTIONS
3 - 7	CONCEPT PLANS





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0 1 2
Miles

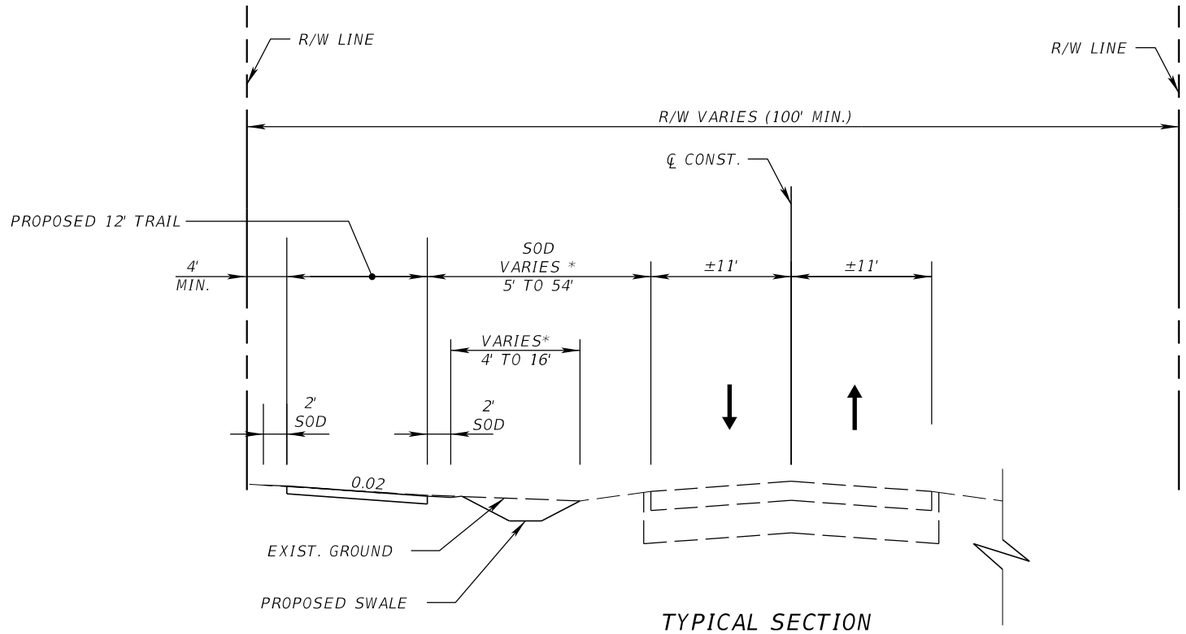
INFRASTRUCTURE ENGINEERS, INC.
MICHAEL L. MOHLER, P.E.
1511 EAST SR 434, SUITE 1001, OVIEDO, FL 32708
Ph.: 407.957.1660 Fax: 407.957.8744
VENDOR NO. F593221706
FL CERTIFICATE OF AUTHORIZATION NO. 6876

NOTE: THE SCALE OF THESE PLANS MAY HAVE CHANGED DUE TO REPRODUCTION.

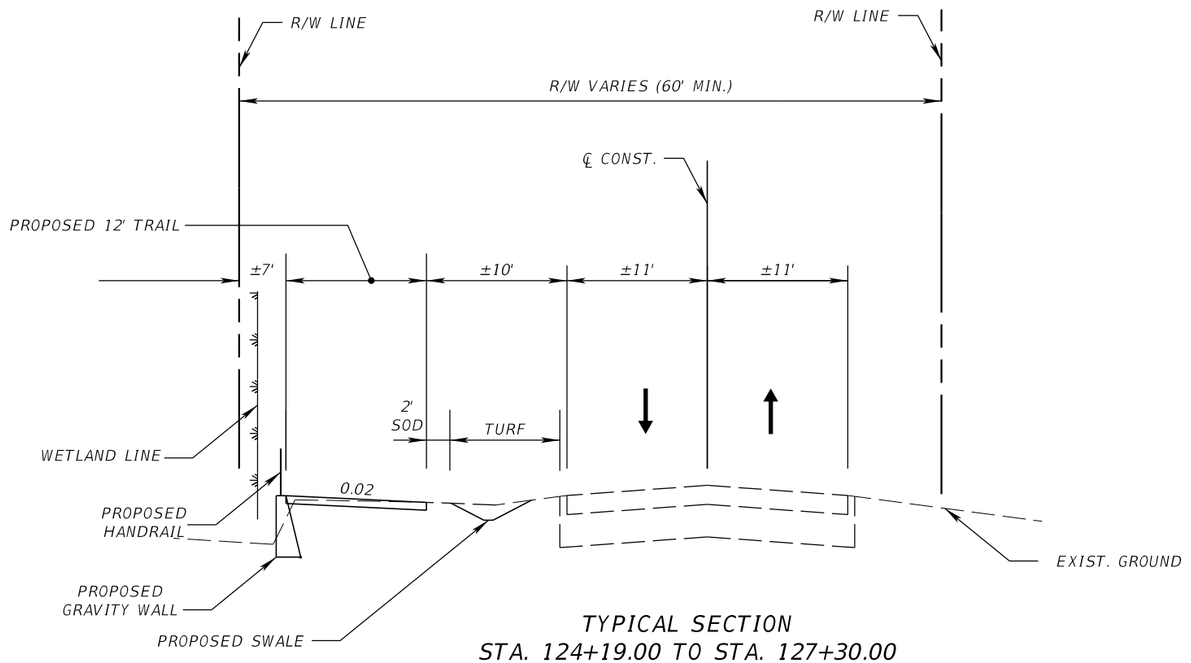
ROADWAY PLANS
ENGINEER OF RECORD: MICHAEL L. MOHLER, P.E.

P.E. NO.: 52034

SHEET NO.
1



TYPICAL SECTION
STA. 103+06.07 TO STA. 124+19.00
STA. 127+30.00 TO STA. 132+64.19



TYPICAL SECTION
STA. 124+19.00 TO STA. 127+30.00

NOTES:

1. *FROM STA. 115+80.00 TO STA. 118+85.00, CONSTRUCT THE TRAIL USING OPTIONAL BASE GROUP 9. USE OPTIONAL BASE GROUP 1 ELSEWHERE.*

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

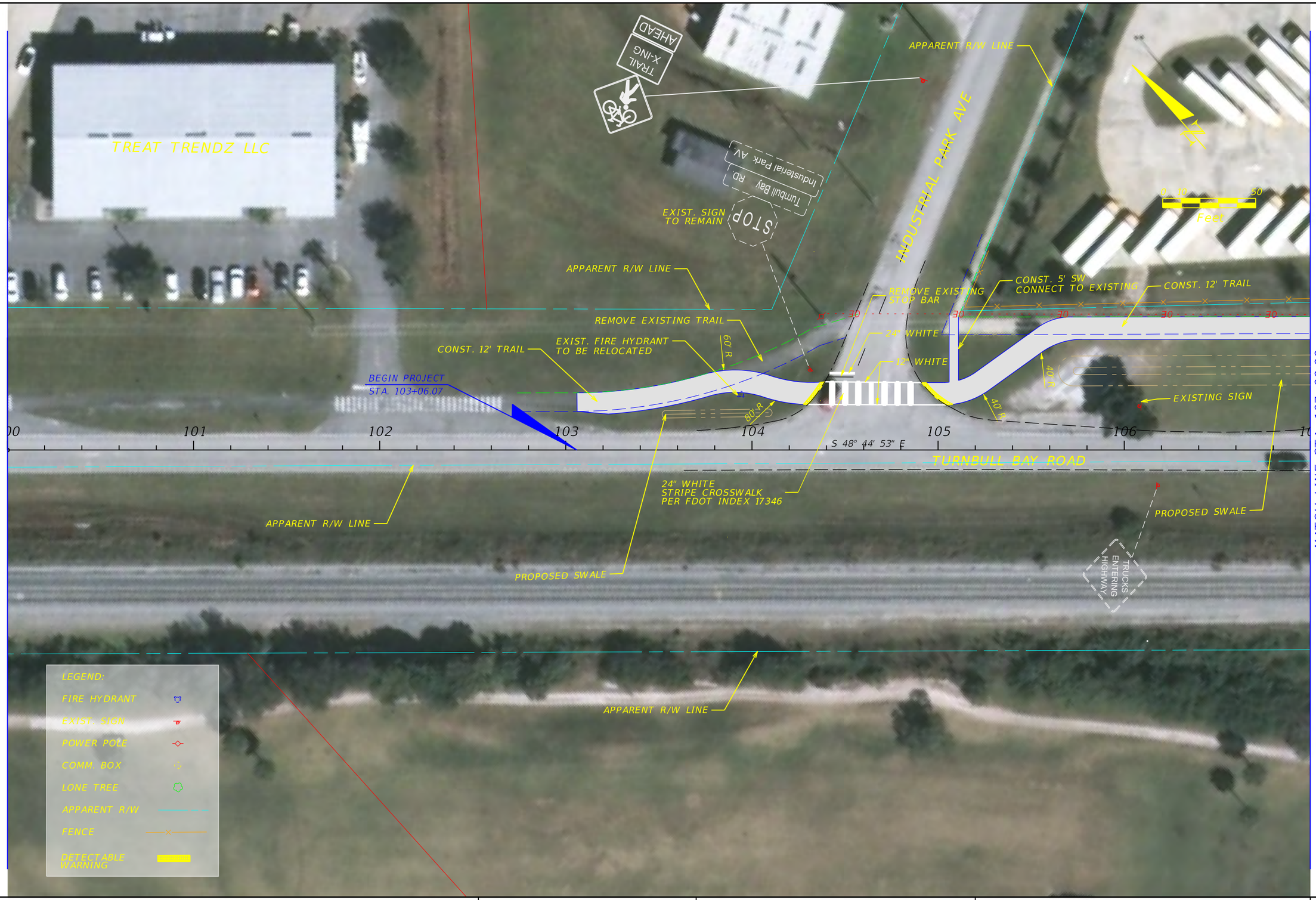
MICHAEL L. MOHLER, P.E.
P.E. No. 52034
INFRASTRUCTURE ENGINEERS, INC.
1511 EAST SR 434, SUITE 1001
WINTER SPRINGS, FLORIDA 32708
CERTIFICATE OF AUTHORIZATION: 6876

RIVER TO SEA TPO
Transportation Planning Organization
VISION - PLAN - IMPLEMENT

TYPICAL SECTIONS

SHEET NO. 2

jchestnut 11/21/2017 3:38:15 PM Z:\400\2013\13203FL00.06 _Turnbull_Bay\13203000006\roadway\TYPSRD01.DGN



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

MICHAEL L. MOHLER, P.E.
P.E. No. 52034
INFRASTRUCTURE ENGINEERS, INC.
1511 EAST SR 434, SUITE 1001
WINTER SPRINGS, FLORIDA 32708
CERTIFICATE OF AUTHORIZATION: 6876

RIVER TO SEA TPO Transportation Planning Organization VISION - PLAN - IMPLEMENT

CONCEPT PLAN

SHEET NO. 3

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

jchestnut 11/20/2017 4:07:35 PM Z:\400\2013\13203FL00.06 _Turnbull_Bay\13203000006\roadway\PLANRD01.dgn

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

MICHAEL L. MOHLER, P.E.
P.E. No. 52034
INFRASTRUCTURE ENGINEERS, INC.
1511 EAST SR 434, SUITE 1001
WINTER SPRINGS, FLORIDA 32708
CERTIFICATE OF AUTHORIZATION: 6876

RIVER TO SEA TPO
Transportation Planning Organization
VISION - PLAN - IMPLEMENT

CONCEPT PLAN

SHEET NO. 4

1292 TURNBULL BAY ROAD

SOUTHARD'S RECYCLING

WETLAND LINE

N

0 10 50
Feet

TREES TO BE REMOVED

COMM. BOXES TO BE RELOCATED

EXIST. MAILBOXES TO BE RELOCATED

EXIST. SIGN TO BE RELOCATED

COMM. BOX TO BE RELOCATED

EXISTING FENCE

CONST. BK SW INLET W/HANDRAIL

UTILITY POLE TO BE RELOCATED

EXIST. FENCE TO BE RELOCATED

CONST. SIDE DRAIN

CONST. 12' TRAIL

CONST. SIDE DRAIN

EXIST. SIDE DRAIN TO REMAIN

COMM. BOX TO BE RELOCATED

MATCH LINE STA. 114+00.00

MATCH LINE STA. 121+00.00

114 115 116 117 118 119 120

S 55° 45' 29" E

TURNBULL BAY ROAD

CONST. 18" PIPE

CONST. BK SW INLET

EXIST. SIDE DRAIN TO BE REMOVED

CONST. 18" PIPE

EXISTING SIGN

PROPOSED SWALE

APPARENT R/W LINE

PROPOSED SWALE

CONST. 18" PIPE

EXISTING WOOD SIGN

RECONSTRUCT DRIVEWAY

APPARENT R/W LINE

LEGEND:

- FIRE HYDRANT
- EXIST. SIGN
- POWER POLE
- INLET
- COMM. BOX
- LONE TREE
- APPARENT R/W
- FENCE
- WETLAND

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

MICHAEL L. MOHLER, P.E.
P.E. No. 52034
INFRASTRUCTURE ENGINEERS, INC.
1511 EAST SR 434, SUITE 1001
WINTER SPRINGS, FLORIDA 32708
CERTIFICATE OF AUTHORIZATION: 6876

RIVER TO SEA TPO Transportation Planning Organization VISION - PLAN - IMPLEMENT

CONCEPT PLAN

SHEET NO. 5

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

MICHAEL L. MOHLER, P.E.
P.E. No. 52034
INFRASTRUCTURE ENGINEERS, INC.
1511 EAST SR 434, SUITE 1001
WINTER SPRINGS, FLORIDA 32708
CERTIFICATE OF AUTHORIZATION: 6876

RIVER TO SEA TPO Transportation Planning Organization
VISION - PLAN - IMPLEMENT

CONCEPT PLAN

SHEET NO. 6

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jchestnut 11/20/2017 4:07:39 PM Z:\400\2013\13203FL00.06 _Turnbull_Bay\13203000006\roadway\PLANRD04.dgn

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

MICHAEL L. MOHLER, P.E.
P.E. No. 52034
INFRASTRUCTURE ENGINEERS, INC.
1511 EAST SR 434, SUITE 1001
WINTER SPRINGS, FLORIDA 32708
CERTIFICATE OF AUTHORIZATION: 6876

RIVER TO SEA TPO
Transportation Planning Organization
VISION - PLAN - IMPLEMENT

CONCEPT PLAN

SHEET NO. 7

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Appendix C

INFRASTRUCTURE ENGINEERS, INC.

RIVER TO SEA TPO
Transportation Planning Organization
VISION - PLAN - IMPLEMENT

U.S. Fish and Wildlife Service
National Wetlands Inventory

TURNBULL BAY ROAD

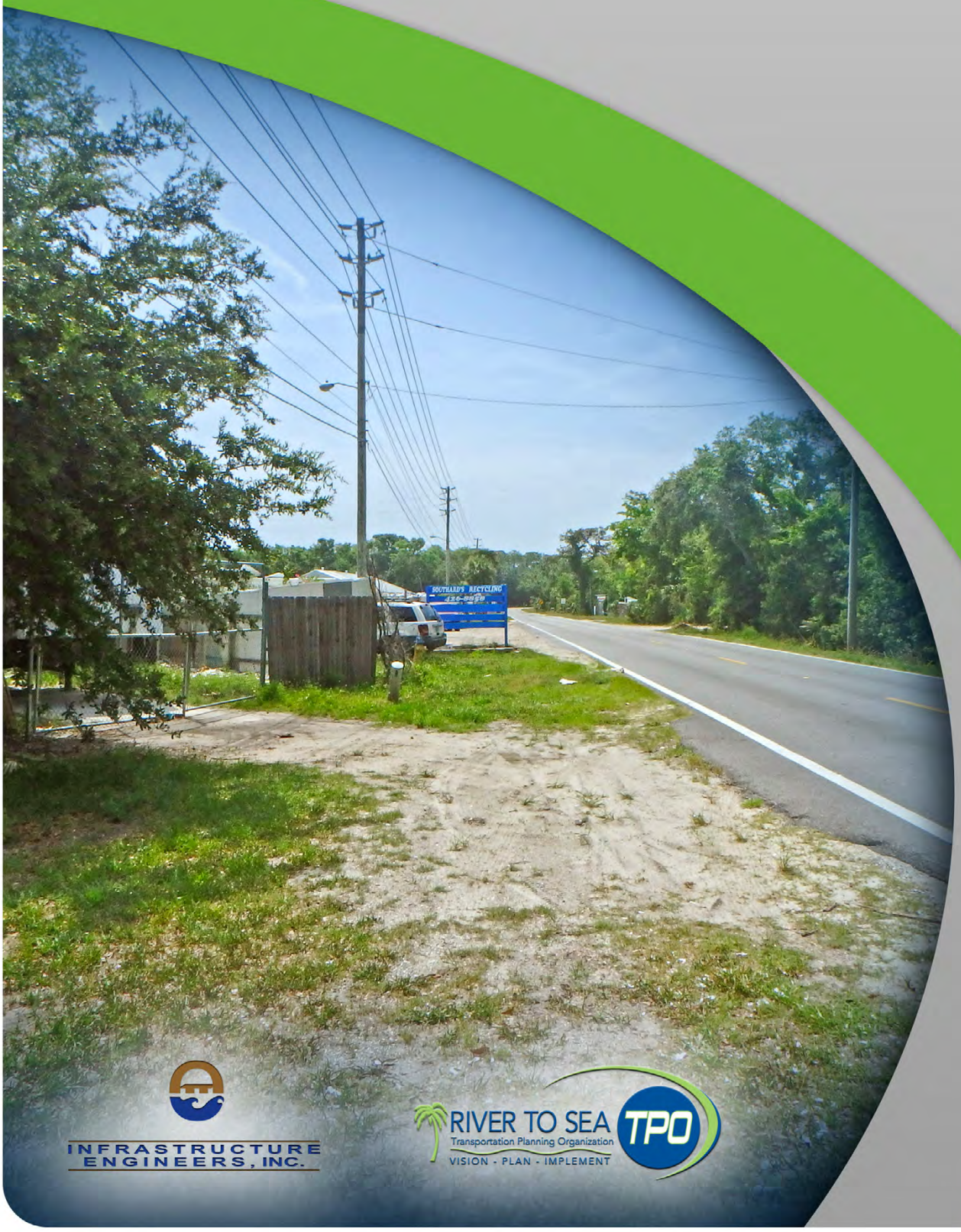
September 5, 2017

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Appendix D



INFRASTRUCTURE ENGINEERS, INC.

RIVER TO SEA TPO
Transportation Planning Organization
VISION - PLAN - IMPLEMENT

United States Department of Agriculture

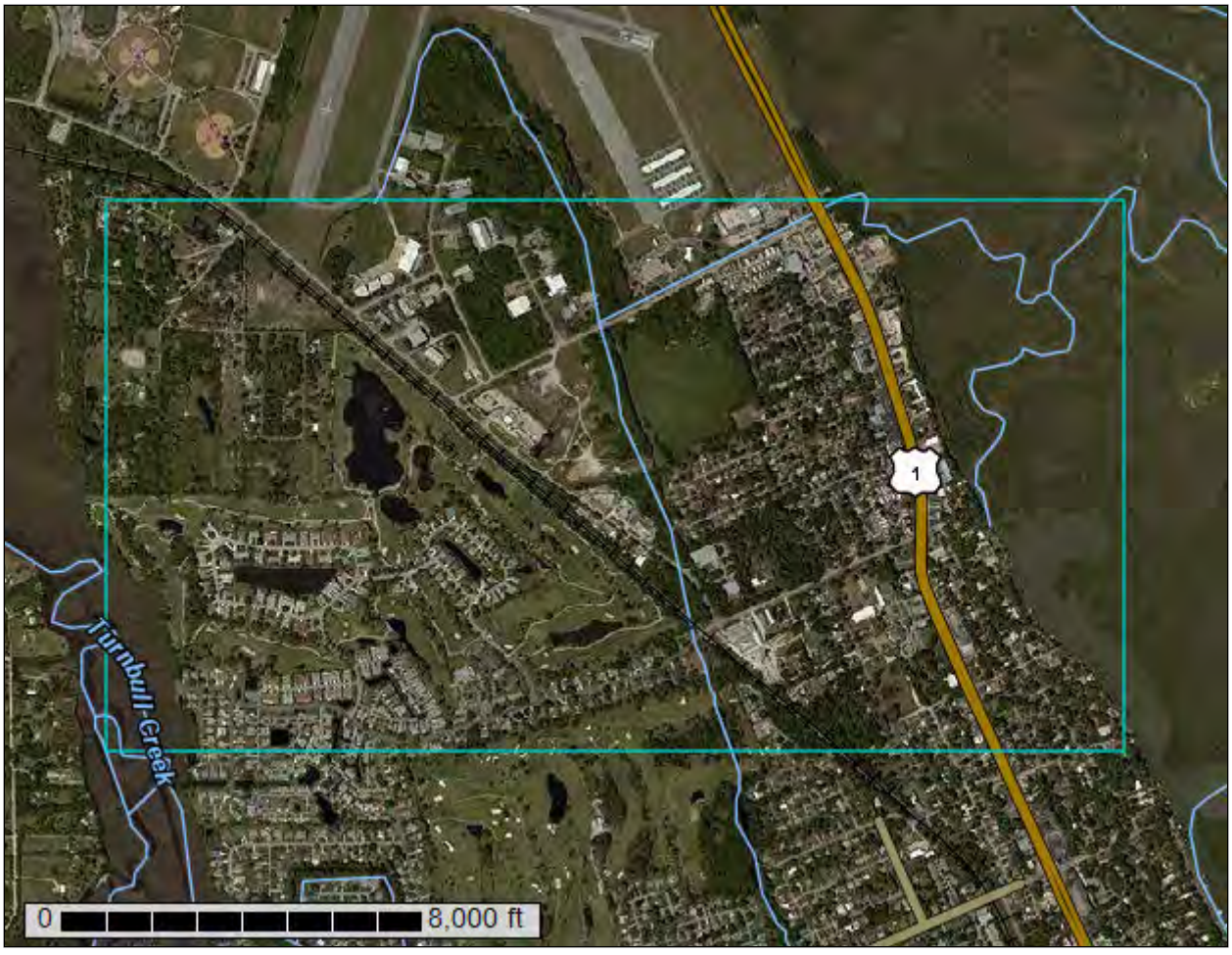
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Volusia County, Florida

Turnbull Bay Road



September 5, 2017

Custom Soil Resource Report
Soil Map

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 1:20,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Volusia County, Florida
Survey Area Data: Version 15, Sep 20, 2016

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

Date(s) aerial images were photographed: Mar 30, 2015—Apr 4, 2015

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

Volusia County, Florida (FL127)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
3	Arents	27.3	3.2%
13	Cassia fine sand, 0 to 2 percent slopes	129.1	15.3%
16	Cocoa-Urban land complex, 0 to 5 percent slopes	253.9	30.2%
27	Hontoon muck, frequently ponded, 0 to 1 percent slopes	5.0	0.6%
28	Hydraquents	88.6	10.5%
29	Immokalee sand	42.6	5.1%
32	Myakka-Myakka, wet, fine sands, 0 to 2 percent slopes	185.0	22.0%
35	Myakka-Urban land complex	2.8	0.3%
52	Pompano fine sand	23.3	2.8%
53	Pompano-Placid complex	10.0	1.2%
56	Samsula muck, frequently ponded, 0 to 1 percent slopes	5.6	0.7%
67	Turnbull muck	16.3	1.9%
99	Water	52.0	6.2%
Totals for Area of Interest		**841.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

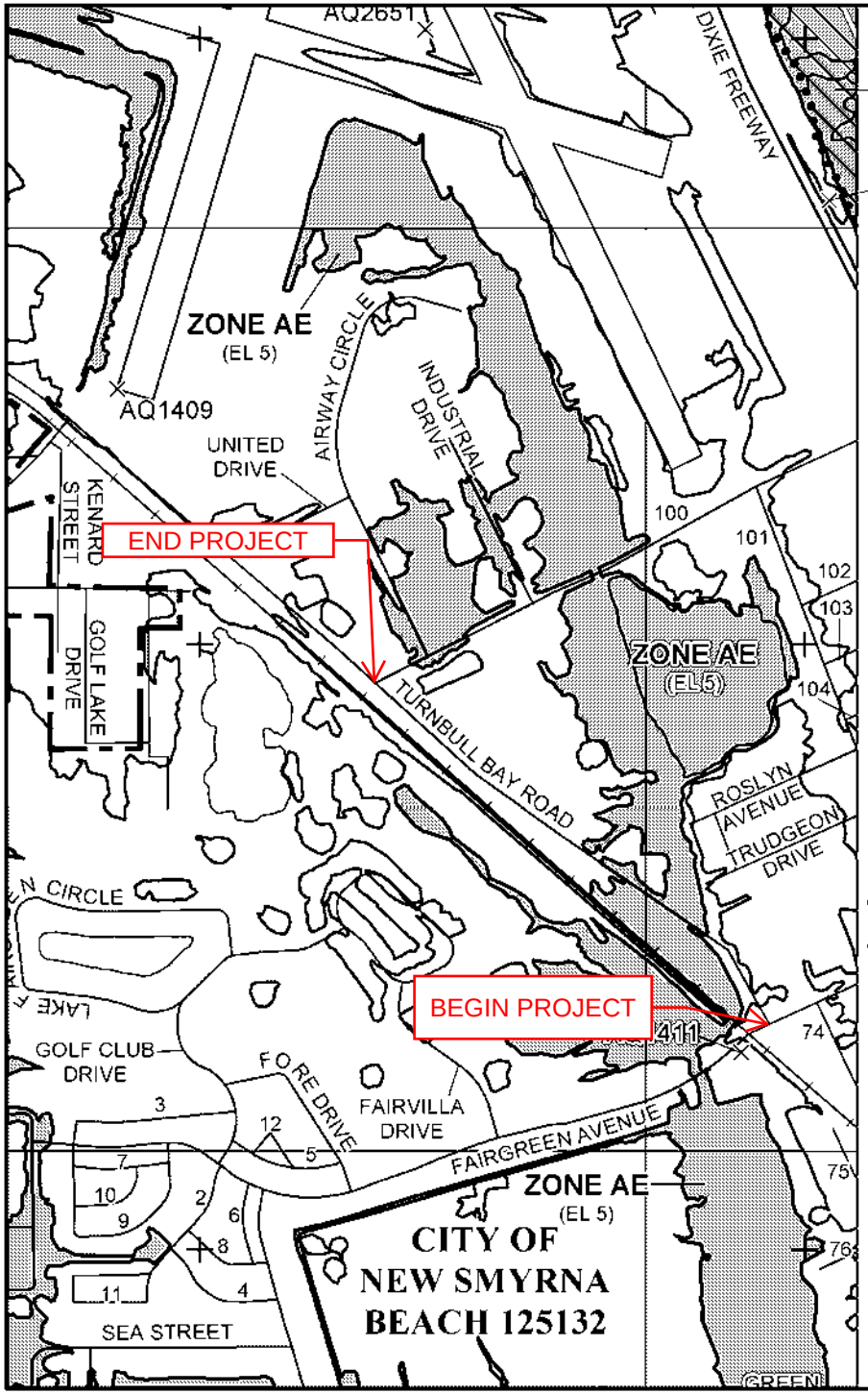
A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties

Appendix E

INFRASTRUCTURE ENGINEERS, INC.

RIVER TO SEA TPO
Transportation Planning Organization
VISION - PLAN - IMPLEMENT



ZONE AE
(EL 7)

DM2590

1715000 FT

KEY TO NUMBERED STREETS

1...CITRUS OPEN DRIVE
2...PAR DRIVE
3...ANDREA DRIVE
4...BIRDIE DRIVE
5...STYMIE LANE
6...CHIP LANE
7...PUTTER LANE
8...EAGLE LANE
9...BOGEY CIRCLE
10...GRACE DRIVE
11...SANDRA CIRCLE
12...TRAP CIRCLE
13...PELICAN DRIVE
14...QUAIL HOLLOW DRIVE
15...FOX FIRE CIRCLE
16...MIDDLEBURY LOOP
17...OLD MINORCAN TRAIL
18...TERRIER WAY
19...NEW YORK DRIVE
20...ISLAND POINT DRIVE
21...MILL RUN DRIVE
22...MOCKINGBIRD DRIVE
23...CARDINAL DRIVE
24...EGRET DRIVE
25...MALTESE LANE
26...OSPREY DRIVE
27...WELLESLEY COURT
28...MOURNING DOVE DRIVE
29...ROCHESTER COURT
30...WHIPPOORWILL DRIVE
31...FOX TAIL COURT
32...SKY TREE COURT
33...SOFT PINE COURT
34...WOODLAND AVENUE
35...GLENDEVON DRIVE

1710000 FT

36...W PINE AVENUE
37...JEFFERSON STREET
38...ROUTH AVENUE
39...SUNNY LANE
40...PARKER DRIVE
41...EUCLID STREET
42...DEBBIE STREET
43...HOWARD AVENUE
44...WEST STREET

JOINS PANEL 0541

MAP SCALE 1" = 1000'

500 0 1000 2000

FEET

METER

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0540H

FIRM

FLOOD INSURANCE RATE MAP

VOLUSIA COUNTY, FLORIDA AND INCORPORATED AREAS

PANEL 540 OF 930

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EDGEWATER, CITY OF	120308	0540	H
NEW SMYRNA BEACH, CITY OF	125132	0540	H
VOLUSIA COUNTY	125155	0540	H

- NOTE -

THIS MAP INCLUDES BOUNDARIES OF THE COASTAL BARRIER RESOURCES SYSTEM ESTABLISHED UNDER THE COASTAL BARRIER RESOURCES ACT OF 1982 AND/OR SUBSEQUENT ENABLING LEGISLATION

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
12127C0540H
MAP REVISED
FEBRUARY 19, 2014

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988. Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 'Flood Protection Measures' of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Florida State Plane East zone (FIPS zone 0901). The **horizontal datum** was the North American Datum of 1983 (NAD 83), GRS1980 Spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland, 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by the Volusia County, Florida GIS Department at a scale of 1:12,000 or larger from photography dated 2006 or later.

Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

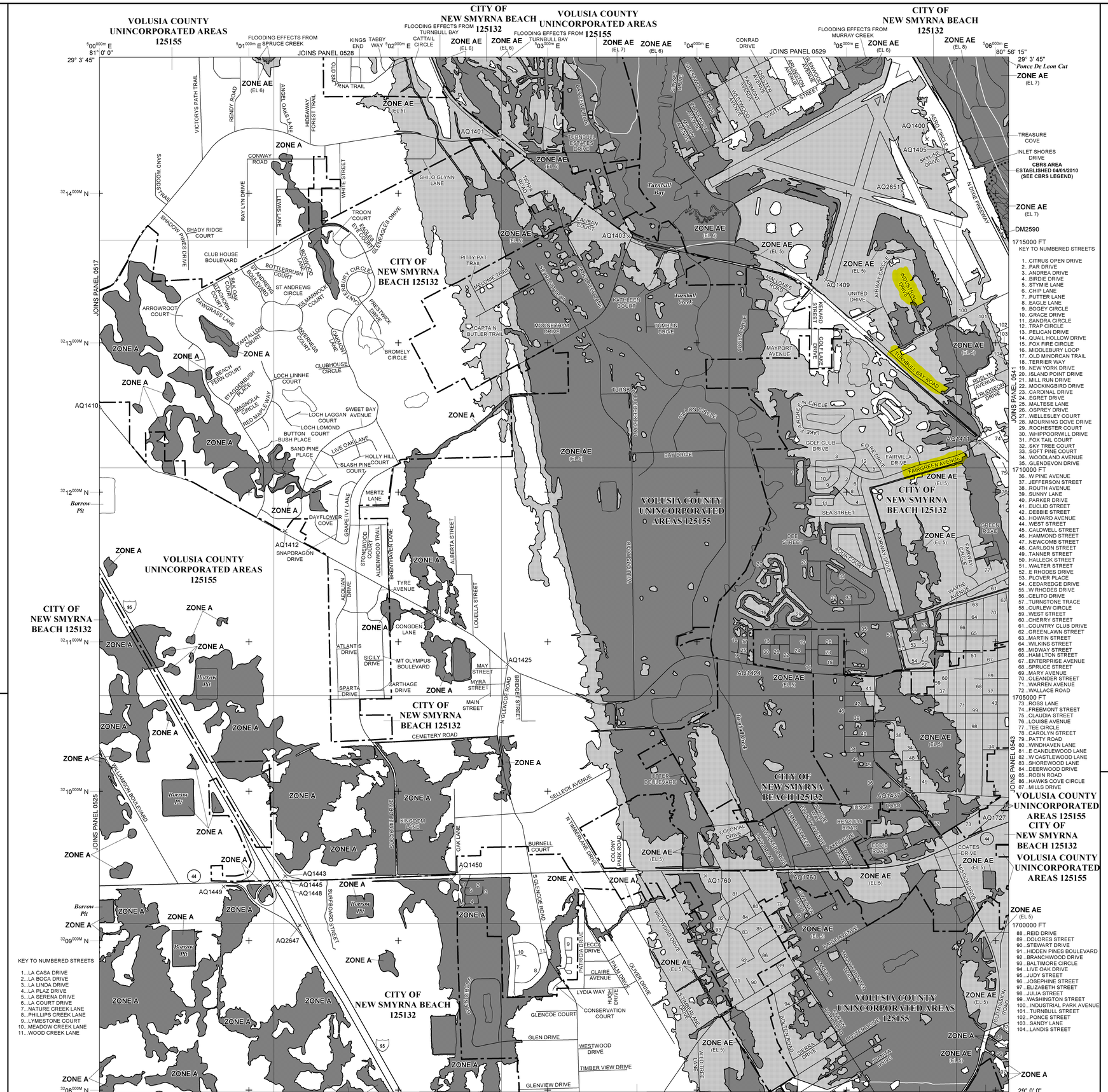
For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) LEGEND

(04-01-2010) CBRS Area

FLOOD INSURANCE NOT AVAILABLE FOR STRUCTURES NEWLY BUILT OR SUBSTANTIALLY IMPROVED ON OR AFTER APRIL 1, 2010 IN DESIGNATED CBRS AREAS.

Boundaries of the John H. Chafee Coastal Barrier Resources System (CBRS) shown on this FIRM were transferred from the official CBRS source map(s) for this area and are depicted on this FIRM for informational purposes only. The official CBRS maps are enacted by Congress via the Coastal Barrier Resources Act, as amended, and maintained by the U.S. Fish and Wildlife Service (FWS). The official CBRS maps used to determine whether or not an area is located within the CBRS are available for download at http://www.fws.gov. For an official determination of whether or not an area is located within the CBRS, or for any questions regarding the CBRS, please contact the FWS field office for this area at (703) 358-2161.



KEY TO NUMBERED STREETS

1...LA CASA DRIVE
2...LA BOCA DRIVE
3...LA LINDA DRIVE
4...LA PLAZ DRIVE
5...LA SERENA DRIVE
6...LA COURT DRIVE
7...NATURE CREEK LANE
8...PHILLIPS CREEK LANE
9...LYMESTONE COURT
10...MEADOW CREEK LANE
11...WOOD CREEK LANE

KEY TO NUMBERED STREETS

1...CITRUS OPEN DRIVE
2...PAR DRIVE
3...ANDREA DRIVE
4...BIRDIE DRIVE
5...STYMIE LANE
6...CHIP LANE
7...PUTTER LANE
8...EAGLE LANE
9...BOGEY CIRCLE
10...GRACE DRIVE
11...SANDRA CIRCLE
12...TRAP CIRCLE
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14...QUAIL HOLLOW DRIVE
15...FOX FIRE CIRCLE
16...MIDDLEBURY LOOP
17...OLD MINORCAN TRAIL
18...TERRIER WAY
19...NEW YORK DRIVE
20...ISLAND POINT DRIVE
21...MILL RUN DRIVE
22...MOCKINGBIRD DRIVE
23...CARDINAL DRIVE
24...EGRET DRIVE
25...MALTESE LANE
26...OSPREY DRIVE
27...WELLESLEY COURT
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29...ROCHESTER COURT
30...WHIPPOORWILL DRIVE
31...FOX TAIL COURT
32...SKY TREE COURT
33...SOFT PINE COURT
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35...GLENDEVON DRIVE
36...W PINE AVENUE
37...JEFFERSON STREET
38...ROUTH AVENUE
39...SUNNY LANE
40...PARKER DRIVE
41...EUCLID STREET
42...DEBBIE STREET
43...HOWARD AVENUE
44...WEST STREET
45...CALDWELL STREET
46...HAMMOND STREET
47...NEWCOMB STREET
48...CARLSON STREET
49...TANNER STREET
50...HALLECK STREET
51...WALTER STREET
52...E RHODES DRIVE
53...PLOVER PLACE
54...CEDAREDGE DRIVE
55...W RHODES DRIVE
56...CELITO DRIVE
57...TURNSTONE TRACE
58...CURLEW CIRCLE
59...WEST STREET
60...CHERRY STREET
61...COUNTRY CLUB DRIVE
62...GREENLAWN STREET
63...MARTIN STREET
64...WILKINS STREET
65...MIDWAY STREET
66...HAMILTON STREET
67...ENTERPRISE AVENUE
68...SPRUCE STREET
69...MARY AVENUE
70...OLEANDER STREET
71...WARREN AVENUE
72...WALLACE ROAD
73...ROSS LANE
74...FREEMONT STREET
75...CLAUDIA STREET
76...LOUISE AVENUE
77...TEE CIRCLE
78...CAROLYN STREET
79...PATTY ROAD
80...WINDHAVEN LANE
81...E CANDLEWOOD LANE
82...W CASTLEWOOD LANE
83...SHOREWOOD LANE
84...DEERWOOD DRIVE
85...ROBIN ROAD
86...HAWKS COVE CIRCLE
87...MILLS DRIVE
88...REID DRIVE
89...DOLORES STREET
90...STEWART DRIVE
91...HIDDEN PINES BOULEVARD
92...BRANCHWOOD DRIVE
93...BALTIMORE CIRCLE
94...LIVE OAK DRIVE
95...JUDY STREET
96...JOSEPHINE STREET
97...ELIZABETH STREET
98...JULIA STREET
99...WASHINGTON STREET
100...INDUSTRIAL PARK AVENUE
101...TURNBULL STREET
102...PONCE STREET
103...SANDY LANE
104...LANDIS STREET

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain Boundary
- Floodway Boundary
- Zone D Boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- Limit of Moderate Wave Action
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- (A) (A) — Cross section line
- (23) (23) — Transect line
- Culvert
- Bridge
- Footbridge
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 32°80000m N — 1000-meter Universal Transverse Mercator grid ticks, zone 17
- 4989000FT — 5000-foot grid values: Florida State Plane coordinate system, East zone (FIPS Zone 0901), Lambert Conformal Conic
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 15, 2002

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
February 19, 2014 - to update corporate limits, to reflect updated topographic information, to add and change Base Flood Elevations, to add floodways, to add and change Special Flood Hazard Areas, to incorporate previsously issued Letters of Map Revision, and to change zone designations.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0540H

FIRM
FLOOD INSURANCE RATE MAP

VOLUSIA COUNTY, FLORIDA AND INCORPORATED AREAS

PANEL 540 OF 930
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EDGEWATER, CITY OF	120308	0540	H
NEW SMYRNA BEACH, CITY OF	125132	0540	H
VOLUSIA COUNTY	125155	0540	H

- NOTE -

THIS MAP INCLUDES BOUNDARIES OF THE COASTAL BARRIER RESOURCES SYSTEM ESTABLISHED UNDER THE COASTAL BARRIER RESOURCES ACT OF 1982 AND/OR SUBSEQUENT ENABLING LEGISLATION.

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
12127C0540H
MAP REVISED
FEBRUARY 19, 2014

Federal Emergency Management Agency

RIVER TO SEA TPO
Transportation Planning Organization
VISION - PLAN - IMPLEMENT

INFRASTRUCTURE ENGINEERS, INC.

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