Intelligent Transportation Systems Master Plan

# Transportation Issues Executive Summary

Phase 1

August 2016

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

# Intelligent Transportation Systems Master Plan

Phase 1

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# Transportation Issues Executive Summary

# INTRODUCTION

The River to Sea Transportation Planning Organization (R2CTPO) serves Volusia County and portions of Flagler County with a population over 600,000 people. Both counties border the Atlantic Ocean and are lined with beaches attracting a substantial number of visitors from the region and beyond. Beach tourism and special events in the area draw travelers to the roadway system within R2CTPO's planning area. The R2CTPO manages the planning process for funding improvements to move tourist traffic along with an expanding local population base. Flagler County has been one of the fastest growing counties in Florida, as the population grows more vehicles will be on the road and congestion is likely to worsen.

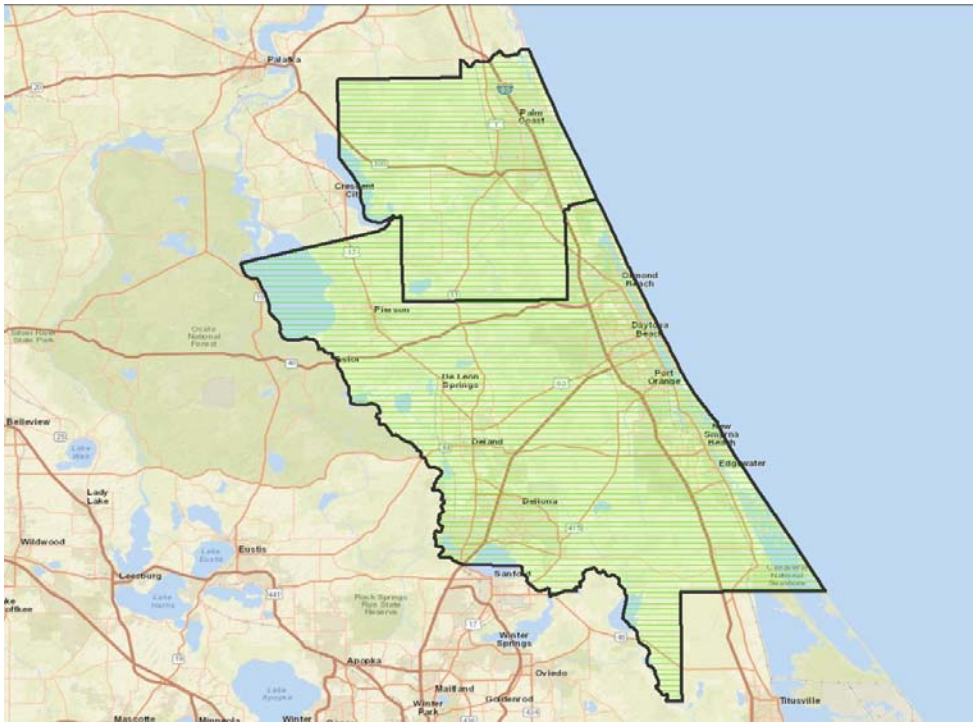
Transportation Planning Organizations (TPOs) in urbanized areas, like R2CTPO, face varied challenges. For the R2CTPO challenges lay in providing safe and efficient mobility to their residents and to tourists. More vehicles on the roads increases the need for transportation improvements. In the midst of the citizen's desires for a more efficient system and accommodating drivers who are unfamiliar with navigating roads in the area, the TPO is limited in financial resources. Insufficient funding and other resource constraints are the new transportation reality. Question - How does a transportation agency address growing mobility needs where there are financial constraints? Answer - by fully utilizing existing infrastructure through the use of advance technologies. The R2CTPO is actively laying the groundwork for a plan implementing advanced technologies through a robust Intelligent Transportation System (ITS).

Expanding the approach to transportation planning, through diversifying improvement types, is essential to R2CTPO's efficiency. Transportation Agencies cannot only be concerned with building and maintaining roads, but also with ensuring maximum benefit from the existing transportation system. To fully utilize existing infrastructure, the R2CTPO can focus resources on optimizing operations to improve the quality of travel. Strategies identified in the R2CTPO's ITS Master Plan will support improving the efficiency of the transportation system. These strategies support a safer roadway system and reducing congestion through the improvement of vehicle travel times, incident reduction and response, and performance monitoring.

## WHAT ARE INTELLIGENT TRANSPORTATION SYSTEMS?

One definition of ITS frequently used is "the application of advanced sensor, computer, electronics, and communication technologies, and management strategies – in an integrated manner – to improve the safety and efficiency of the surface transportation system." A program focused on ITS and operations addresses the reliability problem by implementing a set of strategies preparing for, and responding to, specific causes of unexpected delay and disruption, crashes, breakdowns, weather, construction, poorly timed signals and special events — which, together, amount to more than half of roadway travel delay and unpredictability. The public is aware of some of these ITS

strategies such as Dynamic Message Signs, 511 traveler information services and freeway service patrols to address unexpected delays.




Reliable traveler information and coordination with incident responders within the roadways is a key component to any ITS program. This integration is achieved through Traffic Monitoring Centers (TMCs) where traffic conditions are monitored by operations personnel. In order for operations personnel to provide information to the public, monitor conditions, and coordinate with other agencies, ITS infrastructure needs to be in place. ITS infrastructure is essential to communication, and communication is the bedrock of any ITS program. Agency protocol, firewalls, and software incompatibility are roadblocks to interagency communication.

## WHY AN ITS MASTER PLAN?

An ITS Master Plan will identify transportation issues and opportunities best addressed by ITS treatments, determine what treatments are most appropriate, and prioritize these improvements. The technologies employed by system operators are evolving. These technologies are advancing rapidly and some areas of ITS, particularly traveler information, are drawing increasing interest from the private sector. Rapid change offers opportunities to carry out desired functions of ITS cheaper and more efficiently. On the other hand, it can present more difficult investment decisions for public sector agencies, especially with regard to the level of risk existing with new methods and technologies. An ITS Master Plan can help coordinate compatible technologies amongst transportation agencies in the service area. This will help alleviate the problems resulting from incompatible devices, unproven products, and develop a unified approach to addressing new technologies as they are developed.

Most agencies implement some type of ITS technologies (e.g. interconnected signal, dynamic message signs (DMS), closed circuit TV cameras, etc.). Their current processes involve installing ITS technology in places where the equipment provides an immediate benefit to the public. Individual

agencies are providing ITS infrastructure to meet current and short term needs, often times without collaborating with other agencies in the region. Typically ITS infrastructure is deployed on an as need basis, agencies in the service area have no long term plans providing for operational improvements. A coordinated approach, through an ITS Master Plan, will provides a more permanent solution to R2CTPO's transportation needs. The R2CTPO ITS Master Plan will contain strategies benefiting the region, be a coordinated effort amongst the local agencies, and will institutionalize the process of planning for operations and maintenance of ITS infrastructure within the R2CTPO service area.

## ITS MASTER PLAN VISION, GOALS, AND OBJECTIVES

The R2CTPO ITS Master Plan Vision takes into consideration the R2CTPO's 2040 Long Range Transportation Plan (LRTP) Vision Statement. In addition to creating consistency with the LRTP Vision statement, the vision, goals and objectives of other agencies were also reviewed for incorporation into the ITS Master Plan. This process included reviewing documents from Volusia and Flagler counties, the Florida Department of Transportation (FDOT) ITS program, and the FDOT TSM&O Program. The resulting Vision, related Goals, and supporting Objectives were vetted with the ITS Technical Working Group.

### *Vision*

Improve safety; facilitate the movement of goods and people; enhance the transportation system's efficiency, sustainability, and reliability through deployment of advanced technology and interagency coordination to maximize the transportation system's utilization.

| **Goal 1 - Improve safety and security for all modes** |
|---|
| *Objective 1.1* - Reduce crashes. |
| *Objective 1.2* - Improve ability to detect, verify, respond to, and clear incidents through effective communications and coordination between local governments, public safety officials, and transportation system operators. |
| *Objective 1.3* - Provide traffic management during evacuation conditions. |
| *Objective 1.4* - Share ITS data between transportation and law enforcement agencies. |

| **Goal 2 - Provide real-time and accurate user information to make informed travel decisions** |
|---|
| *Objective 2.1* - Provide pre-trip planning information and accurate and timely traveler information. |
| *Objective 2.2* - Provide route guidance information and information on traffic/travel conditions during adverse weather or evacuation conditions. |
| *Objective 2.3* - Use mobile applications to actively inform the public and invite feedback. |
| *Objective 2.4* - Integrate mobile systems to support multi-modal trip planning. |
| *Objective 2.5* - Promote the use of private-funded technologies and applications. |

| **Goal 3 - Facilitate the efficient movement of goods and people** |
|---|
| *Objective 3.1* - Support efficient intermodal transfer of people and goods. |
| *Objective 3.2* - Improve multimodal travel time reliability and predictability. |
| *Objective 3.3* - Efficiently accommodate special event traffic. |
| *Objective 3.4* - Reduce delays caused by predictable non-recurring congestion. |

| **Goal 4 - Preserve and enhance access to multimodal choices and facilitate connections** |
|---|
| *Objective 4.1* - Provide traveler information services with local and regional route and mode choice information. |
| *Objective 4.2* - Improve transit travel time reliability. |
| *Objective 4.3* - Leverage multi-modal approaches in Transportation Systems Management & Operations projects. |

| **Goal 5 - Integrate ITS projects with local and regional partner agencies and build on existing efforts** |
|---|
| *Objective 5.1* - Maximize use of regional partnering opportunities. |
| *Objective 5.2* - Promote transparent regional agency interoperability. |
| *Objective 5.3* - Expand regional adoption and support of Transportation Systems Management & Operations. |

| **Goal 6 - Protect the environment by improving efficiency and reducing congestion and emissions with technology** |
|---|
| *Objective 6.1* - Reduce the need for roadway widening by maximizing the use of technology. |

| **Goal 7 - Collect , monitor, and report transportation data to support informed transportation policy decisions** |
|---|
| *Objective 7.1* - Deploy technology for travel-time and reliability data collection |
| *Objective 7.2* - Collect multimodal traffic counts. |
| *Objective 7.3* - Report system performance in a dashboard accessible to the public. |
| *Objective 7.4* - Develop data warehouse. |

## INVENTORY OF EXISTING ITS ELEMENTS AND RELATIONSHIPS

To determine the extent of ITS infrastructure owned, operated, or maintained by the various transportation agencies within the R2CTPO boundary, and existing ITS related services having been developed for the area, requests for information were sent out to stakeholders. This information was provided in various formats (GIS, CAD, Excel, PDF, etc.), and was supplemented by database resources available to the public. This information was summarized, in map format, and provided back to the stakeholders for review and subsequent corrections. In addition to physical infrastructure and services, existing ITS related plans and reports were also gathered.

The primary physical means of communication used by the various transportation agencies, for both Center to Field (C2F) and Center to Center (C2C) communications, is fiber optic cabling. Wireless point-to-point links have been established in some areas were fiber optic cabling does not exist.

Within Volusia County there have been a number of ITS infrastructure deployments, including the Daytona Area Smart Highways project, which provided traffic surveillance, incident management, and traveler information along I-4 between SR 44 and I-95 and along I-95 from I-4 to US 92. This project was a partnership between FDOT District 5, the City of Daytona Beach, and the Daytona Beach Police Department.

FDOT District 5 ITS devices are monitored and controlled from the FDOT District 5 Regional Traffic Management Center (RTMC) located in Orlando, FL—this facility is shared with Florida Highway Patrol (FHP) Troop D. Volusia County operates two Traffic Management Centers (TMC) where the County's traffic signals and CCTV cameras are monitored and managed: one in DeLand and the other in Holly Hill. The City of Daytona Beach has one TMC facility, which is utilized in part to operate and monitor the City's traffic signals and CCTV cameras.

The Flagler County area has notably less ITS devices and services deployed, as compared to the Volusia County area, and there is no central TMC for the region; however, the City of Palm Coast is actively pursuing funding for completing fiber optic connections to traffic signals within their jurisdiction and construction of a small scale TMC. The City has previously installed miles of fiber optic backbone cabling throughout the City limits, providing a large portion of the required fiber infrastructure to connect the City's traffic signals; however, traffic signals have not been provided with drop fiber optic cables to the signal controller cabinets, no Ethernet switches are in place in the traffic signal cabinets, and there is currently no TMC in the area that can be used for remote management of the signal system. These fiber connections could be used in the future to connect the Flagler County area to adjacent transportation agencies networks.

Shortages, or lack, of appropriate staff in general is a concern for local transportation agencies, as it takes experienced persons with adequate time to digest and effectively act upon the information obtained from the ITS systems in a timely manner. This situation becomes exacerbated when additional ITS equipment is deployed in an area without consideration for future operations. The current System Engineering process required by FHWA Rule 940, should help to identify these types shortfalls prior to ITS system deployment, but in some cases in the past these procedures were either not in place, not followed, or not enforced. While for the most part communication to ITS devices and traffic signals within agency boundaries where it exists is functional, a breakdown occurs when coordination between various agency communication networks is required; a concern expressed by all agencies contacted. There is very little in the way of automated incident and construction zone management coordination between the various transportation agencies and emergency responders, and sharing of CCTV video feeds between agencies can be improved or provided in all cases. Additionally, there is little sharing of data collected by ITS vehicle detection technologies between agencies—with the exception of Portable Traffic Monitoring Stations and Telemetered Traffic Monitoring Stations data which is made available by FDOT on an annual basis.

## STAKEHOLDER INTERVIEWS

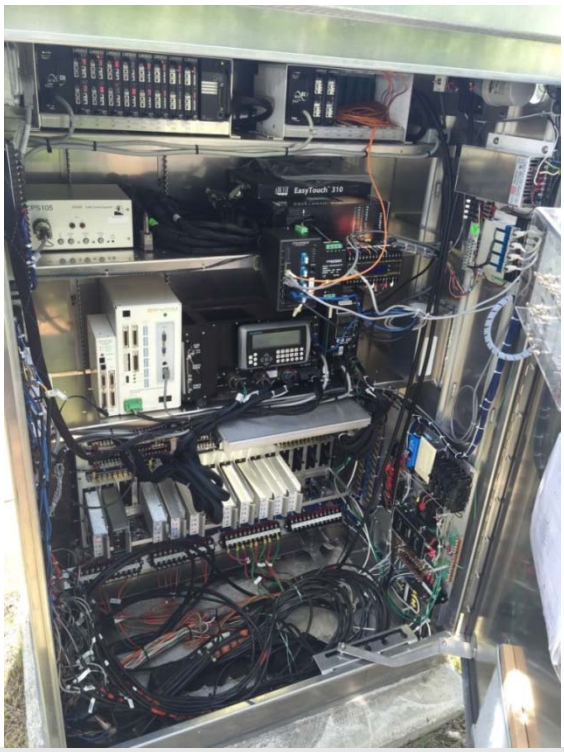
A survey was created to assist with better understanding specific transportation issues faced by the agencies in R2CTPO's service area. Nine agencies filled out the survey and answered questions like what mobility problems result from nonrecurring congestion, how adequate is current inter-agency communication, and what is your agency's long term vision on how ITS can enhance operations? Surveys were proctored through in person meetings and telephone interviews. Answers to the questions varied based on the agency's primary purpose and are summarized in the following subsections.

### *Interview Responses*

This summarizes the top transportation related issues by agency. In some cases the same issue was identified by multiple agencies. The most common issue identified by all agencies is the lack of communication, transparency and lack of flexibility by other agencies in the region. A common example of the problem is observed through agencies inability to directly access and monitor video feeds from other agencies. Another recurring theme, from the surveys, is the lack of available data for before & after studies and for system-wide reporting. Many of the agencies interviewed expressed a need for ITS asset management. They prefer routine recurring maintenance of the devices over the current emergency failure response to outages. This section does not reflect every issue identified by the agency, a complete list can be found in the Appendix.

#### Volusia County Mobility Issues

Congestion on major arterials and collector roadways creates delays for travelers in Volusia County.



The county is currently working with FDOT staff on retiming signals along major corridors. At present the state monitoring system and the county's monitoring system do not communicate with each other. Directly feeding images from FDOT cameras to Volusia County operators, with the ability to select the camera and camera view, will benefit traffic operations in the area. Volusia County is trying to connect their 30 plus cameras to the FDOT network so that FDOT can have access to their views. The County has concerns about other agencies operating adaptive signal systems remotely. The remote signal operators should possess the technical skills to properly adjust signal timing and not rely solely on the software's recommendation.

Mobility issues also affect transit riders through reduced head-ways of buses; special events also cause Votran on-time performance issues. When detours occur, forcing alternative routing, detouring the bus adversely affects continuity in service. Votran could benefit from GPS opticom for Transit Signal Priority (TSP) to improve on-time performance. Prior to pursuing TSP the county needs to assess the devices' compatibility with the existing signal system.

Identifying the availability of parking at parks, the airport, park and ride facilities, and other public places with significant parking is an issue for motorists. Displaying available parking at facilities with high demand will assist travelers. In addition to parking occupancy information, performance measures for roadway corridors and signalized intersections will be useful to Volusia County planning and traffic operations staff. Signalized intersections are a primary cause of arterial delay. Intersection delay can be exacerbated by skipping phases due to signal preemption. Volusia County is working to find the appropriate signal system to better transition from fire or railroad preemption back to the normal signal system timing pattern.

Nonrecurring congestion impacts tourist and residents traveling through Volusia County. Beach traffic worsens congested conditions during rain events. Travel information tends to be confusing to travelers, FDOT staff uses a reference system of milepost numbers or State Routes; this can be confusing to motorists who are not familiar with the area.

### Flagler County Mobility Issues

The Flagler County engineering staff identified a need for improved incident and construction coordination between the local agencies. The County does not monitor or participate in the surrounding agency's communication systems. Little inter-agency coordination exists to alert Flagler County staff of severe congestion events. During incidents, emergency medical services (EMS) and law enforcement respond separately, there is no coordination between law enforcement and the County to mitigate delay caused by incidents.

To address potential nonrecurring congestion issues, the County staff suggested notifying the other agencies and the public of lane closures (e.g. construction projects) from one centralized system. The most prevalent recurring congestion issue is created by schools, during the pick-up and drop-off times. School buses travel in platoons through signalized intersections causing further delay for vehicles queued at stop bars.

Flagler County staff expressed a desire for an asset management system. Maintenance is currently provided through on call services. There are no routine checks of the signal controllers, contractors respond on demand and at times also adjust signal timing. Routine checks on signal timing and maintenance of equipment will prevent disruptions in service.

### Palm Coast Mobility Issues

Palm Coast has invested in a fiber optic cables and is making progress on connecting its arterial network. Some of the arterial corridors in Palm Coast are coordinated, but there is no way to ensure synchronization between the signals. The signal cabinets are not connected to an advanced system to monitor coordination. Seven CCTV cameras were installed but not connected to the fiber optic network. Palm Coast wants to connect their signals and CCTV cameras to the fiber optic network prior to deploying additional ITS strategies. The city's long-term vision is to connect all the signals with fiber for monitoring and real time signal operations, especially on the State Highway System.

Palm Coast does not have automated data collection abilities. The city is interested in possessing video data capabilities for vehicle, bicycle, and pedestrian counts. When developers request this data the city is often times unable to respond with precise counts at the respective location(s). Palm Coast has no access to speed data; they are interested in acquiring travel time data from sources such as Bluetooth.

There is no TMC to assist Palm Coast with monitoring traffic conditions. The city wants to build a TMC, and is pursuing funding through the City Council. As the City's ITS system grows, the city will need to add TMC capabilities to the signal shop, traffic engineer's office, and video access to fire department. This type of staffing is not currently available. Dedicated agency staff are responsible for the maintenance and upkeep of the signals. Even though routine inspections of the equipment occur, the city does not have a maintenance plan/program. An asset management program will optimize maintenance for current and future deployments of ITS equipment.

### Daytona Beach Mobility Issues

The City of Daytona Beach is faced with nonrecurring congestion issues resulting primarily from special events, beach trips, and incidents on I-95/I-4. Special event traffic often times causes queuing to occur that spills back into the intersections. The adaptive signal system on International Speedway Boulevard is challenged by nonrecurring events and the City staff do not currently have the ability to override the system. In addition to spillback on arterial intersections, there are safety issues resulting from queuing on I-95 exit ramps during races at Daytona International Speedway. The vehicle streams queued on freeways and arterials contain local traffic trapped in the race traffic. Better coordination between the signal maintaining agencies could improve the efficiency in resolving these problems.

The City recognizes that communicating travel conditions to drivers is a strategy of an intelligent transportation system; however, the City is not currently able to communicate traffic conditions, from their systems, to travelers. City staff cannot currently view conditions on the roadway network where they do not own the cameras. Access to the County TMC and RTMC to share data can be improved. Physical connections between the networks exist but differences in IT systems and firewalls currently prevent access. Limited FDOT CCTV feeds can be received by Daytona Beach's

TMC, but the City is not currently able to toggle between 6 monitors of FDOT RTMC feeds due to system incompatibility.

Daytona Beach is interested in accessing FDOT probe data for monitoring purposes. They want access to new data sources to see how the corridors are operating and want travel speed data. Bluetooth or HERE travel time data will provide them the information needed to calculate measures of effectiveness. ITS strategies can assist with measuring mobility performance (e.g. travel times) and automatically calculate delay at signalized intersections. Without immediate knowledge of a nonrecurring event nor access to a live video feed to observe traffic conditions, the City has no way of determining the causes of delay and severe congestion. The City does not have enough staff to conduct signal timing/delay studies and regularly utilizes FDOT assistance with this matter.


A robust fiber optic network exists in Daytona Beach providing connections between the devices and the operating center. At present there are gaps in the city's fiber optic network. These gaps prohibit communication and monitoring along roadways and at intersections not connected to the fiber.

**Florida DOT District 5 Mobility Issues**

Florida DOT provides the ITS infrastructure for the limited access facilities in the area and some ITS infrastructure for the arterials on the State Highway System. Mobility data (e.g. travel times/speeds) collected by Bluetooth, radar, and microwave instruments could be used in FDOT's planning process to account for existing conditions and assist with calibrating mesoscopic models. Data is not only collected for internal use, the data is used to disseminate information to the public. FDOT wants to automate the data collection process more and more, they currently have to manually conduct turning movement, bike and pedestrian counts. There is no automoated process for calculating saturation flow rates or for queue length estimation. For transit, FDOT wants to advance automatic passenger counts and vehicle location systems to address the issue of not currently having easy access to this information.

There are a number of special events in Daytona Beach causing non-recurring congestion, such as big races, bike week, and graduations. FDOT and Daytona Beach ITS systems have compatibility issues that FDOT is willing to work with Daytona Beach to resolve. FDOT wants to work with Daytona Beach to improve management and development of special event signal timing plans. Improving signal progression will decrease the amount of vehicle stops and thus decreases the potential of rear-end collisions. Vehicles coming to a complete stop on freeways, due to incidents or congestion, is also an issue leading to rear-end collisions. FDOT wants to avoid the occurrence of these situations.

In work zones the contractor is responsible for maintaining the detection system but the quality of the data collected is typically insufficient. As result the maintenance of traffic and precision in monitoring travel conditions is compromised. FDOT is in the process of producing a developmental specification to have an FDOT maintenance contractor maintain the work-zone ITS communication and detection system.

Striving for a solid communication network could greatly improve future ITS system deployments. FDOT could replace the use traffic demand models for origin destination information with Bluetooth if the ITS network is comprehensively connected. Traffic signal vehicle detection devices, with field modifications and technology deployments, have the ability to collect data but they are not fully utilized for this purpose currently. Automated signalization information and data collection from signal detection system will be improved through a thoroughly connected network. Signal data can be used in conjunction with vehicle probe data to produce advanced analytics. FDOT currently does not automatically capture these types of metrics (e.g. arrivals on red or arrivals on green).

### Florida Highway Patrol Mobility Issues

As a law enforcement agency the Florida Highway Patrol (FHP) is primarily concerned with incident responsiveness. For maintenance of traffic and to improve coordination amongst agencies the FHP recommends allowing law enforcement agencies to record video cameras in their area or jurisdiction. Additional cameras could improve maintenance of traffic during incidents. The FHP wants to see agencies work with FHP to receive camera images or video from FHP units on the scene. This will provide accurate and timely information to TMC and FHP Duty Officers who are feeding information into 5-1-1, dispatch, callers, etc. Obtaining real time footage of incidents and traffic conditions remains an issue for the FHP.

New technologies that increase incident response times could save lives. FHP recommends developing an Incident Response Vehicle for quick response to scene to act as a command post for all first responders. The vehicle could be on call and shared by other agencies and serve as the mobile base/command center for drones. Drones will fly and provide video footage in real time to a TMC, on-scene command post, or incident response vehicle.

There are safety issues caused by traffic backing up in places where the traffic could have been diverted. This is especially true during incidents, information could be provided to the traveler in

advance alerting them to the delay ahead. Generally, clearance times are good except when construction limits shoulder access. First responders decrease roadway capacity by parking their vehicles in through lanes. When the scene is stabilized, first responders should move emergency response vehicles as soon as the need for them reduces. Further coordination between law enforcement and incident responders is needed.

### Flagler County Sheriff's Office Mobility Issues

Flagler County's roads have availability capacity and severe congestion is not an ongoing issue yet. The Flagler County Sheriff's Office is confronted with nonrecurring congestion during special beach events, within work zones, and holiday shopping season can be problematic. In these instances vehicles queue on major roadways due to lack of signal coordination. Signals are not coordinated effectively, signal timing plans are not based on time of day. On the bridges leading to the beach, rear-end collisions result from lack of driver awareness. Because of the vertical curvature on the SR 100 beach bridge, drivers cannot see the vehicles that are queued on the other side of the bridge.


Emergency medical service responders do not receive signal preemption; as a result emergency services could be delayed. Law enforcement does not have access to CCTV systems. Similar to the FHP, Flagler County Sheriff's Office wants to see cameras connected to dispatch to inform incident severity and to provide necessary services.

### Volusia County Sheriff's Office Mobility Issues

The Volusia County Sheriff's Office has the responsibility for assisting residents of Volusia County and the many tourists visiting the area. There are particular issues around the beaches. Pedestrian safety is a concern, helping the pedestrians cross busy beach roads (A1A/Ocean Shore Blvd) is a priority. There are no visible indicators to drivers that pedestrians are trying to cross the roadway.

The sheriff's office identified the lack of signage cautioning motorists of upcoming construction zones as an issue; message boards can provide construction information to travelers. Crashes on the Interstate are a primary cause of nonrecurring congestion for the Volusia County Sheriff's Office. Additional traffic cameras in the high incident areas can improve response times and help coordinate the emergency response.

### SunRail Mobility Issues

SunRail operates a commuter rail system providing intermodal connection with vehicles, transit, and pedestrians. In some instances issues are unique to each modes interaction with SunRail and in other cases the issues affect all the modes. Grade crossings present safety issues for all the modes. When incidents occur, communication across agencies is needed. Currently communication works well during incidents, but could benefit from a regional transit authority or better integration into the RTMC.

Parking management could be an issue in the future. At present parking is free, the current parking demand has not created a situation where 100% of the parking is occupied. SunRail service is slated to expand to the airport and ridership will increase as result. Parking management and occupancy monitoring devices might be a future need as ridership goes up.

## NEXT STEPS

Transportation and law enforcement agencies operating within the R2CTPO planning area identified a number of transportation related issues. Through investigating these issues further, problems can be identified and solutions determined. In many instances an ITS strategy may be an appropriate solution in some instances this may not be the case. As a follow up to identifying transportation issues in the region, the R2CTPO should begin evaluating ITS strategy's ability to address these issues. The ITS improvements should support the ITS Master Plan Goals and Objectives, contribute to an integrated ITS program, and yield a significant cost benefit in relation to mobility and safety.

The R2CTPO should create an ITS Master Plan that includes an implementation strategy, identifies a process for project prioritization, determines agency responsibilities and staffing requirements, provides interagency agreements, targets potential funding sources for initial deployment, operations, and maintenance.

# Appendix A: Existing Conditions Technical Memorandum

Ref: 10889

# TECHNICAL MEMORANDUM

**To:** River to Sea TPO

**From:** Alexander T. Mims, P.E.; Vischal Persaud, E.I.

**Subject:** Existing Conditions Technical Memorandum

**Date:** August 2, 2016

## 1.0 Purpose

The purpose of this document is to summarize existing and planned ITS elements—including physical infrastructure, plans, and other documentation—and to provide an overview of organizational and functional relationships between the various transportation, emergency response, and law enforcement agencies within the River to Sea Transportation Planning Organization (R2CTPO) boundary. This document will be segregated into two major sections: *2.0 Inventory of Existing ITS Infrastructure, Services,* and *Organizational Relationships* and *3.0 Qualitative Assessment of the Existing ITS System.*

## 2.0 Existing ITS Infrastructure and Services

The following sections describe the existing ITS infrastructure owned, operated, or maintained by the various transportation agencies within the R2CTPO boundary and existing ITS related services that have been developed for the area. Information presented in the following sections was obtained through stakeholder interviews, provided by the agencies in various formats (GIS, CAD, Excel, etc.), or gathered from databases accessible to the public. This information was then summarized, in map format, and provided to the transportation agencies for review and subsequent corrections. These maps and tables, providing an ITS infrastructure inventory for major corridors, can be found within the Appendix to this document.

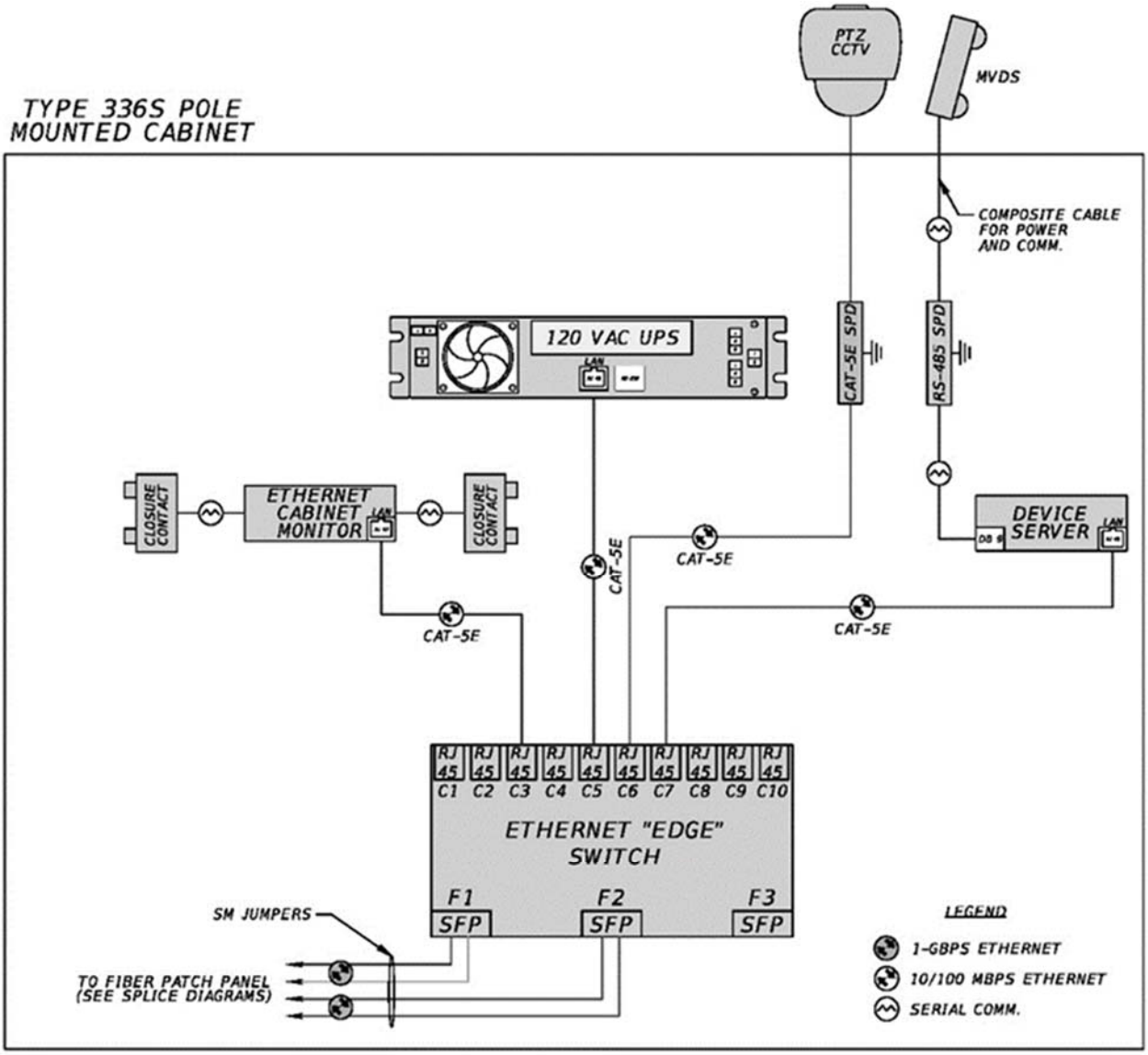
## 2.1 General Overview of Communication Infrastructure

The primary physical communication means, applicable to both Center to Field (C2F) and Center to Center (C2C) communications, utilized by transportation agencies within the R2CTPO boundary is single-mode fiber optics; however, some microwave point-to-point links have been established where no fiber is present. As referenced to the National Transportation Communications for Intelligent Transportation System Protocol (NTCIP) Framework, the majority of C2F and C2C communications in the area utilize TCP/IP[1] or UDP/IP[2] stacks at the Transport Level, from which the IP packets are sent using Ethernet at the Subnetwork Level. When access to an agencies network by a field device is required, a Managed Layer 2 Ethernet Switch that is environmentally hardened and includes both twisted pair (RJ45) and

[1] TCP/IP stands for Transmission Control Protocol / Internet Protocol

[2] UDP/IP stands for User Datagram Protocol / Internet Protocol

fiber optic physical interfaces (most commonly in the form of SFP[3] ports) is typically installed. These switches are housed within ITS equipment cabinets (Local Hubs), or traffic signal controller cabinets. Links between adjacent communication nodes commonly operate at 1 Gigabit/sec, while device connections to the Ethernet switch commonly operate a 10/100 Megabit/sec. Some field devices communicate using serial protocols (RS-232 or RS-485), and require terminal servers to enable Ethernet connectivity—this is typical for microwave vehicle detectors (MVDS). Communications from the field devices operated by each agency with a Transportation Management Center (TMC) is sent back to the TMC for utilization by central management software systems or for review by TMC operators. The following figure is an example of the communication system block diagram for a typical Local Hub cabinet:




COMMUNICATION SYSTEM DIAGRAM

[3] SFP stands for small form-factor pluggable, which in this context is in reference to a fiber optic transceiver form-factor

## 2.2 FDOT District 5

The following is an overview of the major ITS services provided and ITS infrastructure operated and maintained by FDOT District 5, while the historical focus of these services has been limited access facility management, many are being considered for use on arterials.

### 2.2.1 ITS Devices

FDOT District 5 is responsible for the operations and maintenance of hundreds of ITS field devices including:

- Pan-tilt-zoom (PTZ) CCTV Cameras
- Roadway Weather Information Sensors (RWIS) Environmental Sensor Station (ESS)
- Traffic Data Vehicle Detectors
    - Inductive Loops and Piezoelectric Axel Sensors (PTMS/TTMS)
    - Microwave Vehicle Detectors (MVDS)
- Probe Vehicle Detectors
    - BlueTooth Travel Time Sensors
- Dynamic Message Signs (DMS) and Arterial Dynamic Message Signs (ADMS)

The field devices deployed can be broken into two separate functional categories: data collection, and information dissemination. CCTV cameras and RWIS, along with traffic data and probe vehicle detectors, are used to collect traffic and environmental data (weather, pavement condition, etc.), while DMS and ADMS devices are used to disseminate information to the traveling public.

Traffic data vehicle detectors provide presence, volume, occupancy, and speed data for the lanes they are configured to monitor at a point location, and do not perform automatic vehicle identification. Probe vehicle detectors provide speed data and travel times for a roadway segment and can provide origin-destination information—these devices are capable of performing automatic vehicle identification. The automatic vehicle identification data is then transmitted to a central site where it can be matched to past or future detections of the same vehicle at other detector locations. FDOT utilizes the traffic and probe vehicle data collected for a number of purposes, including: incident detection; maintenance of traffic performance measuring; origin-destination research; and travel time predictions.

FDOT District 5 is responsible for maintenance and operation of Portable Traffic Monitoring Sites (PTMS) in the area, which use inductive loops and piezoelectric axel sensors to perform vehicle classification, volume, and speed counts on a per lane basis—these sites are not functional unless a portable traffic counter is installed, which is typically done on a periodic basis for intervals up to 7-days. FDOT Central Office is responsible for maintenance and operation of Telemetered Traffic Monitoring Sites (TTMS) in the area, which are very similar in function to PTMS sites, but use permanent traffic counters (typically powered by solar panels) and a cellular gateway (also known as a cellular router or modem) to provide remote communications and facilitate automated data collection. Data collected by PTMS and TTMS sites is made available by FDOT through the *Florida Transportation Information DVD* and the *Florida Traffic Online* web application—both resources are updated annually.

In addition to FDOT owned devices, FDOT has access to Waze data and FDOT provides Waze with data collected from their field devices. Waze uses a crowd sourcing formula to collect data related to the roadway system—Waze relies on information provided by users of their mobile platform application. Information collected from Waze users is collected and provided to the public, and to the FDOT. The data collected from Waze is particularly useful in areas outside of FDOT's current data collection coverage limits where field devices are not present.

CCTV cameras are used for incident management purposes, for incident verification and detection to determine proper coordination procedures, and for transportation system visual monitoring. FDOT CCTV video feeds are provided, in a number of cases, to outside agencies and news outlets with varying level of success and/or reliability. RWIS ESS devices are used to gather weather and pavement condition information, which can be used to notify the public of hazardous traveling conditions.

DMS and ADMS devices are used to provide travel guidance information to motorists *en route* to their destination. These signs include programmable variable display messages composed of letters, symbols, graphics, or a combination of these items. Estimated travel times, incident information, evacuation guidance, and special event guidance are all examples of uses for DMS and ADMS signs. DMS signs are typically large signs with walk-in enclosures located on limited access facilities, whereas ADMS signs are typically smaller front-access panels located on major arterial roadways. FDOT has developed the *Guidelines for the Use of Dynamic Message Signs on the Florida State Highway System* as guidance for DMS/ADMS operation to ensure information is provided to motorists in an appropriate and consistent manner. The majority of the FDOT operated ADMS signs in the R2CTPO area are aging small panels, which provide significant limitations on the messages that can be displayed, and while these signs are intended primarily for providing travel information to motorists in advance of decision points to alternate routes, in some cases these signs are installed too close to the decision point to be effective—adequate time is not provided for the motorist to observe the panel, interpret the message, and select an alternate route prior to reaching the decision point. Re-evaluation of the location of these ADMS panels was suggested by Volusia County.

FDOT District 5 ITS devices are monitored from the FDOT District 5 Regional Transportation Management Center (RTMC) located in Orlando, FL; a facility shared with Florida Highway Patrol (FHP) Troop D. The RTMC is planned for relocation to Seminole County—the project is presently at the detailed design level for the new RTMC. Within the R2CTPO area FDOT has primarily deployed ITS equipment on limited access roadways (I-4 and I-95), but does manage some ITS equipment on arterials; for instance, the adaptive signal systems and BlueTooth travel time sensors on US 17/92 in Deland and on US 92 in Daytona Beach. FDOT uses the SunGuide software to manage and control their ITS system, this software is operated from the RTMC which is staffed 24 hours a day and seven days a week.

### 2.2.2 Communication System

FDOT operates an extensive communication network within the R2CTPO boundary and beyond. ITS field devices are typically mounted to concrete poles, or sign structures in the case of DMS and ADMS devices, and connected to Local Hub field cabinets. Maintenance of ITS devices is primarily accomplished through the use of maintenance contractors, but the District does employ IT staff to manage their ITS network.

FDOT District 5 is moving towards the implementation of Layer 3 Switches within their Local Hub field cabinets, thereby facilitating IP packet routing decisions between subnetworks at each Local Hub—with this approach each Local Hub is provided with a subnetwork for the local ITS devices and separate subnetworks for links between adjacent Local Hubs. This step provides an increase in the number of Layer 2 broadcast domains while not relying on VLANs[4] exclusively for broadcast domain division at the Local Hub level; in contrast to current ITS deployments by other agencies in the R2CTPO area, where Layer 2 switches are commonly installed in traffic signal cabinets, or Local Hubs, and Layer 3 switches are only installed at the core or major network aggregation points. According to FDOT staff, this solution has increased the reliability of their ITS network, and helped to mitigate the effects of fiber optic cable cuts and VLAN misconfiguration.

In addition to Local Hub cabinets, FDOT operates field network aggregation points, where data from a number of Local Hub cabinets is aggregated, called Master Hubs; in which high capacity Layer 3 switches are installed within HVAC controlled secure equipment shelters that have standby emergency power systems. Links between Master Hubs and the FDOT District 5 RTMC operate at 1 Gigabit/sec to 10 Gigabit/sec, with all future deployments utilizing the latter. Many steps have been taken to ensure reliability of this communication network including redundant and diverse communication paths between nodes, and emergency power systems that can supply power to equipment in the event of a mains power outage. A number of Local Hubs and Master Hubs within the District are fitted with Cyberlock Electronic locks—the current standard— other cabinets are accessible using standard #2 keys.

It should be noted that the FDOT District 5 has been migrating to using Multiprotocol Label Switching (MPLS) for C2C connections between various agencies and the FDOT Core Network, where transportation related data for the District is stored. FDOT District 5 is also in the process of reconfiguring their network to utilize a unique IP address block; this address block was allocated to the District by FDOT Central Office. This is important as transportation agencies that wish to connect to the FDOT ITS network will need to also use unique IP addresses for devices to prevent address duplication, since at this time FDOT does not anticipate the use of Network or Port Address Translation between the various agency ITS networks. Currently, FDOT is working with local transportation agencies to develop and implement unique IP addressing schemes for ITS devices operated and maintained by each local agency, with the goal of eliminating future address duplication issues and facilitating inter-agency communication.

4 VLAN stands for a virtual local area network, and is any broadcast domain segmented in a network at the data link layer (layer 2).

### 2.2.3 Florida 511 Traveler Information System

The Florida 511 Traveler Information System is a statewide service that provides real time traffic information to the public free of charge. This system is accessible through the FL511 Website or over the phone by calling 511. The system provides: estimated traffic speeds and travel times; live CCTV camera feeds; live DMS/ADMS messages; construction information; congestion information; incident information; and sever weather information. This service receives information from FDOT's SunGuide software, and displays real time traffic data collected by the FDOT ITS system and Waze.

### 2.2.4 FDOT District 5 Regional ITS Architecture

This service was developed to satisfy the FHWA Rule 940 requirements for a Regional ITS Architecture (RITSA) and is based on the National ITS Architecture. The RITSA resides on a website (http://www.consystec.com/florida/d5/web/html/if/if17-57.htm) and was generated using a Turbo Architecture Database. The RITSA is periodically updated based on planned and executed ITS deployments. According to the RITSA website: "The Central Florida Regional ITS Architecture is a roadmap for transportation systems integration in Central Florida over the next 20 years." The RITSA consist of several parts including ITS system functional requirements; information exchanges with planned and existing systems and subsystems; and identification of applicable ITS standards. This RITSA is crucial for future ITS deployments funded by the R2CTPO, since ITS projects funded by the Highway Trust Fund and the Mass Transit Account must conform to a RITSA per FHWA Rule 940.

### 2.2.5 FDOT Traffic Incident Management

FDOT's Traffic Incident Management service (TIM) consists of multiple facets including: TIM Teams; Road Rangers; Rapid Incident Scene Clearance (RISC); and Hurricane Response. An important document related to TIM policy is the *State of Florida Open Roads Policy Agreement* between the FHP and FDOT.

The FDOT TIM Teams consist of individuals from law enforcement, fire departments, towing companies, medical personnel, spill response firms, local transportation agencies, and FDOT maintenance crews all working together to clear incidents from the roadway. TIM Teams are active in all FDOT Districts. These teams work together to review past response actions for incidents and explore ways to improve incident response, they also conduct training for incident responders and are active in traffic management for special events—TIM team meetings are open to all incident responders and there is no cost to attend. Within the R2CTPO area is the Volusia-Flager TIM team, which includes members from a number of various agencies within Flagler and Volusia County.

Road Rangers is a free service provided by FDOT, with the mission of providing free highway assistance services during incidents in order to reduce delay and improve safety for the motoring public and emergency responders. Within FDOT District 5 the Road Ranger service area covers 73 centerline miles, and includes I-4 from County Road 532 (Polk/Osceola County Line) to I-95.

RISC is an effort by FDOT to utilize highly innovative heavy-duty towing and recovery programs, in support of the *Florida's Open Road Policy,* that establish a 90-minute goal for clearance of a motor vehicle crash or incident on Florida's roadways. This service is currently not implemented in District 5.

The FDOT Traffic Engineering and Operations Office (TEOO) prepares for special transportation problems related to the hurricane season. FDOT is responsible for seeing that preparations and procedures are introduced that safeguard critical transportation infrastructure and keep the roadways open for coastal residents in case of evacuations. FDOT Districts institute rapid recovery operations to open roads and restore traffic signals, operations at TMC, and provide support as needed by the state Emergency Operations Center. The TEOO in Tallahassee coordinates its efforts with FDOT District staff, FHP, the State Emergency Operations Center, and the Florida Department of Law Enforcement.

## 2.3 Volusia County

Volusia County is responsible for the maintenance and operation of approximately 326 traffic signals, with 187 of these signals connected to the County's communication network. The County also operates 35 CCTV cameras located at signalized intersections and 65 infrared or GPS based emergency vehicle traffic signal preemption systems. The County has two TMC facilities—one in DeLand and the other in Holly Hill—and controls the connected traffic signals using the Econolite Centracs central management system. A separate system is used to monitor and control the County's CCTV camera subsystem.

The County mostly uses 72 strand single-mode and 24/12 strand hybrid backbone fiber optic cabling, totaling to approximately 52 miles, to connect traffic signals to their communication network, with Ethernet switches installed in connected traffic signal controller cabinets. In some cases, when fiber is not available, microwave point-to-point links have been established to extend the network coverage and to span waterbodies. FDOT District 5 and Volusia County have established fiber optic cabling between the FDOT District 5 Operations Office and the Volusia County Deland TMC; however, the data sharing between these two agencies is mostly limited to CCTV video feeds. It should be noted that the County is investigating the use of cellular modems for connecting isolated traffic signals to their communication network in the future.

The County at present has a mix of TS1 and TS2 traffic signal controller cabinets in the field; TS2 Type 1 cabinets are the current standard. Existing traffic signal controllers consist of a mix of Peek 3000E and Econolite ACS3; AC3 controllers are the current standard. Secure access to traffic signal controller cabinets is provided by either standard #2 keys or padlocks. Vehicle detection at signalized intersections is accomplished with a mix of inductive loops, video detection, and microwave detectors.

Maintenance of traffic signals is performed by International Municipal Signal Association (IMSA) certified in-house traffic signal technicians, and the central management system is operated by the Traffic Operations Supervisor. Maintenance of the communications system infrastructure is handled by a combination of County staff and contracted services. The Volusia County Traffic Engineering Division employs 21 full time staff members—the County has

identified five vacant positions that are funded and two vacant positions that are unfunded. Signal operations and maintenance staff includes seven persons: six traffic signal technicians and one Traffic Operations Supervisor.

Volusia County works closely with FDOT District 5 to develop timing plans, and retime coordinated signal corridors, for special events, weekday, and seasonal peak periods. Special traffic patterns and timing plans are implemented in the area of special events. Some corridors have traffic signal timing plans in place for hurricane evacuation from beachside, and for interstate detours related to non-recurring incidents. For County maintained traffic signals, there is a single corridor with an adaptive signal system, specifically Rhythm InSync, deployed: US 17/92 in Deland from Firehouse Road to Beresford Avenue. Bluetooth Travel Time Sensors were installed as part of this adaptive signal project, in order to monitor travel times through the corridor.

The County has recently submitted funding applications for a series of ITS related improvements to the R2CTPO. These applications include adaptive signal systems on a number of major arterial corridors; relocation of a Volusia County TMC; contracted services for operation of adaptive signal systems; and a transit signal priority system at US 17/92 and Fort Florida Road.

### 2.3.1 City of Daytona Beach

The City of Daytona Beach is responsible for maintenance and operation of approximately 125 traffic signals, with 93 of these signals connected to the City's communication network. The City operates 60 CCTV cameras. The City has one TMC facility and controls the connected traffic signals with the Trafficware ATMS.now central management system, this system is also used to monitor the CCTV camera subsystem.

A large portion of the existing ITS infrastructure in and around the City was installed as part of the Daytona Area Smart Highways (DASH), which provided traffic surveillance, incident management, and traveler information along I-4 between SR 44 and I-95 and along I-95 from I-4 to US 92. This project was a partnership between FDOT District 5, the City of Daytona Beach, and the Daytona Beach Police Department. The primary control center for this project was established at the City of Daytona Beach Traffic Management Center in the City's Public Works building on Bellevue Avenue east of Nova Road, with a secondary control center in the Daytona Beach Police dispatch and communications center. Field devices installed as part of DASH include: miles of fiber optic cabling; CCTV cameras; DMS/ADMS structures; communication hubs; power subsystem including generators and power distribution infrastructure.

The City primarily uses fiber optic cabling, both single and multimode, to connect their traffic signals to their communication network, with Ethernet switches installed in connected traffic signal controller cabinets. In total, approximately 90 miles of fiber optic cabling is owned and maintained by the City. One wireless point-to-point link is in place. While the physical fiber optic infrastructure is in place to connect FDOT District 5, Volusia County, and the City's ITS networks, there is currently no data sharing between these entities and the City: Daytona Beach operates as a "closed" system.

The City currently has a mix of TS1 and TS2 traffic signal controller cabinets in the field. Existing traffic signal controllers consist of Trafficware 980 Version 61, Trafficware 980 Version 76 ATC, and Trafficware Type 6 TS2 ATC controllers; Trafficware ATC controllers are the current standard. Secure access to traffic signal controller cabinets is provided by standard #2 keys.

Maintenance of traffic signals is performed by IMSA certified in-house traffic signal technicians, and the central management system is operated by a Sr. Signal Technician. In total, the City employs five full time traffic signal and ITS maintenance and operation staff: one Traffic Division Administrator (who is the prime operator of the TMC) and four traffic signal technicians. Maintenance of the communications system infrastructure is handled by a combination of City staff, including the City IT department, and contracted services. Vehicle detection at signalized intersections is accomplished with a combination of inductive loops, video detection, and microwave detectors. TMC operations consist mainly of handling special events and incident management coordination.

To accommodate the large inrush of traffic related to the numerous special events in the Daytona Beach area, the City staff can implement pre-programmed timing plans, or modify timing manually in real time from the TMC. DMS and ADMS devices in the Daytona Beach area are used in some instances for special event management purposes; however, only FDOT staff has direct control over the DMS and ADMS devices at this time.

The City does not currently have a Traffic Engineer on staff; therefore, signal timing changes and timing plan development are dependent upon assistance from sources outside of the City staff. On City maintained traffic signals, there is a single corridor with an adaptive signal system, specifically Rhythm InSync, deployed: US 92 in from Tomoka Farms Road to Beach Street. This system is managed by FDOT District 5 from the Orlando RTMC. Bluetooth Travel Time Sensors were installed as part of this adaptive signal project, in order to monitor travel times through the corridor.

During stakeholder interviews with the City of Daytona Beach, City staff expressed concern regarding the ability of the adaptive signal system to accommodate large special event traffic, such as a race at the Daytona International Speedway. City staff has been deactivating the adaptive signal system, and reverting to time based coordination, during these types of events.

A *Daytona Area Event Management Plan* is being developed to better accommodate special events (Bike Week, Race Weeks, etc.) within the City, which will include recommendations for additional ITS infrastructure in the area—including probe vehicle travel time sensors, network controlled blank out signs, and ADMS structures. FDOT District 5, through the use of consultant engineering services, is leading the project and will ultimately be responsible for construction, integration, and operation of the system, which will be operated from the District 5 RTMC. The following stakeholder are being closely coordinated with during the development of this plan: City of Daytona Beach; Volusia County; Ormond Beach; the International Speedway; and the City of Daytona Beach Police Department. Scheduled construction letting for the project is June, 6$^{th}$ 2017.

### 2.3.2 VOTRAN

VOTRAN is Volusia County's public transit service, which operates busses and shuttles along with special services for the disabled and elderly. VOTRAN busses are fitted with automatic vehicle location (AVL) and automatic passenger count (APC) systems. VOTRAN MYSTOP service is available on both desktop and mobile devices, that allows live bus tracking and trip planning, along with providing alerts about possible delays, detours, and schedule changes. Bus route maps and schedules are available on VOTRAN's website.

The physical fiber optic infrastructure is in place to enable connections between VOTRAN, Daytona Beach, Volusia County, and FDOT District 5; however, little to no data is currently shared. Historically, VOTRAN was provided with FDOT CCTV camera video feeds, but this functionality is no longer in place. No transit signal priority systems are active for VOTRAN transit vehicles at this time.

## 2.4 Flagler County

Flagler County operates and maintains three signalized intersections, none of which are connected to a communication system. The County has no existing or planned TMC, or ITS system deployments—with the exception of GPS emergency vehicle preemption systems deployed at a few traffic signals. Traffic signals within the County are maintained through contracted services; the County relies on FDOT District 5 to develop signal timings and to warrant new traffic signals. At present there is no fixed-route public transit system operating in Flagler County. There is only a demand-response transit service in Flagler County; however, the County recently adopted a Transit Development Plan that considers the desirability and feasibility of establishing a fixed route service.

### 2.4.1 City of Palm Coast

The City of Palm Coast is responsible for the maintenance and operation of the majority of traffic signals in Flagler County—approximately 50 in total. The City has installed around 40 miles of fiber optic cable backbone, which is used for communication between various facilities, but at this time none of the traffic signals have been connected to the fiber optic network. The City does plan, in the near future, to install fiber optic cable drops and Ethernet switches within 34 of the traffic signal controller cabinets in the area. At this time there is no TMC in Palm Coast, but the City is actively pursuing funding for the installation of a small TMC within City Hall. The City also has a number of CCTV cameras deployed; however, these CCTV cameras are not connected to a communications network and are therefore not functional. The City IT staff is responsible for tracking usage and administering the existing fiber optic network.

The City has a mix of TrafficWare TS2, Peek 3000E, and TRANSYT 1880EL traffic signal controllers deployed and housed within mostly TS2 traffic signal cabinets. In-house Traffic Signal Technicians are responsible for maintenance of the City's traffic signals. The City employs three full time traffic signal maintenance and operations staff members: one Traffic Engineering Operations Manager and two traffic signal technicians.

Some of the signalized corridors use time based coordination, but at this time no means to time-sync the traffic signals (other than using the AC 60Hz line frequency) is in place—resulting in time "drift" that needs to be manually corrected periodically in the field. The majority of traffic signals under the City's operation and maintenance responsibility have GPS-based emergency vehicle preemption systems in place.

In 2015 the *City of Palm Coast Traffic Detection Hardware and Software Study Concept of Operations* report was developed, which provides guidance for upgrading the City's traffic signal control and monitoring capabilities and provides recommendations for the selection of a central management system software along with the installation of a City TMC.

## 2.5 SunRail

SunRail is Central Florida's commuter rail line. Within the R2CTPO boundary there is a single SunRail Station located in DeBary, with plans for expansion North to DeLand in the future. Presently travel conditions are provided to travelers using Twitter, SunRail.com, and on-platform and on-board announcements—SunRail also provides General Transit Feed Specification feeds, which defines a common format for public transportation schedules and other information, that can be used by Google Transit. SunRail uses a combination of fiber optic cables, copper connections, and wireless to communicate between remote locations and the SunRail operating center.

## 2.6 Other Local Agencies and School District Transportation Dispatch

The City of Bunnell is responsible for maintenance and operation of a small number of traffic signals, but has not deployed any ITS systems and does not operate a TMC. Other Local agencies, not responsible for traffic signal maintenance and operation, have historically funded installation of emergency vehicle preemption equipment for both their emergency response vehicles and traffic signals in the area on select intersections and corridors.

During stakeholder interviews, no automated means of communication between the transportation agencies and the School Districts Transportation Dispatch was mentioned, with the exception of Volusia County who provides periodic updates for emergency road and lane closures to Volusia County School Transportation.

## 2.7 Emergency Responders & Law Enforcement Agencies

From discussions with emergency responders and law enforcement agencies, as well as transportation agencies, incident management is primarily the responsibility of FHP, local law enforcement, fire rescue, and emergency medical services (EMS)—assistance is provided by FDOT Road Rangers, and local traffic signal maintenance staff if required. The area transportation agencies, operating from their TMC/RTMC if applicable, support emergency responders and law enforcement by providing incident information obtained from their ITS systems, information from CCTV feeds is important for incident management, but all agencies expressed the need for heightened coordination. Emergency responders and law enforcement have established protocols and systems, most notably the Computer Aided Dispatch System

(CAD), but this level of coordination does not extend to the local transportation agencies. FDOT District 5 utilizes SunGuide software, which has the ability to automatically interface with the FHP CAD system, but no other agencies within the R2CTPO operate a similar system. Coordination between transportation agencies and emergency responders during incidents is primarily accomplished through phone calls and email correspondence.

Various emergency responders, including fire rescue vehicles, have emergency vehicle preemption systems installed. While most new deployments are using a GPS based emergency vehicle preemption system to interface with traffic signal controllers, infrared based systems are still in place. While generally there is consistency within each emergency response agency on the type of preemption technology implemented on vehicles, this consistency does not exist throughout the infrastructure in the R2CTPO area, or in some cases throughout the traffic signal maintaining agency jurisdiction—resulting in vehicles that have mismatched preemption technologies with the traffic signal infrastructure. In 2009 the *Countywide Emergency Vehicle Preemption Study* was completed, which recommended the use of GPS based emergency vehicle preemption systems for future deployments. According to Volusia County, based on recent discussions between the County and FDOT, County operated EVAC vehicles are not eligible for emergency traffic signal preemption devices.

## 3.0 Qualitative Assessment of the Existing ITS System

While for the most part communication to ITS devices and traffic signals within agency boundaries where it exists is functional, a breakdown occurs when communication between various agency ITS networks is required. There is little automated incident and construction zone management coordination between the various transportation agencies and emergency responders, and sharing of CCTV video feeds can be improved in all cases. Additionally, there is limited sharing of data collected by vehicle detection technologies between agencies—with the exception of PTMS and TTMS data which is made available by FDOT on an annual basis. This is likely a result of incompatibility of networking equipment, protocols, and device configurations; lack of IT personnel; network security concerns; lack of developed software or software interfaces; lack of institutionalized policy and procedure; and agency preference for managing and controlling their systems independently of outside control. Improving interagency coordination and data sharing through the use of a regional ITS network is a complex issue with a number of facets, but is a lofty goal that could provide substantial transportation system benefits in the future.

In the Volusia County and Daytona Beach area, most of the physical ITS communication infrastructure is in place to link a number of the key transportation and emergency response agency facilities: including VOTRAN, Daytona Beach TMC, Volusia County Holly Hill and DeLand TMCs, FDOT District 5 RTMC, Daytona Beach Police Department, Volusia County Emergency Communication Center, FHP, and the Volusia County Sheriff Department. The Flagler County and City of Palm Coast area has no TMC, so there is no infrastructure in place to link the local transportation agencies together or link these agencies to emergency responders. There is a focus on connecting traffic signals to a ITS network common among all local transportation agencies contacted that maintain traffic signals; along with a desire for automated vehicle, pedestrian, and bicycle data collection.

Shortages of appropriate staff is a concern for local transportation agencies, as it takes experienced persons with adequate time to digest and effectively act upon the data obtained from the ITS systems in a timely manner. This situation becomes exacerbated when additional ITS equipment is deployed without consideration for future management and operations. The current System Engineering process required by FHWA Rule 940, should help to identify these types of shortfalls prior to ITS system deployment, but past instances these procedures were either not in place, not followed, or not enforced.

Within the Volusia County and Daytona Beach areas, some of the equipment installed as part of the DASH projects, in particular the DMS/ADMS signs, are aging and are in need of replacement. A portion of this equipment is being replaced as part of interstate capacity improvement projects on I-4 and I-95. The traffic signal maintaining agencies are continually upgrading their traffic signal equipment: including modern traffic signal controllers; LED signal heads; UPS systems; replacement of vehicle detectors; emergency vehicle preemption systems; and communication equipment upgrades. Overall, agencies within the R2CTPO area have established maintenance procedures of the communications infrastructure and traffic signals within their respective maintenance jurisdictions—equipment mostly functions as intended. Maintenance of future ITS deployments is critical to their functionality and longevity, and cannot be understated. Proper maintenance requires detailed inventory control and records keeping; adequate preventative maintenance; funding allocation; skilled maintenance staff; and quick response time to equipment failure or damage. FDOT District 5 utilizes ITSFM, OSPInsight, and MIMS software to provide ITS device inventory control, track fiber optic cabling usage, and manage maintenance requests. Most local transportation agencies have skilled maintenance staff experienced in maintaining traffic signals, but a lack of experience in maintaining ITS devices and administering a communications network exists in some cases—these gaps are typically filled with agency IT staff or outside contractors. Some local agencies have routine preventative maintenance programs, but it is rare for these agencies to have computerized inventory control and maintenance software in place such as FDOT District 5 uses.

# APPENDIX

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# R2CTPO - ITS MASTER PLAN

## R2CTPO ROADWAY NETWORK AND KEY FACILITIES

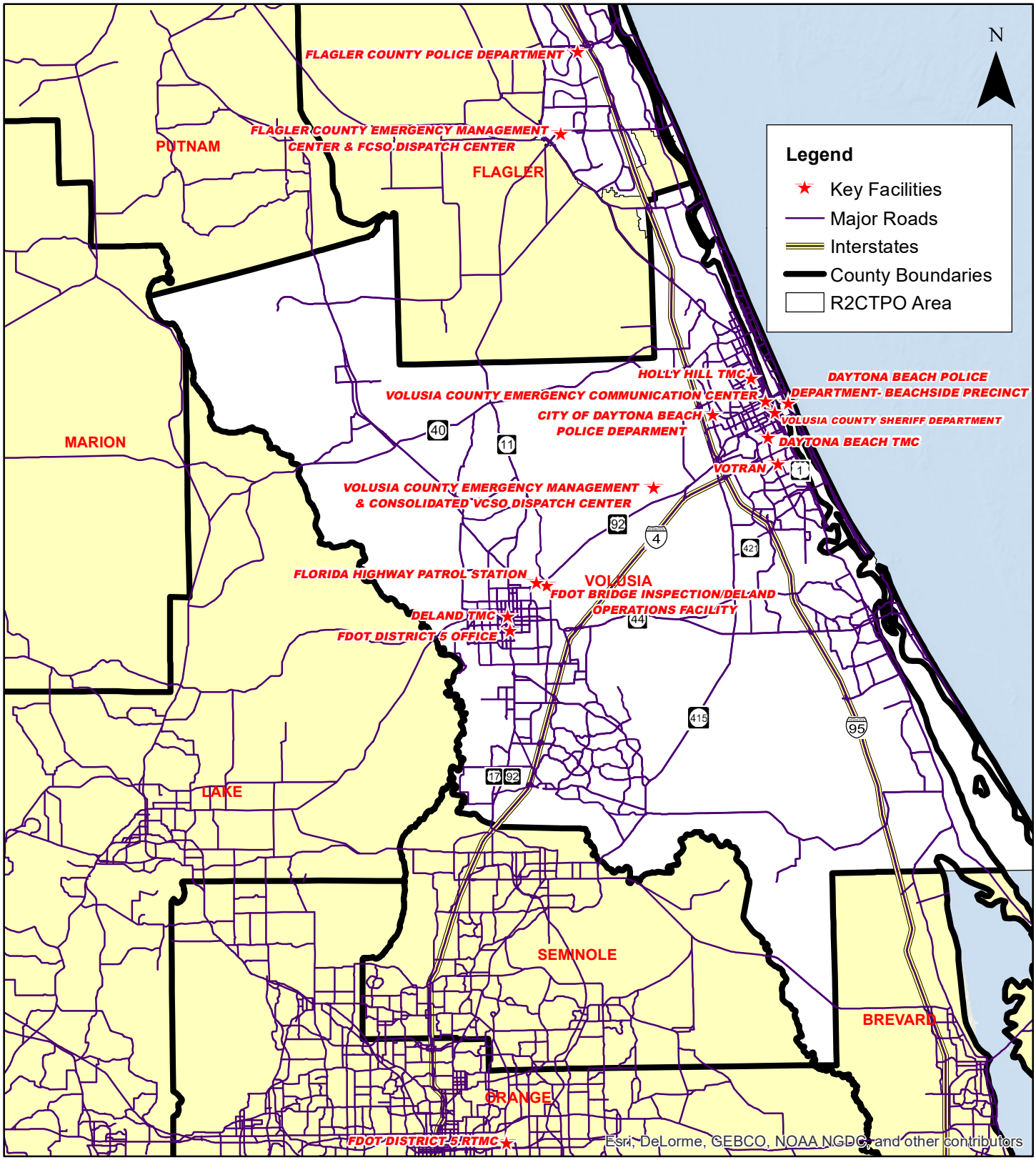



FIGURE A

OVERALL STUDY AREA

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN
## LOCATION OF EXISTING TRAFFIC SIGNALS

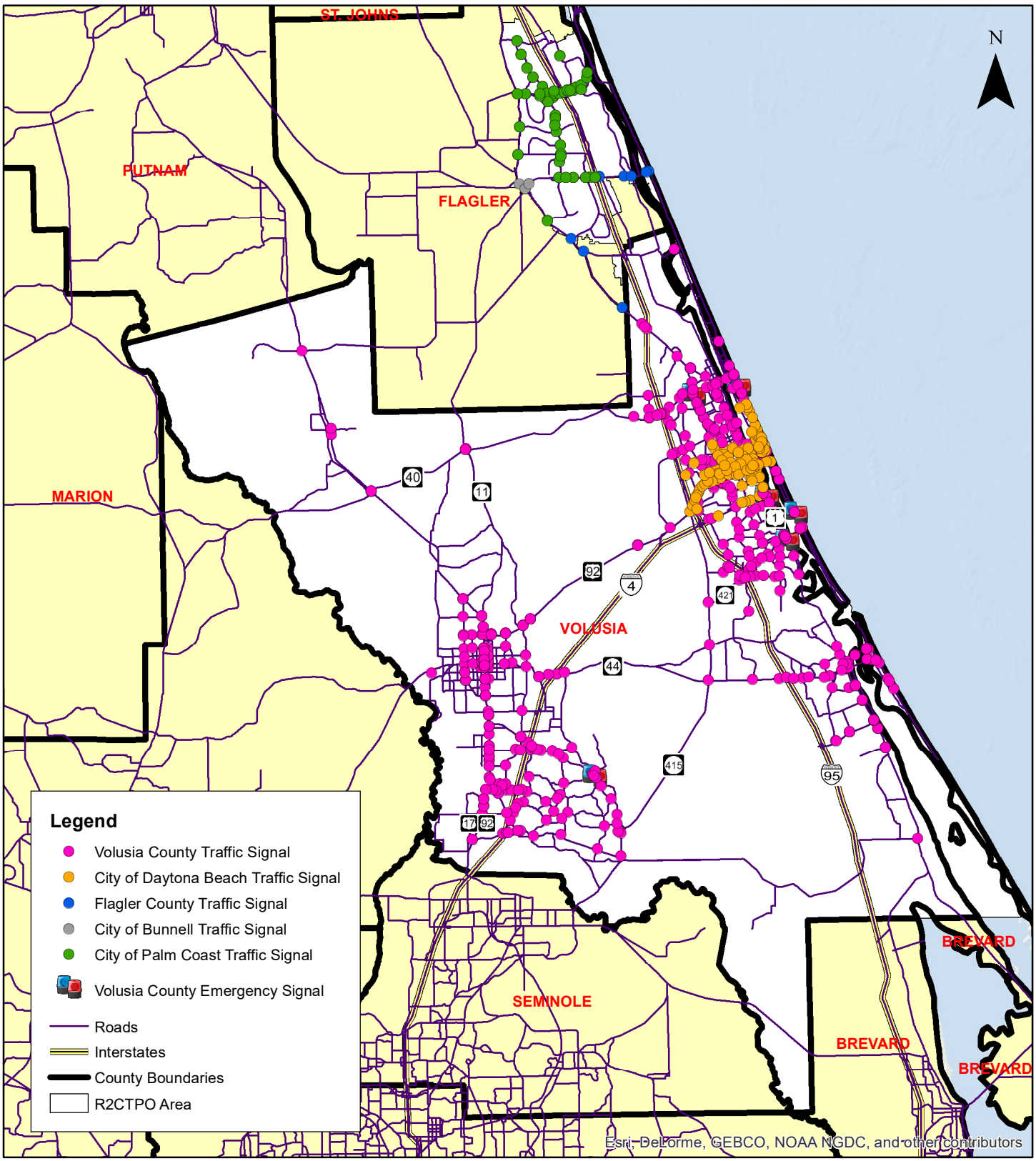



FIGURE B1

OVERALL STUDY AREA

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN

## LOCATION OF EXISTING TRAFFIC SIGNALS

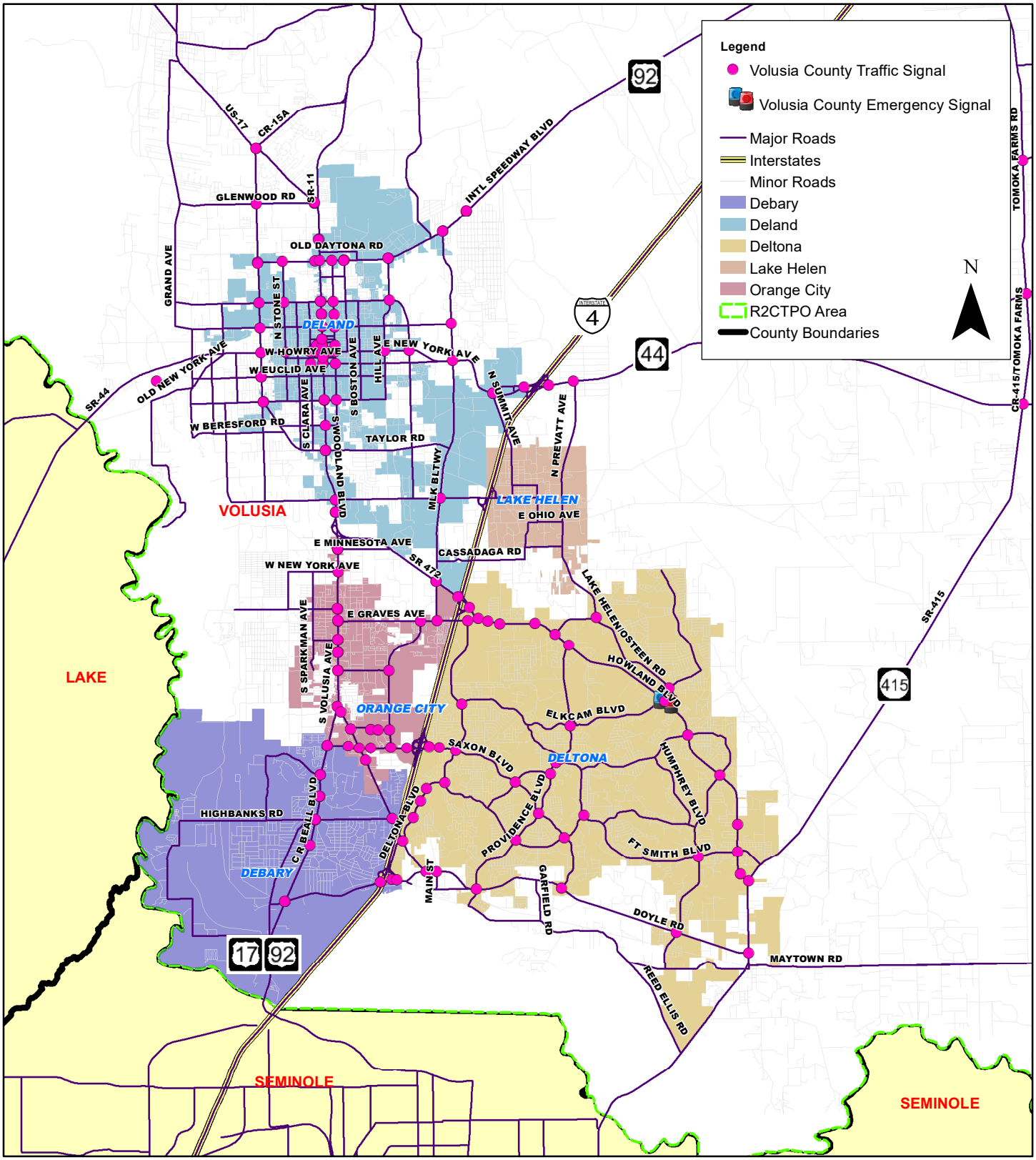



FIGURE B2

WEST VOLUSIA COUNTY

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

TEDS
Traffic Engineering
Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN

## LOCATION OF EXISTING TRAFFIC SIGNALS

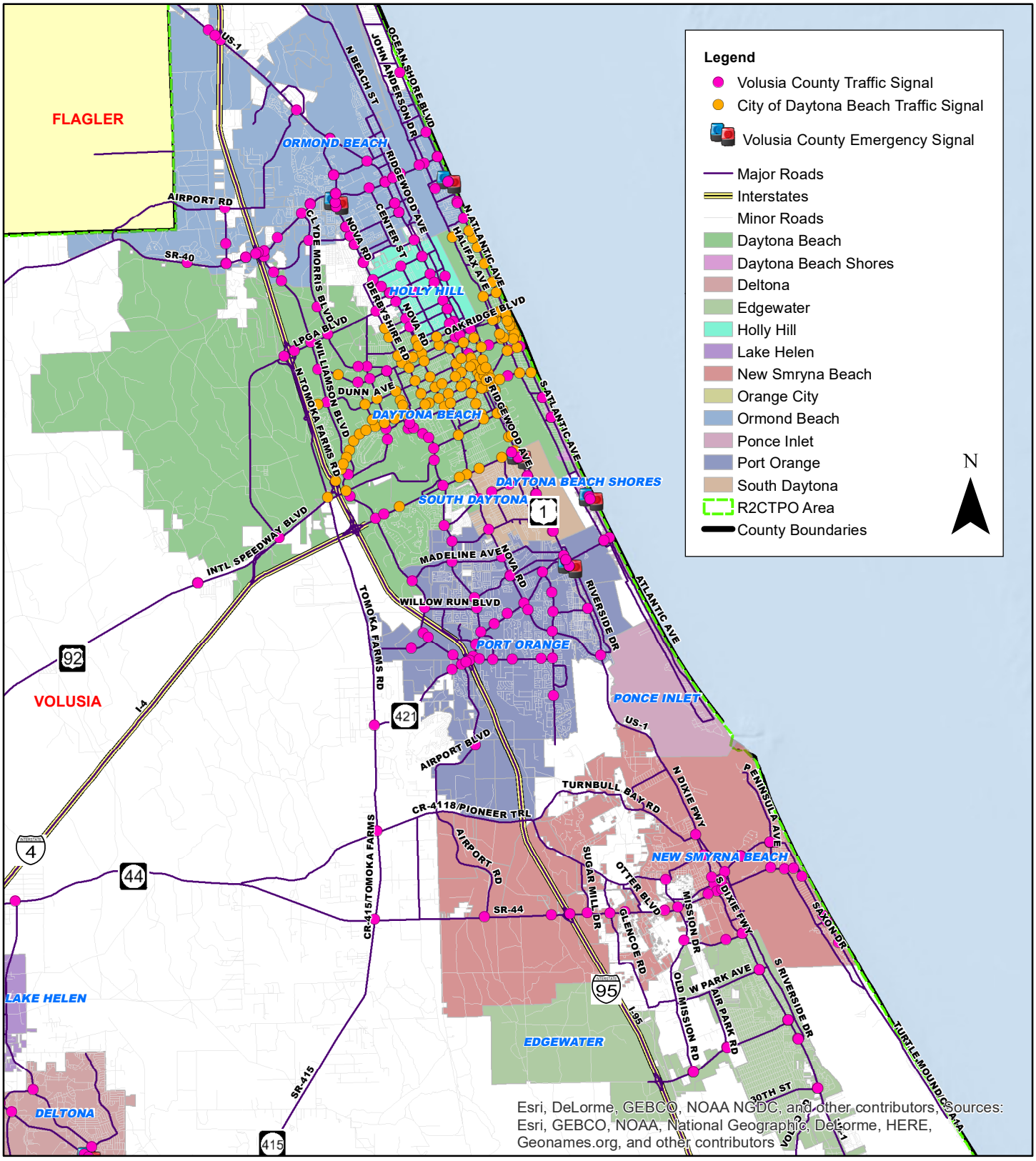



FIGURE B3

EAST VOLUSIA COUNTY

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN

## LOCATION OF EXISTING TRAFFIC SIGNALS

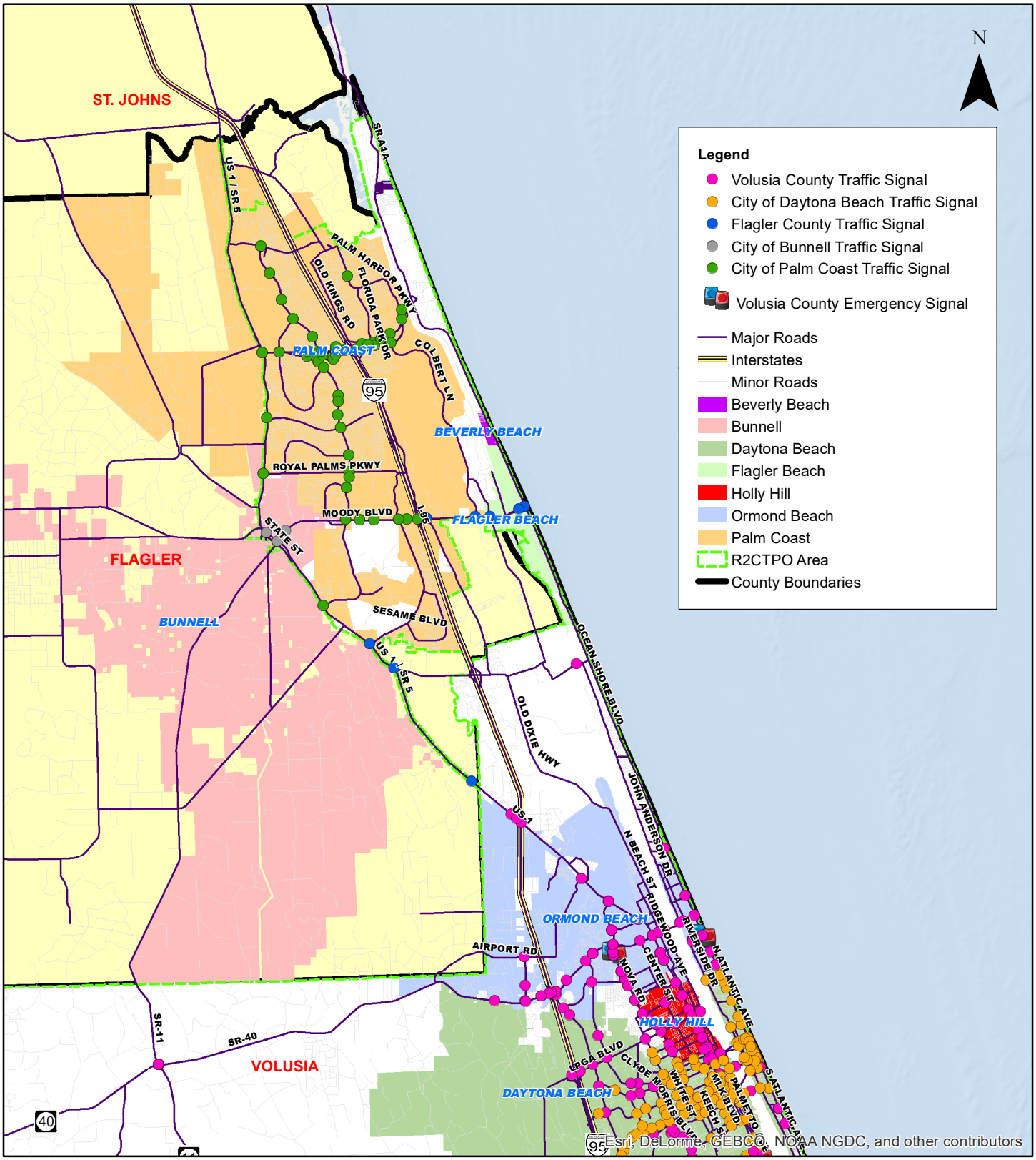



FIGURE B4

FLAGLER COUNTY

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN
## EXISTING TRANSIT SYSTEM ROUTES

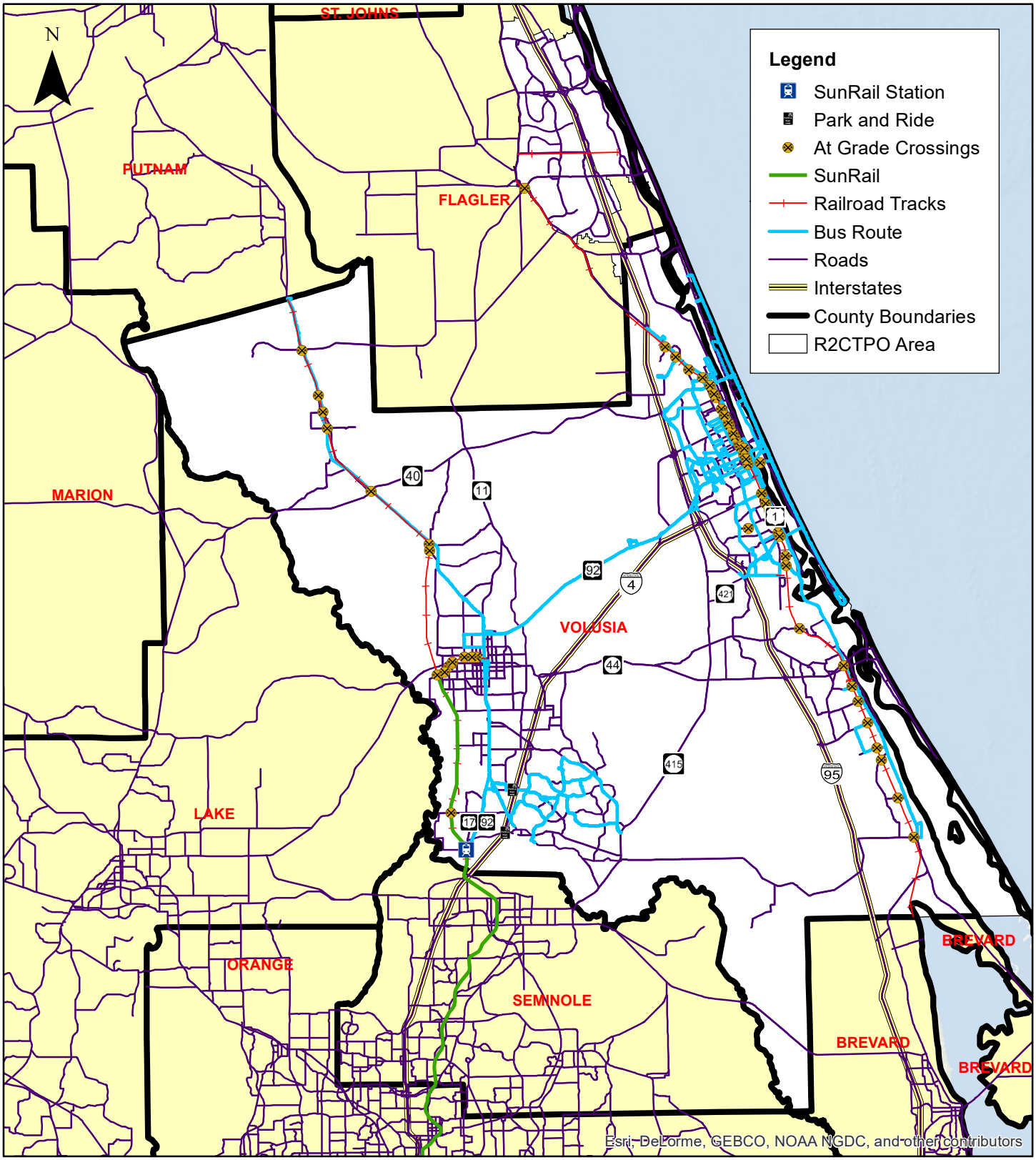



FIGURE C1

OVERALL STUDY AREA

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN

## EXISTING TRANSIT SYSTEM ROUTES

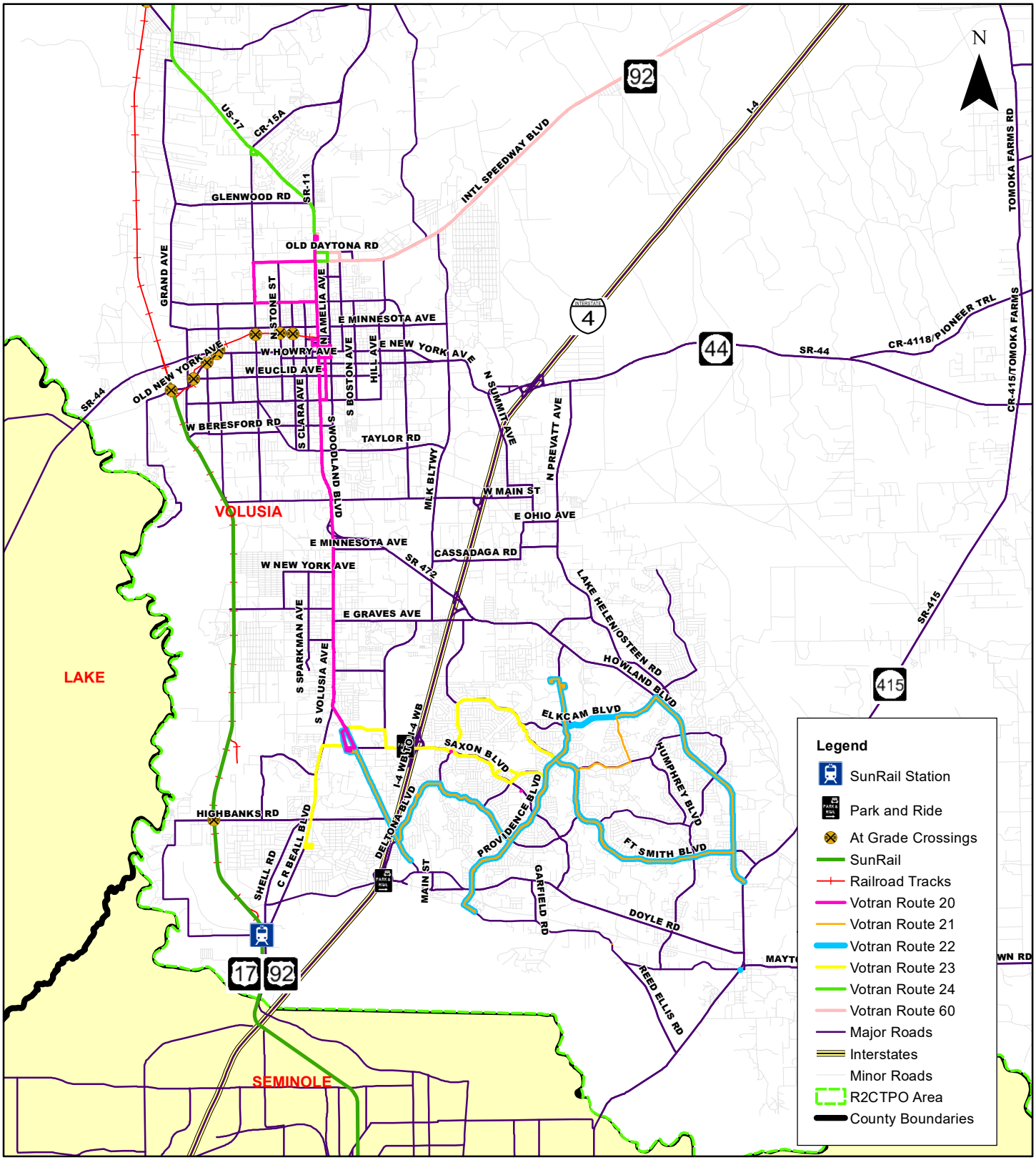



FIGURE C2

WEST VOLUSIA COUNTY

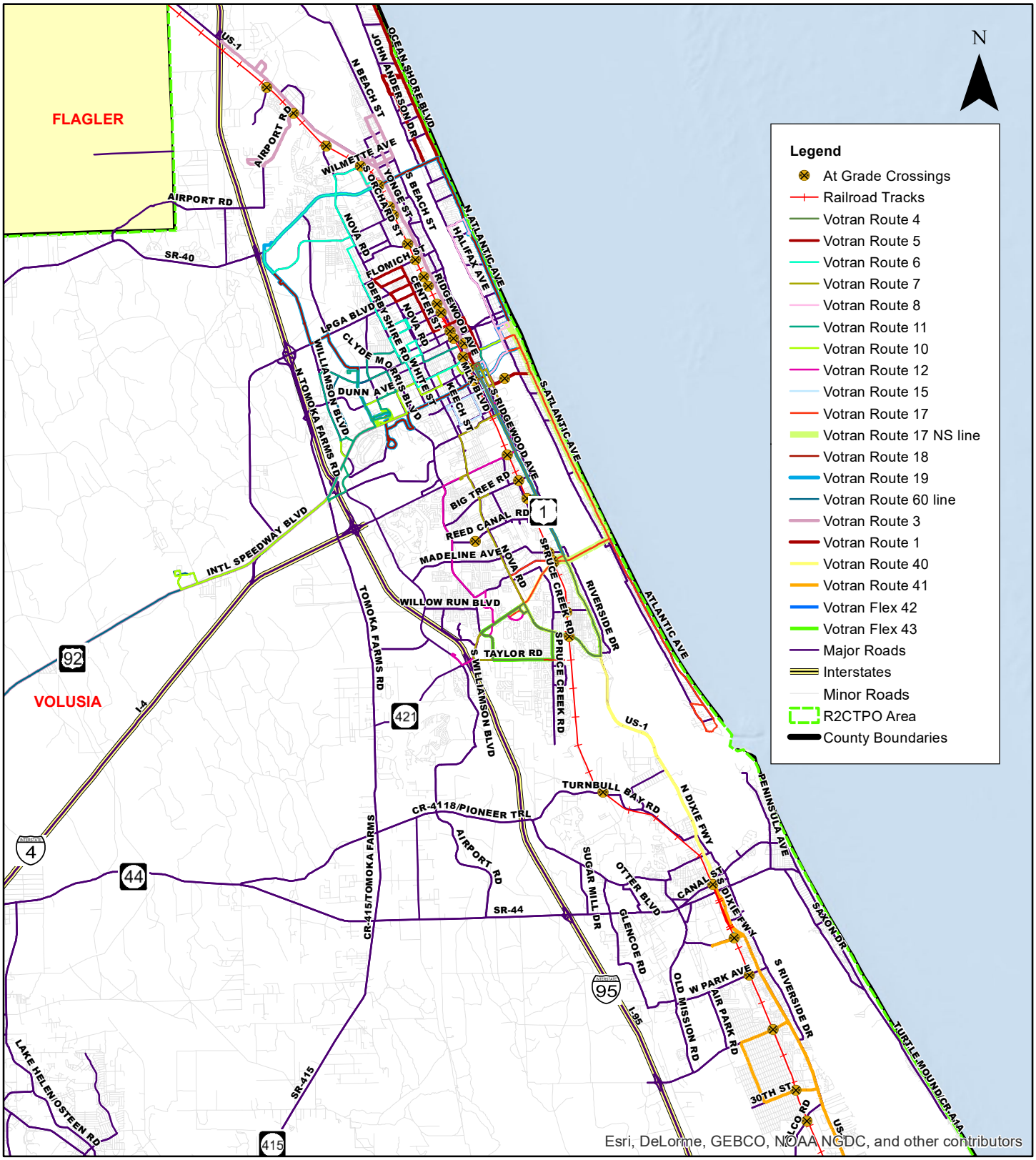
RIVER TO SEA TPO
Transportation Planning Organization
VISION - PLAN - IMPLEMENT

TEDS
Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN

## EXISTING TRANSIT SYSTEM ROUTES




## FIGURE C3

## EAST VOLUSIA COUNTY

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN
## EXISTING TRANSIT SYSTEM ROUTES

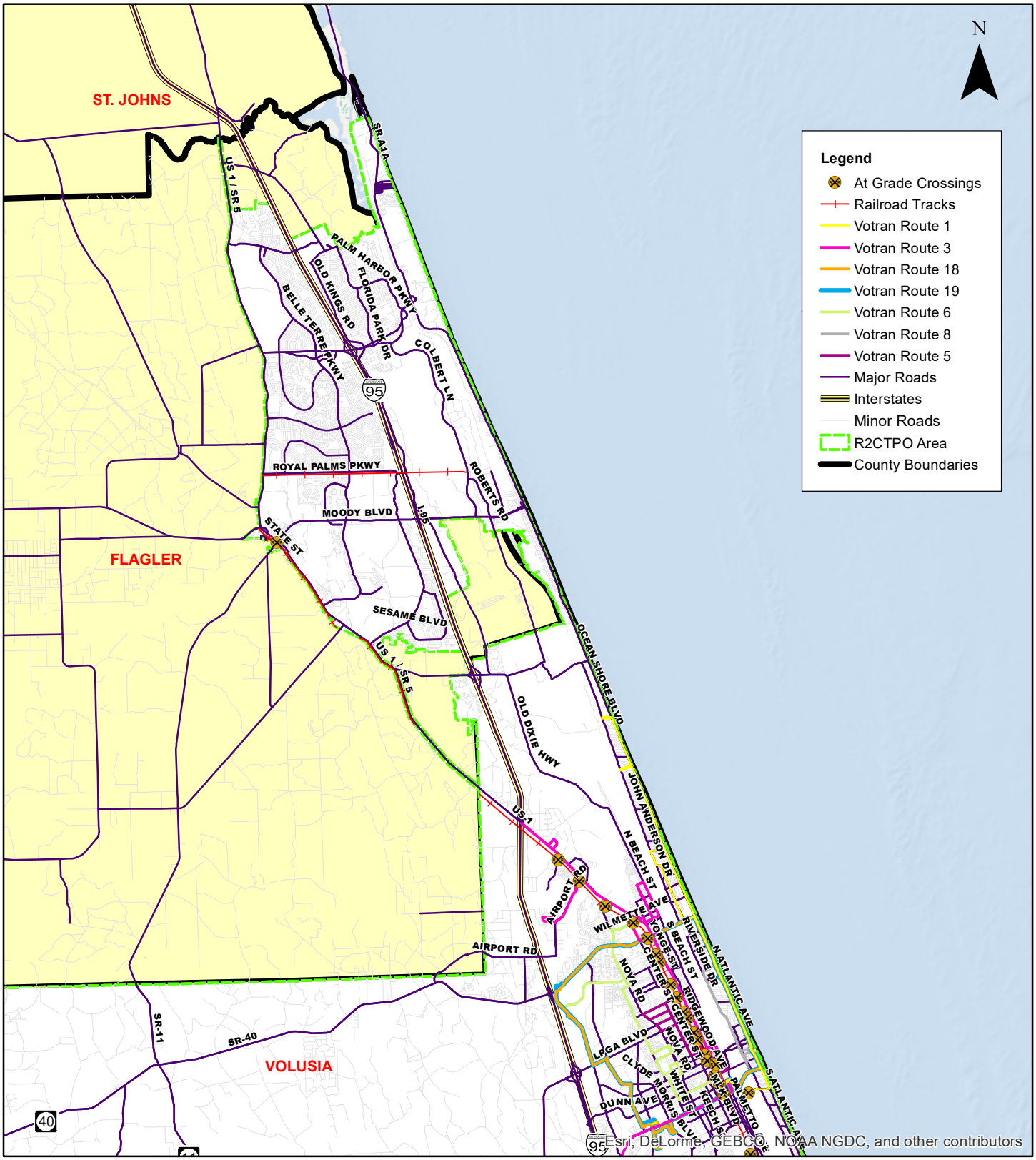



FIGURE C4

FLAGLER COUNTY

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN

## EXISTING DYNAMIC MESSAGE SIGN LOCATIONS

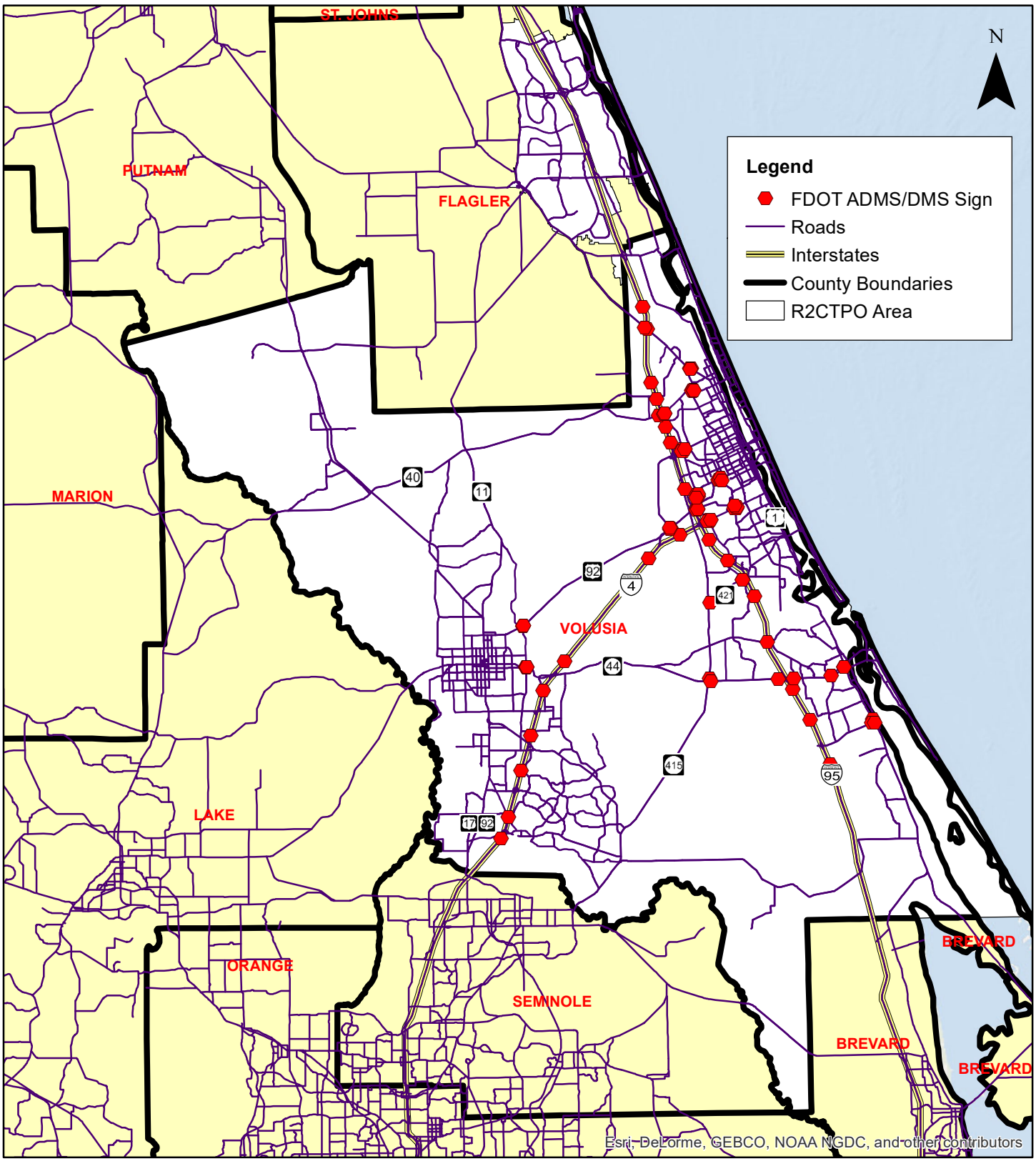



FIGURE D1

OVERALL STUDY AREA

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN

## EXISTING DYNAMIC MESSAGE SIGN LOCATIONS

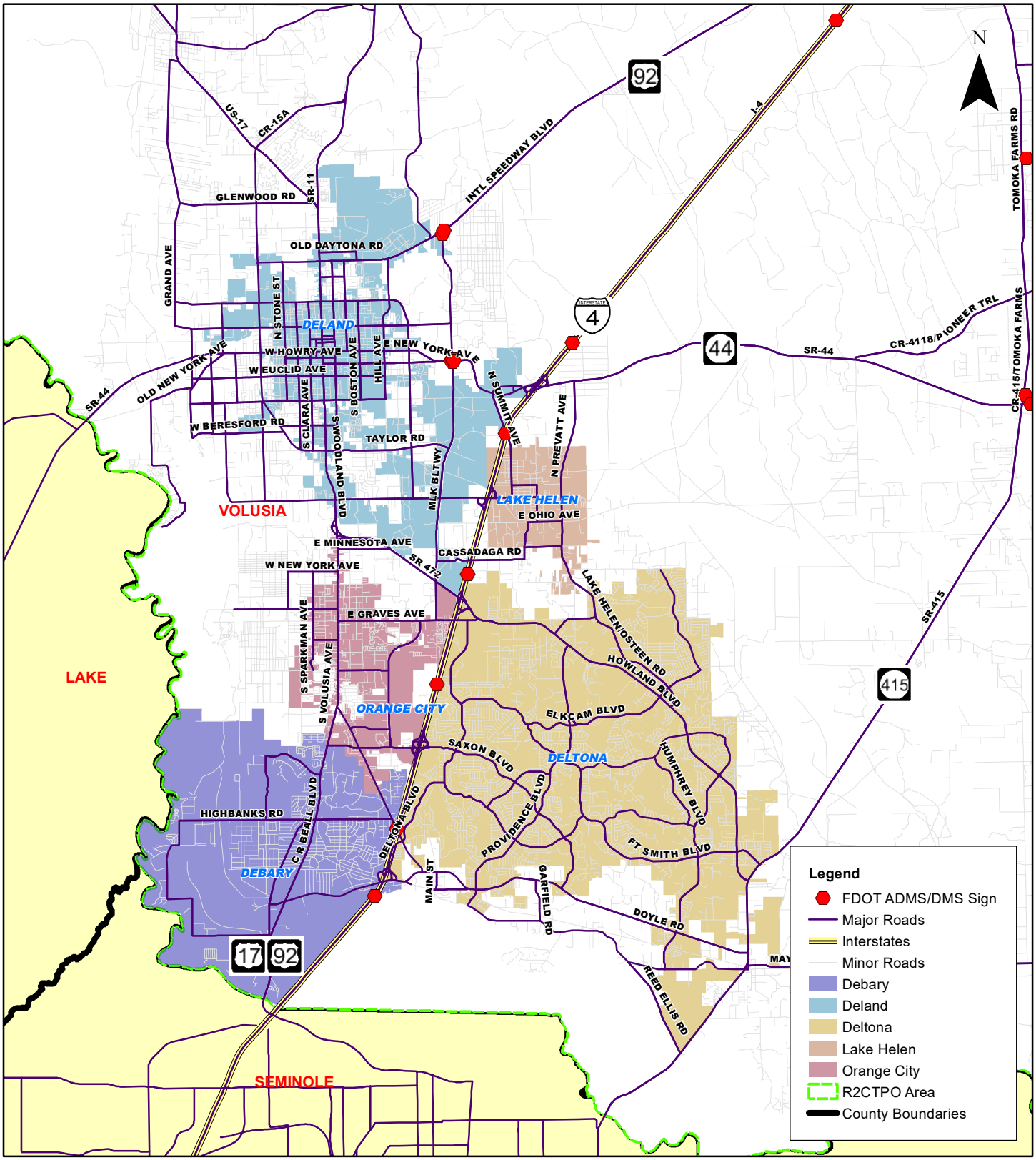



FIGURE D2

WEST VOLUSIA COUNTY

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

TEDS
Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN

## EXISTING DYNAMIC MESSAGE SIGN LOCATIONS

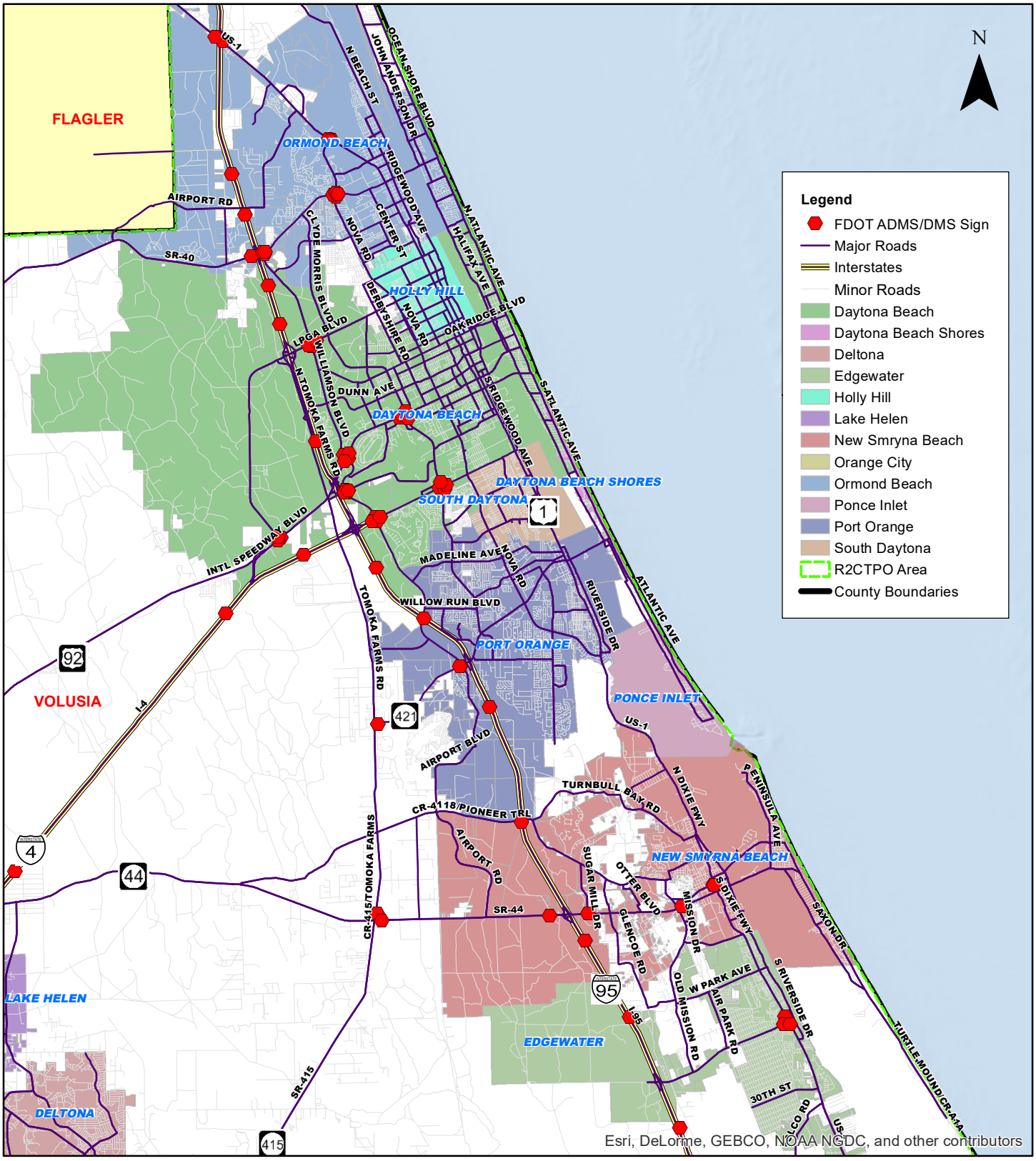



FIGURE D3

EAST VOLUSIA COUNTY

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN

## EXISTING DYNAMIC MESSAGE SIGN LOCATIONS

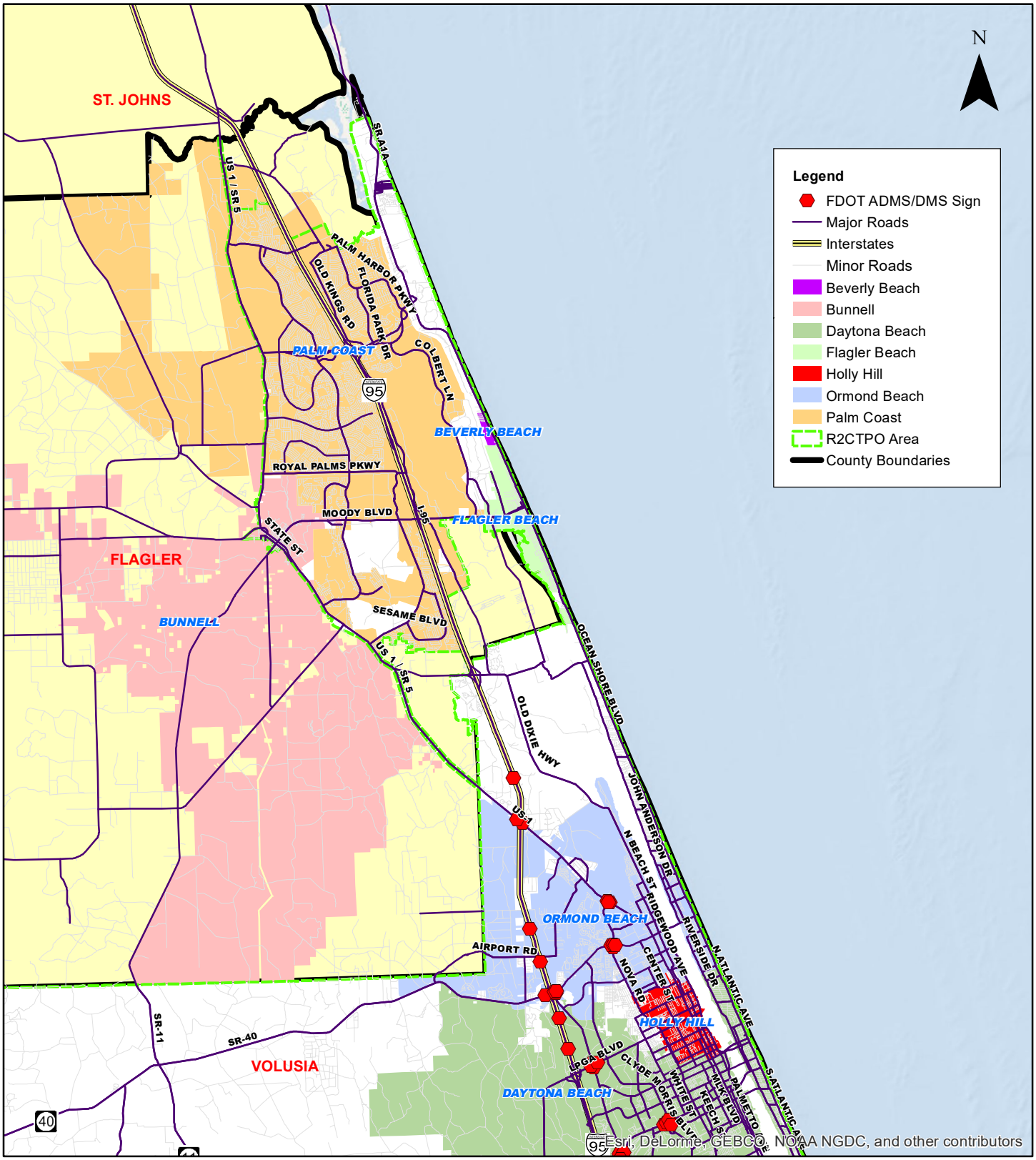



FIGURE D4

FLAGLER COUNTY

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN
## EXISTING CCTV LOCATIONS

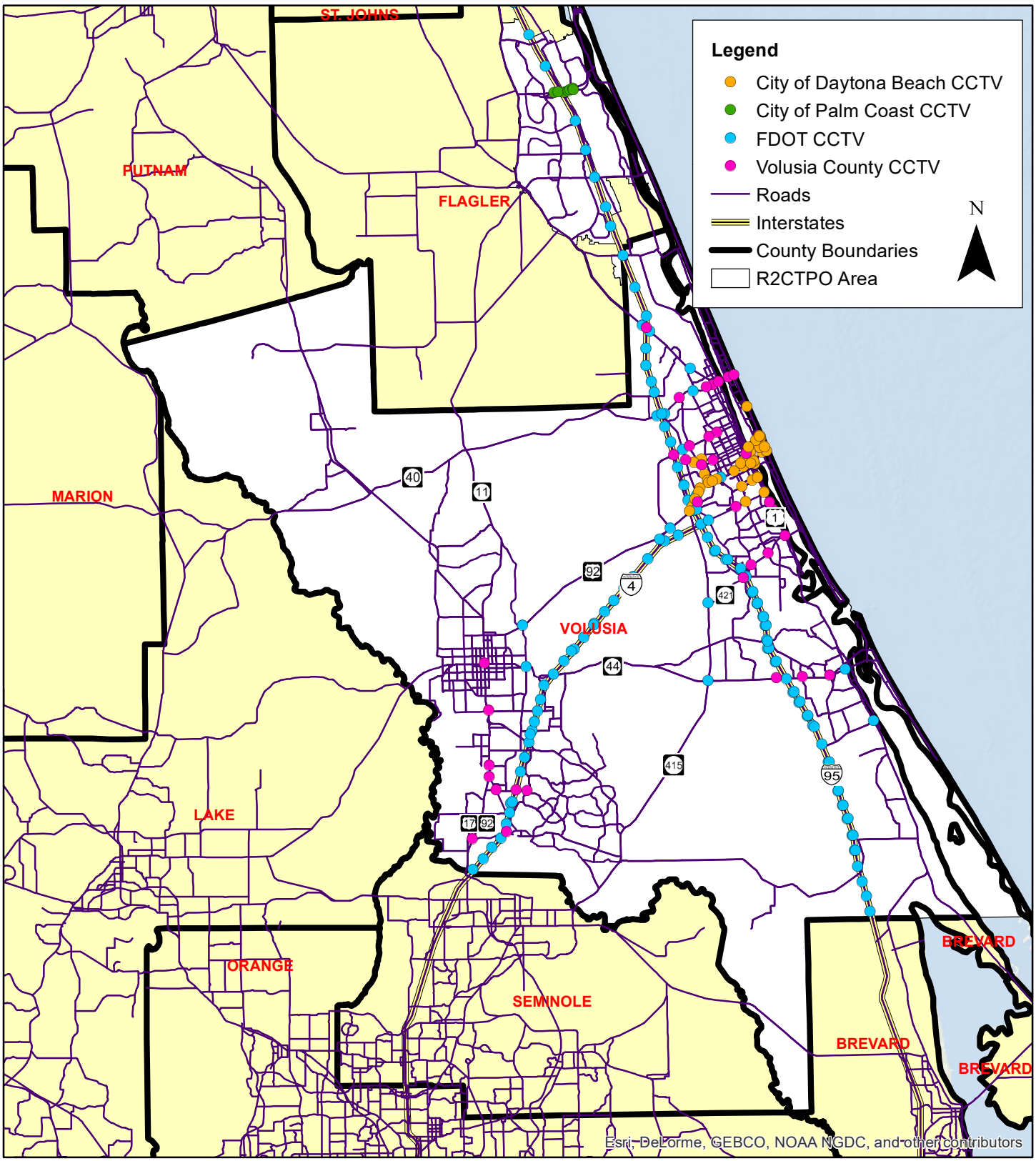



FIGURE E1

OVERALL STUDY AREA

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN
## EXISTING CCTV LOCATIONS

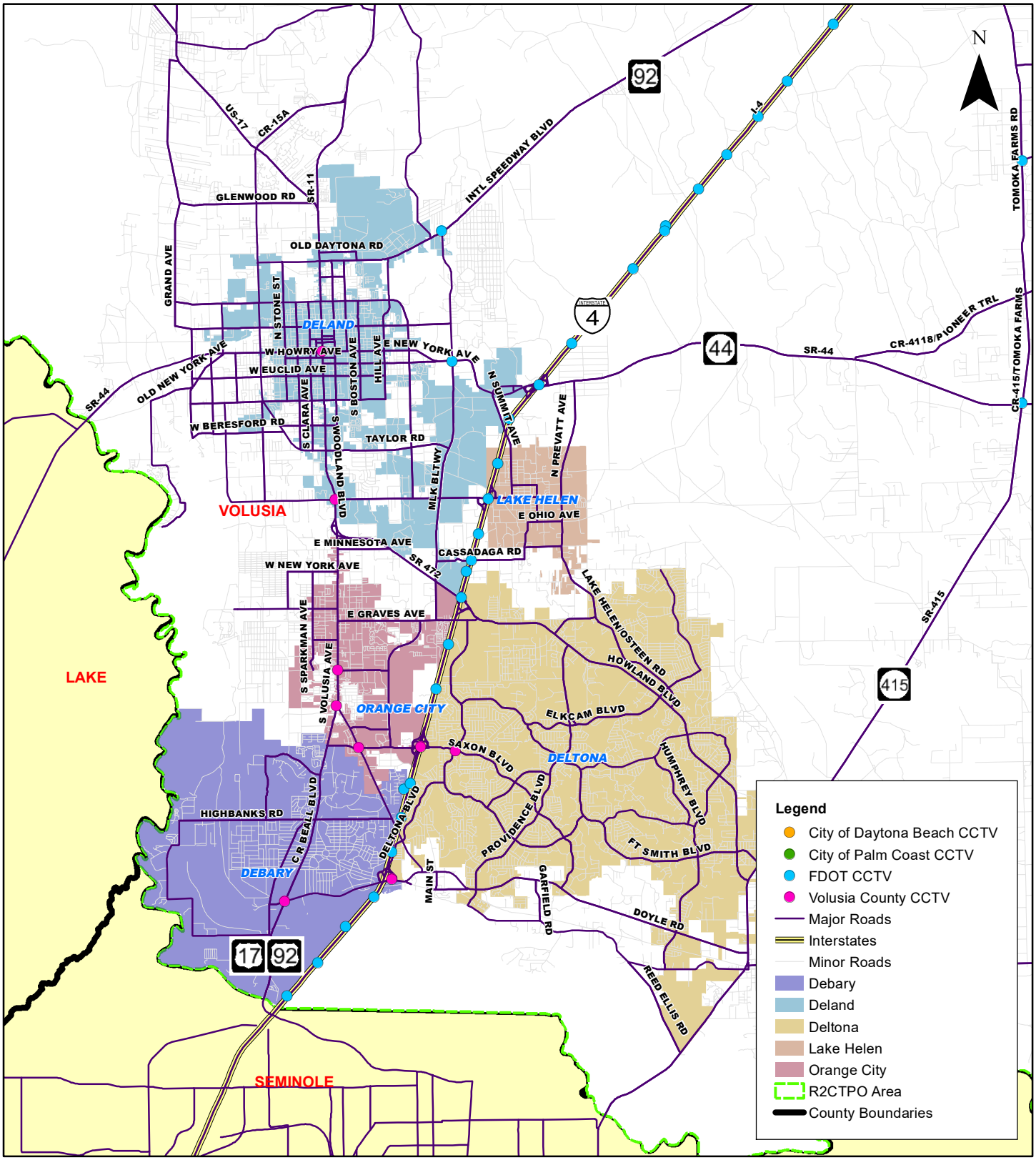



FIGURE E2

WEST VOLUSIA COUNTY

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN
## EXISTING CCTV LOCATIONS

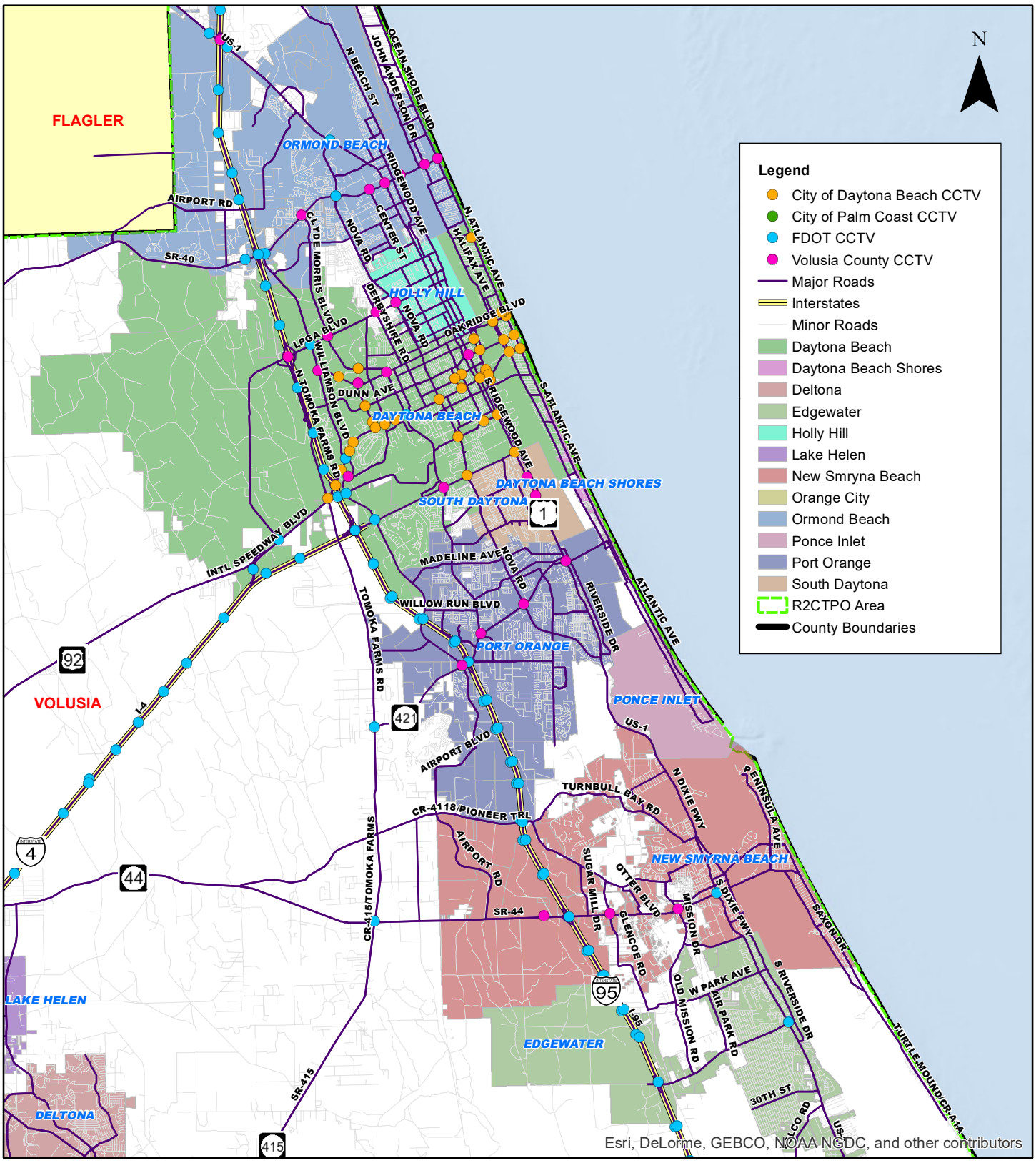



FIGURE E3

EAST VOLUSIA COUNTY

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN
## EXISTING CCTV LOCATIONS

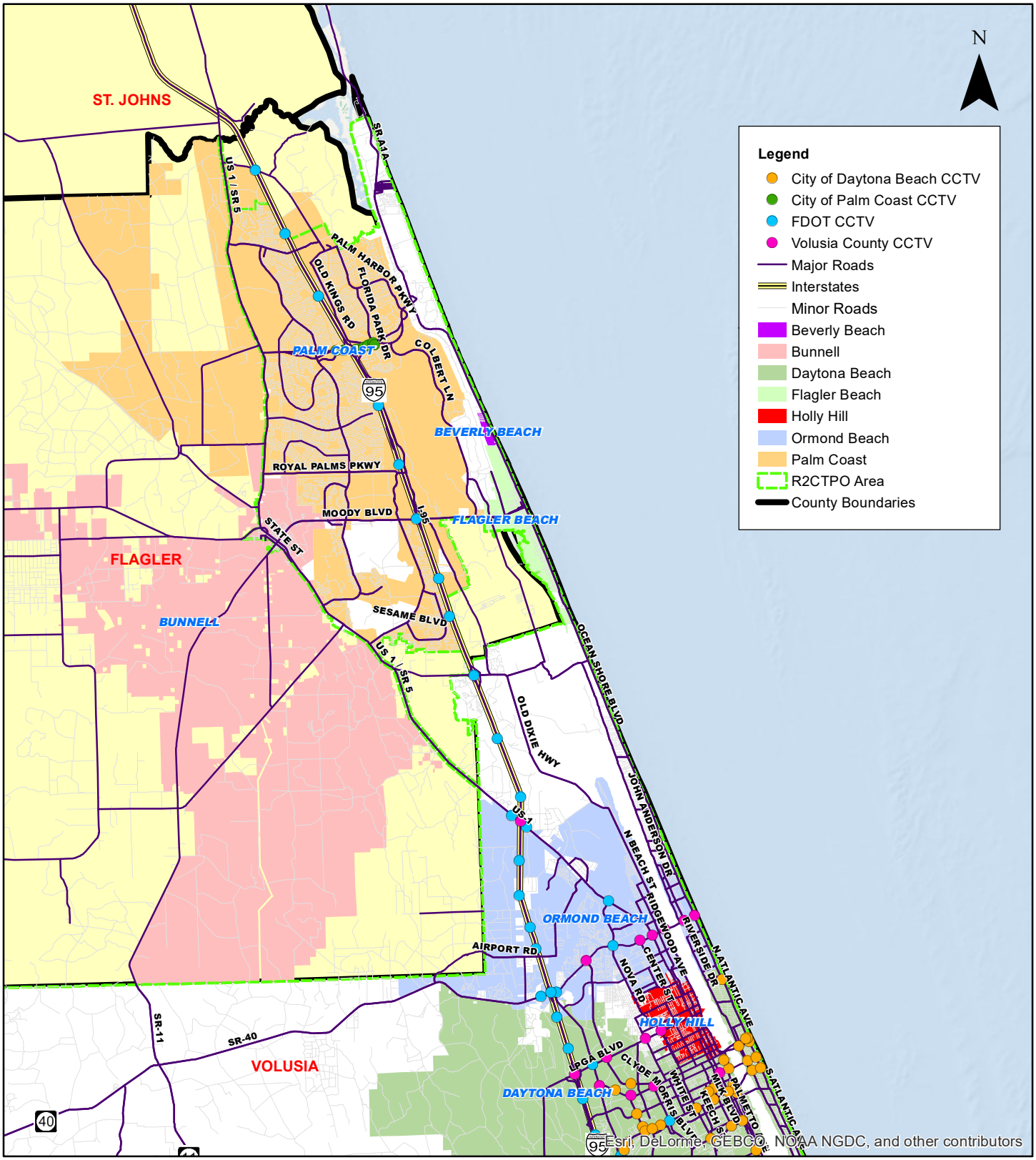



FIGURE E4

FLAGLER COUNTY

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

**Table 1**

| Major Roadway Segment - ITS Device and Signal Summary | | | | | | | |
|---|---|---|---|---|---|---|---|
| | SEGMENTS | | TOTAL | | | | |
| CORRIDOR | FROM | TO | MILES | ADMS | CCTV | SIGNALS | ADAPTIVE |
| I-4 | Volusia County Line | I-95 | 27.2 | 8 | 33 | 0 | No |
| SR 400 | I-95 | US 1 | 4.3 | 4 | 4 | 8 | No |
| I-95 | Volusia County Line | North Flagler County Line | 61.2 | 13 | 68 | 0 | No |
| SR 44 | Spring Garden Ave | I-4 | 6.0 | 2 | 2 | 12 | No |
| SR 44 | I-4 | SR 415 | 10.2 | 0 | 1 | 3 | No |
| SR 44 | SR 415 | I-95 | 4.9 | 2 | 2 | 4 | No |
| SR 44 | I-95 | SR A1A | 4.3 | 2 | 2 | 7 | No |
| US 17/92 | Volusia County Line | US 92 | 15.2 | 0 | 5 | 29 | Yes |
| US 17/92 | US 92 | SR 15A | 2.8 | 0 | 0 | 4 | Yes |
| Orange Camp Rd | US 17/92 | I-4 | 3.1 | 0 | 1 | 2 | No |
| Saxon Blvd | US 17/92 | Providence Blvd | 4.9 | 0 | 2 | 11 | No |
| Enterprise Rd | Debary Ave | US 17/92 | 3.8 | 0 | 2 | 7 | No |
| Dirksen Dr/Debary Ave/Doyle Rd | US 17/92 | SR 415 | 10.0 | 0 | 2 | 10 | No |
| SR 15A | US 17/92 (south) | US 17 (north) | 6.9 | 0 | 0 | 9 | No |
| SR 472 | US 17/92 | I-4 | 2.9 | 0 | 0 | 2 | No |
| Howland Boulevard | I-4 | SR 415 | 9.8 | 0 | 0 | 16 | No |
| US 92 | US 17/92 | I-95 | 15.9 | 2 | 3 | 9 | No |
| US 92 | I-95 | SR A1A | 4.9 | 4 | 14 | 19 | Yes |
| LPGA Blvd | I-95 | US 1 | 4.1 | 2 | 5 | 7 | No |
| SR 40 | Tymber Creek Rd | SR A1A | 4.7 | 5 | 10 | 11 | No |
| Williamson Blvd | SR 421 | SR 40 | 12.5 | 9 | 9 | 18 | No |
| Mason Ave | Williamson Blvd | US 1 | 3.9 | 0 | 4 | 12 | No |
| Clyde Morris Blvd | SR 421 | SR 40 | 12.6 | 4 | 7 | 24 | No |
| SR 5A (Nova Road) | US 1 | US 1 | 15.6 | 3 | 7 | 33 | No |
| Dunn Avenue | Williamson Blvd | US 1 | 4.2 | 0 | 2 | 9 | No |
| US 1 | Volco Road | Volusia County Line | 34.0 | 7 | 13 | 49 | No |
| SR 421 | Tomoka Farms Rd | US 1 | 6.8 | 3 | 6 | 13 | No |
| SR 442 | I-95 | US 1 | 3.7 | 1 | 1 | 3 | No |
| Tomoka Farms Rd | SR 44 | LPGA Blvd | 14.8 | 1 | 3 | 4 | No |
| SR A1A | Saxon Dr | Riverside Dr | 5.4 | 0 | 0 | 7 | No |
| SR A1A | S. Peninsula Dr | SR 40 (Granada Blvd) | 16.4 | 0 | 6 | 23 | No |
| SR A1A | SR 100 | Ocean St | 11.7 | 0 | 0 | 1 | No |
| Palm Coast Pkwy | US 1/SR 5 | Palm Harbor Pkwy | 5.1 | 0 | 7 | 15 | No |
| SR 100 | State St | SR A1A | 8.2 | 0 | 0 | 12 | No |
| Belle Terre Pkwy | Matanzas Woods Pkwy | SR 100 | 9.6 | 0 | 0 | 19 | No |

* Some CCTV cameras and traffic signals are located at intersections of 2 roadways included in this table and thus are included in the quantities for each roadway.

# R2CTPO - ITS MASTER PLAN
## EXISTING COMMUNICATIONS NETWORK

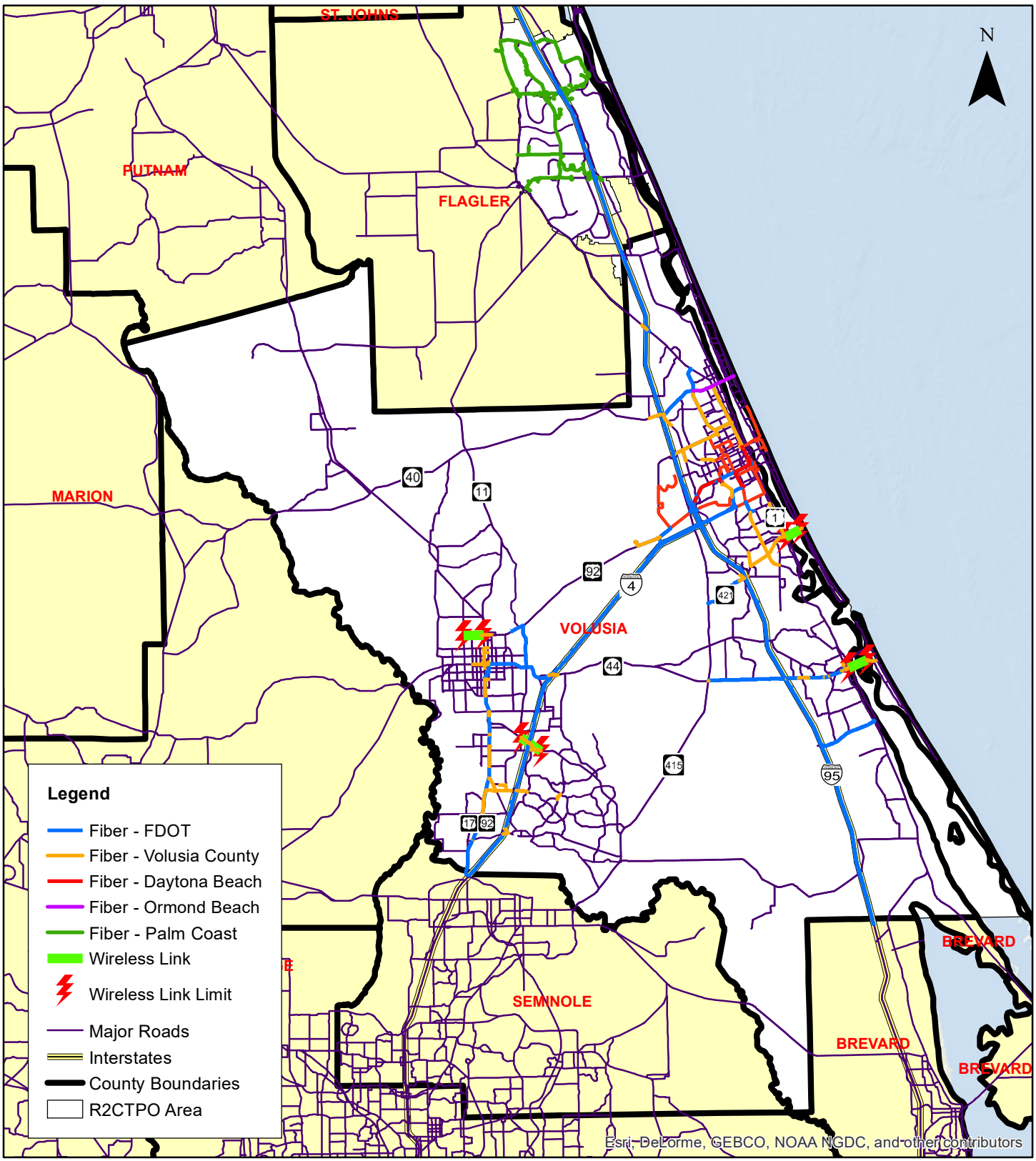



FIGURE F1

OVERALL STUDY AREA

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN

## EXISTING COMMUNICATIONS NETWORK

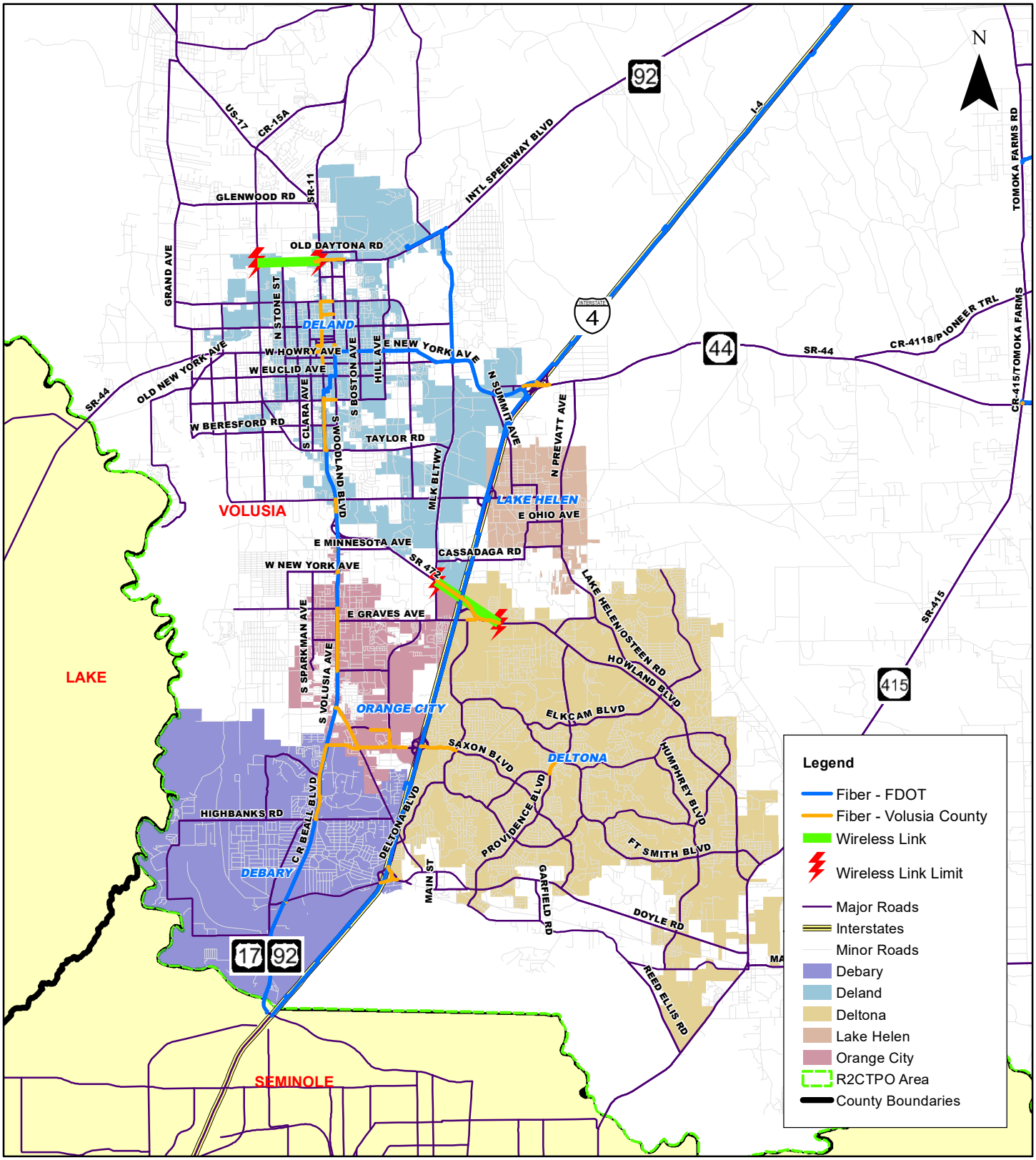



FIGURE F2

WEST VOLUSIA COUNTY

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

TEDS
Traffic Engineering
Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN

## EXISTING COMMUNICATIONS NETWORK

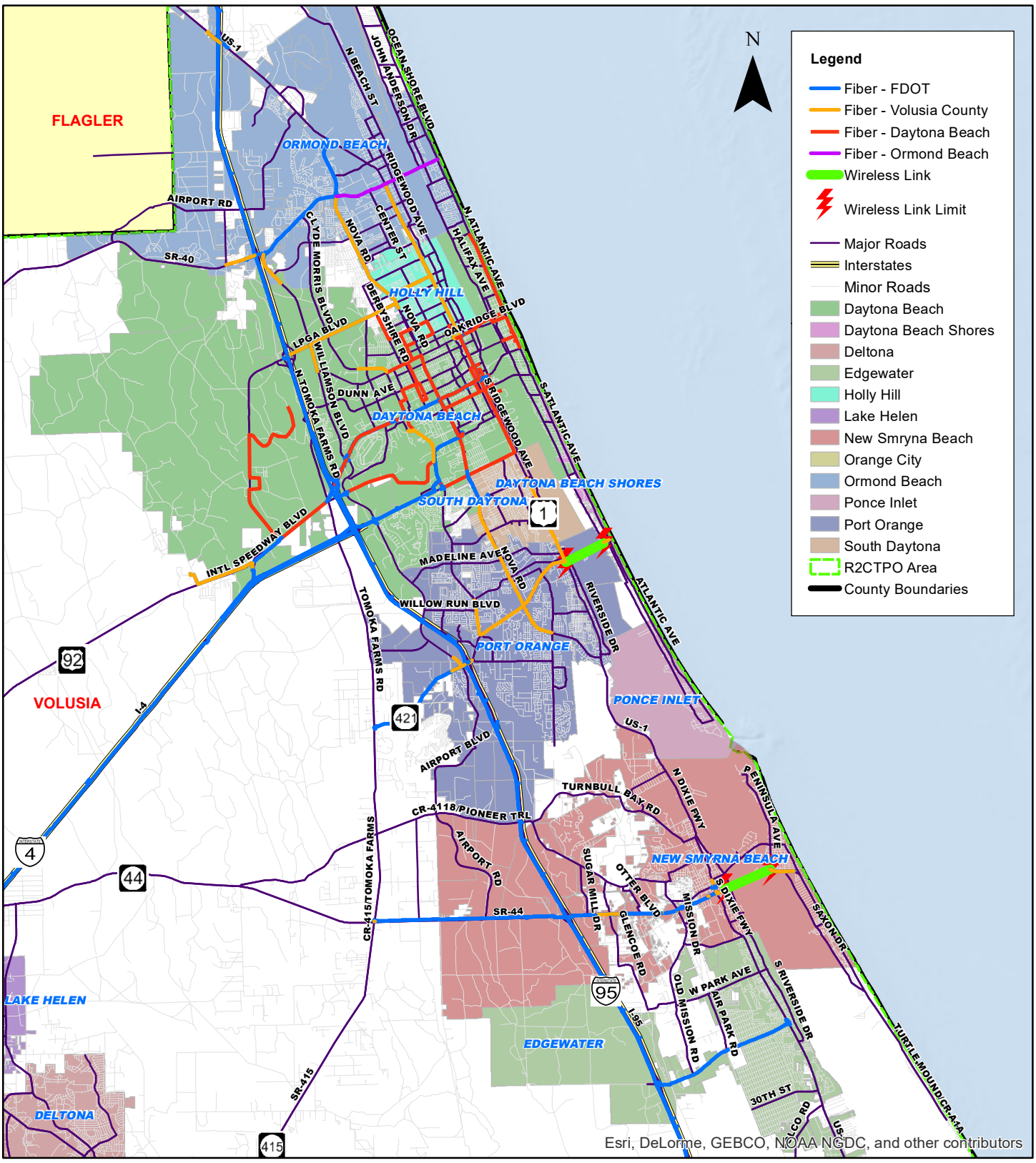



FIGURE F3

EAST VOLUSIA COUNTY

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

# R2CTPO - ITS MASTER PLAN

## EXISTING COMMUNICATIONS NETWORK

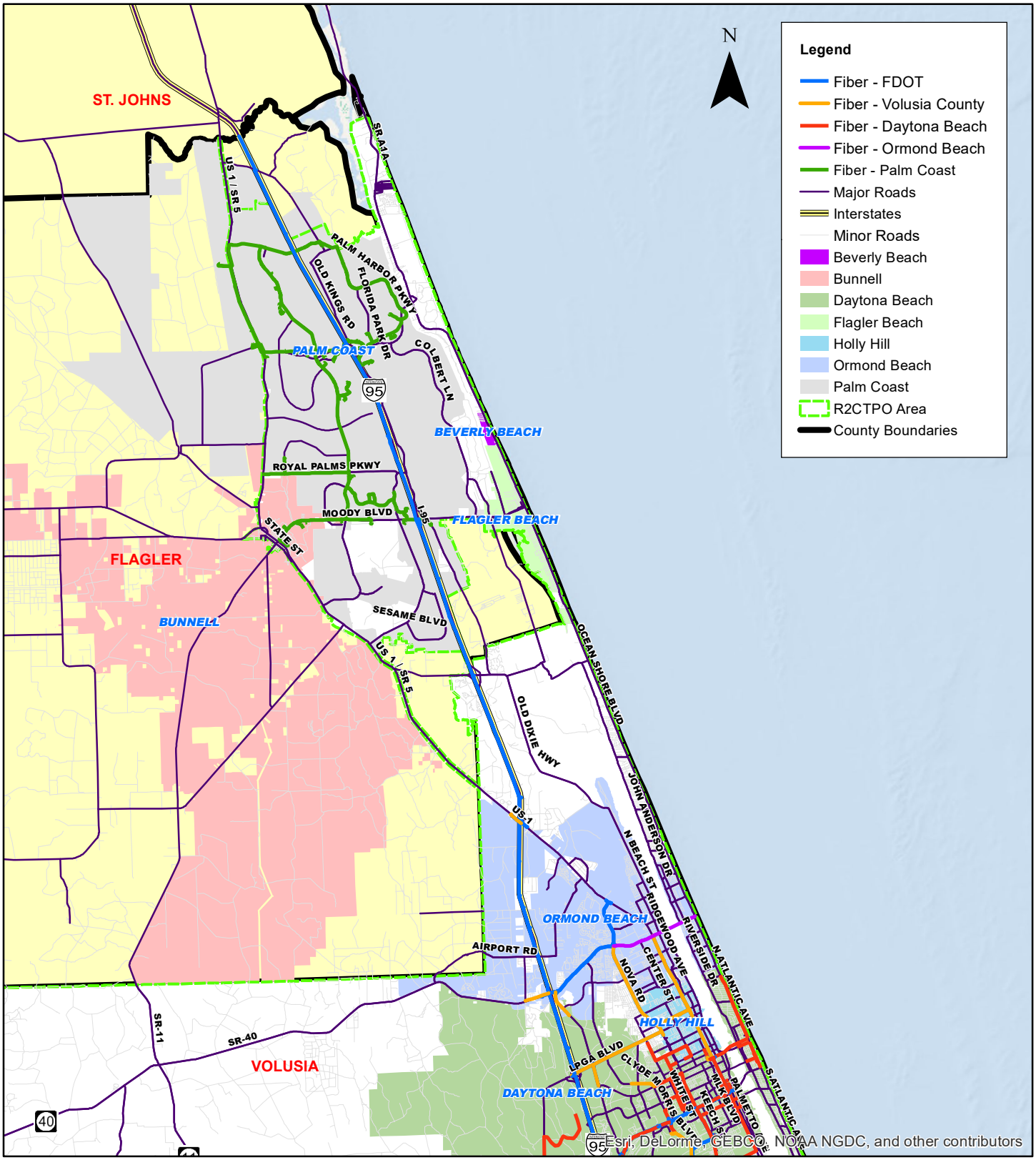



FIGURE F4

FLAGLER COUNTY

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

TEDS Traffic Engineering Data Solutions, Inc.

KITTELSON & ASSOCIATES, INC. TRANSPORTATION ENGINEERING/PLANNING

**Table 2**

| Major Roadway Segment - Fiber Optic Cable Summary | | | | |
|---|---|---|---|---|
| | SEGMENTS | | | |
| CORRIDOR | FROM | TO | FIBER TYPE | OWNER |
| I-4 | Volusia County Line | I-95 | 72sm | FDOT |
| SR 400 | I-95 | US 1 | 36sm and 30sm | FDOT/Daytona Beach |
| I-95 | Volusia County Line | North Flagler County Line | 3sm, 72sm and 144sm | FDOT |
| SR 44 | Spring Garden Ave | I-4 | 36sm and 72sm | FDOT/Volusia |
| SR 44 | SR 415 | I-95 | 36sm | FDOT |
| SR 44 | I-95 | US 1 | 36sm | FDOT |
| Kepler Rd | SR 44 | US 92 | 36sm | FDOT |
| US 17/92 | Volusia County Line | US 92 | 6mm and 36sm | FDOT/Volusia |
| Saxon Blvd | US 17/92 | Normandy Blvd | 36sm | Volusia |
| Enterprise Rd | Saxon Blvd | US 17/92 | 36sm | Volusia |
| I-4 On Ramp | Debary Ave | I-4 | 36sm | Volusia |
| SR 472 | MLK Jr Beltway | Wolfpack Run | 36sm | Volusia |
| US 92 | Langley Ave | Kepler Rd | 36sm | FDOT |
| US 92 | Indian Lake Rd | I-4 Off-ramp | 12mm and 36sm | Volusia |
| US 92 | I-4 Off-ramp | US 1 | 12mm to 72sm | Daytona Beach/FDOT |
| LPGA Blvd | I-95 | US 1 | 36sm | Volusia |
| SR 40 | Tymber Creek Rd | I-95 | 36sm | Volusia |
| SR 40 | I-95 | SR 5A (Nova Rd) | 36sm | FDOT |
| SR 40 | SR 5A (Nova Rd) | US 1 | 36sm | Ormond Beach |
| Clyde Morris Blvd | SR 400 | US 92 | 30sm and 72sm | FDOT/Volusia |
| Clyde Morris Blvd | SR 421 | Herbert St | 6mm | Volusia |
| SR 5A (Nova Road) | Spruce Creek Rd | Big Tree Rd | 6mm | Volusia |
| SR 5A (Nova Road) | Big Tree Rd | SR 400 | 12mm | FDOT |
| SR 5A (Nova Road) | SR 400 | US 92 | 18sm | Daytona Beach |
| SR 5A (Nova Road) | US 92 | LPGA Blvd | 18sm and 96sm | Daytona Beach |
| SR 5A (Nova Road) | LPGA Blvd | I-95 | 36sm | Volusia |
| US 1 | US 92 | Mason Ave | 12mm and 18sm | Daytona Beach |
| US 1 | Mason Ave | SR 40 | 12mm, 24sm and 36sm | Volusia |
| SR 421 | Tomoka Farms Rd | I-95 | 36sm | FDOT/Volusia |
| SR 442 | I-95 | US 1 | 36sm | FDOT |
| Palm Coast Pkwy | US 1/SR 5 | Palm Harbor Pkwy | 288sm | Palm Coast |
| SR 100 | State St | Belle Terre Pkwy | 12mm and 144sm | Palm Coast |
| SR 100 | Belle Terre Pkwy | I-95 | 24sm | Palm Coast |
| Belle Terre Pkwy | Matanzas Woods Pkwy | SR 100 | 288sm | Palm Coast |
| Royal Palms Pkwy | US 1/SR 5 | Belle Terre Pkwy | 12mm and 24sm | Palm Coast |
| US 1/SR 5 | Palm Coast Pkwy | Matanzas Woods Pkwy | 288sm | Palm Coast |
| Matanzas Woods Pkwy | US 1/SR 5 | North Old Kings Rd | 288sm | Palm Coast |
| Palm Harbor Pkwy | North Old Kings Rd | Hammock Dunes Bridge | 288sm | Palm Coast |