Concept of Operations (ConOps) for SR-9/I-95 from Miami-Dade/Broward County Line to north of Griffin Road

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Table of Contents

1. Overview 1
1.1 Identification 2
1.2 Purpose and Intended Audience 5
1.3 Document Overview 6
1.4 High-Level System Overview 6
1.5 Stakeholders 8
1.6 Referenced Documentation 10
2. Current System Situation 10
2.1 Background, Objectives, and Scope 10
2.2 Operational Constraints 11
2.2.1 Capacity Limitations 11
2.2.2 Regional Considerations 12
2.2.3 Transportation System Management and Operations (TSM&O) 14
2.2.4 Resources 15
2.3 Description of the Current System or Situation 15
2.3.1 Express Lanes 16
2.3.2 Existing TSM&O/ITS Infrastructure 17
2.3.3 RTMC Software 20
2.3.4 Toll Systems 21
2.3.5 Incident Management 21
2.3.6 Enforcement Activities 22
2.3.7 Customer Service Activities 23
2.3.8 Traveler information and Data Sharing 23
2.3.9 Multi-Modal Aspects 23
2.4 User Class Profiles 23
2.5 Support Environment 24
3. Change Justification 25
3.1 Justification for Changes 25
3.2 User Needs 25
4. Concepts for the Proposed System 26
4.1 Background, Objectives, and Scope 26
4.2 Operational Policies and Constraints 29
4.3 Description of the Proposed System 31
4.3.1 Dynamic Message Sign Systems 35
4.3.1.1 Motorists Information 35
4.3.1.2 Toll Operations 37
4.3.2 Microwave Vehicle Detection System 37

4.3.3 CCTV Camera System 38
4.3.4 Tolling Gantries 39
4.3.5 Other Traffic Management Systems 39
4.3.5.1 Ramp Signal Systems 39
4.3.5.2 Wrong Way Driving (WWD) Systems 41
4.3.5.3 Warning Gate Systems (WGS) 41
4.4 Modes of Operation 42
4.4.1 Incident Management Concepts 42
4.4.2 Emergency Access 43
4.4.3 Staging and Investigation Areas 43
4.4.4 Toll Signing Scheme 46
4.4.5 Trip Building 46
4.4.6 Toll Assessment Calculations 47
4.5 User Involvement and Interaction 48
4.5.1 FDOT District Four SunGuide® RTMC 48
4.5.2 FDOT District Six Maintenance 48
4.5.3 FTE 48
4.5.4 FHP 49
4.5.5 Local Fire Rescue 49
4.5.6 Broward County Public Works 49
4.6 Assumptions and Constraints 65
4.7 Risks 65
4.8 Support Environment 66
5. Operational Scenarios 66
5.1 Normal Operations 67
5.2 Crash in the General Use Lanes 67
5.3 Crash in the Express Lanes 68
5.4 Crash in the Direct Express Lane Exit/CD Road 68
6. Summary of Impacts 70
6.1 Summary of Benefits 70
6.2 Monitoring and Analysis Activities 70
7. Analysis of the Proposed System 71
7.1 Alternatives 71
Cost, Schedule, and Procurement Options 72
7.2 72
7.3 Systems Engineering Plan 72
7.3.1 Project Systems Engineering Management Plan (PSEMP)73
7.3.2 Requirements Traceability Verification Matrix (RTVM) ..73
7.3.3 Systems Verification Plan 73
7.3.4 Design Process 73

7.3.5 Systems Validation Plan 73
7.4 Performance Measurement for System Validation 74
8. Notes 75
9. Appendices 75
10. Glossary 75

List of Tables

Table 1: All ConOps or Related Subsidiary Documents for the SR 9/I-95 Improvements 5
Table 2: Summary of Existing Stakeholder Roles and Responsibilities 8
Table 3: Average Annual Daily Traffic (AADT): Year 2025 and Future Year 2045 .. 11
Table 4: Existing DMS Signage 19
Table 5: Agency Responsibilities 24
Table 6: Responsibility Matrix (I-95 Express Lanes from Miami-Dade County Line to Griffin Road) 50
Table 7: Risk Register 65

List of Figures

Figure 1: Project Location Map 3
Figure 2: High Level Proposed System Overview 7
Figure 3: Employment Density, 2045 12
Figure 4: District Four SIS Facilities 14
Figure 5: High Level Existing System Overview 16
Figure 6: Existing I-95 Corridor Express Lanes Ingress/Egress 18
Figure 7: Proposed Express Lanes Ingress/Egress – South End 27
Figure 8: Proposed Express Lanes Ingress/ Egress – North End 28
Figure 9: I-95 Roadway Section A – between County Line and Hallandale Beach Blvd 31
Figure 10: I-95 Roadway Section B – Between Hallandale Beach Blvd and Pembroke Road 32
Figure 11: I-95 Roadway Section C - between Pembroke Road and Hollywood Blvd. 32
Figure 12: I-95 Roadway Section D – between Hollywood Blvd and Sheridan Street 32
Figure 13: I-95 Roadway Section E – between Sheridan Street and Stirling Road 33
Figure 14: I-95 Roadway Section F – Between Stirling Road and Griffin Road 33
Figure 15: I-95 Roadway Section G – North of Griffin Road 33
Figure 16: I-95 Express Lanes System Overview 35
Figure 17: Arterial DMS Concept 37
Figure 18: Ramp Signal System Components 40
Figure 19: Typical Warning Gate System – Express Lane Egress 42
Figure 20: Staging and Investigation Areas 45

List of Acronyms and Abbreviations

23 CFR 940 ..... Federal rule for ITS planning and architecture development
ADMS ..... Arterial Dynamic Message Sign
AET ..... Automated Electronic Tolling
AVI ..... Automatic Vehicle Identification
C2C ..... Center-to-Center
CAV ..... Connected and Autonomous Vehicle
CCTV ..... Closed-Circuit Television
CD ..... Collector-Distributor
ConOps ..... Concept of Operations
C-V2X ..... Cellular Vehicle-To-Everything
DMS ..... Dynamic Message Sign
DDI ..... Diverging Diamond Interchange
DSS ..... Decision Support System
EOP ..... Emergency Operations Plans
ETC ..... Electronic Toll Collection
EL ..... Express Lanes(s)
FDOT ..... Florida Department of Transportation
FHP ..... Florida Highway Patrol
FHWA ..... Federal Highway Administration
FTE ..... Florida's Turnpike Enterprise
GTR ..... General Tolling Requirements
GUL ..... General Use Lane
HAZMAT ..... Hazardous Materials
HDMS ..... Highway Dynamic Message Sign
HOV ..... High Occupancy Vehicle
HOT ..... High Occupancy Toll
HSR ..... Hard Shoulder Running
ICM ..... Integrated Corridor Management
IT ..... Information Technology
ITS ..... Intelligent Transportation Systems
IVR ..... Interactive Voice Recognition
LOS ..... Level of Service
LSDMS ..... Lane Status Dynamic Message Sign

MOC ..... Maintenance of Communication
MOE ..... Measure of Effectiveness
MOT ..... Maintenance of Traffic
MOU ..... Memorandum of Understanding
MVDS ..... Microwave Vehicle Detection Stations
NTCIP ..... National Transportation Communications / ITS Protocol
O&M ..... Operations and Maintenance
OTM ..... Operator Task Manager
PD&E ..... Project Development and Environmental Plan
PSEMP ..... Project Systems Engineering Management Plan
RCTO ..... Regional Concept for Transportation Operations
RISC ..... Rapid Incident Scene Clearance
RITSA ..... Regional ITS Architecture
RSS ..... Ramp Signal System
RTMC ..... Regional Transportation Management Center
RTVM ..... Requirements Traceability Verification Matrix
SEFRTOC ..... Southeast Florida Regional TMC Operations Committee
SELS ..... Statewide Express Lanes Software
SEMP ..... Systems Engineering Management Plan
SIS ..... Strategic Intermodal System
SITSA ..... Statewide ITS Architecture
SIRV ..... Severe Incident Response Vehicle
TADMS ..... Toll Amount Dynamic Message Sign
TIM ..... Traffic Incident Management
TMC ..... Transportation Management Center
TSMCA ..... Traffic Signal Maintenance and Compensation Agreement
TSM&O ..... Transportation Systems Management and Operations
USDOT ..... United States Department of Transportation
V2I ..... Vehicle-to-Infrastructure
V2X ..... Vehicle-to-Everything
WAN ..... Wide Area Network
WGS ..... Warning Gate Systems
WWD ..... Wrong Way Driving

1. Overview

The Express Lanes ConOps is based on IEEE Guide for Information Technology – System Definition – Concept of Operations (ConOps) Document (IEEE Std 1362-1998) dated March 19, 1998. The content of the ConOps follows the guidance identified in the Express Lanes Handbook as is discussed in further detail throughout this Express Lanes ConOps.

For express lanes, there are three levels of ConOps; regional, corridor, and project. This particular version is a project level ConOps. The project level ConOps is developed late in the PD&E process or during preliminary design and is specific to the project that will be designed and constructed.

The express lanes project ConOps is a planning level document describing the operations, incident management, maintenance, stakeholder roles and responsibilities, connectivity, and integration of pricing and toll collection activities for the express lanes facility and associated systems. It is based on Florida's Statewide Systems Engineering Management Plan (SEMP), which explains roles and responsibilities for implementation and management of Intelligent Transportation System (ITS) projects. Stakeholders include operators (i.e., Transportation Management Centers), emergency responders, law enforcement, maintenance providers, local governments, transit agencies, customers, and others as deemed necessary by the Department for successful O&M of the subject express lanes project. The ConOps determines the geographical and physical extent, user needs, sequence of activities performed, and the development, operations and maintenance of the express lanes system.

The express lanes project ConOps is a living document "delivered" before progressing to the system requirements and design phases and as such is updated as the various components of the project are implemented, tested and deployed. It is typical for additional changes to the user needs and project concept to occur in subsequent project phases however changes made later in the project need to be managed carefully as they result in greater cost. The ConOps reflects the latest scope of the express lanes system and is aligned with the system requirements, design and implementation to ensure successful system testing, system validation, operations and maintenance.

The audience for the document includes all the stakeholders involved with the various components for the project, including implementers, operators and maintainers, as well as law enforcement and first-responders. The audience can be a variety of people or users with various levels of technical knowledge. The document is written using layman's English to define technical terms.

This project level express lanes ConOps follows this template. The first section of the express lanes ConOps document provides three elements: system identification; an overview of the document; and, a high-level overview of the proposed system.

1.1 Identification

Project Name: SR-9/I-95 from Miami-Dade/Broward County Line to north of Griffin Road
Financial Project Identification: 439170-1-22-02
Federal Aid Project Number: TBD

The ConOps document describes the operational requirements for the SR 9/I-95 from the Miami-Dade County Line to the Griffin Road interchange (FPID 439170-1-22-02) and includes any operational aspects associated with the approaches to the interchanges, express lanes and ingress/ egress points along I-95. The project limits include the entire area between Miami-Dade County Line to the Griffin Road interchange including interchange improvements at Griffin Road, Stirling Road and Sheridan Street. The project length is approximately 6.5 miles within FDOT D4 and may extend to the south within D6 territory.

The SR 9/I-95 project includes various geometric improvements along the mainline general use lanes, express lanes and interchanges to address congestion, highway safety, emergency evacuations, and to improve system connectivity between southern Broward County and the Fort Lauderdale Airport. One of the key geometric improvements includes the addition of direct express lane exits (NB to Sheridan Street and SB to Ives Dairy Rd), and a braided CD road between Sheridan Street and Stirling Road.

The ConOps serves to document the scope of work agreed upon by the various stakeholders and is written for the project development team. As a critical component to the systems engineering process, the ConOps provides a framework for the future development of functional/design requirements.

Figure 1: Project Location Map

Each express lane project contains multiple components with existing subsidiary documents or in some cases existing ConOps for statewide platforms such as tolling systems, toll collection and pricing software. All related ConOps documents are described in a hierarchical manner, identifying the position of this document relative to other ConOps or related subsidiary documents as shown in Table 1 below.

Table 1: All ConOps or Related Subsidiary Documents for the SR 9/I-95 Improvements

Title of ConOps or Related Document	Summary of Contents
Southeast Florida Express Lanes Regional Concept for Transportation Operations, May 2014	Overview and guidance for the implementation of EL in the Southeast Florida region using the functional categories of Planning and Policy; Physical, Design Features; Operations; Communications; Financial; and Legal
Project Systems Engineering Management Plan (PSEMP) for SR 9/I-95 from Miami-Dade County Line to Griffin Road	Guidance plan for ITS systems engineering and implementation for this project.
Concept of Operations for SR 9/I-95 from Miami-Dade County Line to Griffin Road	This document, which contains the project level Concept of Operations information including system inclusions for express lanes.

1.2 Purpose and Intended Audience

The SR 9/I-95 Improvement project will improve approximately 6.5 miles of I-95 and is intended to improve safety, connectivity, access, evacuations and reduce congestion. The project will improve existing express lane operations and provide additional off ramp and on ramp weaving sections south of Sheridan Street. Specifically, the purpose of this ConOps document is to:

- Communicate user needs and the proposed system expectations, the system developer's understanding of the user needs, and how the system will meet those needs:
- Build consensus among user groups or developers;
- Create the basis for requirements development and verification and framework for system validation; and
- Provide project information for use by the FDOT District Four Public Information Office (PIO)

The audience for the document includes all stakeholders involved with the various components of the project, including implementers, operators, and maintainers, as well as law enforcement and first responders. The audience consists of people from multiple parties with varying levels of technical knowledge. Therefore, the document is written to clearly define technical terms and utilize layman's English for most of the text.

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1.3 Document Overview

The purpose of this ConOps document is to assess the system and operations of the planned improvements along I-95. This ConOps document describes the existing system operations, identifies the stakeholders relevant to the project execution, the shortcomings or unmet needs, changes that would address the needs, operational scenarios, and the final system after the changes are made to the system or operation.

This document follows the Concept of Operations template (Form FM-SE-01 dated January 28th, 2026). The structure of this document includes the following topics:

- Section 1. Overview
- Section 2. Current System
- Section 3. Change Justification
- Section 4. Concepts for the Proposed System
- Section 5. Operational Scenarios
- Section 6. Summary of Impacts
- Section 7. Analysis of the Proposed System.

This ConOps document describes the existing transportation system and its operations, limitations, and strategies that would address the needs and the final system and operations agreed to by the stakeholders.

The analysis and conclusions included in this document specifically evaluate the express lanes on I-95 and the implications.

1.4 High-Level System Overview

In addition to the physical geometric improvements, the SR 9/I-95 project will also include the following additional system components:

- Dynamic Message Signs (DMS)
- Microwave Vehicle Detection Systems (MVDS)
- Close-Circuit Television Cameras (CCTV)
- Ramp Signal System (RSS)
- Statewide Express Lanes Software (SELS)
- Electronic Toll Collection System (ETC)
- Connected and Autonomous Vehicle Systems (CAV)
- Wrong Way Driving (WWD) System
- Warning Gate Systems (WGS)

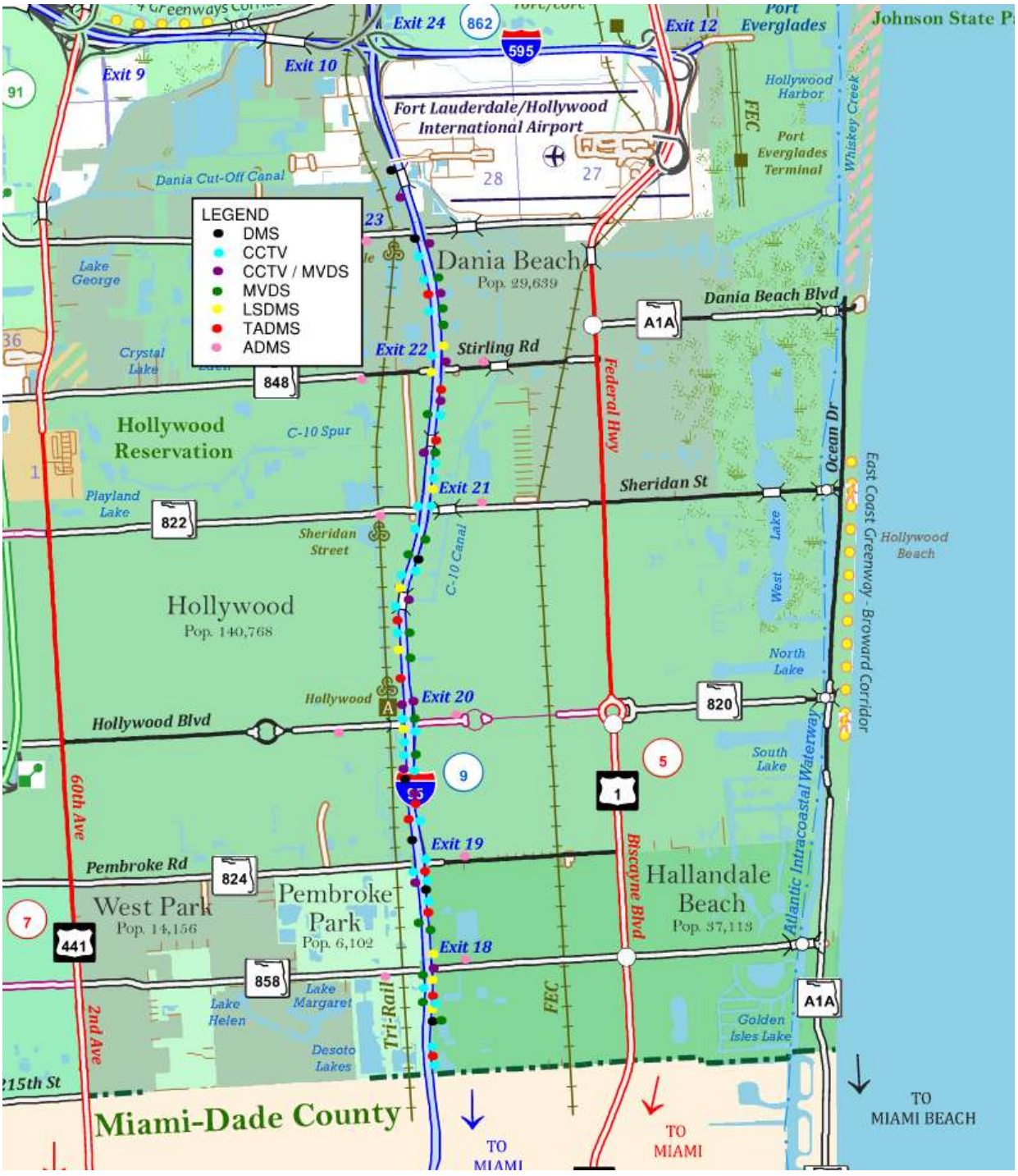


Figure 2: High Level Proposed System Overview

1.5 Stakeholders

The SR 9/I-95 corridor provides a main north-south thoroughfare for motorists, transit and commercial traffic. In addition to the motoring public, there are a number of stakeholder agencies that play a critical role in the operations of the project corridor. See Table 2: Summary of Existing Stakeholder Roles and Responsibilities.

Table 2: Summary of Existing Stakeholder Roles and Responsibilities

Stakeholder	Roles and Responsibilities
District Four Operations	• Monitor corridor for congestion and incidents • Operation of express lane facilities • Operate and maintain traffic management system components • Receive regular system status reports • Provide corridor Service Patrol • Develop and refine ramp metering operations strategies
District Six Operations	• Setting toll rates for Segment 3N • Operate and maintain ITS devices, including TADMS for Segment 2S.
Central Office	• Statewide guidelines on traffic and incident management • Statewide 511 program • Statewide data sharing • Statewide regulations on traffic operations • SELS and SunGuide® change management
Florida Highway Patrol Troop L	• Partner in developing operational procedures • Enforcement of traffic laws • Incident scene management if Fire/Rescue services are not present • Enforcement of regulatory displays at ramp meter signals • Enforcement of Bus Only Lane Violations
Florida's Turnpike Enterprise	• Operation, maintenance and marketing of Florida SunPass services • Development and maintenance of SELS • Specification, development, and maintenance of tolling hardware including antennas, readers, communications, and other infrastructure • Customer support including call center and account management

Broward County Fire Rescue	• Management of incident scenes in partnership with FHP • Provide emergency care and rescue services at incident sites • Provide fire containment and initial HAZMAT response and containment • Provide emergency medical care • Transport injured from incident scene to hospital
Local and County Transportation Agencies	• Manage regional traffic control efforts and assist in coordinating traffic across boundaries along alternate routes • Coordinate with other regional agencies during emergencies and evacuation for emergency traffic control in the event of freeway/expressway closures • Coordinate transit signal priority services utilizing bus location data on parallel corridor routes
Broward County Public Works	• Manage regional traffic control efforts and assist in coordinating traffic across boundaries along alternate routes • Coordinate with other regional agencies during emergencies and evacuation for emergency traffic control in the event of freeway / expressway closure • Coordinate transit signal priority services utilizing bus location data on parallel corridor routes
Federal Highway Administration	• Provide funding support for key projects • Provide technical and procedural oversight for ITS and other program compliance on projects with Federal funding and/or on Interstate system
Metropolitan Planning Organization	• Develop Constrained Long Range Transportation Plan, Transportation Improvement Plan and/or Regional Transportation Priorities Plan (typical) • Champion the enhancement of transportation systems management and operations for all agencies in region
Broward County Transit	• Provide bus and rail transit services in corridor including Express Bus Service

	• Provide and maintain park-and-ride facilities adjoining corridor supporting bus service • Provide service alerts and advisories • Provide next train arrival time • Provide next bus arrival time

1.6 Referenced Documentation

The following documentation is referenced as part of the SR 9/I-95 Improvements projects Concept of Operations.

- FDOT, "Concept of Operations (ConOps) Template" Version 2.1, Form FM-SE-01, January 28, 2026.
- FDOT, "Managed Lanes Guidebook," 2023.
- FDOT, "Operations Task Manager (OTM) User Manual (SELS)," August 17, 2017.
- Florida's Statewide System Engineering Management Plan, Appendix R – Concept of Operations Template, January 28, 2026.
- SR 9/I-95 Project Development and Environment Study, FPID No. 439-1-22-02, ETDM No. 14500
- Southeast Florida Express Lanes Regional Concept for Transportation Operations, May 2014
- FDOT, "Florida Statewide ITS Architecture (SITSA)," available online at https://teo.fdot.gov/architecture/
- http://sunguide.info/index.php
- www.smartsunguide.com

2. Current System Situation

2.1 Background, Objectives, and Scope

I-95 is the primary north-south interstate facility linking all major cities along the Atlantic seaboard and is one of the most important transportation systems in southeast Florida. I-95 is one of the two major expressways, Florida's turnpike being the other, that connects major employment centers and residential areas within the South Florida tri-county area.

This section of SR 9/I-95 is a limited access facility with eight general use lanes (four in each direction) and four dynamically tolled express lanes (two in each direction). This segment of I-95 is functionally classified as a divided urban principal arterial interstate and has a posted speed limit of 65 miles per hour. The access management classification for this corridor is class 1.2. The project limits extend from the Miami-Dade / Broward County line to north of Griffin Road, approximately 6.5 miles.

The FDOT TSM&O Program uses technology to manage the project corridor more effectively, and provides motorists with safer, more reliable roadways. These technologies are deployed along the project corridor and are operated for the FDOT District Four SunGuide® RTMC. The RTMC will use the statewide SunGuide® Software to monitor and control the field devices. The FTE provides the Electronic Toll Collection System for all express lanes. This includes the gantry toll equipment, toll tag readers, toll tags (SunPass), and all the back office support for account management. The corridor has existing express lane technology and will be improved during this project.

2.2 Operational Constraints

2.2.1 Capacity Limitations

This section of SR 9/I-95 is contained within the Broward Metropolitan Planning Organization. The 2045 Southeast Florida Regional Transportation Plan was developed from the planning organizations from Miami-Dade, Broward, and Palm Beach Counties. Interchange improvements at I-95 and Griffin Road is listed as one of the top 5 priority projects. Currently, the existing interchanges are congested and affect traffic operations along the general use lanes of I-95 between ramps and the arterial intersections near I-95.

According to the 2045 projections (see figure 3), the section of I-95 between Sheridan Street and Griffin Road will be one of the highest areas of employment density in Broward County. Employment density growth is expected to increase by 10% by 2045. Hotel and motel rooms are expected to increase by 10%. Population growth is expected to occur along the entire corridor both east and west along the I-95 corridor between the Fort Lauderdale Airport (Griffin Road) and the Miami-Dade County line. Specifically, areas along Sheridan Street, Stirling Road, Hollywood Blvd and Pembroke Road are expected to see population density growth between 10 and 20%. The expected growth along the corridor of both residents and employment centers will result in a significant increase in travel demand through this corridor and further deteriorate the already congested I-95 corridor.

Table 3: Average Annual Daily Traffic (AADT): Year 2025 and Future Year 2045

		2025	2045 (No build)
North Section	**EX Lanes**	40,000	45,000
	GP Lanes	222,000	303,000
Mid Section	**EX Lanes**	40,000	45,000
	GP Lanes	246,000	332,000
South Section	**EX Lanes**	24,300	45,000

	GP Lanes	259,000	333,000

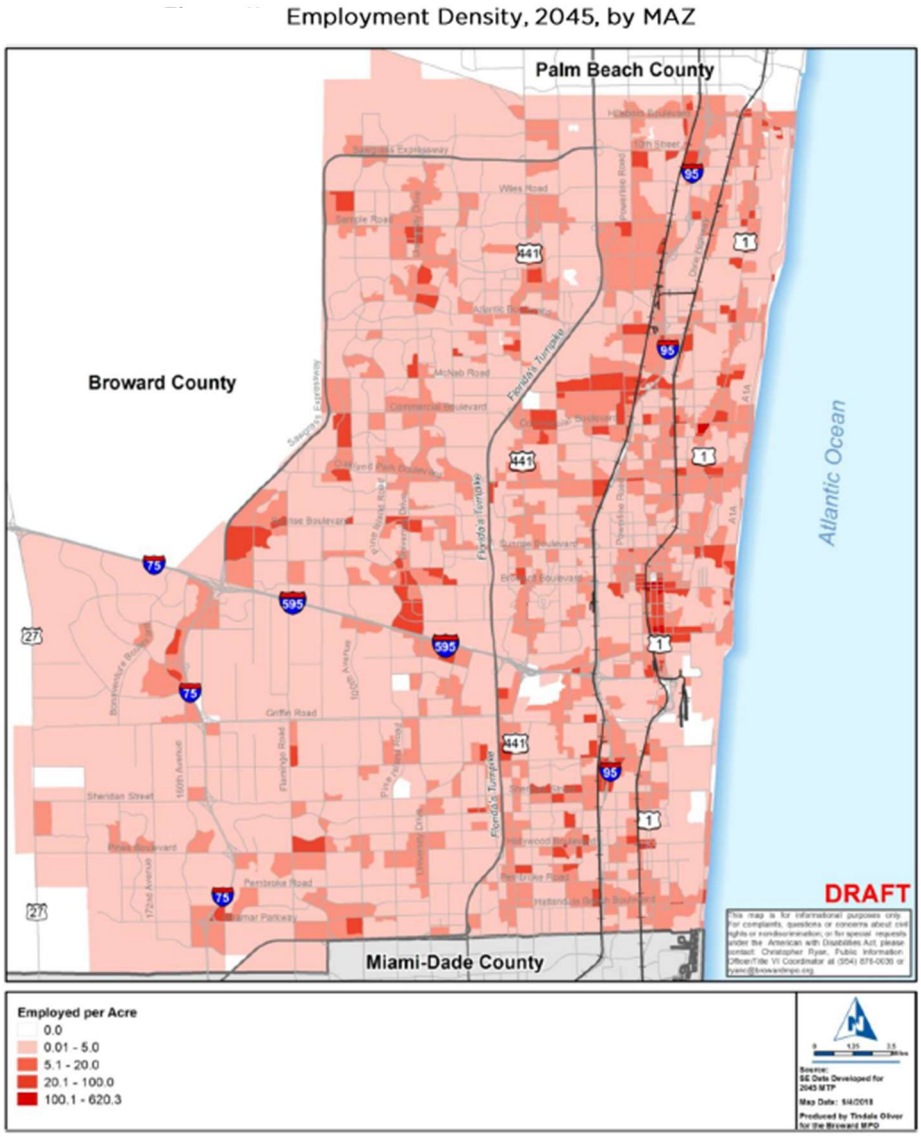


Figure 3: Employment Density, 2045

2.2.2 Regional Considerations

This section of I-95 connects southern Broward County and northern Miami-Dade County to the Fort Lauderdale Airport and high population centers around the downtown Fort Lauderdale area. It is the county's busiest north-south transportation corridor. The I-95 corridor provides system-level connections to I-595, Florida's Turnpike, and I-75. I-95 is a designated Strategic Intermodal System (SIS) corridor, providing connections to several other SIS corridors and hubs (see Figure

4). The Sheridan Street and Hollywood Blvd rail stations provide connections to commuter rail along with Amtrak service and Broward County Transit bus service. At Griffin Road is the Fort Lauderdale Airport Tri-Rail station (Taxi, Amtrack, Park and Ride) providing multimodal connections to the airport and Broward County Transit connections. The proposed capacity and operational improvements along this I-95 project will improve commuter access to these major transportation facilities as well as enhance mobility within the larger South Florida Region.

The proposed direct express lane exits and CD roads along this corridor will reduce the off-ramp congestion along this corridor and improve general safety and crashes due to daily congestion events. The District Four Operations group will continue to manage this corridor using ITS field devices within the project limits as well as sharing traffic data and video surveillance with adjacent agencies, FHP, FTE, D6 and Broward County.

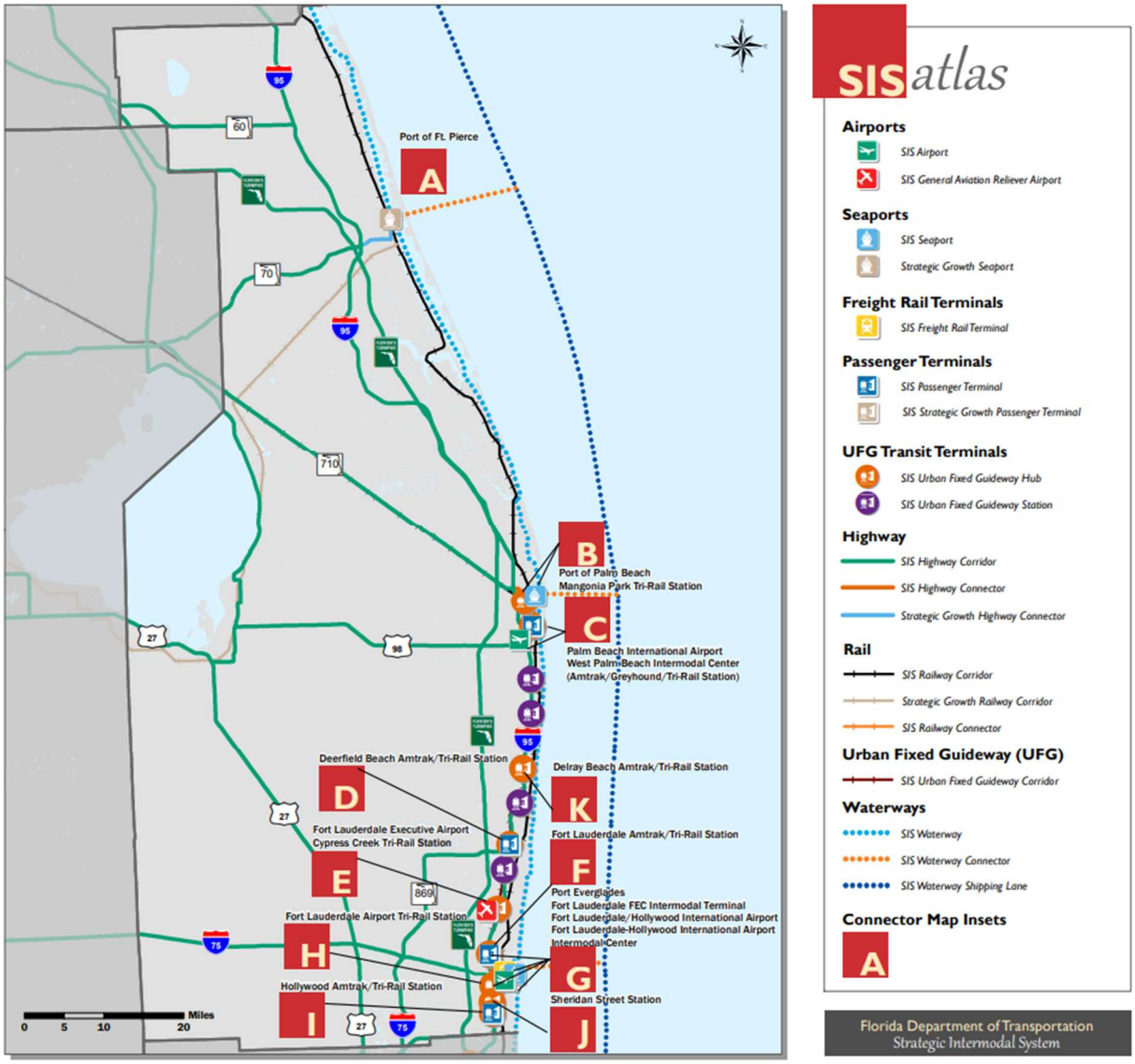


Figure 4: District Four SIS Facilities

2.2.3 Transportation System Management and Operations (TSM&O)

The SunGuide® Software has limited capability to share control of ITS field devices and sharing control is currently not used among the districts TMCs. The Districts rely heavily on the verbal communication procedures established through the Southeast Florida Regional TMC Operations Committee (SEFRTOC), which currently works well for existing operations.

The FDOT has developed a Regional Concept for Transportation Operations (RCTO) for express lanes across Southeast Florida. The proposed regional network of express lanes includes all major highways in Broward County. As the FDOT moves forward with the deployment of a Regional Express Lanes Network, coordination of each facility/ project will be required to ensure a regional consistency for the public.

2.2.4 Resources

FDOT District Four has adequate resources available within the project limits for the existing conditions. FDOT District Four has optimized the use of their existing resources, and any additional devices, systems, and operations/maintenance responsibilities will require additional funding to ensure the existing performance of the ITS program is maintained as the system is expanded to support express lanes along I-95.

2.3 Description of the Current System or Situation

The FDOT has implemented a mature ITS program along the project corridor that is operated from the FDOT District Four SunGuide® RTMC. The RTMC operates 24 hours per day / 7 days per week and uses the Statewide SunGuide® Software to monitor and control the field devices.

The D4 RTMC participates in the SEFRTOC to coordinate operations at interchanges with roadways operated by other regional TMCs (FDOT D6, FTE and Broward County). Through the SEFTROC, procedures exist for incident coordination, information dissemination and sharing data/video. The District's TMC acts as the command-and-control center for ITS programs. The TSM&O Program elements pertinent to the I-95 project include field devices, software, incident management, traveler information, express lanes and ramp signaling.

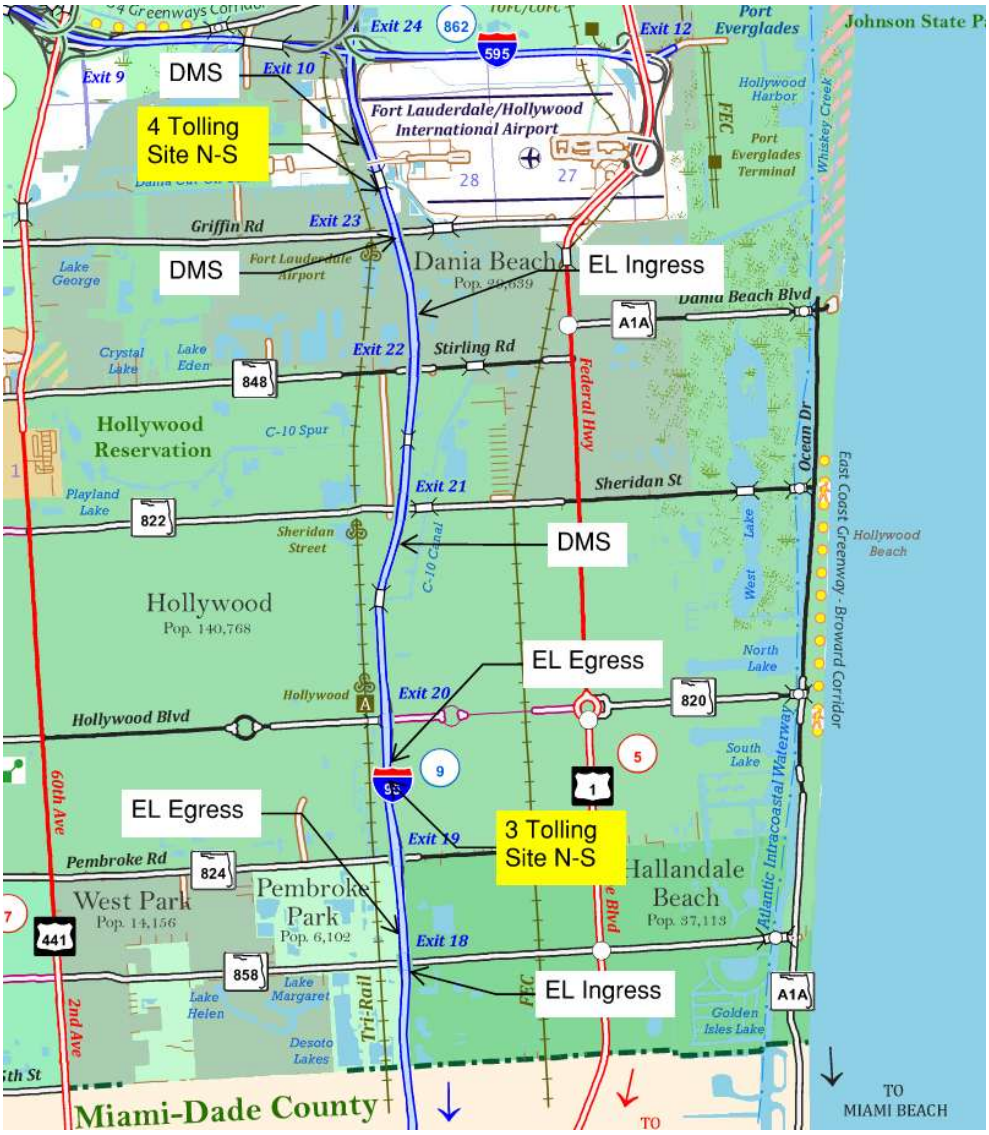


Figure 5: High Level Existing System Overview

2.3.1 Express Lanes

Within the study area, the District Four SunGuide® RTMC manages the Express Lanes (EL) in each direction from Miami-Dade County Line to Griffin Road except for the section of I-95 northbound for Segment 3N, which will be maintained by FDOT District Six. Within each direction EL segment, a toll gantry registers the vehicles utilizing the managed lanes facility. The District Four SunGuide® RTMC is responsible for toll setting, ITS maintenance, and incident management along the SR 9/I-95 corridor, including El. The managed lanes facility has the objective of maintaining speeds above 45 miles per hour to ensure reliable travel times.

FTE provides the Electronic Toll Collection (ETC) System for all EL throughout the State of Florida. This includes the toll and data gantry equipment, toll tag readers, toll building equipment and all back-office software for account management and customer service. The District Four SunGuide® RTMC coordinates with the FDOT District Six TMC on all events along the SR 9/I-95 corridor since the proximity of the express lane segments being operated by each district is so close and any event along the project corridor could impact the adjoining district.

The existing SR 9/I-95 EL currently traverse this project area. The District Four RTMC is responsible for setting tolls along tolling segments in Broward County in each direction, communicating toll amounts to FTE's back-office services, and posting messages and toll amounts on all SR 9/I-95 EL assigned Toll Amount Dynamic Message Sings (TADMS). A diagram of the current access points of the express lanes in the study area is shown in Figure 6.

2.3.2 Existing TSM&O/ITS Infrastructure

The District has the following ITS Field devices along the Project Limits. They are monitored and controlled through the SunGuide® Software. They include:

- **Closed Circuit Television Cameras (CCTV)** - CCTV are used for monitoring the roadways to support incident detection, verification and incident clearance verification. The District also uses dedicated CCTV to verify messages on the DMS, ADMS, LSDMS and TADMS. The CCTV cameras provide full coverage and support full pan, tilt, and zoom capability. The video is shared among the TMCs through a regional fiber communication network. The video is shared with the public through the Florida Advanced Traveler Information System (FLATIS) or the 511 website. For FDOT District Four, the video is made available to local agencies through the Broward County Communications network, or through a direct link to the FDOT District Four SunGuide® RTMC. Media and the District Four Emergency Operations Center (EOC) also have access to all the regional video through the FDOT District Four SunGuide® RTMC. Video is also shared with the public and local agencies through real time video streams on the District's RTMC website (SunGuide.info) and TrafficLand.

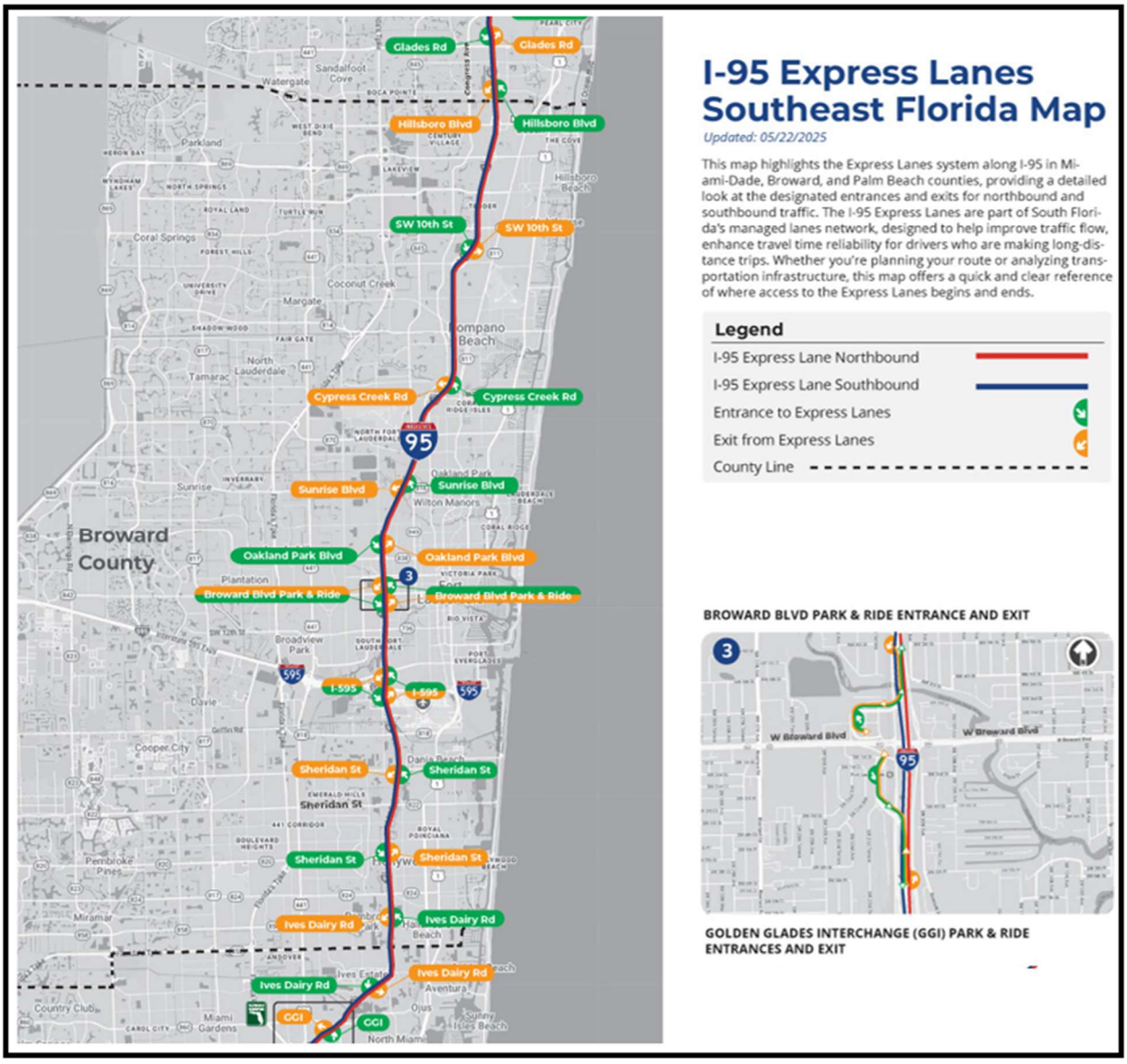


Figure 6: Existing I-95 Corridor Express Lanes Ingress/Egress

- **Dynamic Message Signs (DMS)** – Highway DMS are used to disseminate event information (incidents, lane closures, weather, etc.), safety messages, travel time messages, and special alerts to motorists along the I-95 corridor. All DMS have CCTV to verify the DMS messages. Seven DMS (including ADMS, LSDMS, and TADMS) locations along the project corridor include:

Table 4: Existing DMS Signage

North Bound DMS	South Bound DMS
TADMS NB North of County Line	DMS SB South of Hallandale Beach Blvd
DMS NB North of County Line	TADMS SB North of Hallandale Beach Blvd
TADMS NB South of Hallandale Beach Blvd	DMS SB North of Pembroke Road
LSDMS NB North of Hallandale Beach Blvd	TADMS SB North of Pembroke Road
DMS NB South of Pembroke Road	DMS SB South of Hollywood Blvd
TADMS NB South of Pembroke Road	LSDMS SB at Hollywood Blvd
TADMS NB North of Pembroke Road	TADMS SB North of Hollywood Blvd
DMS NB South of Sheridan Street	LSDMS SB North of Hollywood Blvd
LSDMS NB North of Sheridan Street	TADMS SB South of Sheridan Street
TADMS NB North of Sheridan Street	LSDMS SB South of Sheridan Street
TADMS NB South of Stirling Road	LSDMS SB at Stirling Road
LSDMS NB North of Stirling Road	TADMS SB South of Griffin Road
	DMS SB at Griffin Road

- **Microwave Vehicle Detection Stations (MVDS)** are used to monitor traffic operations and collect real- time traffic flow data including vehicle classification, volume, speed, and occupancy. The data is shared across TMCs to calculate and present travel time information on the DMS. The data is also used to support the traffic management functions such as detecting incidents and archiving traffic data for transportation planning purposes. MVDS data is also used by the tolling algorithm to help establish the toll rates needed to provide better travel time reliability within the express lanes. MVDSs are spaced at approximately 1/3-mile intervals along the project corridor.
- **Ramp Signal System (RSS) –** Ramp signaling is a traffic management strategy that installs ramp signals at highway on-ramps to regulate the flow of traffic on-to the freeway mainline. It reduces the conflicts and delay caused by a platoon of vehicles trying to merge onto the highway. When activated, a ramp signal head alternates between green and red to establish a steady flow of vehicles, which allows them to smoothly merge onto the mainline traffic. This reduces the delay caused by a platoon of vehicles competing for available gaps as they merge on the highway.

  Ramp signals are currently controlled through the MAXVIEW Software from the FDOT District Four SunGuide® RTMC and have proven to reduce recurring and non- recurring congestion in the General Use Lanes. The RTMC has established operating procedures for the I-95 general use lanes ramp signal system (RSS) that can be applied to other projects, including this one.

  There are three ramp signal locations withing the study corridor (Hollywood Blvd, Pembroke Road, Hallandale Beach Blvd).

The existing I-95 RSS in FDOT District Four are operated in a traffic responsive mode. When the traffic volume in the GUL reaches a set threshold amount the RSS are automatically activated from the MAXVIEW software. Generally, the times of operation of the I-95 RSS are times of heavy congestion during the AM/PM peak in the general use lanes.

- **Wrong Way Detection (WWD) System –** WWD is a traffic safety system for detecting vehicles driving the wrong way on the off ramps at I-95 interchanges. When activated, a led flashing wrong way sign activates to alert the motorist of their movement. A signal is also sent to the TMC Software and the FDOT District Four SunGuide® RTMC operators can monitor the traffic movement as well as add messages to local DMS signs on the main line corridor of I-95.

  WWD treatments exist on three of the interchanges (Hallandale Beach Blvd, Pembroke Road and Griffin Road).

- **Fiber Optic Communication** - There is an existing fiber optic communication backbone along the project limits with lateral runs to the field devices. The existing fiber consists of 2-144 count single mode fiber optic cables, communicating to the regional Traffic Management Centers using master HUBs.

- **Toll / Data Gantry** - There are multiple express lane toll sites on this corridor that connects to FTE for tolling. See Figure 7& Figure 8 for details on toll gantry locations.

    - Toll Site #1 (North and Southbound) – ½ Mile North of Pembroke Road
    - Toll Site #2 (Northbound only) – ½ Mile South of Hollywood Blvd
    - Toll Site #3 (North and Southbound) – ½ Mile South of Stirling Road
    - Toll Site #3 (North and Southbound) – ½ Mile North of Griffin Road

2.3.3 RTMC Software

The D4 RTMC utilizes the SunGuide® Software. SunGuide® Software is FDOT's Statewide TMC software application for the control of ITS roadway devices, traffic and incident management, data collection, traveler information dissemination, as well as information exchange across a variety of transportation agencies.

The FDOT District Four SunGuide® RTMC has additional software applications to support their specific operations and maintenance. The RTMC has GPS devices on the Road Ranger vehicles that send GPS data to SunGuide® Software to display and report on Road Ranger positioning.

The FDOT District Six TMC also has the Operator Task Manager (OTM) application that supports all aspects of the TMC operations; data collection, performance reporting, information dissemination, express lanes operations, ramp signaling operations, Rapid Incident Scene Clearance (RISC) operations, Road Ranger Break log, shifts change, communication logs, and ITS maintenance. OTM interfaces with the SunGuide® Software through a data bus communication that allows OTM to collect data from SunGuide® Software and send commands to SunGuide® Software. The TMC has specific contractual operational performance measures that are tracked

using the Operator Quality Control Database (OPQC). The OTM and OPQC software applications are owned by the FDOT District Six TMC and the (Statewide Express Lane Software (SELS) are part of the TMC as a module of OTM.

2.3.4 Toll Systems

The existing toll systems used for express lanes within the state are provided by FTE. The system utilizes toll gantries to house the toll equipment needed to accurately identify a vehicle using the facility, and apply the appropriate toll based upon data provided by the MVDS and interpreted by the SELS. Tolling for express lanes requires the vehicle to have a transponder that is interoperable with FTE's SunPass. Tolls are dynamically set based upon the density levels along the facility. Users of the express lanes are provided pricing rates for a trip that encompasses up to three accessible destinations. Upon reaching the end of that trip segment, the user is provided additional information on pricing to stay in the express lanes giving them the option of leaving the lanes if they did not want to pay the new dynamically priced rates. Existing toll facilities are monitored by FTE's SunWatch & SLAM teams.

2.3.5 Incident Management

Existing Incident Management efforts along the project corridor include five key program elements; Traffic Incident Management (TIM) Team, Road Rangers, Rapid Incident Scene Clearance (RISC), FDOT D4's Severe Incident Response Vehicles (SIRV) and FDOT D6's Incident Response Vehicles (IRV) Operations, and the Florida Highway Patrol (FHP) Hireback Program. These resources work closely with FDOT Maintenance/Asset management Contractors for extended incidents.

- **TIM Team** - The FDOT District Four SunGuide® RTMC has an established TIM Team. The TIM Team consists of FDOT, FTE, FHP, tow companies, local police, local fire rescue, consultants, and asset management companies. Through the TIM Team, the FDOT District Four SunGuide® RTMC has established an excellent working relationship with the incident responders. The TIM Team has helped to establish quick clearance policies and provide a forum to discuss issues, which results in continuous improvement to incident response within the region.

- **Road Rangers** - Road Rangers are the FDOT's Service Patrol Program, which is managed by the District's RTMC. They provide the following services:
  - Provide short-term maintenance-of-traffic (MOT) services during incidents
  - Assist in Incident Management and response
  - Clear disabled vehicles from travel lanes
  - Clear debris from travel lanes
  - Change flat tires
  - Jump-start vehicles and make minor repairs
  - Supply emergency gasoline, diesel, water

- Provide stranded motorists two free local calls
- Monitor abandoned vehicles and notify FHP

The Road Ranger vehicles include tow trucks, pick-up trucks, flatbed tow trucks (Broward County only) and Class "C" Heavy-Duty wreckers. The Road Ranger vehicles (pick-up trucks and tow trucks) constantly patrol the project corridor and other vehicles (flatbed tow trucks and heavy duty wreckers) are strategically located for quick response/clearance.

- **Rapid Incident Scene Clearance (RISC) Program** – The RISC program offers financial incentives to pre-qualified towing companies to respond to and clear large-scale incidents such as large truck crashes, rollovers and cargo spills within a specified period of time. The RISC contractor has 60 minutes to arrive on scene with the required equipment. Once given a "notice to proceed" by the FHP Trooper on scene, the RISC contractor has 90 minutes to "open all travel lanes" to traffic. FDOT District Four SunGuide® RTMC coordinates with FHP to activate RISC. In Broward County, FHP, the RTMC, or the SIRV operator has the ability to activate RISC.

- **Severe Incident Response Vehicles (SIRV)** – The D4 SIRV assists in the mitigation of delays caused by severe traffic incidents and to increase the safety of emergency responders. The SIRV operators are specially trained staff that serve as an Incident Commander responsible for coordination and communication between incident responders, the FDOT District Four SunGuide® RTMC and FDOT Maintenance. In addition, the SIRV vehicle is outfitted with traffic management equipment such as cones, signs, spill absorbent, roadway repair supplies and flares to be used for the MOT to ensure the safety of everyone on scene. The SIRV program provides an immediate FDOT presence at all Level 3 incidents 24-hours a day and seven days a week. It also provides responses to Level 2 incidents in the General Use Lanes during peak travel times from 6am to 7pm Monday through Friday. After-hours SIRV response is available for freeways after the normal hours on an on-call basis. FDOT District Six similarly utilizes Incident Response Vehicles (IRV) program as well.

- **FHP Hireback Program** – This program provides dedicated FHP officers to the Express Lanes corridors in order to help ensure that incidents are cleared quickly and safely, and that all aspects of the facility are being correctly operated regarding moving operations.

2.3.6 Enforcement Activities

The Florida Highway Patrol Troop L oversees all enforcement along the project corridor including toll violations.

2.3.7 Customer Service Activities

Express Lane customer service is being provided by FTE. All other customer inquiries are handled under normal District processes.

2.3.8 Traveler information and Data Sharing

In addition to the DMS, the FDOT provides additional traveler information through a Statewide 511 System known as FLATIS. FLATIS provides traveler information via a website (www.FL511.com) and an Interactive Voice Recognition (IVR) system by dialing 511. The FLATIS is populated from information provided by the FDOT District Four SunGuide® RTMC via the SunGuide® Software. FLATIS provides users up-to-the minute reports on traffic events, regional travel times, construction events, links to other agencies and more.

Following advances in technology that increased the number of motorists that own smartphones, FDOT entered into an agreement to exchange data with Google, the provider of a cellular phone application (Waze) that aids motorists with navigation through the roadways. Waze is a community-based traffic and navigation system that allows users to input information through a smartphone app and collaborate in updating maps online. In the first phase of this collaboration, FDOT allowed Waze to access FDOT'S third party data feed so that information on roadway incidents that the TMCs are managing may be disseminated to Waze users through the app. Also, as part of this phase, Waze shares information on incidents that have been reported by the app users with FDOT by providing FDOT with Waze's incident data feed.

The Waze incident data feed is processed by the Center-to-Center (C2C) interface of the SunGuide® software through a C2C plug-in that downloads incident alert data from Waze and feeds it to the TMCs through a C2C Event Status data feed. The TMC operators are alerted of the Waze events through a read only icon that is displayed in the SunGuide® Software's Operator Map. Phase 2 of this Waze and FDOT Data Sharing Agreement facilitates the processing of Waze information using an Incident Detection Subsystem (IDS) and reduces the burden on the operators by automating many of the processes that were handled manually. Waze incidents will be processed similarly to other incident data feeds that are currently used by FDOT TMCs.

2.3.9 Multi-Modal Aspects

There are no new multi-modal aspects associated with the current corridor. Existing multi-modal services exist at Griffin Road, Sheridan Street, Hollywood Blvd Tri-Rail and Transit park-and-ride facilities. The Griffin Road station provides access to Fort Lauderdale Airport.

2.4 User Class Profiles

For the project, the agencies involved are identified previously in Section 1.5. These organizations are responsible for providing a safe and efficient transportation system which meets the needs of

users traveling the I-95 corridor. A list of each agency and their role/responsibility for the services on the corridor are listed in Table 5.

The traffic signal system is currently supported by individual agencies through various agreements related to operating and maintain the traffic control system. Maintenance of traffic signal equipment located on the State Highway System is a coordinated activity where FDOT provides funding to County Maintenance and Traffic Operations Department as outline in the Traffic Signal Maintenance and Compensation agreement (TSMCA).

Operating and maintaining express lanes along I-95 is the responsibility of FDOT District Four except for the northbound I-95 segment to toll site 3N.

Table 5: Agency Responsibilities

Agency	Roles and Responsibilities
FDOT District Four	• Monitor corridor for congestion and incidents. • Operation of express lane facilities on I-95. • Operate and maintain traffic management system. • Develop and operation ramp metering strategies.
Expressway Agency/ FTE	• Coordination on traffic management on I-95.
FDOT District Six	• Coordination on traffic management on I-95. • Maintain ITS devices on NB segment 3N.
Local and County Transportation Agencies	• Manage regional traffic control efforts and assist in coordinating traffic across boundaries along alternate routes.
Broward County Transit	• Provide bus and rail transit services in corridor including express bus service.
Metro Planning Organization	• Develop constrained Long Range Transportation Plan, Transportation Improvement Plan and/or Regional Transportation Priorities Plan.

2.5 Support Environment

The existing ITS systems are maintained and managed from the RTMC. The ITS Maintenance Contracts include preventive and emergency repair services. The ITS Maintenance Contractor has performance measures for responding and resolving failures depending on the nature of the failure (e.g., critical versus non-critical). These services are tracked via software operated out of the FDOT District Four SunGuide® RTMC. FDOT District Four has a contractor that provides roadway maintenance/asset maintenance for I-95. The roadway and asset maintenance contractors are contracted to maintain the system according to a level of service established within the FDOT's Maintenance Rating Program as specified within their respective scope of services. These same services will be provided by this same contractor along the I-95 direct connector ramps, to ensure movements to/from the I-95 Express Lanes South are maintained.

The FTE has maintenance contracts with vendors to provide toll collection equipment maintenance on all FTE owned and managed toll facilities, including the toll buildings and toll equipment that will be deployed on I-95.

3. Change Justification

3.1 Justification for Changes

This I-95 improvement project is the south end segment in Broward County of a larger express lanes project along the I-95 corridor. The entire express lane segment extends from Boca Raton to I-395 in Miami and is already operating. Based upon recommendations provided from the SR 9/I-95 Express Lanes from Miami-Dade County Line to Griffin Road PD&E Study (FPID: 439170-1-22-02), the corridor will be improved to add direct express lane exits and CD roads to improve travel along the mainline of I-95 at several key intersections. Once all segments are completed, users will have access to an express lanes network with improved mobility and reduced congestion along the entire Southeast Florida Express Lanes Network.

3.2 User Needs

Every effort has been made to ensure that all potential users and needs have been identified for the improvement of express lanes on I-95. It is possible that as this project progresses, the list of users may be expanded. It's also anticipated that as specific equipment or communication systems are defined that the needs of the identified users will be better defined or expanded. The development of these improvements during the PD&E and design phase will need to include ITS infrastructure and the proper resources to manage, operate, and maintain the corridor. These additional systems and assets include, but are not limited to:

- **ITS Infrastructure** – TADMS, ADMS, LSDMS added to inform motorists approaching the express lanes. Furthermore, replacement and enhancement of ITS devices (CAV, CCTV, DMS, MVDS, RSS, tolling, WWD, etc.) will be necessary for infrastructure impacted during construction.
- **Operations Staff** – Proper staffing levels will need to be provided based on network coverage, operations strategies, and necessary coordination with external partners. Activities anticipated to be considered for expansion and further evaluation at this state of project development include:
    - 24/7/365 network monitoring and management of EL, GUL, and messaging
    - Incident management response, resources, and personnel
    - Enhanced performance measurement, analysis, and reporting
    - Engineering and operational analysis
    - Information Technology (IT) support

  - Pubic Information and outreach

- **ITS Maintenance Staff** – Due to new infrastructure and additional devices being utilized for future conditions, an evaluation of current maintenance staffing levels is needed.

The proposed improvements will require extensive coordination, particularly among the various adjacent sections of EL project, and an all-encompassing approach to consider the infrastructure and operational changes that are a result of the future work. The changes identified in the project will be further evaluated during subsequent phases of design. For the purposes of this ConOps, high-level assumptions were identified to include the following:

- New data/toll gantries required.
- Proper resources for RTMC Operations, Incident Response, Engineering/Technical Support, Public Information, and ITS Maintenance will be budgeted to maintain the project's goals.
- Comprehensive public information campaign developed to assist commuters with the new I-95 express lane direct exits, CD roads, and the new DDI at Stirling Road.

A system validation plan will be developed during the design phase, by the Engineer-of-Record, using the guidance from the ConOps. Specifically, it will define system goals, objectives, and recommended strategies with performance measures for validation of the system. The goals, objectives and strategies will serve as inputs to the development of the System Validation Plan to be completed following ConOps and system requirements development.

4. Concepts for the Proposed System

4.1 Background, Objectives, and Scope

The I-95 improvement project will include express lane and general use lane improvements with direct exits from express lanes to CD roads as depicted in Figures 7 & 8. Ramp signals will be replaced at the interchange entrance ramps at Hallandale Beach Blvd, Pembroke Road, Hollywood Blvd, and Sheridan Street.

The FDOT District Four has established business rules and operational policies for the 95 Express Phases 1 and 2, which include ramp signaling operations.

As more opportunities arise for incorporation of Connected and Autonomous Vehicles, FDOT District Four will accommodate additional roadside ITS infrastructure to include Cellular Vehicle to Everything (C-V2X) devices, additional CCTV, additional DMS, cellular communication devices, and other technology as needed. C-V2X devices should be considered at strategic locations such as high-crash locations at major exits of I-95. The design of the ITS System should account for these potential future technology enhancements regarding power and communication.

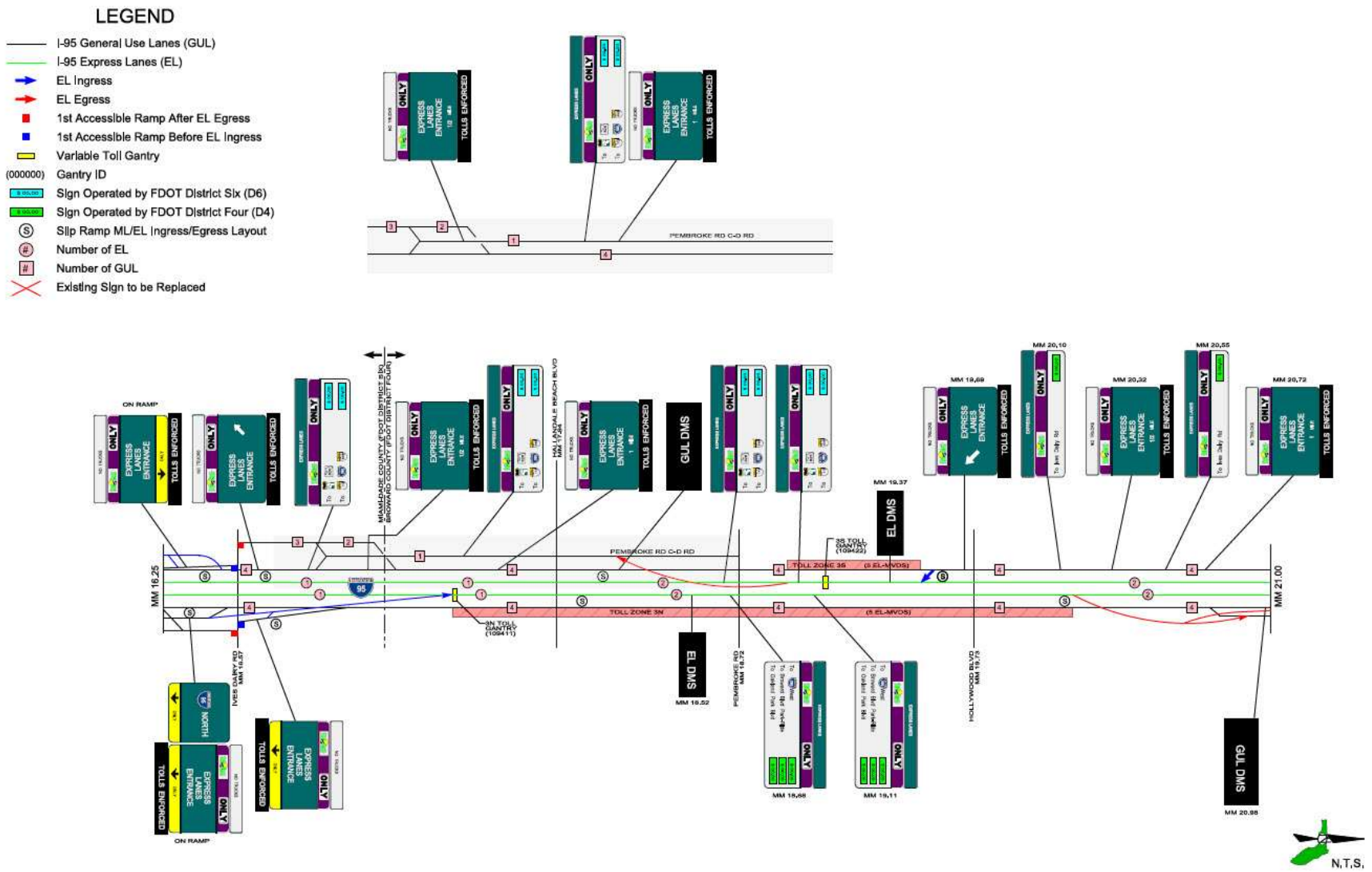


Figure 7: Proposed Express Lanes Ingress/Egress – South End

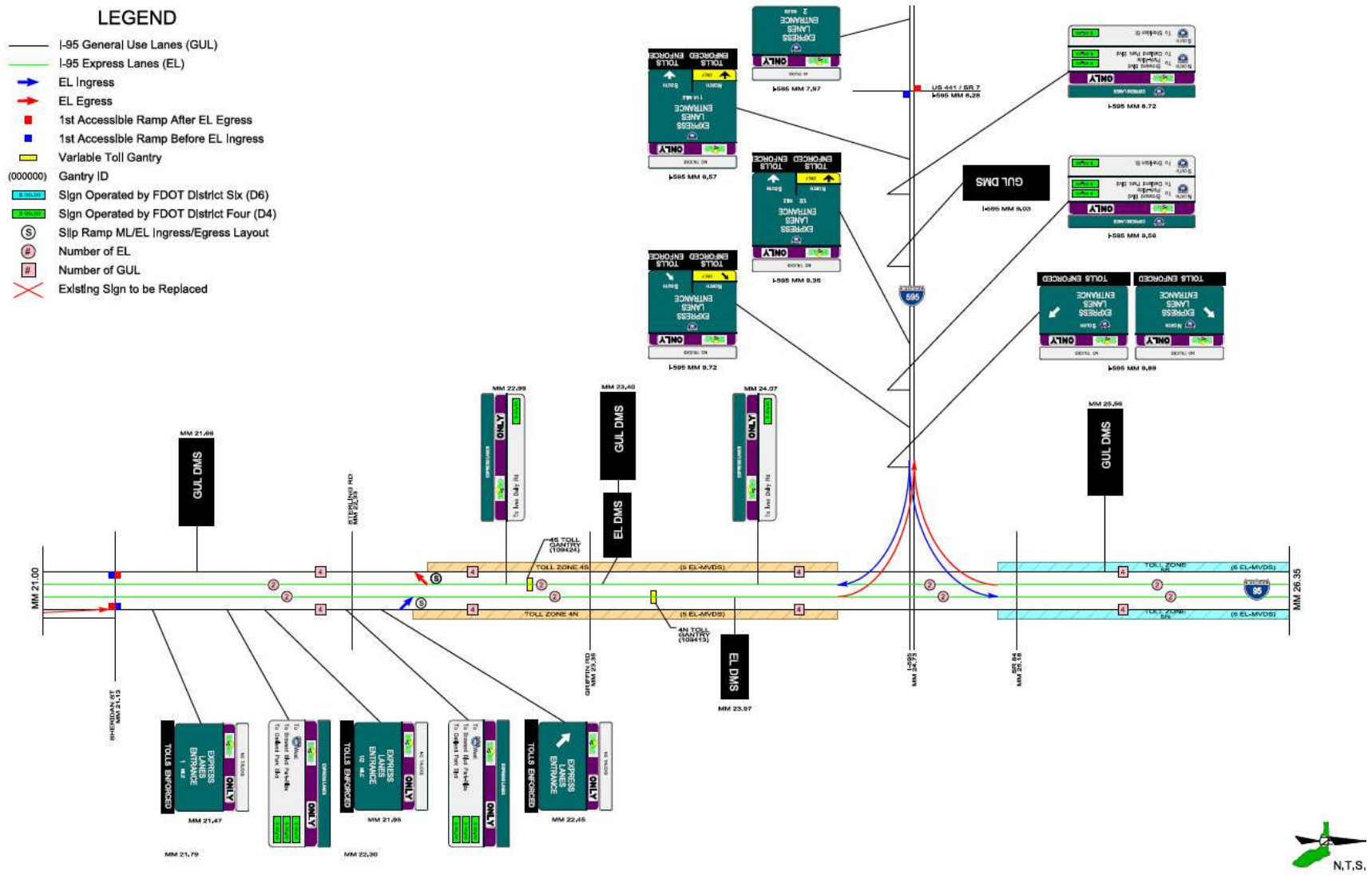


Figure 8: Proposed Express Lanes Ingress/ Egress – North End

4.2 Operational Policies and Constraints

As express lanes are deployed across the State of Florida, the FDOT has established guidance and policy decisions that will affect the Project operations. The guidance and policy decisions establish the basis from which business rules and procedures are developed. The existing guidance and policy decisions are contained in the following documents:

- Florida Administrative Code 14-100.003 (Toll Rule) was established in 2008 and was amended February 15, 2018. They were implemented on March 1, 2014 for 95 Express Lanes Phase 1. It establishes the minimum toll of $0.50 and a maximum toll rate of $1.50 per mile for 95 Express from I-395 to GGI. There is no maximum toll rate for all other express lanes.
    - FDOT Central Office Managed Lanes Guidebook (2023) – This document was developed and is intended to provide a statewide perspective in supporting regional solutions. The actions represent those that need to happen on a statewide basis and are developed to encourage the Consistent, Predictable, Repeatable (CPR) process. The Handbook contains information on planning and implementation for express lanes facilities. It contains the definition for a tolling segment that is different from the original concept. The new definition introduces the use of data toll gantries. The Data toll gantries are defined as toll gantries that are between two consecutive ingresses. This will impact toll revenues and the TMC's ability to manage demand along the corridor. The Handbook is considered a "living" document and may be modified as express lanes are deployed across Florida.
    - 95 Express Lanes Phase 2 Business Rules Technical Memorandum – This document contains the business rules for the 95 Express Phase 2 project, which will be the first operational trip-based express lanes project in Florida. The business rules primarily focus on elements that affect how tolls are charged for various scenarios. For example, what toll amounts are charged when a Toll Amount DMS has a stuck message or failed. The 95 Express Phase 2 business rules Memorandum define the following concepts and their impacts to tolling:
        - Operating Modes
        - Trip Tolls
        - Toll Adjustments
        - Special Cases
            - Closed Operations
            - Detector Malfunction
            - Toll Amount DMS Malfunction
            - Stuck Segment Toll
            - Stuck Maximum Trip Toll
            - Lane Status DMS Malfunction
            - Verification CCTV Camera Failures
            - FTE Communication Problems
            - Statewide Express Lanes Software (SELS) Start-Up
            - Operating Mode Changes

The I-95 Express Lanes will not have any toll exemptions for high occupancy vehicles, vanpooling, carpooling, motorcycles, or hybrid vehicles, since no existing HOV lanes are present along the corridor.

The possible constraints for the proposed system include:

- The long flyovers from I-95 to Sheridan Street could provide operational constraints if an incident occurs, or if a vehicle becomes disabled. Incident response requirements will need to be evaluated to ensure proper performance requirements are established and met.
- Funding for operations and maintenance will be provided from toll revenues. It is critical to the success of the project that adequate funding levels for the additional resources are allocated to ensure the performance targets are met.
- Incorporation of additional technologies to accommodate future Connected and Autonomous Vehicle operations, including dedicated CAV lanes.

Design speeds less than 50 MPH/posted speeds less than 40 MPH, along the direct exits from I-95 to Sheridan Street and Ives Dairy Road would require FTE to charge a minimum toll to the users based upon FTE's back office software in conjunction with vehicle speeds.

4.2.1 Dynamic Pricing for Segment 3S

The Project includes one tolling segment that is shorter than one (1) mile in length, identified in this ConOps as Segment 3S, with an approximate length of three-quarters (¾) mile. Express lane toll segments are identified in the Managed Lanes Guidebook as being at least one mile in length; however, toll segment length and gantry placement are dependent on ingress/egress configuration, corridor geometry, and operational needs. Accordingly, Segment 3S reflects corridor-specific access spacing and operational considerations within the project limits. Toll segment definitions used by the Statewide Express Lanes Software (SELS) to operate express lanes facilities may vary from planning-level toll segment definitions.

Dynamic pricing for Segment 3S will be implemented using FDOT's statewide express lanes approach, with the primary operational objective of facilitating free-flow operating conditions in the express lanes, defined as travel that is unimpeded with speeds of at least 45 mph.

From a policy standpoint, dynamic pricing decisions for Segment 3S will be applied as a demand management tool to support Express Lane performance. Segment 3S will continue to be treated in SELS as an ingress-to-egress toll segment, and the toll amount posted for Segment 3S will be calculated using the operational data assigned to Segment 3S consistent with established 95X practices.

The Project also recognizes the following operational constraints associated with Segment 3S that must be considered when applying these policies:

- Because Segment 3S is shorter than the minimum toll segment, operational conditions can change rapidly; therefore, tolling decisions must emphasize proactive, stable adjustments intended to prevent breakdown rather than reactive changes after breakdown occurs.

- For 95X operations, the Project does not propose using demand conditions from upstream toll Segment 4S as an input to the Segment 3S toll calculation is SELS.
- Benefit sections (Express Lane roadway between an egress and the next ingress) are not included in current toll-setting calculations; however, for this specific use case, the Project may propose using MVDS data located within the benefit section between the Segment 4S egress and Segment 3S ingress as performance feedback (not demand input) to support earlier operational awareness immediately prior to the Segment 3S ingress.
- Segment 3S remains a short toll segment for purposes of SELS segment length assignment (ingress-to-egress) and therefore remains subject to the practical maximum toll framework historically applied to short toll segments. As a result, Segment 3S operations rely on proactive density-based control and stability rules rather than dependence on high toll ceilings to manage demand.

This policy application and associated operational approach for Segment 3S is carried forward into the system and detection descriptions in Section 4.3, 4.3.2 and 4.4.

4.3 Description of the Proposed System

The proposed project will increase capacity and improve traffic operations at the existing interchanges and cross streets and enhance the managed lanes along SR 9/I-95 from the Miami-Dade/Broward County Line to north of Griffin Road. The SR 9/I-95 project corridor is approximately 6.5 miles in Broward County, Florida. There are two diamond interchanges planned within the project limits; SR 818/Griffin Road and SR 822/ Sheridan Street. SR 848/Stirling Road is proposed as a DDI interchange. There are two direct exits proposed; in the northbound express lanes to Sheridan Street, and the other in the southbound express lane to Ives Dairy Road. Also, a direct ingress will be provided to the northbound express lanes from Ives Dairy Road. The project will also address social demands, economic development, and modal inter-relationships.

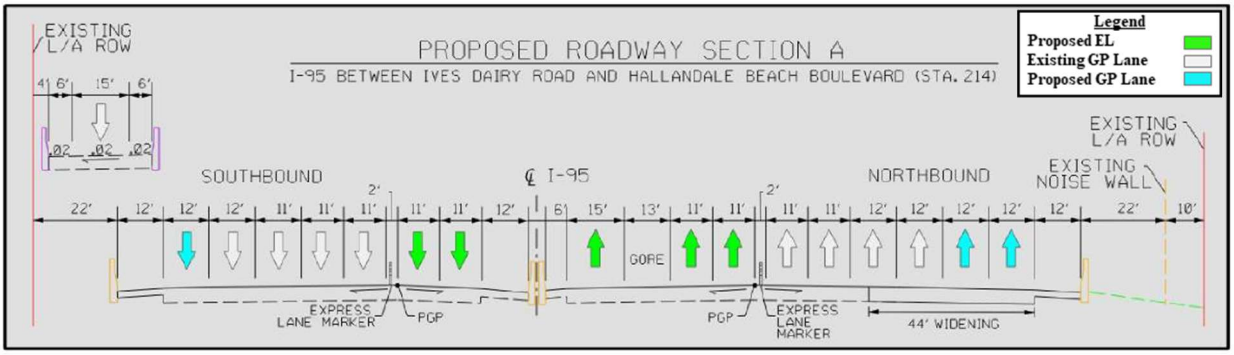


Figure 9: I-95 Roadway Section A – between County Line and Hallandale Beach Blvd

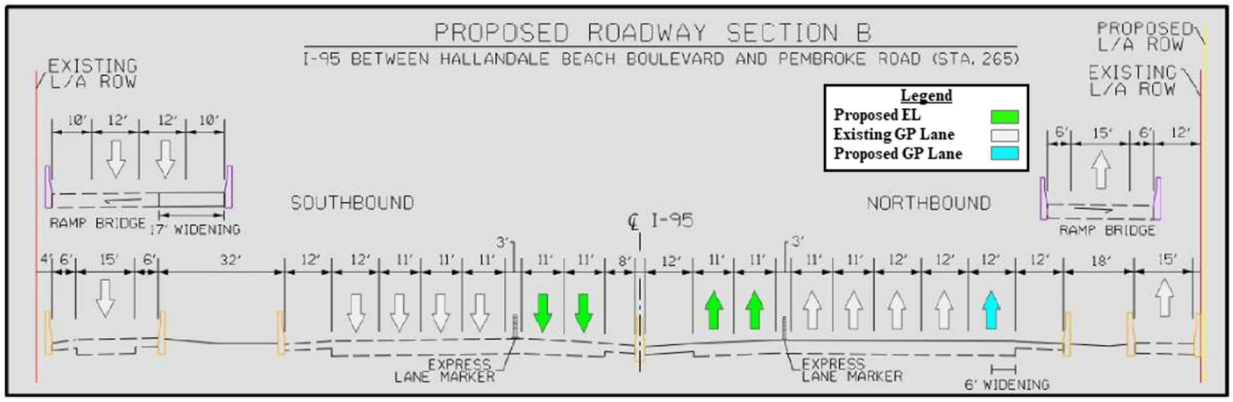


Figure 10: I-95 Roadway Section B – Between Hallandale Beach Blvd and Pembroke Road

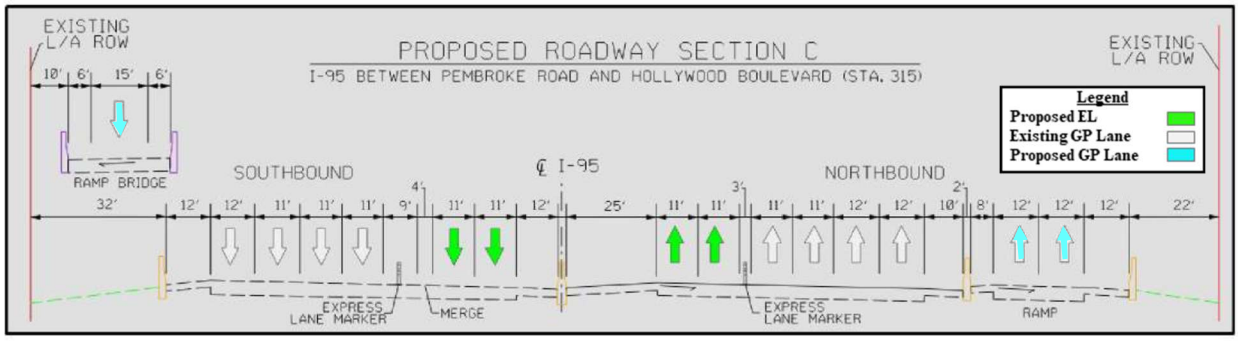


Figure 11: I-95 Roadway Section C - between Pembroke Road and Hollywood Blvd.

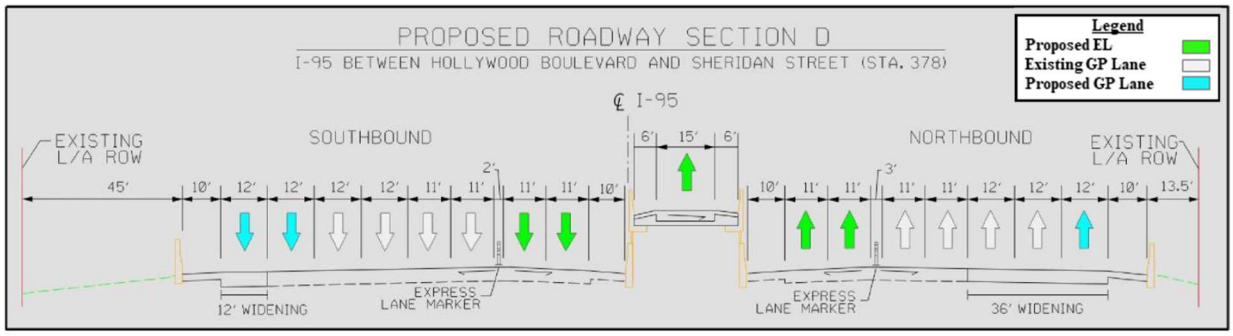
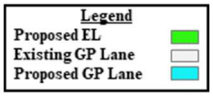


Figure 12: I-95 Roadway Section D – between Hollywood Blvd and Sheridan Street



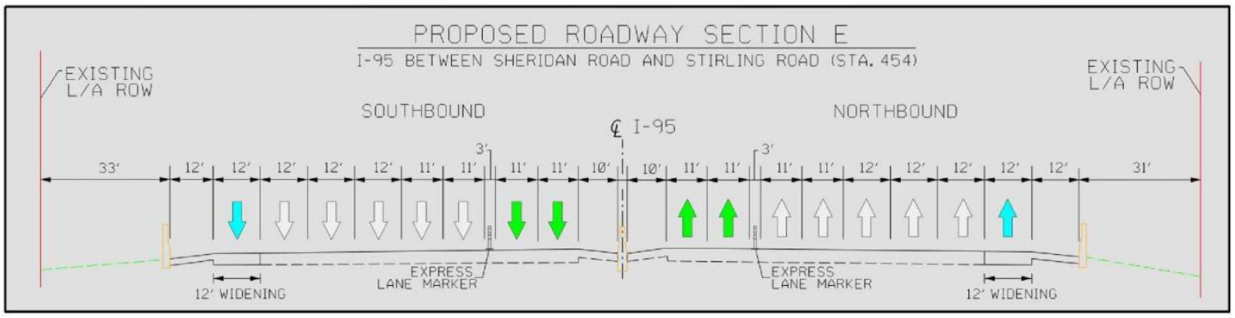


Figure 13: I-95 Roadway Section E – between Sheridan Street and Stirling Road

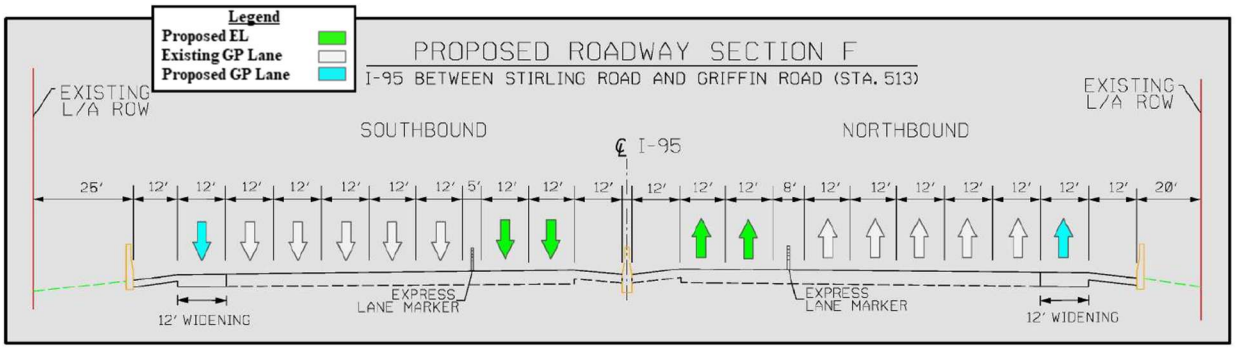


Figure 14: I-95 Roadway Section F – Between Stirling Road and Griffin Road

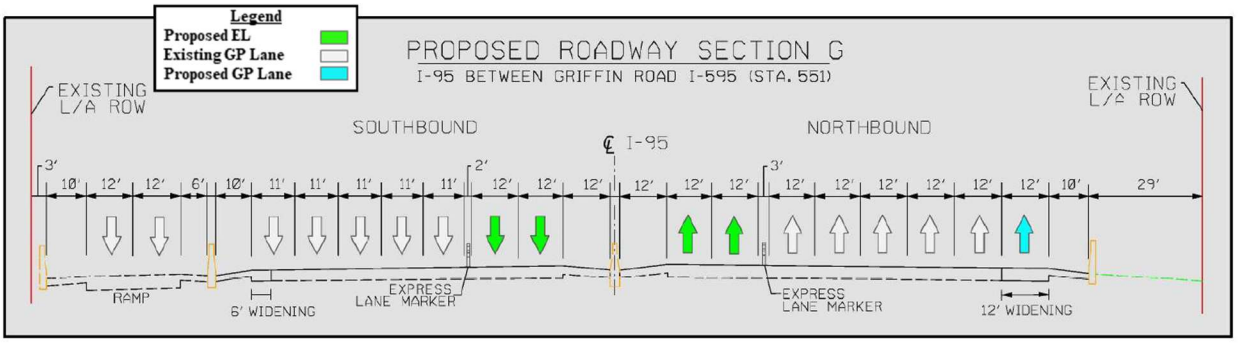


Figure 15: I-95 Roadway Section G – North of Griffin Road

In addition to the physical geometric improvements, the I-95 project will also include the following additional ITS/Toll system components:

- Dynamic Message Signs System
- Vehicle Detection System
- Closed-Circuit Television Cameras System
- Travel Time Detection System
- Ramp Signal System

- License Plate Reader or Transponder Technology for access to, and enforcement of, Transitway connector ramps.
- Statewide Express Lanes Software (SELS)
- Electronic Toll Collection System (Gantries and Back Office)
- C-V2X devices (Future Needs based upon accommodating CAV)
- Wrong Way Driving (WWD) System
- Warning Gate System (WGS)

The Electronic Toll Collection System includes both the toll gantries and back office operations. This FTE ETC system is deployed statewide and consists of All-Electronic Tolling (AET) lanes and Automatic Vehicle Identification (AVI) transponders. The AET will be deployed for all express lanes.

- Toll Sites - The AET toll sites will be equipped with detectors, CCTV, and transponder readers. The data collected from the gantries will be used to assess tolls through the FTE back office operations. Express Lanes are SunPass only. Vehicles without a valid SunPass are violators.
- Back Office Operations – The FTE will use the existing back office operations to process toll collections, account management, and customer service support. The customer service representatives will have access to express lanes operations data to assist with fielding questions from customers regarding the tolls charged. FTE will also use a trip building software application to determine the total toll to charge motorists.

A high-level graphical overview of the systems is depicted in Figure 16 and key components are described in the following subsections. The FDOT District Four SunGuide® RTMC utilizes the Statewide Express Lane Software (SELS), which will also be used for these Express Lanes. The RTMC has the TADMS and LSDMS controls through SunGuide® Software. The SELS application interfaces with SunGuide® Software to obtain detector data and event information related to express lanes operations. The SELS will send the final toll amounts by segment and trip to the FTE. For Segment 3S, SELS will calculate the posted Segment 3S toll rate based on the Segment 3S conditions assigned within SELS and will transmit the resulting toll value to SunGuide® for posting on TADMS and for distribution to supporting tolling/back-office functions. For this specific Segment 3S use case, the Project may propose a targeted enhancement that makes MVDS located within the benefit section between the Segment 4S egress and Segment 3S ingress available as performance feedback to support earlier operational awareness, without changing toll segment definitions or assigned toll segment lengths in SELS.

The SELS will provide a web service to allow FTE customer service representatives access to toll operation data, incident information, and TADMS/LSDMS messages regarding the Express Lanes operations.

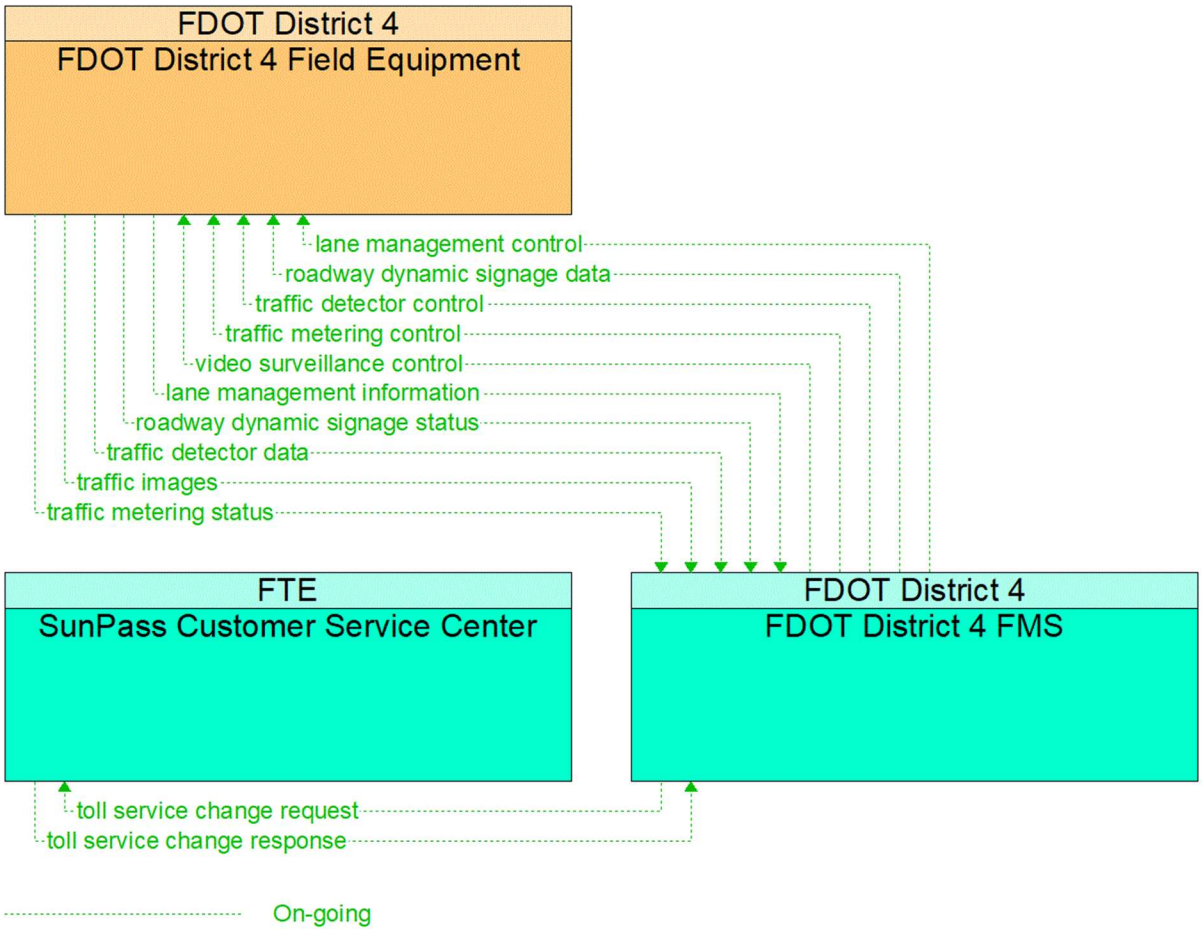


Figure 16: I-95 Express Lanes System Overview

4.3.1 Dynamic Message Sign Systems

The I-95 project will utilize DMS in two functional areas as described below (HDSM and ADMS). All DMS will be full color, allowing for the posting of regulatory messages to support enforcement of the Express Lanes during facility closures.

New DMS and ADMS to accommodate improved lanes will be designed and provided in concept plans and exhibits provided in the ConOps **in the next stages of the project.**

4.3.1.1 Motorists Information

The D4 RTMC Operators will use the DMS to inform motorists with event information that may impact the motorists' decision to divert in or out of the Express Lanes. They will also be used

for travel times, vehicle alerts, safety messages, construction, and other messages approved by the FDOT in accordance with District Four's RTMC standard operating procedures.

- **Highway DMS (HDMS)** – The HDMS will be placed in general use lanes prior to each ingress location into the Express Lanes and in the Express Lanes prior to each egress location out of the Express Lanes. The HDMS will be controlled by the SunGuide® Software as the HDMS messages will be generated by the SunGuide® Software and associated with specific events created in SunGuide® Software.
- **Arterial DMS (ADMS)** – Figure 17 provides the typical concept for ADMS signage. The ADMS is typically placed on arterial approaches to I-95 for General Use Lane entrance ramps that enter prior to an express lanes ingress locations, but after the HDMS identified for the express lanes entrance locations. This will ensure all motorists can receive event information regarding the express lanes prior to entering. The need for ADMS will be based upon where HDMS exist, where express lanes entrance locations exist, and where on-ramps to I-95 exist. The ADMS needs for the project should be identified during the development of the procurement documentation.

  Existing ADMS Sites are found:

  - EB Griffin Road West of Anglers Ave
  - WB Stirling Road at S Compass Way
  - EB Stirling Road west of Tri-Rail
  - WB Sheridan Steet East of N 26th Ave
  - EB Sheridan Street at Tri-Rail Overpass
  - WB Hollywood Blvd East of S 28th Ave
  - EB Hollywood Blvd East of S Park Rd
  - WB Pembroke Road at S 27th Ave
  - WB Hallandale Beach Blvd at NW 9th Terrace
  - EB Hallandale Beach Blvd near Hammock Lane

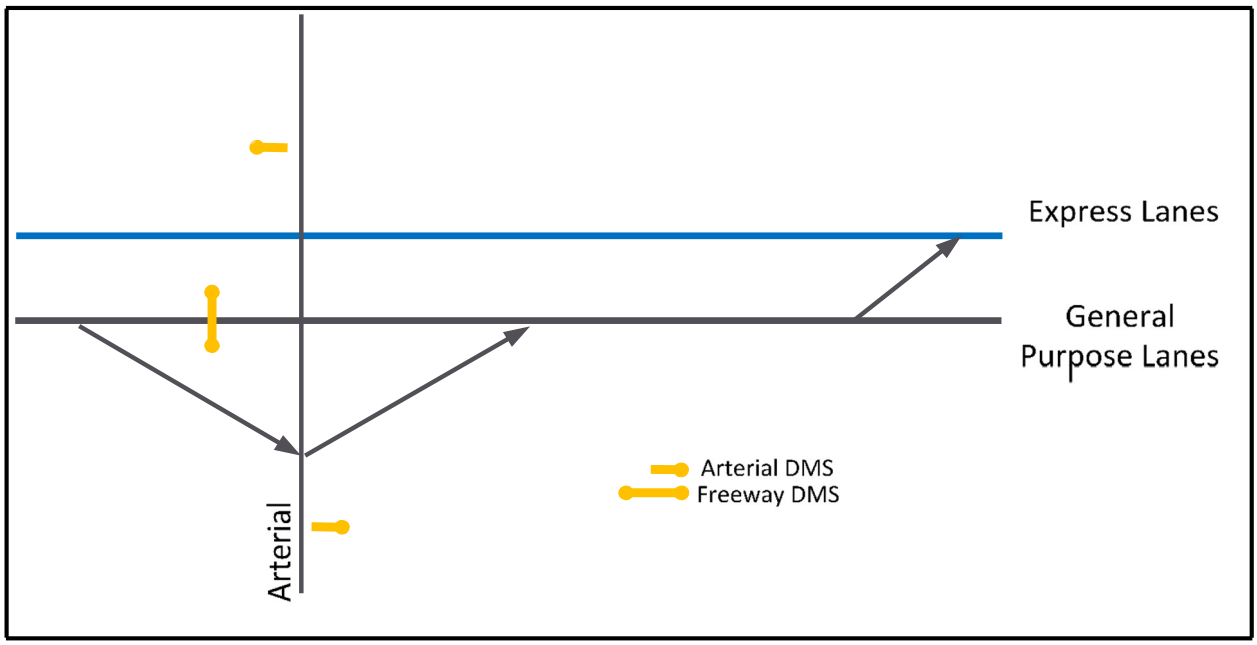


Figure 17: Arterial DMS Concept

4.3.1.2 Toll Operations

- **Toll Amount DMS (TADMS)** – The TADMS are attached to static signs containing the Express Lanes destinations. The static signs containing the TADMS are referred to as Toll Amount Signs. The TADMS display the toll amounts for each destination and are controlled by the SELS. In addition to the toll amounts, they should be able to display "OPEN" and "CLOSED". They should be designed to provide a high degree of reliability and availability. Each express lanes entrance will have two Toll Amount Signs; one located before and one located after the ½ Mile Express Lanes Entrance sign.
- **Lane Status DMS (LSDMS)** – The LSDMS are attached to static guide signs for the Express Lanes entrance. They typically display the status of the I-95 Express Lane's operational status, such as "OPEN", "CLOSED", or "CONGESTED". The LSDMS will be controlled by the SELS. The "CONGESTED" messages are displayed when express lanes performance drops below the target of an average speed of 45 miles per hour. They should be designed to provide a high degree of reliability and availability. Each express lanes entrance will have three LSDMS attached to the three express lanes entrance ramp guide signs typically at the 1-mile, ½-mile, and at the Express Lanes entrance ramp.

4.3.2 Microwave Vehicle Detection System

The MVDS will collect real-time traffic volumes, speeds, and occupancy data. The raw detector data will be processed to reduce erroneous data from the data set before it is fed into the dynamic pricing algorithm for calculating tolls. The MVDS will be integrated into the RTMC SunGuide®

Software for collecting and storing the raw data. This data will also be used by the RTMC Operators to detect incidents and can be used to post travel times. The MVDS in the Express Lanes requires a higher level of accuracy and reliability as they play a critical part of determining tolls to be charged. The accuracy of the detectors should be 95% for speed, volume, and occupancy over any given 15-minute period for both free flowing and congested conditions. When detectors are not providing the required level of accuracy, then they will be removed from the data fed into the dynamic pricing algorithm.

For the express lane, MVDS within each segment will include no fewer than five (5) detector stations, including one (1) near the beginning of the segment, one (1) near the end of the segment, and three (3) intermediate locations equally spaced at 1/4 mile (minimum) intervals to account for the recommended 1 mile minimum segment length. Where Segment 3S geometry and length limit strict adherence to this nominal spacing, detection coverage will be distributed evenly among four (4) detector "stations," including one (1) near the beginning of Segment 3S, one (1) near the end of Segment 3S, and three (3) intermediate locations spaced evenly at ¼ mile.

For Segment 3S, MVDS coverage will continue to support observation of Express Lane operating conditions used for density-based dynamic pricing consistent with 95X SELS practice. For this specific Segment 3S use case, the Project may implement a targeted enhancement whereby MVDS equipment located withing the benefit section between the Segment 4S egress and the Segment 3S ingress is made available as an early performance feedback indicator. This benefit-section data would provide earlier visibility into whether the Express Lanes are delivering the intended operational benefit immediately prior to the Segment 3S ingress, supporting proactive adjustments intended to prevent breakdown conditions from forming within Segment 3S.

This proposed use of benefit-section MVDS data is not intended to treat the benefit-section as a toll segment, incorporate Segment 4S demand into Segment 3S toll calculations, or modify how Segment 3S length is assigned in SELS (which remains ingress-to-egress). Instead, the Project proposes to assign the benefit-section MVDS to the tolling algorithm in SELS to optimize toll calculations for the non-standard segment length of 3S. Accordingly, use of benefit-section MVDS for performance feedback does no change Segment 3S's toll segment length classification or the applicable maximum toll framework for Segment 3S.

SELS will use traffic detector inputs to support density-based dynamic pricing, including the computation of traffic density values used by the configured LOS and Delta-Density tables. When detector data is unavailable, SELS will temporarily implement rates from a TOD table until detector operation is restored, at which point SELS reverts to dynamic pricing.

4.3.3 CCTV Camera System

The CCTVs will be integrated into the existing CCTV control software used by the RTMC. The RTMC Operators will use the CCTV to quickly detect, verify, and monitor incidents in both the Express Lanes and General Use Lanes. The dedicated verification CCTV will also be used by the RTMC Operators to confirm the messages/toll amounts posted on DMS. The CCTV should be

designed to provide 100% coverage of the Express Lanes and General Use Lanes along I-95 from Miami-Dade County line to Griffin Road along the General Use lanes and the Express connection ramps, emergency access points, staging areas, accident investigation sites, and the ramps with Ramp Signals. The CCTV will be used to monitor and to determine when there is spillback onto the arterials, as well as monitoring the operation of the ramp signal heads.

4.3.4 Tolling Gantries

Toll gantries will be utilized for toll collection and enforcement purposes within each segment of the express lanes. Using the AVI equipment in this way will ensure that the correct tolls will be assessed for vehicles within the express lanes by reducing the amount of time between when a vehicle sees a specified price and when the vehicle is identified as having entered each segment. The current configuration shows a gantry along SR 874. For operational purposes, gantries will be located as close as possible to the entry location of vehicles entering the express lanes or at the beginning of tolling segments. The proposed gantry locations can be found in Figure 7 & Figure 8.

4.3.5 Other Traffic Management Systems

4.3.5.1 Ramp Signal Systems

RSS will be included for I-95 project. The RSS will be operated during the peak periods from the MAXVIEW software. The RSS may also be used during other times to support incident management efforts along the I-95 General Use Lanes. The existing RSS operating procedures will be evaluated and enhanced as needed to serve the I-95 Express Lanes South project.

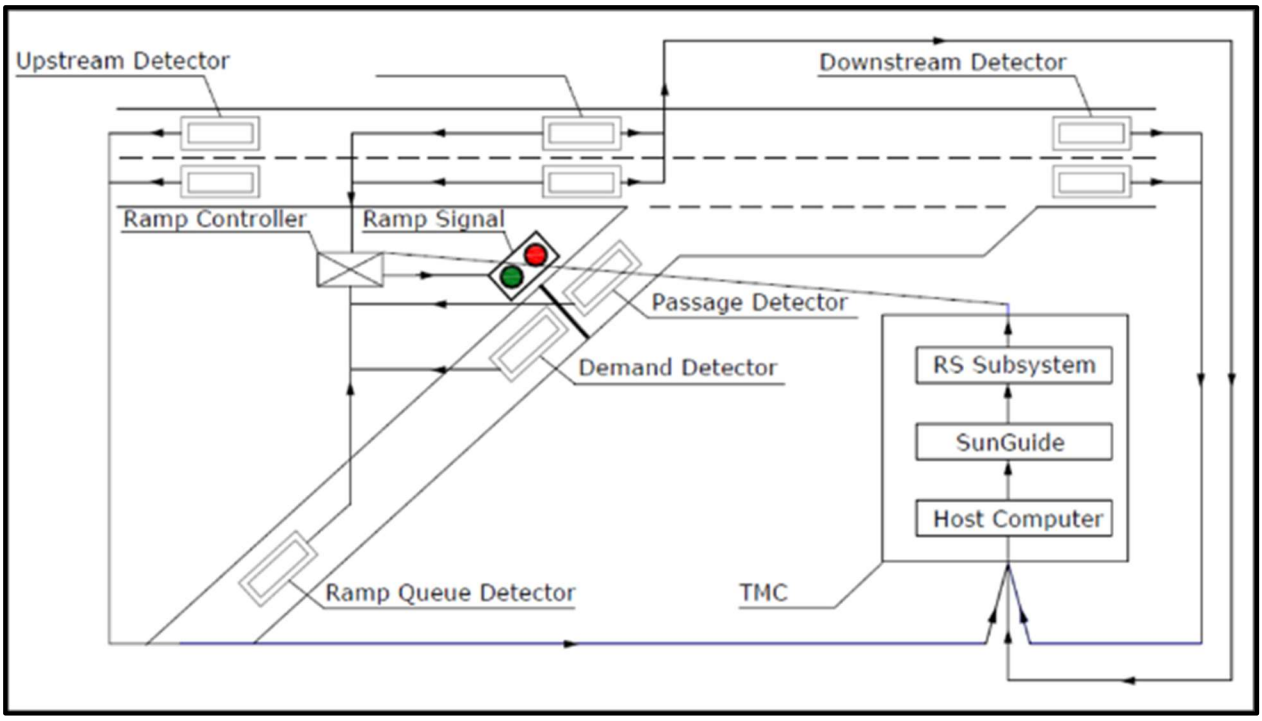


Figure 18: Ramp Signal System Components

The RTMC has established operating procedures for the I-95 RSS that can be applied to this project (e.g., establishing the minimum and maximum rates). It is anticipated that resources above and beyond the day-to-day operations will be needed during the first six months of the project. These resources include field staff to observe operations, additional law enforcement to ensure compliance, and engineers to monitor/establish/evaluate the system operating parameters. An analysis will need to be conducted to identify any potential concerns that should be addressed as the operational procedures are developed. In the future, the RSS may be controlled and operated by SunGuide® as depicted in Figure 18.

The first potential geometric characteristic is the acceleration distance. The acceleration distance plays a key role in the operational procedures because it identifies the mainline speeds that the ramp signals can safely operate.

Another geometric concern for operational strategies is queue storage of the ramps. One of the goals of the RSS is to NOT have ramp queues backing onto the arterials and impacting arterial operations. Therefore, if the ramp demand significantly exceeds the capacity of the ramp signal operational strategy, there is a potential for queue spillback onto the arterials. Three general types of ramp signal strategies include:

- One Vehicle per Green Metering (Single-Lane): It permits vehicles to enter the freeway one-by-one, as vehicles approach the signal. One vehicle per green metering has a capacity of 900 vehicles per hour (VPH).

- Multiple Vehicles per Green Metering (Single-Lane): This approach allows two or more vehicles to enter the freeway facility per green cycle. The multiple vehicles per green approach can produce a capacity of 1200 VPH.

- Tandem (Dual-Lane): It permits two vehicles to enter the freeway facility per cycle with dual-lane ramps. The vehicles in each lane are released in a staggered fashion. Tandem metering may be combined with multiple vehicles per green in some locations where demand is extremely heavy. The tandem strategy can produce a capacity of 1700 VPH.

4.3.5.2 Wrong Way Driving (WWD) Systems

Wrong way driving systems planned during concept design will be discussed in future submittals.

4.3.5.3 Warning Gate Systems (WGS)

Warning gate systems should be considered to automatically close the direct express ramp exit ramps in the event of a crash within the exit ramp. These locations would effectively close the northbound express lane exit to Sheridan Street and the southbound exit ramp to Ives Dairy Road. The gates will incrementally open at varying lengths, mounted on the inside barrier wall, and direct traffic back into the through express lanes. The ability to remotely close the exit ramps will reduce the congestion event and reduce the number of vehicles stuck on the exit ramp. This system will reduce the delay for motorists and reduce the time for crash clearance by emergency personnel. These systems also can be used during maintenance or repair work and will reduce the duties of road rangers on these specific facilities.

The design of the WGS must be considered during the early stages of the roadway design as specific barrier wall widths and structural considerations are necessary to accommodate the WGS. A maintenance area may be needed behind the barrier wall that would require a median space for maintenance staff. Also, the speed of the roadway section and motorists sight distance factors into the number of warning gates required, the length of the gates, and the spacing required.

Additional design considerations include adequate signage to alert motorists that the WGS is activated remotely from the RTMC and a physical barrier is needed (concrete barrier wall or flexible delineator) to effectively block traffic from entering the exit ramp behind the warning gates. See typical details below in Figure 19: Typical Warning Gate System – Express Lane Egress.

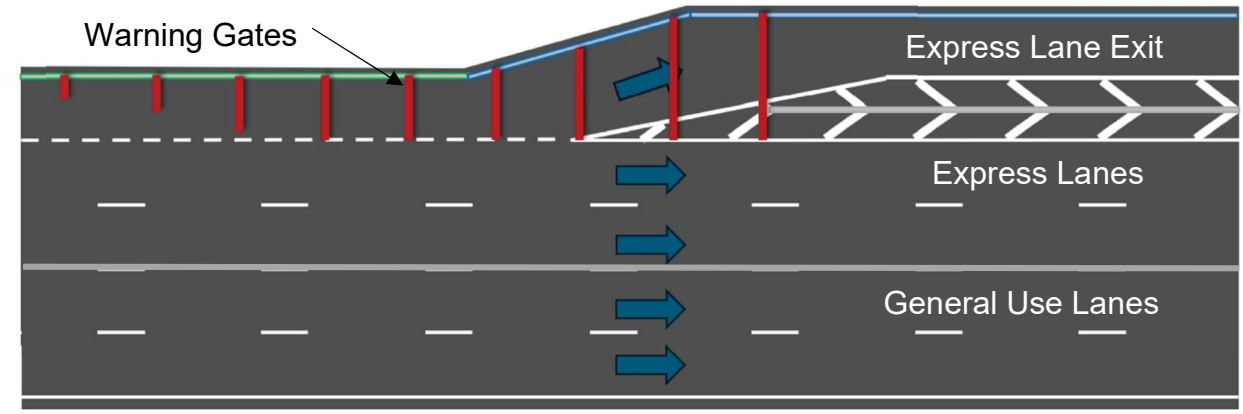


Figure 19: Typical Warning Gate System – Express Lane Egress

4.4 Modes of Operation

Standard operation of the project will match the current express lane operations in daily normal use.

Currently the southbound express lanes egress point only allows a general exit to Ives Dairy Road requiring multi-lane merging. The new southbound direct exit lane allows a direct exit to Ives Dairy Road reducing the merging conflicts in traffic. The new direct exit in the northbound direction occurs farther north of the existing express lane egress point which will not have any impact on existing express lane access.

The EL module contained in the SELS is the primary operator interface for EL operators and controls the distribution of calculated toll amounts to the Turnpike and DMSs in the field. The software will recommend toll amounts to the EL operator, who will then acknowledge the recommendations and subsequently confirm that the approved toll amounts have been used and posted correctly on the TADMSs. The EL operator will also confirm that the LSDMS are displaying the correct messages.

It is recognized that Segment 3S remains subject to the practical maximum toll framework historically applied to short toll segments, and that toll ceilings alone may not be sufficient to control demand under certain conditions. Therefore, reliable Segment 3S operations are achieved through proactive, stable density-based toll adjustments and adherence to established business rules intended to prevent breakdown, rather than reliance on maximum toll escalation after congestion has formed.

4.4.1 Incident Management Concepts

Incident management will play a critical role in ensuring the I-95 project provides a reliable trip option to motorists. A comprehensive Incident Management Plan will be developed prior to

opening the Express Lanes that will identify and document quick clearance policies, staging/accident investigation areas, and additional resources. The Incident Management Plan will utilize the existing procedures established for the I-95 project, where applicable. The Incident Management Plan should be developed to achieve the following incident management performance targets:

- Incident Verification (Event Creation to Event Confirmation) < one minute
- Severe Incident Response (Road Rangers/ SIRV Notification to Road Rangers/ SIRV Arrival) < five minutes
- Travel Lane Blocking Duration (First Travel Blockage to All Travel Lanes Open) < twenty (20) minutes
- Facility Closed due to Non-Recurring Events < three percent of the time

Additional consideration should be made during design to utilize automated warning gates to close direct express lane exit ramps if possible to prevent traffic from entering the single lane exits during a crash that will cause a substantial traffic delay.

The following incident management concepts were developed for the I-95 project ConOps. The concepts presented herein to support incident management focus on Emergency Access, Staging/Investigation Areas, Incident Response Resources, and Emergency Stopping Sites (ESS).

4.4.2 Emergency Access

Emergency access along I-95 will be continuous because the Express Lanes will be separated from the General Use Lanes with Express Lane Markers (ELM). Emergency access for southbound express lanes is from Griffin Road with a direct exit from the southbound express lanes to Ives Dairy Road. The northbound express lane ingress point is just north of Ives Dairy Road to an egress point near Hollywood Blvd to allow for general exits to Sheridan Street and north to Griffin Road. Emergency access will be limited on the single lane flyovers created by the direct connector ramps. Close coordination with the D4 RTMC, FHP, and other local first responder agencies will be critical for emergency access when responding to incidents along the direct connector ramps.

Access to the northbound direct express ramp to Sheridan will occur at Ives Dairy Road with an egress to the express lanes before Hallandale Beach Blvd. Access to the southbound direct express ramp to Ives Dairy Road will occur at Sheridan Street with a southbound ingress point near Hollywood Blvd.

4.4.3 Staging and Investigation Areas

The staging areas are strategic locations along the corridor that will allow incident responders quick, safe access to the Express Lanes. They are located at both ends of the I-95 Project, as well as at interim locations upstream of heavy demand sections of the corridor. Staging areas can be located at interchange on-ramps immediately upstream of express lanes entrance ramps, toll gantry building sites, or investigation areas. If located at toll gantry building sites, additional pavement

area would need to be provided in order to still allow maintenance access to the toll gantry building while staging occurred.

The investigation areas will be used by FHP and other responders to work events once they have been removed from the travel and shoulder lanes of the Express Lanes. The investigation areas can be located at interchange off-ramps or toll gantry building locations within the Express Lanes. Investigation areas should provide a safe, paved work area to accommodate multiple vehicles and tow trucks (approximately 100 feet by 20 feet). See Figure 20 for more details of these proposed locations.

In order to ensure a safe environment, it is critical that the staging and investigation areas are protected and well-lit for the emergency responders that will utilize the area. In addition, dedicated signing to ensure the area is utilized by Authorized Personnel only, will help to maintain that safe environment for all users of the facility. Close coordination with the FDOT District Six SunGuide® TMC should occur when any staging or investigation area is being used or expected to be used.

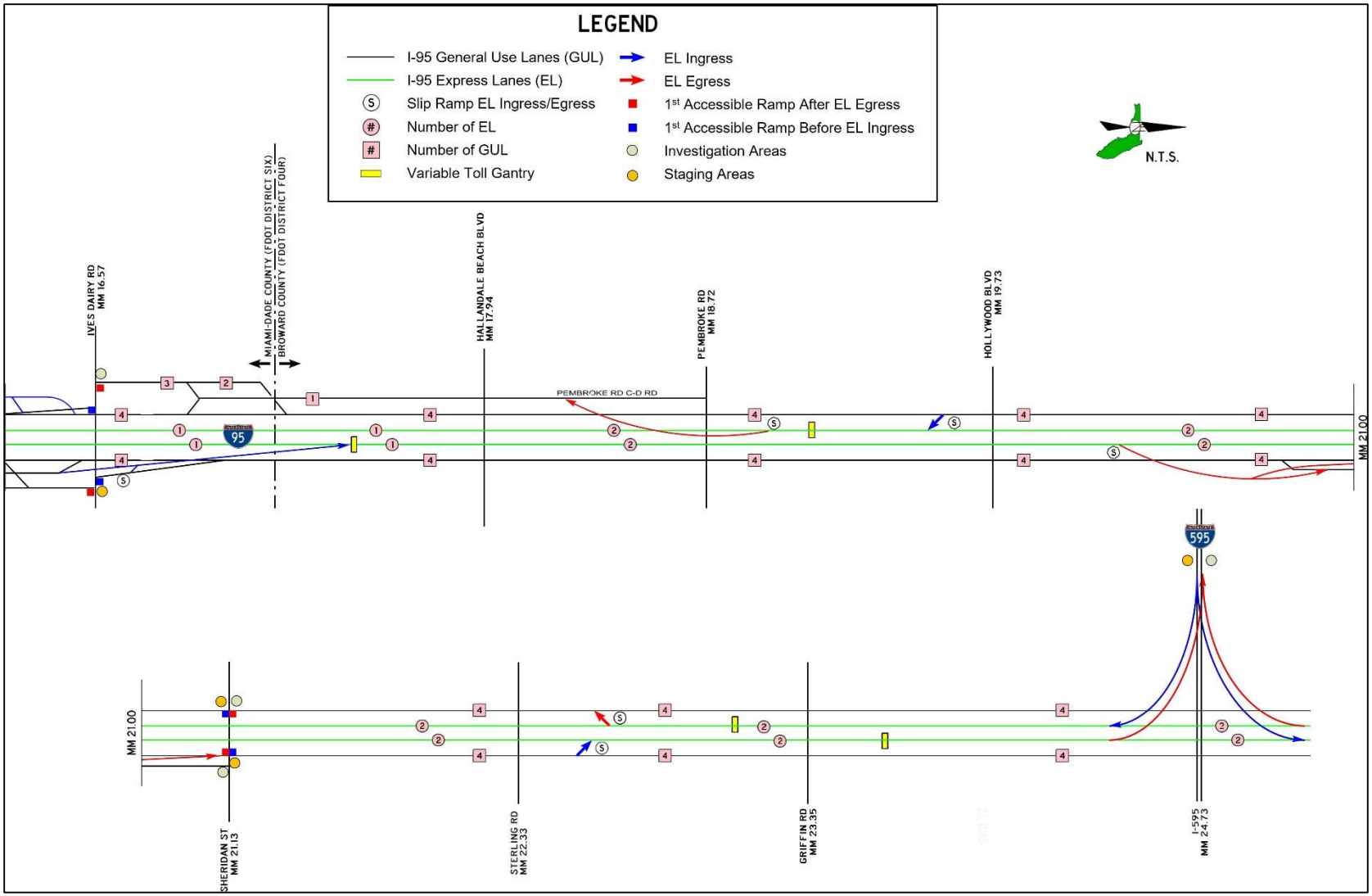


Figure 20: Staging and Investigation Areas

4.4.4 Toll Signing Scheme

The I-95 project corridor spans approximately 6.5 miles (from Miami-Dade County line to Griffin Road). Because there are existing express lanes facilities on this corridor, there will be crossovers for destination signing between the segments to the North and South of this project.

The proposed destination signing will accommodate the lane assignments as depicted in Figure 7 & Figure 8 for the I-95 project and adjoining segments. The destination signing concept shows Ives Dairy Road as the last destination in the Southbound direction, and I-595/ Broward Blvd as last destinations in the Northbound direction. The northbound ingress near Pembroke Park with a NB egress location near Hollywood Blvd is combined as destinations for Sheridan Street, Stirling Road and Griffin Road and will be priced accordingly. An additional northbound ingress point exists near Striling Road. In the south bound direction, express lane ingress occurs near Griffin Road and Hollywood Blvd with southbound egress near Pembroke Park to exit to Ives Dairy Road.

Additional tolling signage will be required to accommodate the direct express lane exit ramps north of Pembroke Road for southbound exits to Ives Dairy Road. An additional northbound exit ramp will be provided to Sheridan Street requiring additional signage near Hollywood Blvd.

Additional collector-distributor roads (CD) will be provided in the northbound and southbound lanes from Hallandale Beach Blvd to Hollywood Blvd. These CD roads will reduce the congestion currently caused by exiting vehicles and provide additional storage lengths for exiting vehicles.

The southbound direct exit from I-95 to Ives Dairy Road will need additional signage to direct traffic from the express lane ramp to Ives Dairy Road or to remain on I-95.

4.4.5 Trip Building

The Project will be operated using a Trip-Based tolling strategy. FTE will be responsible for the account management functions that will assess tolls, which includes the toll assessment calculations. To assess trip tolls, FTE will follow a Trip Building process that consists of determining if a vehicle completed a defined Trip by combining vehicle transactions at a sequential set of segments beginning with the Trip's First Segment and verifying that the vehicle traveled consecutive segments of a trip within a configurable interval (Segment Travel Time Limit). The segments are combined to define trips, which are displayed at the entrance of the Express Lanes. A toll amount will be calculated for each segment based on the traffic density in that segment. The trip tolls will be a summation of the segment tolls traveled for a specific trip. For example, the trip toll for traveling Southbound on I-95 from the Griffin Road on-ramp to the Ives Dairy Road off-ramp, will be the summation of two segment tolls. For this example, the FTE will read the transponders of motorists that passed through a toll gantry near Striling Road in one segment and a toll gantry north of Pembroke Road and those motorists will be charged the effective trip toll

based on the toll assessment calculation (See Toll Assessment Calculations section below) to their SunPass® account.

The toll assessment will provide a Trip Toll benefit by locking in the Trip Toll when the motorists first enters the Express Lanes along the project corridor. The current policies/procedures for I-95 regarding tolling will be as follows:

- TADMS/LSDMS failures,
- Vehicle Detector System failures,
- Retroactive Adjustments and Overrides,
- Data exchange with FTE,
- Use of operating modes,
- Maximum Trip Tolls,
- Trip Configuration, and
- Time-based relationships among tolls posted and when tolls are effective (charged).

A key component of implementation of this new trip building system will be maintaining operations of the express lanes along the corridor during construction. Incorporation of trip building in FTE's Back Office, toll rate signing, express lanes access, etc. are all critical components to be included in the development of a continuity plan, which should be developed in close coordination with FTE.

4.4.6 Toll Assessment Calculations

Once it has been established that a valid Trip was completed by a vehicle, the Toll Assessment will compare the sum of the segment tolls included in the trip to the Maximum Trip Toll determined by the Trip Building process. If the sum of the included segment tolls is greater than the Maximum Trip Toll, the Maximum Trip Toll (lower value) will be used instead of the sum of the included segment tolls.

Since the effective time of a toll in any segment is a combination of the time at which the toll change was first sent to the Toll Amount DMS and transit times associated with the Toll Amount DMS on which it is displayed, the Segment Tolls for segments included in a Trip will often become effective at different times. This means that the Maximum Trip Tolls will not always be equal to the sum of current effective tolls, even if the trip is synchronized (all segment updates submitted at the same time). If a simple sum of the effective tolls for each segment were used, there could be times when the actual Maximum Trip Toll could be higher than that shown to drivers (e.g. when a downstream segment has an increasing toll and a shorter transit time than the First Segment) which would violate the business rule of not charging more than what is displayed on the Toll Amount DMS. As this project is further developed, a key component will be the coordination with FTE to ensure their back-office system is reconfigured to accommodate the new trips, and that the OTM and SELS are reconfigured with the new access locations.

4.5 User Involvement and Interaction

The I-95 project operations and maintenance will be a multi-agency effort among the FDOT District Four, FDOT District Six, FTE, FHP, Local Fire Rescue, and Broward County Public Works. This section highlights the responsibilities of the partnering agencies.

4.5.1 FDOT District Four SunGuide® RTMC

The FDOT District Four SunGuide® RTMC will be responsible for operating the Express Lanes from I-95 in this section in both directions. Also, the RTMC will be responsible for operating the Express Lanes along the direct connector ramps to I-95. Toll Amount DMS/Lane Status DMS will be on the RTMC network. The RTMC Operators will monitor traffic conditions in the Express Lanes and post toll amounts via the SELS. The vehicle detectors will be used to monitor traffic conditions, toll setting and reporting by the RTMC. The dedicated CCTV for the RTMC controlled Toll Amount DMS and Lane Status DMS will be on the RTMC network and will be used by the RTMC to confirm the messages posted. The CCTV and Motorist Information DMS in Broward County along the Express Lanes and General Use Lanes will be on the RTMC network for incident management.

The RTMC will be responsible for the maintenance of ITS devices within the project limits. They will also be responsible for maintaining the power service and communications conduit for all devices along I-95. There will be no change from their current responsibilities.

The RTMC will be responsible for incident management within the Express Lanes and General Use Lanes along I-95. This includes incident detection, dispatching resources (Road Rangers, SIRV and RISC), agency notifications and posting messages on Motorists Information DMS.

The RTMC will be responsible for the performance reporting of the General Use and Express Lanes.

4.5.2 FDOT District Six Maintenance

The FDOT District Six Maintenance will be responsible for the ITS devices located in Broward County along I-95 in the southbound direction in advance of Segment 2S, which District Six is responsible for tolling. There will be no change from their current responsibilities.

4.5.3 FTE

FTE will handle account management of the SunPass® accounts, which includes all back office functions. Back office functions include developing and maintaining the trip reconstruction software and any interface software developed to receive the tolls set by the District. The FTE will also share data required to support the express lanes reporting requirements. The FTE Customer Service Representatives will handle all initial account inquiries and will be supported by FDOT

District Four SunGuide® RTMC to address any toll disputes, respectively. FTE will also be responsible for the ETC equipment on the toll gantries, the toll buildings, and the equipment inside the toll buildings.

4.5.4 FHP

FHP will be responsible for providing field enforcement of the Express Lanes and Ramp Signaling, as well as incident management support. These additional Troopers will be provided through existing, or new, FHP Hire-Back contracts managed by FDOT District Four.

4.5.5 Local Fire Rescue

The fire rescue agencies will continue to provide emergency services for incidents along the project corridor. These agencies will have to revisit their existing mutual aid agreements for responding to incidents near their respective jurisdictional boundaries. They include:

- Broward County Fire Rescue

4.5.6 Broward County Public Works

Broward County Public Works is responsible for the operation and maintenance of arterial traffic signals along the project corridor. Broward County's Traffic Engineering Division is co-located with the FDOT D4 RTMC in Fort Lauderdale. The arterial operations will be impacted by the ramp signal operations and close coordination among the FDOT District Four SunGuide® RTMC and Broward County Traffic Engineering Division will play a critical role in the success of the ramp signaling operations. The FDOT District Four SunGuide® RTMC will produce and distribute weekly Ramp Signaling reports. These weekly reports identify the operational periods for each ramp signal, release rates, and the observed ramp queuing from ramp signal operations. This provides valuable information to Broward County for any signal timing adjustments needed to improve traffic flow along the arterials.

Table 6 is a matrix that includes specific responsibilities between the various agencies.

Table 6: Responsibility Matrix (I-95 Express Lanes from Miami-Dade County Line to Griffin Road)

I-95 Express Lanes: FDOT District Four						LEGEND:				
Responsibility Matrix						FDOT District Four (non-Turnpike)				
						Turnpike ®: Limited Design and Shop Drawing Review by Turnpike				
						(NA): Not Applicable				
				Submittal Reviews		Construction/ Implementation/ Testing	Maintenance		RCI/Pontis/ Asset Mgmt	
Element	Description	Ownership	Design Delivery	Design Plans	Shop Drawings		Program District	Perform		Notes
Express Lanes (EL) Performance Reporting	Performance and accuracy statistics for speeds, incidents, ITS equipment performance, etc.	District	NA	NA	NA	NA	District	District	NA	Turnpike Finance will provide the District with monthly revenue and transaction data for performance report preparation, if requested.
Traffic & Revenue Forecasting	Traffic and Revenue (T&R) forecasting of District tolls projects as requested by Central Office and/or the District	Turnpike	Turnpike	NA	NA	NA	Turnpike	Turnpike	NA	Turnpike will manage the preparation of T&R forecasts for the District and/or Central Office, as requested.
Project Systems Engineering Management Plan (PSEMP)	A plan for the implementation of the express lanes project using the Systems Engineering Process (SEP) principles.	District	District and Turnpike	District and Turnpike	NA	NA	District and Turnpike	District and Turnpike	NA	
Project/ Corridor Concept of Operations	A plan for how the express lanes will be operated.	District	District and Turnpike	District and Turnpike	NA	NA	District and Turnpike	District and Turnpike	NA	The Concept of Operations should be consistent with the overall regional plan defined in the Regional Concept of Transportation Operations (RCTP) documentation.
Right of Way	Includes all of the right of way associated with the project	District	District	District	NA	NA	District	District	District	

I-95 Express Lanes: FDOT District Four						LEGEND:				
Responsibility Matrix						FDOT District Four (non-Turnpike)				
						Turnpike ®: Limited Design and Shop Drawing Review by Turnpike				
						(NA): Not Applicable				
				Submittal Reviews		Construction/ Implementation/ Testing	Maintenance		RCI/Pontis/ Asset Mgmt	
Element	Description	Ownership	Design Delivery	Design Plans	Shop Drawings		Program District	Perform		Notes
Utility Permitting	Includes any necessary permits for utilities associated with the toll site (e.g. leased line or power service permits)	NA	District	NA	NA	NA	NA	NA	NA	
Toll Building Permitting	Includes the permitting of the Toll Equipment Building	NA	Turnpike	NA	NA	NA	NA	NA	NA	Turnpike is self-permitting. Permitting completed through Building Code Administrative Services Inc. (BCAS). Coordination through FTE Building Permit Coordinator.
Roadway/ Pavement	Includes resurfacing, patching, pavement marking and other elements within the corridor.	District	District and Turnpike (R)	District and Turnpike (R)	NA	District and Turnpike	District	District	District	Turnpike (R) includes a review of the roadway features surrounding the toll point (100' section) including pavement design.
Bridges	Includes all bridges and bridge components, inclusion in PONTIS, inspection and routine and periodic maintenance.	District	District	District	District	District	District	District	District	

I-95 Express Lanes: FDOT District Four						**LEGEND:**				
Responsibility Matrix						FDOT District Four (non-Turnpike)				
						Turnpike ®: Limited Design and Shop Drawing Review by Turnpike				
						(NA): Not Applicable				
Element	**Description**	**Ownership**	**Design Delivery**	**Submittal Reviews**		**Construction/ Implementation/ Testing**	**Maintenance**		**RCI/Pontis/ Asset Mgmt**	**Notes**
				Design Plans	**Shop Drawings**		**Program District**	**Perform**		
Signing and Pavement Markings	Includes static signs and pavement markings related to the express lanes operations.	District	District and Turnpike (R)	District and Turnpike (R)	District and Turnpike (R)	District	District	District	District	Turnpike (R) includes a limited review of the toll rate signs, SunPass, and other related toll collection messaging, as well as any pavement marking (including express lane markers and rpms) for the express lanes.
DMS/ VMS Signs	Includes DMS/VMS signs related to the express lane operations.	District	District and Turnpike (R)	District and Turnpike (R)	District and Turnpike (R)	District	District	District	District	Turnpike (R) includes review of the toll rate signs, SunPass, and other related toll collection messaging.
Sign Structures	Includes the structure required to hold any signs related to the express lane operations.	District	District	District	District	District	District	District	District	
Adjacent/ Existing Toll Facilities	Includes existing toll facilities and impacts to express lanes operations during construction.	District and Turnpike	District	District and Turnpike (R)	District and Turnpike (R)	District and Turnpike (R)	NA	NA	NA	Turnpike (R) includes a limited review of impacts to the existing express lane facility operations during the new project construction not limited to traffic control plans, changes to the ingress/egress locations, signing, ITS and tolling impacts.

I-95 Express Lanes: FDOT District Four						LEGEND:				
Responsibility Matrix						FDOT District Four (non-Turnpike)				
						Turnpike ®: Limited Design and Shop Drawing Review by Turnpike				
						(NA): Not Applicable				
				Submittal Reviews			Maintenance			
Element	Description	Ownership	Design Delivery	Design Plans	Shop Drawings	Construction/ Implementation/ Testing	Program District	Perform	RCI/Pontis/ Asset Mgmt	Notes
District Fiber Optic Cable (FOC)	Includes the communication back-bone for both the ITS system for traffic operations as well as the communication back-bone for tolls data.	District	District and Turnpike (R)	District and Turnpike (R)	District and Turnpike (R)	District and Turnpike	District	District	District	Turnpike (R) includes review to confirm tolls data connectivity approach and architecture from toll sites to the FTE Tolls Data Center. Optical Time Domain Reflectometer is required as a contract deliverable per FDOT Standard Specifications. Review test documents to ensure acceptable dB losses.
Turnpike (FOC)	Includes the communication back-bone on the Turnpike for Tolls Data. In most District Express Lane Projects, the District will have project network communication connect to the existing Turnpike fiber optic backbone.	Turnpike	Turnpike	NA	NA	Turnpike	NA	Turnpike	Turnpike	Includes review to confirm tolls data connectivity approach and architecture from toll sites to the FTE Tolls Data Center. Optical Time Domain Reflectometer is required when new fiber is installed as a contract deliverable per FDOT Standard Specifications. Review test documents to ensure acceptable dB losses. The District is responsible for identifying all fiber/ buffer allocations on District fiber in ITS FN.

I-95 Express Lanes: FDOT District Four										LEGEND:
Responsibility Matrix										FDOT District Four (non-Turnpike)
										Turnpike ®: Limited Design and Shop Drawing Review by Turnpike
										(NA): Not Applicable
				Submittal Reviews			Maintenance			
Element	Description	Ownership	Design Delivery	Design Plans	Shop Drawings	Construction/ Implementation/ Testing	Program District	Perform	RCI/Pontis/ Asset Mgmt	Notes
Tolls Lateral and Interconnects (FOC)	Includes the lateral drop between the nearest splice vault and the tolls communications cabinet fiber distribution panel (FDP) inside or between toll equipment buildings.	District	District and Turnpike	District and Turnpike	District and Turnpike	District and Turnpike	District	District	District	Review test documents to ensure acceptable dB losses.
Leased Line Telephone Company (Telco)	Includes the site infrastructure (pull boxes and conduit) from the toll equipment building to the nearest splice vault or point of presence.	District and Telco (*)	District, Telco (*) and Turnpike	District, Telco (*) and Turnpike	District, Telco (*) and Turnpike (	District, Telco (*) and Turnpike	District, Telco (*) and Turnpike	District, Telco (*) and Turnpike	District and Telco (*)	Turnpike coordinates with the Telco and communicates need based on forecasted traffic volumes and toll system bandwidth requirements. Telco (*) requires 200 days advanced coordination prior to turning the site over to the toll equipment contractor. This effort includes circuit ordering and equipment installation by Telco. To be included only if leased lines are used.

I-95 Express Lanes: FDOT District Four						LEGEND:				
Responsibility Matrix						FDOT District Four (non-Turnpike)				
						Turnpike ®: Limited Design and Shop Drawing Review by Turnpike				
						(NA): Not Applicable				
				Submittal Reviews		Construction/ Implementation/ Testing	Maintenance		RCI/Pontis/ Asset Mgmt	
Element	Description	Ownership	Design Delivery	Design Plans	Shop Drawings		Program District	Perform		Notes
District Four SunGuide® RTMC to FTE Tolls Data Center Communications Media (for sending toll amount data)	This item is associated with the protocol for communicating tolls amount data from the District to the Turnpike. It not associated with the physical communications media, but the rather the protocol. The Turnpike owns the Interface Control Document. Communications media will be either fiber communications or leased line.	District and Turnpike	District and Turnpike	District and Turnpike	District and Turnpike	NA	District and Turnpike	District and Turnpike	NA	
Tolls WAN Monitoring	Includes monitoring of all of the Toll's WAN electronics (within FTE and District network) and leased line connectivity.	Turnpike	Turnpike	NA	NA	NA	Turnpike	Turnpike	Turnpike	Turnpike will monitor WAN switch for connectivity. Wide Area Communication requires a response as soon as practicable. Performance metrics should be established for response and repair time.

I-95 Express Lanes: FDOT District Four						LEGEND:				
Responsibility Matrix						FDOT District Four (non-Turnpike)				
						Turnpike ®: Limited Design and Shop Drawing Review by Turnpike				
						(NA): Not Applicable				
				Submittal Reviews		Construction/ Implementation/ Testing	Maintenance		RCI/Pontis/ Asset Mgmt	
Element	Description	Ownership	Design Delivery	Design Plans	Shop Drawings		Program District	Perform		Notes
ITS Roadside Equipment	Includes all of the ITS roadside equipment (not including the signs - covered elsewhere in matrix) and system required to identify traffic conditions and monitor vehicle speeds and volumes through the corridor.	District	District	District	District	District	District	District	District	
ITS Roadside Communication	Includes the equipment required to connect the roadside equipment with the ITS building/cabinet equipment.	District	District	District	District	District	District	District	District	
ITS Traffic Management Software	Includes the software required for traffic management as well as calculating the toll amounts.	District	District	District	District	District	District	District	NA	District will test pricing system. The Turnpike and District will jointly perform End to End testing.
ITS Power Service	Includes power services required for equipment use.	District	District	District	District	District	District	District	NA	ITS power **shall not** be combined or shared with the toll equipment building power service.

I-95 Express Lanes: FDOT District Four						LEGEND:				
Responsibility Matrix						FDOT District Four (non-Turnpike)				
						Turnpike ®: Limited Design and Shop Drawing Review by Turnpike				
						(NA): Not Applicable				
				Submittal Reviews		Construction/ Implementation/ Testing	Maintenance		RCI/Pontis/ Asset Mgmt	
Element	Description	Ownership	Design Delivery	Design Plans	Shop Drawings		Program District	Perform		Notes
ITS Cabinet/ Building	Includes the site infrastructure and building or cabinet required to house the ITS equipment and/or ancillary equipment.	District	District	District and Turnpike	District	District	District	District	District	For Turnpike involvement in submittal review - Should Toll's wide area network (WAN) regeneration be required, then the District ITS cabinet/building shall accommodate the Tolls WAN equipment and electronics.
Toll Site	Locating of tolling site and all the civil/ site infrastructure in, around, and below the gantry, building, maintenance access area, utility constraints, drainage, etc	District	District and Turnpike (R)	District and Turnpike (R)	District and Turnpike (R)	District and Turnpike	District	District	District	Turnpike (R) includes the review of site components for conformance.

I-95 Express Lanes: FDOT District Four						LEGEND:				
Responsibility Matrix						FDOT District Four (non-Turnpike)				
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						(NA): Not Applicable				
				Submittal Reviews		Construction/ Implementation/ Testing	Maintenance		RCI/Pontis/ Asset Mgmt	
Element	Description	Ownership	Design Delivery	Design Plans	Shop Drawings		Program District	Perform		Notes
Toll Gantry	Includes the structure and all associated elements included with the structure required for installing, operating, and testing toll equipment. Includes all ancillary items such as grating, fall protection systems, gear operators, electrical equipment, man lifts, access gates, etc. Excludes toll equipment and associated cables provided by the toll equipment contractor.	District	District and Turnpike (R)	District and Turnpike (R)	District and Turnpike (R)	District and Turnpike	District	District	District	Turnpike (R) includes the review of gantry components for conformance. Turnpike to provide guidance on the appropriate use of accessible and non-accessible gantries. District to notify Turnpike when performing Toll Gantry Structure inspections.

I-95 Express Lanes: FDOT District Four						**LEGEND:**				
Responsibility Matrix						FDOT District Four (non-Turnpike)				
						Turnpike ®: Limited Design and Shop Drawing Review by Turnpike				
						(NA): Not Applicable				
				Submittal Reviews		**Construction/ Implementation/ Testing**	**Maintenance**		**RCI/Pontis/ Asset Mgmt**	
Element	**Description**	**Ownership**	**Design Delivery**	**Design Plans**	**Shop Drawings**		**Program District**	**Perform**		**Notes**
Toll Equipment Building	Includes the toll equipment building and foundation	District	District and Turnpike	District and Turnpike	District and Turnpike	District and Turnpike	District	District	District	Turnpike (R) includes the review of toll equipment building components for conformance. The District will perform maintenance on the Toll Equipment Building. Electrical components within the building will be maintained by the district, but the power Distribution to the building will be maintained by D4. D4 will need to program the maintenance cost for this element. Replacement of building from damage beyond repair or end of service life is the Districts responsibility. D4 is responsible for obtaining/ determining the building. FTE will have the building added to the Turnpikes commercial insurance policy and the District's/Project's portion of the insurance premium is deducted from the toll revenue distribution by Central Office

I-95 Express Lanes: FDOT District Four						LEGEND:				
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						(NA): Not Applicable				
				Submittal Reviews		Construction/ Implementation/ Testing	Maintenance		RCI/Pontis/ Asset Mgmt	
Element	Description	Ownership	Design Delivery	Design Plans	Shop Drawings		Program District	Perform		Notes
Toll Equipment Building (Facility Systems)	Includes the systems required for operation of the toll equipment building. These systems include stand-by-generator, automatic transfer switch (ATS), diesel fuel tank, HVAC, lighting, electrical power up to the UPS, equipment connections to the SCADA system and other required systems.	District	District and Turnpike	District and Turnpike	District and Turnpike	District and Turnpike	District	District	District	Turnpike (R) includes the review of the facility systems for conformance. This does not include gantry or rack-mounted toll equipment provided and installed by the toll equipment contractor, which is covered under "Toll Equipment" in this matrix. D4 is responsible for purchasing all fuel for generators. Replacement of all toll equipment building facility systems due to damage beyond repair and end of service life is D4 responsibility. D4 will need to program the maintenance costs for this element. Fire suppression systems in toll equipment buildings shall be installed by others under a separate contract by the Turnpike.

I-95 Express Lanes: FDOT District Four						LEGEND:				
Responsibility Matrix						FDOT District Four (non-Turnpike)				
						Turnpike ®: Limited Design and Shop Drawing Review by Turnpike				
						(NA): Not Applicable				
				Submittal Reviews			Maintenance			
Element	Description	Ownership	Design Delivery	Design Plans	Shop Drawings	Construction/ Implementation/ Testing	Program District	Perform	RCI/Pontis/ Asset Mgmt	Notes
Toll Equipment Building (Power Service)	Includes power services required by the toll facility.	District	District and Turnpike	District and Turnpike	District and Turnpike	District and Turnpike	District	District	District	Turnpike (R) includes the review of the facility power systems for conformance. The toll equipment building power service shall be dedicated and not shared. Roadway lighting and ITS power shall not be combined or shared with the toll equipment building power service.
Toll Loops	Includes the loop system installed in the tolling area pavement, 50 feet on both sides of the gantry centerline in the express lanes, inside shoulder and adjacent general purpose lane as required by the toll equipment contractor.	District	District and Turnpike	District and Turnpike	NA	District and Turnpike	District	Turnpike	District	The toll equipment contractor shall install these loops in the tolling pavement area in conjunction with the gantry and building mounted toll equipment. The loops are part of the tolling system. The Turnpike will perform an annual inspection of the toll pavement. District will program and pay for maintenance performed by the Turnpike. Turnpike will provide estimates for District programming.

I-95 Express Lanes: FDOT District Four						LEGEND:				
Responsibility Matrix						FDOT District Four (non-Turnpike)				
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						(NA): Not Applicable				
				Submittal Reviews		Construction/ Implementation/ Testing	Maintenance		RCI/Pontis/ Asset Mgmt	
Element	Description	Ownership	Design Delivery	Design Plans	Shop Drawings		Program District	Perform		Notes
Toll Equipment	Includes the gantry/ground/building mounted equipment provided and installed by the toll equipment contractor. Includes the gear boxes on accessible gantries.	District	NA	NA	NA	Turnpike	District	Turnpike	District	Turnpike will test the tolling system. The Turnpike and District will jointly perform End to End testing. Toll equipment installation as-builts are provided by the toll equipment contractor. TEC equipment, TEC equipment power cable, E6 cables, J arms, J arms connecting plates and their associated hardware, and data cables shall be maintained by the Turnpike. The district does not have to program the maintenance costs for this element. They are deducted from the toll revenue that the District receives.
FCC License	This includes the coordination and acquisition of the license for the AVI subsystem RF license from the Federal Communications Commission	Turnpike	NA	NA	NA	Turnpike	NA	NA	NA	Timeline as required by FCC, requires Northing and Easting, Lat/Long and physical building address for application.

I-95 Express Lanes: FDOT District Four						LEGEND:				
Responsibility Matrix						FDOT District Four (non-Turnpike)				
						Turnpike ®: Limited Design and Shop Drawing Review by Turnpike				
						(NA): Not Applicable				
				Submittal Reviews		Construction/ Implementation/ Testing	Maintenance		RCI/Pontis/ Asset Mgmt	
Element	Description	Ownership	Design Delivery	Design Plans	Shop Drawings		Program District	Perform		Notes
Toll Amount Pricing	District will provide toll amount/rates through coordination with the RTMC and provide them to Turnpike Toll's back office.	District	NA	NA	NA	NA	NA	NA	NA	The District is responsible for the dynamic pricing of Express Lanes based on traffic conditions. (The Turnpike establishes toll rates through the Rule Making Process.)
Toll Transaction Processing Software	Includes the software required to manage and operate the toll facility including transaction creation, trip building, account management, and violations processing	Turnpike	NA	NA	NA	Turnpike	NA	NA	NA	Turnpike performs these services. The district is charged for the related toll operating costs.
Incident Management	Includes programs used to enforce tolls within the system	District	NA	NA	NA	District	District	District	NA	
Toll Enforcement (Back Office)	Includes programs used to enforce tolls within the system.	Turnpike	NA	NA	NA	Turnpike	Turnpike	Turnpike	NA	Includes back office processing for toll violations in accordance with violation business rules for Express Lanes. Turnpike performs these services. The district is charged for the related toll operating costs.

I-95 Express Lanes: FDOT District Four						LEGEND:				
Responsibility Matrix						FDOT District Four (non-Turnpike)				
						Turnpike ®: Limited Design and Shop Drawing Review by Turnpike				
						(NA): Not Applicable				
				Submittal Reviews		Construction/ Implementation/ Testing	Maintenance		RCI/Pontis/ Asset Mgmt	
Element	Description	Ownership	Design Delivery	Design Plans	Shop Drawings		Program District	Perform		Notes
Traffic Enforcement (Roadside)	Coordination of speed enforcement, illegal access/egress, and unauthorized vehicles with FHP or other enforcement agencies.	District	NA	NA	NA	NA	NA	NA	NA	
Toll Transaction Processing	Back office processing of Express Lane toll transactions in accordance with Express Lane Toll Processing Business Rules. This element is associated with the transaction processing activity.	Turnpike	Turnpike	NA	NA	Turnpike	Turnpike	Turnpike	NA	
Public Information (PIO)	Coordination of all project related information on the Express Lanes Project.	District and Turnpike	District and Turnpike	NA	NA	NA	NA	NA	NA	District Public Information Office provides operational information and statistics (average toll, traffic information, incident management). Turnpike addresses Express Lanes tolling methodology and processes.

4.6 Assumptions and Constraints

For express lanes, assumptions and constraints may include:

- New policies and procedures required for traffic and incident management coordination, maintenance, demand management activities, etc.
- Geometric limitations such as shoulder width, ramp geometrics, number of managed lanes, separation type, and other elements that influence system performance.
- Additional staff and budget resources needed vs. the amount that can be budgeted or acquired.
- Performance requirements used for developing and operating the system.
- Definition of interagency agreements, including memoranda of understanding (MOUs) and Mutual Aid agreements, new agreements needed, existing agreements that are to remain in force, or modifications that may be needed to existing agreements.
- Products or technologies that may be used based on inclusion in the FDOT Approved Products List.
- Construction and work zone limitations
- Public outreach and publicity need relative to new travel patterns or operational policies.
- Compatibility and incompatibility are relative to access between Management Lanes facilities, including truck and carpool regulations, HazMat, and other freight operations, etc.

4.7 Risks

The Project Risk Assessment and Regulatory Compliance Checklist (Form 750-040-05) is simultaneously being completed during the planning process. As the checklist is being completed, the Risks associated with expanding express lanes on this corridor may be updated. At this time, the Risk Assessment Checklist has not been completed to an extent that allows for the specific risks or mitigation strategies to be quantified. Certain risks discussed during development of the project have been listed below.

Table 7: Risk Register

Risk #	Risk Owner	Description of Risk and Impact	Like-lihood (1-4)	Impact (1-4)	Rating (L + I) (2-8)	Mitigation Strategy
1	FDOT D4	Blockage in Direct Express lane exit ramps causing delays, queuing, and potential for secondary crashes	2	4	6	Automatic gates for lane closure can be considered during design if possible. Road ranger staging plans can be developed for response.
2	FDOT FTE	Emerging technology to replace legacy ITS/Toll collection systems, providing opportunities for reduced O&M costs and more accurate tolling.	3	3	6	Coordination with FTE and FDOT Central Office on Emerging Technology

3	FDOT D4/D6	Cut in Fiber Optic Communications resulting in temporary outages for CCTV and/or tolling.	2	4	6	Coordination with CE&I firms to reduce construction impacts. Consider redundant communication options during design.
4	FDOT FTE	Cut in Fiber Optic Communications that impact tolling and signage	2	3	5	Coordination with FDOT D4 on adjacent project impacts.
5	FDOT D4	DDI Operations at Stirling Road	2	3	5	Public Outreach campaign before and during DDI opening to traffic.
6	FDOT FTE	Changes in pricing policy to address either congestion in EL and/or public acceptance	2	2	4	Analysis of toll pricing changes and anticipated impact on travel behavior and free flow traffic.
7	FDOT FTE	Cybersecurity Risks impacting reliability of ITS/ Tolling Systems	1	3	4	Compliance with FDOT IT standards

4.8 Support Environment

The support environment needed for the project will not change from the existing RTMC operations described in Section 2.5. Future support needed for maintenance of equipment will be assessed following the selection of equipment during the planning and construction phases. Express lane and supporting hardware and software may be different than the current equipment used by the District. The District Four SunGuide® RTMC will develop maintenance plans.

FTE will be responsible for Electronic Toll collection (ETC), which includes account management, customer service, and maintaining the electronic tolling system (SunPass) at the toll gantries and inside the toll buildings. FDOT district Four will be responsible for maintaining the gantry structures and toll buildings located along the project limits except for the northbound segment for toll site 3N. The business rules for account management will be developed, maintained, and managed by FTE.

Tolling activities will operate on the SunPass system and support open-road/all electronic tolling, function with current FDOT and FTE tolling policies and back-office software. System support and maintenance activities needed for toll operations will be provided by FTE's in-house or contract/consultant staff.

5. Operational Scenarios

This section provides hypothetical operational scenarios for the I-95 project. Three different scenarios are presented; Typical Operations, Crash in the General Use Lanes, and Crash in the Express Lanes.

5.1 Normal Operations

John, a resident of Fort Lauderdale, is running late for 4:00 pm meeting with a very important customer. His smart phone app indicated that SR 9/I-95 is the "best route with toll, despite heavier traffic than usual." He decides to take the recently constructed direct express lane exit to his exit at Ives Dairy Road which will hopefully avoid delays on the general purpose lanes. The TADMS approaching I-95 display a toll amount of $1.50 to Ives Dairy Road which he is willing to pay for a more reliable travel time. John is a SunPass account holder and uses the express lanes only when necessary.

Meanwhile, the District Four SunGuide® RTMC operators are actively monitoring congestion along SR 9/I-95 GULs and use the CCTV cameras to verify there are no events along SR 9/I-95, only recurring peak period congestion. The RSS Operators monitor their computer screens and observe the release rates of the ramp signals reducing due to the congestion along SR 9/I-95 GULs in the southbound direction. RTMC EL Operators are monitoring the SELS map and speed graphs based on the data collected in real time for the vehicle detectors as well as checking the CCTV cameras along SR 9/I-95. RTMC EL Operators see demand increasing in the EL, but the speeds are free flowing. The SELS notifies them that the tolls have adjusted in response to increasing demand for the EL. The SunGuide® software presents a video snapshot of the TADMS and the toll amounts that should be displayed. They confirm everything is working properly.

FTE's back-office software processes the data collected from the toll and data gantries as John passes and builds his trip to the Ives Dairy Road interchange where he will exit. FTE's back-office software receives the toll amount data from SELS, which when combined from each toll gantry (tolling point), applies the total charge to John's SunPass account.

5.2 Crash in the General Use Lanes

During the rush hour, Angela which is a District Four SunGuide® RTMC Operator is monitoring the performance of SR 9/I-95 using the CCTV cameras and vehicle detectors. While turning the CCTV cameras, she observes a crash in the northbound GULs between Pembroke Road and Hollywood Blvd. It is a multi-vehicle crash resulting in blocking all GULs, but not the El.

Angela confirms the incident location and its impacts on SR 9/I-95 downstream traffic south of the Pembroke Road interchange. Within two minutes of incident detection, she dispatches Road Rangers and SIRV to the scene. Next, she enters the event data into SunGuide® which automatically generates updated messages on all relevant DMSs upstream of the event within three minutes of event confirmation. Subsequently, she notifies all relevant agencies and partnering staff within 7 minutes of event confirmation and continues to monitor the event.

SunGuide® is used to update messages on applicable DMSs on the approach to the lane closures to inform drivers of the incident blocking the northbound GULs. FHP has notified Broward County Fire Rescue of the incident, and they dispatch the nearest available unit to the incident. Broward County Fire Rescue tends to any injuries and begins to transport injured motorists and passengers

to the nearest hospital. The FHP officer on the scene coordinates with the other response vehicles on the scene to clear the lanes as safely and efficiently as possible. Angela continues to monitor the situation using the CCTV cameras and updates DMSs in the area based on new information she's able to confirm.

5.3 Crash in the Express Lanes

During morning rush hour Alejandro, a District Four SunGuide® RTMC EL operator, is monitoring performance of the EL using the CCTV camera and vehicle detectors along SR 9/I-95. He receives a call from an FHP officer indicating there is an incident in the southbound EL between Sheridan Street and Hollywood Blvd interchanges. Alejandro uses the nearest CCTV camera to view a single-vehicle crash with the median barrier which results in blocking both EL.

Alejandro confirms the incident location and its impact to the EL. Next, he changes the toll operating mode in the SELS from "Dynamic" to "Closed" for the blocked segment containing the incident. He logs the incident in the SELS and uses the Automated Vehicle Location (AVL) subsystem of SunGuid®e that provides the locations of all Road Rangers in the vicinity to dispatch Road Rangers to close the southbound EL access at Stirling Road.

SunGuide® is used to change the messages on all DMSs (GUL DMS, LSDMS, and TADMS) on the approach to inform drivers of the incident blocking the southbound EL. Alejandro manually adjusts the variable toll to set it to the base toll amount, and the toll adjustment is made retroactively for 10 minutes before the adjustment to account for any motorist caught on the ramp or caught in the congestion queue created by the incident.

To begin clearing the incident, he dispatches additional Road Rangers and any necessary response vehicles to the scene where they block other entrances to the EL, provide incident clearance support and divert any traffic in the EL to the GUL per predetermined plans.

FHP has notified Broward County Fire Rescue of the incident, and they dispatch the nearest available unit to the scene. Broward County Fire Rescue tends to any injuries and begins to transport injured motorists and passengers to the nearest hospital. The FHP officer on the scene coordinates with the other response vehicles on the scene to clear the ramp using the shoulders while relocating any damaged vehicle to the closest investigation area. Alejandro continues to monitor the situation using the CCTV cameras and updates DMSs in the area based on new information he is able to confirm.

5.4 Crash in the Direct Express Lane Exit/CD Road

During the morning rush hour, Natalie, the District Four SunGuide® RTMC EL operator is monitoring performance of the EL using CCTV cameras and vehicle detectors along SR 9/I-95. She receives a notification on the computer-aided dispatch system indicating there is a crash in the northbound direct express exit ramp to Sheridan Street. Natalie can monitor the crash using the

CCTV cameras and confirms with FHP and a local camera view that the crash is in the single lane direct exit lane and before the allowed return back to I-95.

After coordinating the incident with FHP and the SunGuide® software, Natalie changes the toll operating mode in the SELS from "Dynamic" to "Closed" for the blocked segment containing the incident. She logs the incident in the SELS and uses the Automated Vehicle Location (AVL) subsystem of SunGuide® that provides the locations of all Road Rangers in the vicinity to dispatch Road Rangers to the scene of the crash near Sheridan Street.

As soon as it is safe to do so, Natalie activates the Warning Gate System (WGS) to begin closing the direct exit ramp at the northbound exit ramp to Sheridan Street. This will close off access to the direct ramp off and prevent additional motorists from being trapped in the off ramp behind the crash. The adjacent flashing beacon sign in advance of the WGS is activated as well as DMS upstream to alert motorists that the direct express exit ramp is closed.

SunGuide® is used to change the messages on all DMSs (GUL DMS, LSDMS, and TADMS) on the approach to inform drivers of the incident blocking the northbound CD ramps. Natalie manually adjusts the variable toll to set it to the base toll amount, and the toll adjustment is made retroactively for 10 minutes before the adjustment to account for any motorist caught on the ramp or caught in the congestion queue created by the incident.

Road Rangers will confirm the WGS is appropriately activated and closing off the express exit ramp. If the WGS is not remotely activated there is a manual option at the WGS control box in the median south of the direct express lane ramp, that can be manually activated by Road Rangers. They will provide any other necessary response vehicles to the scene to block other entrances from the EL or the CD ramps, provide incident clearance support and divert any traffic to the GUL or the off-ramp per predetermined plans. The Road rangers will have to enter I-95 from the Hollywood Blvd interchange and travel north to the Sheridan Street exit to access a crash on the off ramp or in the case of a crash on the return ramp from the CD road back to I-95, they will have to continue on I-95 past the Sheridan Street exit and access the return ramp at the general purpose lanes near the overpass of I-95 at Sheridan Street and clear the crash on the CD on-ramp.

FHP will notify Broward County Fire Rescue of the incident, and they dispatch the nearest available unit to the scene. Broward County Fire Rescue tends to any injuries and begins to transport injured motorists and passengers to the nearest hospital. The FHP officer on the scene coordinates with the other response vehicles on the scene to clear the ramp using the shoulders while relocating any damaged vehicle to the closest investigation area. Natalie continues to monitor the situation using the CCTV cameras and updates DMSs in the area based on new information she is able to confirm.

6. Summary of Impacts

6.1 Summary of Benefits

The proposed I-95 project will provide additional capacity and operational improvements that are expected to provide the following benefits:

- Improved Safety
- Reduced Travel Times/Vehicle Delays
- Improved Trip Reliability
- Increase in Person/Vehicle Throughput
- Sustainability
- Increase in Transit Ridership

The operational impacts of the proposed system will increase the workload of the existing RTMC Operations, Incident Responders, ITS Maintenance, and Roadway Maintenance resources. This additional workload will require additional funding for the operation and maintenance of the proposed system. Subsequently, this will require additional cross training for the system users. The new procedures should be developed at least six months prior to opening the I-95 project to allow enough time to properly train the system users. This includes training for Express Lanes operational procedures/strategies, incident coordination/response, maintenance of traffic procedures and enforcement.

6.2 Monitoring and Analysis Activities

The I-95 project will need to be continuously monitored and analyzed to ensure the proposed system is operating such that these benefits are realized to the public. Based on the FDOT's experience with 95 Express, the demand for the Express Lanes will change over time resulting in adjustments to the dynamic pricing algorithm parameters and operational strategies. In addition, there will be a need to feed data from the proposed system into toll and revenue updates, improve the accuracy of projections and ensure the proposed system is sustainable.

The FDOT will establish a comprehensive performance measurement program (similar to existing 95 Express) that will provide the data and tools to perform periodic analysis of the proposed system and support general data requests. General data requests from other agencies/consultants will occur for future toll and revenue studies, as well as future analysis of Express Lanes operations. Thresholds in performance should be established to prompt the need for analysis. The performance measurement program will include the following elements:

- Monthly Performance Reporting/General Data Requests:
    - Total Trips
    - Revenue
    - Tolls
        - Monthly Revenue
        - Total Revenue

        - Minimum and Maximum Range
        - Average Weekday
        - Average Peak Period
        - Average Weekend
        - Average Off Peak
        - 85^{th} Percentile Weekday
    - Volume (Express Lanes and General Use Lanes)
        - Average Weekday
        - Average Weekend
        - Average Peak Periods
    - Speed (Express Lanes and General Use Lanes)
        - Average Overall
        - Average Peak Periods
        - Percentage of Time Above 45 MPH
    - Facility Availability
        - Percentage of Time Closed due to Planned Events
        - Percentage of Time Closed due to Non-recurring Events
    - Transit Usage
        - Passenger counting on trips along the facility
- Conduct periodic analysis when system approaches undesirable performance.
    - Speeds drop below 45 MPH in the Express Lanes during peak periods

Extended or frequent closures that impact availability of the Express Lanes

7. Analysis of the Proposed System

7.1 Alternatives

The PD&E Study considered the following alternatives:

No-Build Alternative
The No-Build Alternative proposes to keep the existing corridor into the future without improvements, except for routine maintenance. Planned and approved adjacent projects in the area are considered, without any proposed changes within the limits of this project. No traffic capacity, operations, safety, mobility or evacuation improvements would be implemented along the I-95 mainline, the EL, or the interchanges and arterials within the study area.

Build Alternative #1 – Sheridan Street NB to WB Flyover / Median Alignment (not selected)
The Build Alternative #1 considered but not selected proposed a general lane exit flyover within the median of I-95 to service traffic westbound on Sheridan Street. This design would eliminate

one major traffic movement from the I-95 and Sheridan Street interchange. Traffic models show this would improve traffic to a level of service of C in the AM peak, and D in the PM peak. However, this option would require a high number of additional ROW parcels along Sheridan Street and would present a high level of constructability challenges, and high costs.

Build Alternative #2 – Sheridan Street NB to WB Flyover / East Alignment (not selected)
The Build Alternative #2 considered but not selected proposed a general lane exit flyover aligned on the East side of I-95 to service traffic westbound on Sheridan Street. This design would eliminate one major traffic movement from the I-95 and Sheridan Street interchange. Traffic models show this would improve traffic to a level of C in the AM peak, and D in the PM peak. However, this option was discarded due to the high number of additional ROW parcels required along I-95 and Sheridan Street.

Build Alternative #3 Direct Express Lane Exits and Braided CD Roads (Preferred)
The preferred Build Alternative #3 includes providing two direct express lane exit ramps (NB to Sheridan Street and SB to Ives Dairy Road); introduction of braided CD ramps providing direct access from Hollywood Blvd to Hallandale Beach Blvd (in both SB and NB), reconfiguration of interchanges, and a diverging diamond interchange at Stirling Road.

Summary
The effect of the No-Build Alternative includes the continuation of existing delays and congestion along the project corridor. Also, as travel demand and truck traffic are projected to increase over the next 20 years, given the continued growth expected in this area of Broward County, under this alternative, congestion and delay will worsen; levels of service on the arterials will deteriorate; and no related environmental impacts, such as traffic noise levels, will be addressed. Therefore, the preferred Build Alternative is recommended.

7.2 Cost, Schedule, and Procurement Options

Cost estimates and schedule to be provided in the design draft versions of the ConOps.

7.3 Systems Engineering Plan

The Systems engineering process will be utilized for this project to ensure that the project will meet Stakeholder needs as detailed in Section 3.2. Specifically, this includes the following steps:

- Refinement of the Project Systems Engineering Management Plan (PSEMP)
- Update of the Requirements Traceability Verification Matrix (RTVM) included in the PSEMP document.
- Development of a Systems Verification Plan.
- Design using the information in Section 4 “Concepts for the Proposed System.”
- Preparation of a Systems Validation Plan that will take account of user needs and performance measures developed in this ConOps.

7.3.1 Project Systems Engineering Management Plan (PSEMP)

The PSEMP will detail what portions of the Regional ITS Architecture (RITSA) will be included within the Project ITS Architecture.

- Discuss the high-level functional requirements to meet the Stakeholder needs
- Discuss how the project will be managed to ensure a successful project

7.3.2 Requirements Traceability Verification Matrix (RTVM)

The RTVM (based Form FM-SE-22B dated September 4, 2019) for the project included details for the user needs previously identified. Verification and compliance of these needs will still need to be accounted for beyond this project.

7.3.3 Systems Verification Plan

The Systems Verifications Plan will detail how the System Verification will be performed and will show the System Verification Test Cases and Activities. Verification activities will be conducted using the methods listed below:

1. Analyze
2. Deliverable
3. Construction
4. Inspection
5. Test

7.3.4 Design Process

The Design Process will include plans and specification development as required. The design will include all elements required to provide a complete submittal per FDOT.

7.3.5 Systems Validation Plan

The Systems Validation Plan (SVP) will validate that the user needs for safety and mobility are met by the project. Each stakeholder's need that is identified in the ConOps will have a corresponding validation mechanism identified in the SVP. Specifically, the SVP will discuss:

- All ConOps users need to be addressed by the implementation of this system
- Description of stakeholders along with roles and responsibilities
- Locations where evaluation activities will occur and how or what data will be collected
- Schedule of evaluation activities
- Details of how each evaluation activity will be conducted

7.4 Performance Measurement for System Validation

The objectives of the before-and-after analysis are as follows:

1. To determine the effectiveness of express lanes in addressing safety and mobility goals.
2. To document the challenges encountered in construction and operations of the express lanes and other discussed improvements; as well as training maintenance and operations staff on the additional equipment.
3. To document impacts on other modes of transportation.

Performance of the project will be demonstrated through testing and qualitative performance of the system improvement area. Monitoring and evaluation of approved performance measures (speed, volume, delay, occupancy) will be reviewed for assessing expectations and the analysis of potential time-savings. The performance measures listed below should be maintained:

- Monthly Performance Reporting/ General Data Requests
    - Total Trips

- Tolls (Generated and maintained by Florida's Turnpike)
    - Monthly Revenue
    - Total Revenue
    - Minimum and Maximum Range
    - Average Weekday
    - Average Peak Period Average Weekend
    - Average Off Peak
    - 85th Percentile Weekday
    - Exempt Vehicle data
    - Toll Distribution by amount/ by hour

- Volume (EL vs GUL)
    - Average Peak Periods
    - Average Weekday
    - Average Weekend

- Speed (EL and GUL)
    - Percentage of Time above 45 miles per hour
    - Average Overall
    - Average Peak Periods

- Facility Availability
    - Percentage of Time Closed due to Non-Recurring Events
    - Percentage of Time Closed due to Planned Events
    - Additional analysis to be considered to maintain desirable system performance
    - Speeds below 45 MPH in the EL (peak periods)
    - Number of closures that impact the availability of El

        - Frequency
        - Incident duration of time spent above threshold of incident clearance goal

- Travel Time Reliability Measures
    - Travel Time Index

- Mobility Measures
    - Travel Time
    - Vehicle Miles Traveled
    - Vehicle Hours Traveled
    - Delay

- Safety Measures
    - Crash Rate by type
    - Crash Frequency by type

8. Notes

This section will be annotated, as needed, with changes to the approved ConOps document made over the course of the project. There are no notes at this time.

9. Appendices

APPENDIX A Preferred Build Alternative Roll Plots

10. Glossary

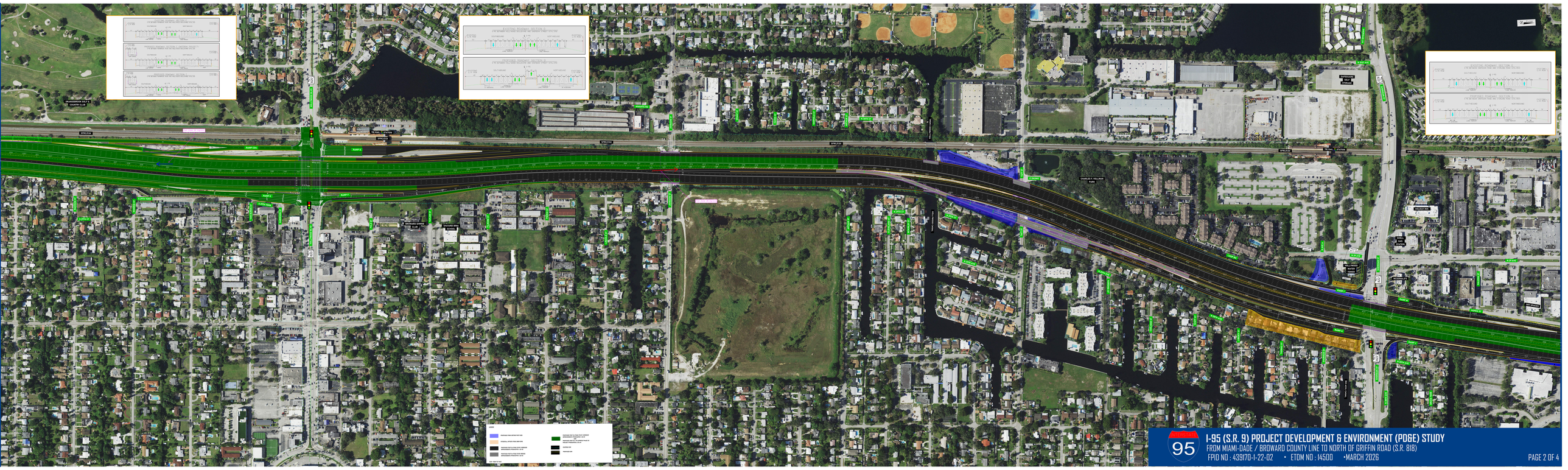
TBD

DOCUMENT REVISION HISTORY			
Version Number	**Approved Date**	**Description of Change(s)**	**Created/ Modified By**
1.0	Feb 2026	Initial Draft	Acey Roberts, RS&H
1.1	March 2026	Version 1.1	Acey Roberts, RS&H

APPENDIX A: Preferred Build Alternative Roll Plots

PREFERRED ALTERNATIVE

I-95 (S.R. 9) PROJECT DEVELOPMENT & ENVIRONMENT (PD&E) STUDY
FROM MIAMI-DADE / BROWARD COUNTY LINE TO NORTH OF GRIFFIN ROAD (S.R. 818)
FPID NO : 439170-1-22-02 • ETDM NO : 14500 • MARCH 2026


I-95 (S.R. 9) PROJECT DEVELOPMENT & ENVIRONMENT (PD&E) STUDY
FROM MIAMI-DADE / BROWARD COUNTY LINE TO NORTH OF GRIFFIN ROAD (S.R. 818)
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PAGE 2 OF 4


EXISTING ROADWAY SECTION 'A'
FROM SW 10TH ST TO SW 17TH AVE
SOUTHBOUND
NORTHBOUND
PROPOSED ROADWAY SECTION 'A'
FROM SW 10TH ST TO SW 17TH AVE
SOUTHBOUND
NORTHBOUND
EXISTING ROADWAY SECTION 'E'
FROM SW 10TH ST TO SW 17TH AVE
SOUTHBOUND
NORTHBOUND
PROPOSED ROADWAY SECTION 'E'
FROM SW 10TH ST TO SW 17TH AVE
SOUTHBOUND
NORTHBOUND
EXISTING ROADWAY SECTION 'G'
FROM SW 10TH ST TO SW 17TH AVE
SOUTHBOUND
NORTHBOUND
PROPOSED ROADWAY SECTION 'G'
FROM SW 10TH ST TO SW 17TH AVE
SOUTHBOUND
NORTHBOUND
I-95 (S.R. 9) PROJECT DEVELOPMENT & ENVIRONMENT (PD&E) STUDY
FROM MIAMI-DADE / BROWARD COUNTY LINE TO NORTH OF GRIFFIN ROAD (S.R. 818)
FPID NO.: 439170-1-22-02
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MARCH 2026
PAGE 3 OF 4


EXISTING ROADWAY SECTION @
SOUTHBOUND
NORTHBOUND
PROPOSED ROADWAY SECTION @
SOUTHBOUND
NORTHBOUND
LEGEND
PROPOSED TOLL (EXPRESS) LANES
GENERAL USE/HOV TOLL (EXPRESS) LANES
PROPOSED FDOT SIS TRUCK ONLY/HOV (MANAGED) PREMIUM LANES
PROPOSED FDOT SIS TRUCK ONLY/HOV (MANAGED) PREMIUM LANES
PROPOSED FDOT SIS TRUCK ONLY/HOV (MANAGED) PREMIUM LANES
EXISTING I-95
EXISTING TOLL
I-95
95
I-95 (S.R. 9) PROJECT DEVELOPMENT & ENVIRONMENT (PD&E) STUDY
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PAGE 4 OF 4