Orlando, FL

November 7-8, 2024

2024 TRANSPORTATION SYMPOSIUM

Planning and Design of Managed Lanes

Andrew Velasquez, PE, PTOE (AECOM)
James E. Beverly, Jr., CPM (FDOT)

Florida's Turnpike Enterprise (FTE)

FDOT

Introduction

- High-level technical guidance for toll facilities and managed lanes
- Part 1
  - Planning/PD&E Considerations
  - Screening Process
  - Corridor Development
- Part 2
  - FTE Design support for Managed Lanes
  - Project Types
  - Documents
  - Best Practices

TRANSPORTATION SYMPOSIUM

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Part 1 – Planning/PD&E Considerations and Corridor Development

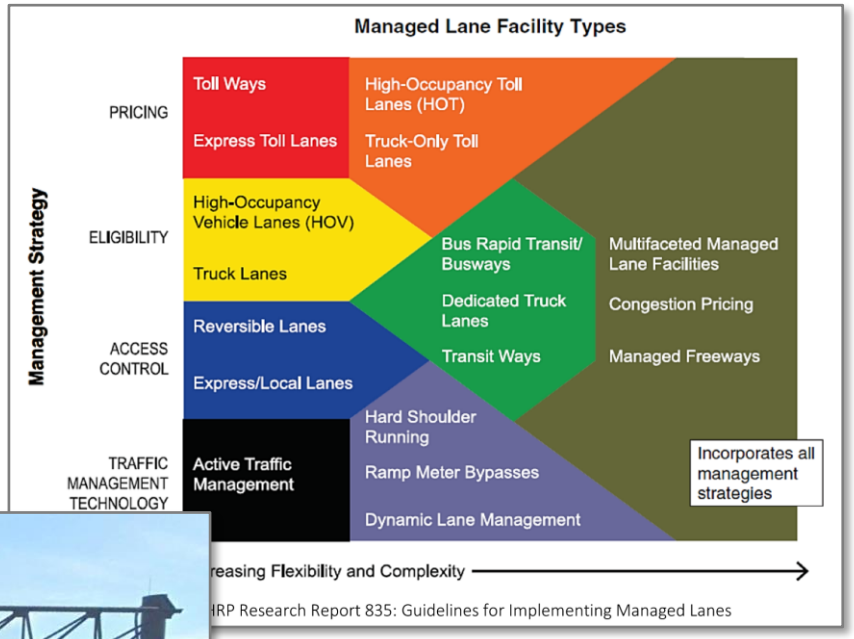
Andrew Velasquez, PE, PTOE

AECOM/Turnpike GEC Support

FDOT

Managed Lanes Types

- Express Lanes
- Long-Distance Trip Lanes (Thru Lanes)
- Truck-Only Lanes
- Managed Transit Lanes
- Part-Time Shoulder Use
- Connected and Automated Vehicle-Only Lanes
- Reversible Lanes
- Carpool 3+ Lanes



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Planning/PD&E Considerations

Planning/PD&E processes are similar for express and thru lanes

Managed Lanes

Express Lanes

Operational Strategies
1. Vehicle eligibility
2. Separation
3. Access control
4. Tolling

Thru Lanes

Operational Strategies
1. Vehicle eligibility
2. Separation
3. Access control

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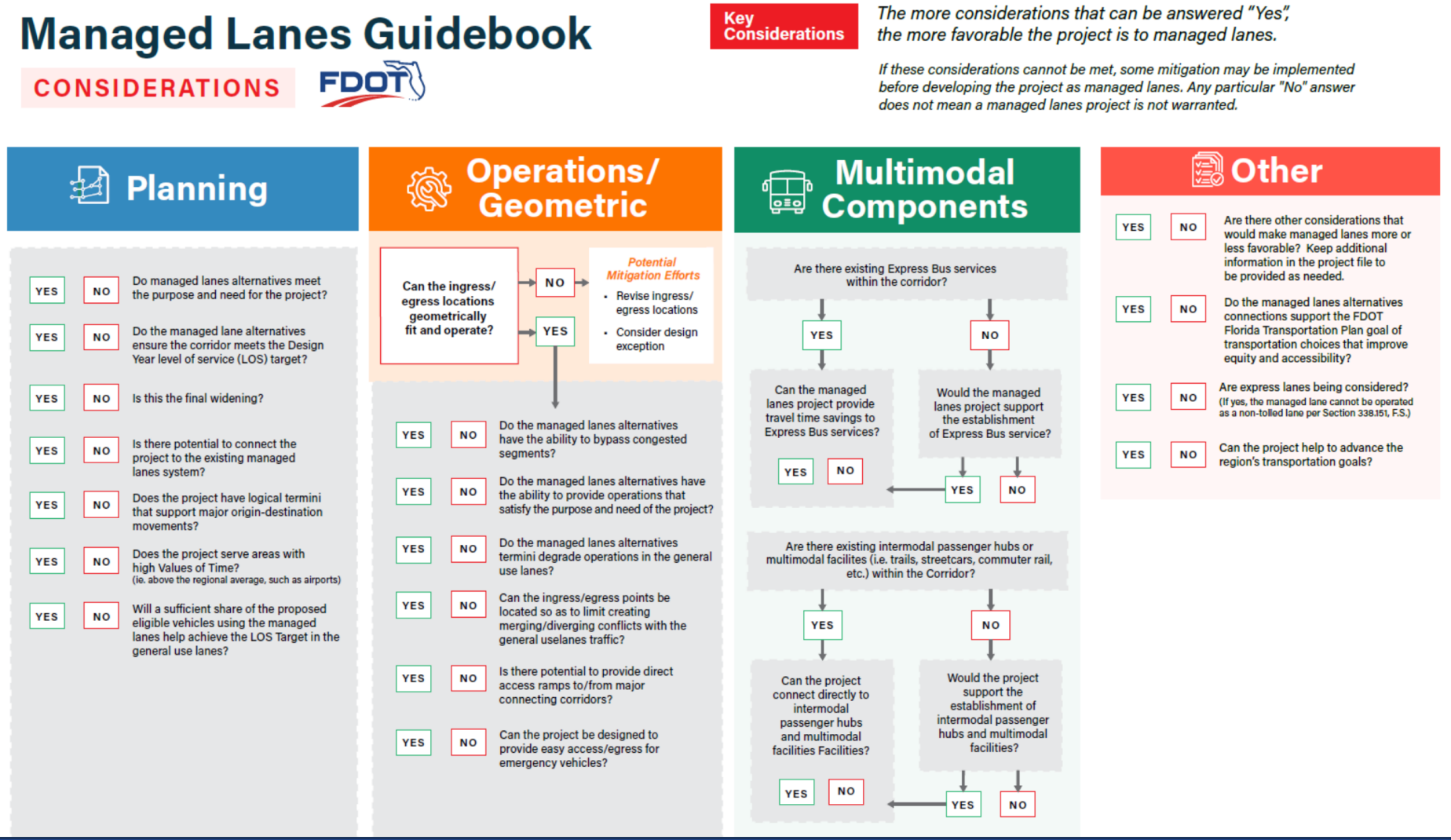
Planning/PD&E Considerations

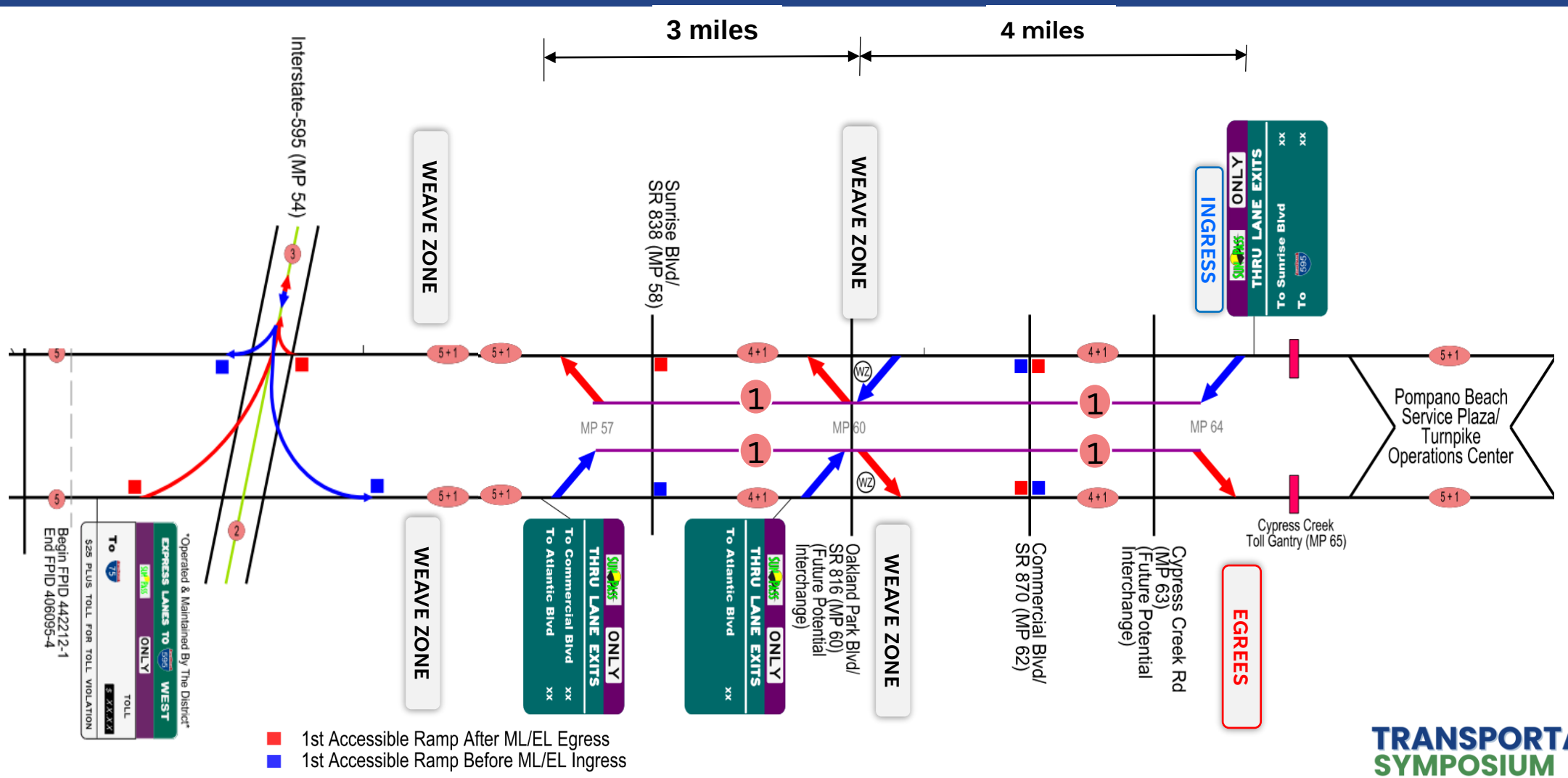
Are Managed Lanes Appropriate?

Key Considerations

- Purpose and need
- Operationally sound
- Geometric constraints
- Multimodal accommodations
- Other factors



Conceptual Thru Lanes Diagram



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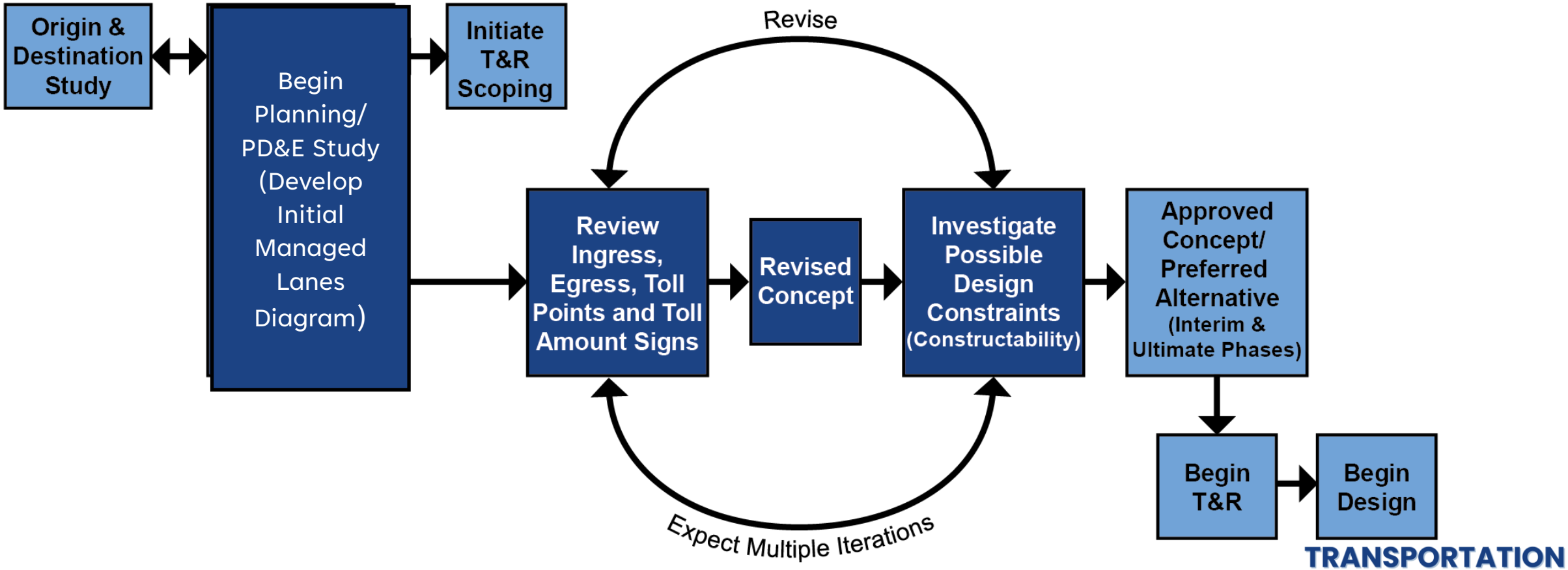
Thru Lanes Screening Criteria

Planning	Is this the final widening? (i.e., will this section of the facility be at build out, meaning no additional capacity projects are anticipated to be made after this project?)	Yes
	Does widening meet the Design Year LOS target?	No
	Does the project propose to add more than one lane in each direction?	No
	Does the project have termini that support major origin-destination movements?	Yes
	Is there potential to extend, or is this project an extension of, existing managed lanes?	Yes
Operations / Geometric	Can the initial ingress / egress locations geometrically fit and operate acceptably?	Yes
	Is each project segment able to bypass at least two interchanges in both directions?	Yes
	Do the project termini avoid degrading operations in the general lanes?	Yes
Multimodal	Will the project support existing or proposed Express Bus Service?	Yes
Other	Are there any other considerations that would make express/thru lanes project favorable?	N/A
	Do managed lanes support the FTP goal of transportation choices that improve equity and accessibility?	N/A
	Can the project help advance the regions transportation goals?	Yes

Planning/PD&E Considerations

Project Development Process



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Corridor Development

Data Collection

- Traffic Volume
- Vehicle Classification Counts
- Travel Speeds
- **O-D Data**

→

- Early Project Stage
- Movements between Interchanges in a Corridor
- Sub-Area including Arterials & Highways
- Consideration of ML Ingress/Egress &/or Direct Connections to other Arterials/Highways

↓

Match Traffic Counts at Peak Period and Daily Level

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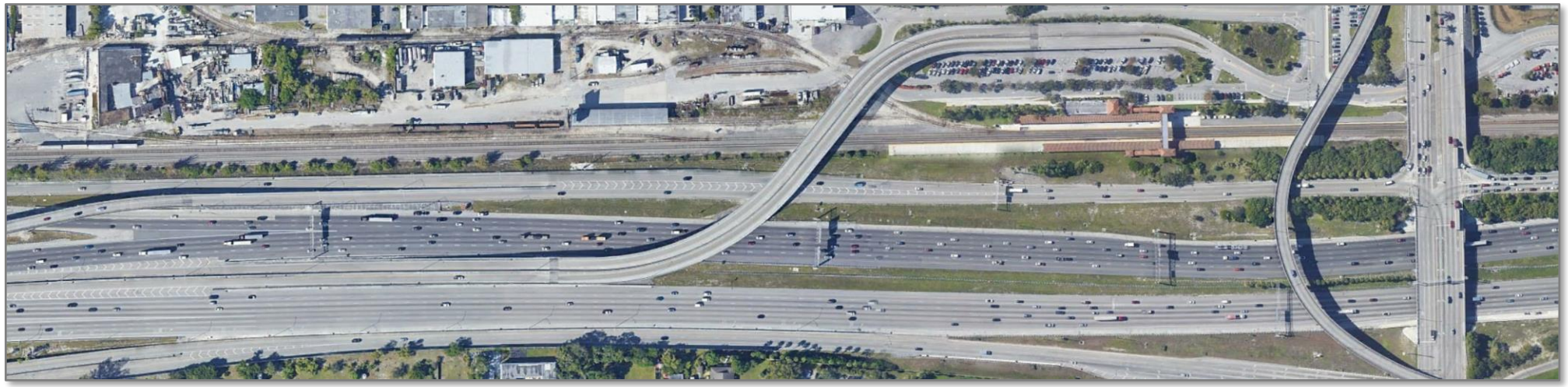
Corridor Development

Factors for Determining Access Locations

1. Analysis of O-D Data
2. Spacing & Geometry of Interchanges
3. Length of Segment(s)
4. Geometric Characteristics
5. Operational Characteristics
6. ITS/Signage
7. Tolling Infrastructure
8. Park-and-Ride Lot Locations
9. Transit Service
10. Availability of ROW
11. Environmental Impacts
12. Cost



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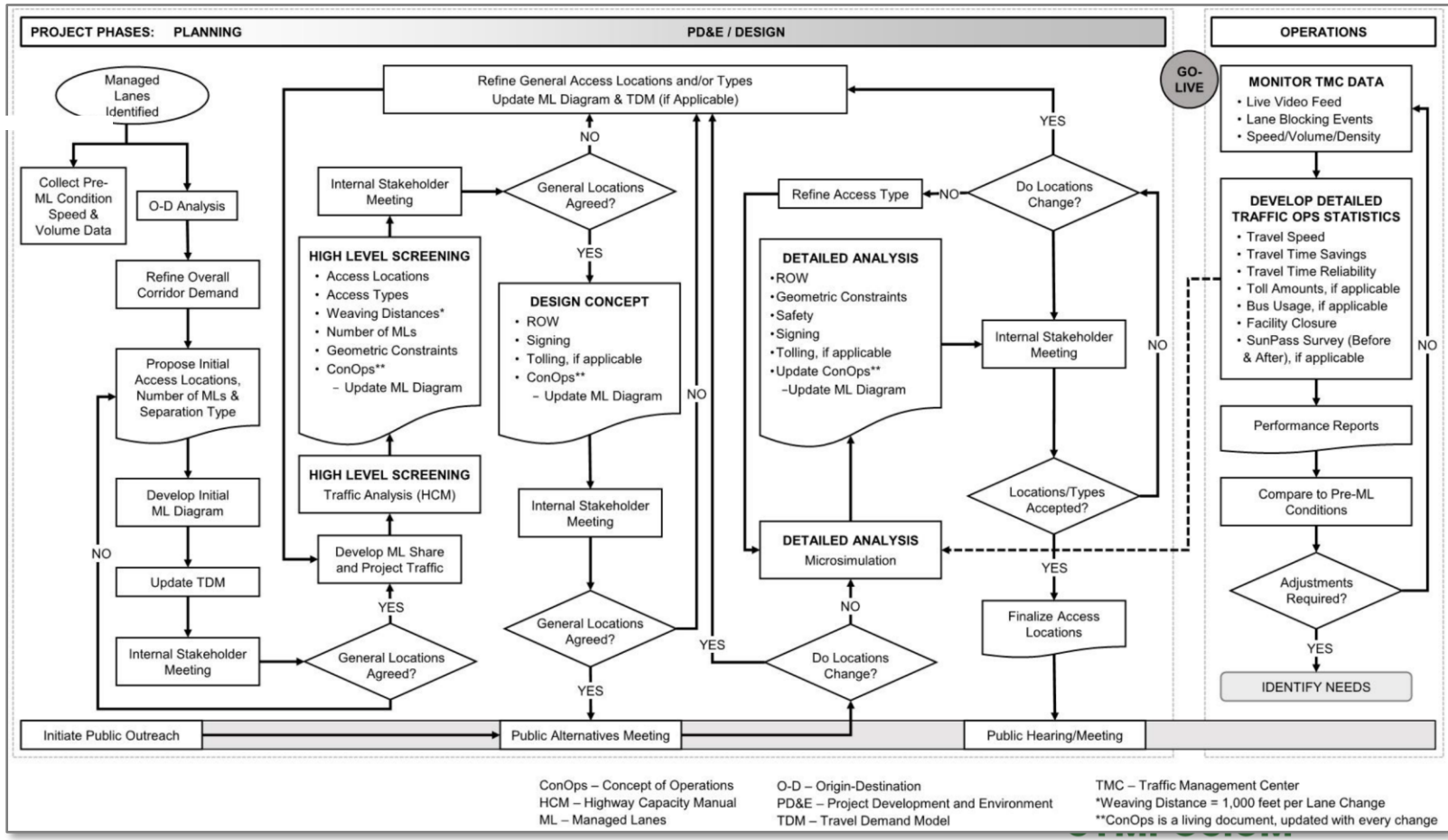
Corridor Development

Managed Lanes Guidebook (Appendix C)

- Planning
- PD&E
- Design
- Operations

Access Point Location Flowchart



Corridor Development

Access Plan Key Characteristics

- Segment Lengths

1 Managed Lane in Each Direction:
Segment Length = 3 to 7 Miles

2 Managed Lanes in Each Direction:
Segment Length = 4 to 10 Miles

Bypasses at Least 2 Interchanges

- Lane Change Distance

Minimum 1,000 Feet per Lane Change for Ingress / Egress Locations

- Demand

- Greater than 40% Eligible Trips
- DDHV > 50% Capacity

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Corridor Development

Managed Lanes Demand

Analysis from a Systemwide Perspective

Regional Travel Demand Model
Corridor Demand

↓

Express Lanes Time of Day (ELToD) Model
Split between Managed Lanes and General Use Lanes

Project Traffic:
PD&E and Design

VS

Revenue Traffic:
Traffic & Revenue Study

ELTOD Benefits

- ✓ Refined value of time
- ✓ Includes value of reliability
- ✓ Provides 15-min or hourly volumes and estimated toll amounts
- ✓ Sensitive to changes in pricing policy

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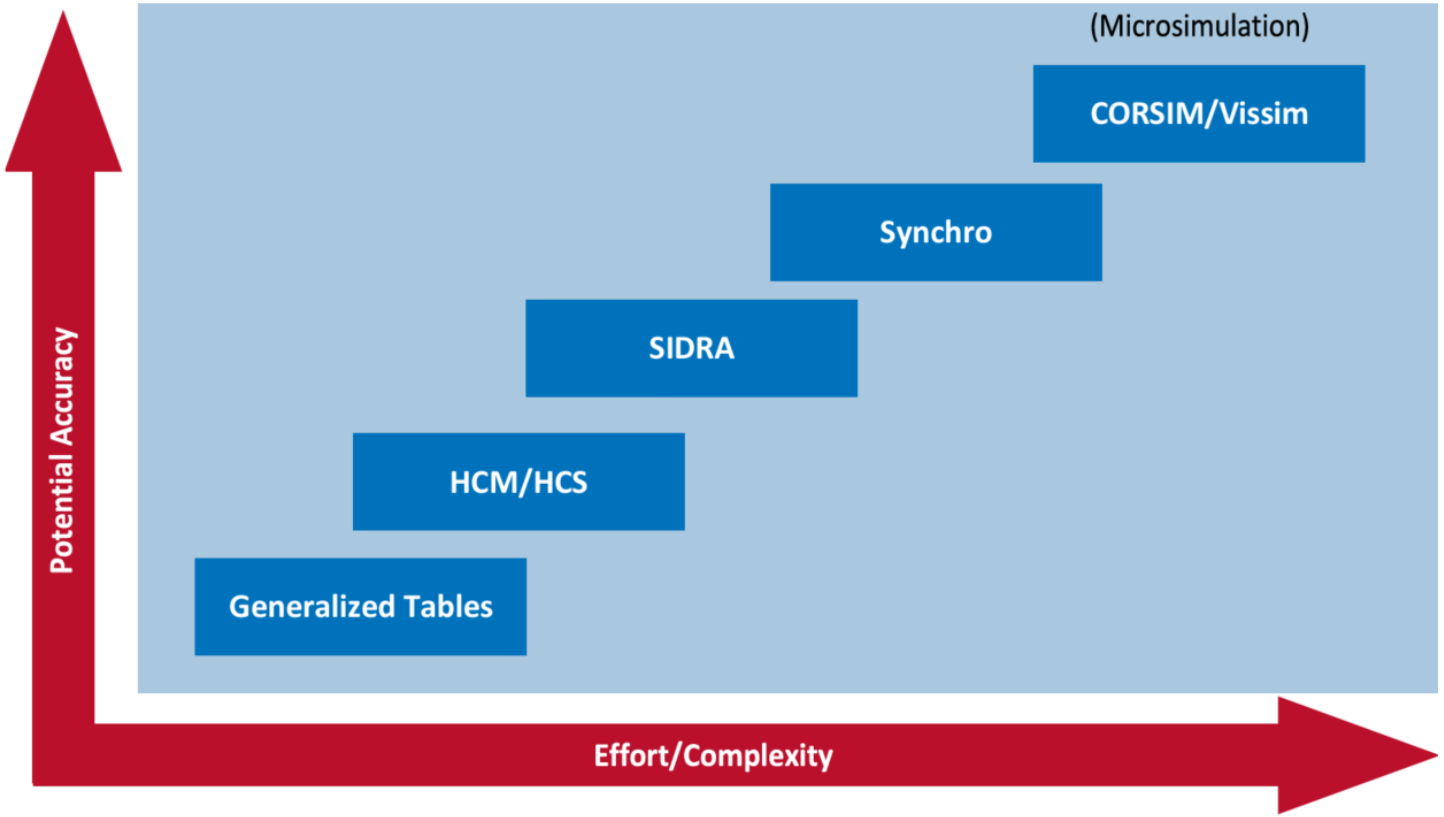
Corridor Development

Traffic Analysis



Project Phase	Analysis Tool
Sketch Planning	Generalized Tables HCM/HCS
PD&E/Design	HCM/HCS Microsimulation
Operations	Microsimulation

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Part 2 – Design and Tolling Considerations

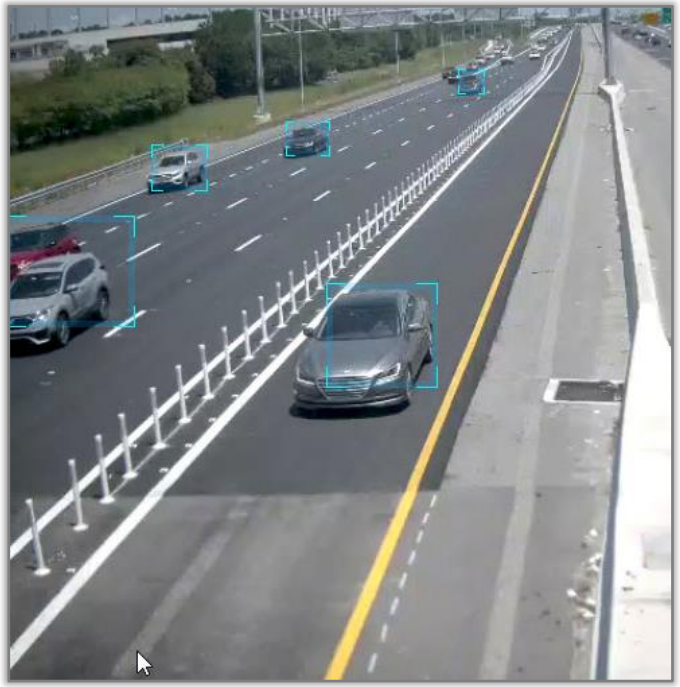
James E. Beverly, Jr., CPM

FDOT/Turnpike Tolls Design Administrator

FDOT

Part 2 – FTE Support for Tolling/Managed Lanes

- Project Types
- Documents
- Best Practices
- Safety



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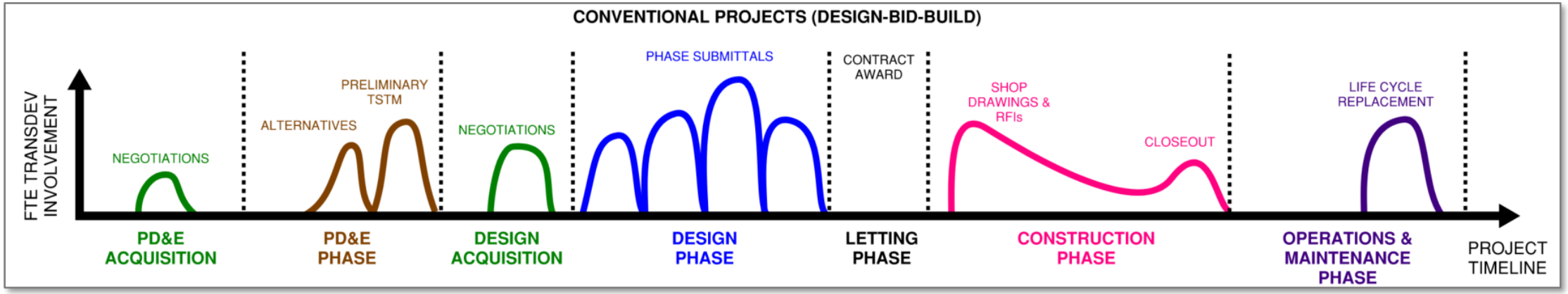
Conventional Projects

- Supports Districts' (scope, units, and hours)
  - Review and negotiate Section 4.7 "Tolling Concepts for PD&E"
  - Review and negotiate TAB 31T Toll Facility Development "Design"
  - Supports District Structures TAB 18 Miscellaneous Structures (toll gantry)
  - FTE TransDev assigns a Production PM and Toll Systems PM
- Supports all project phases including lifecycle replacement



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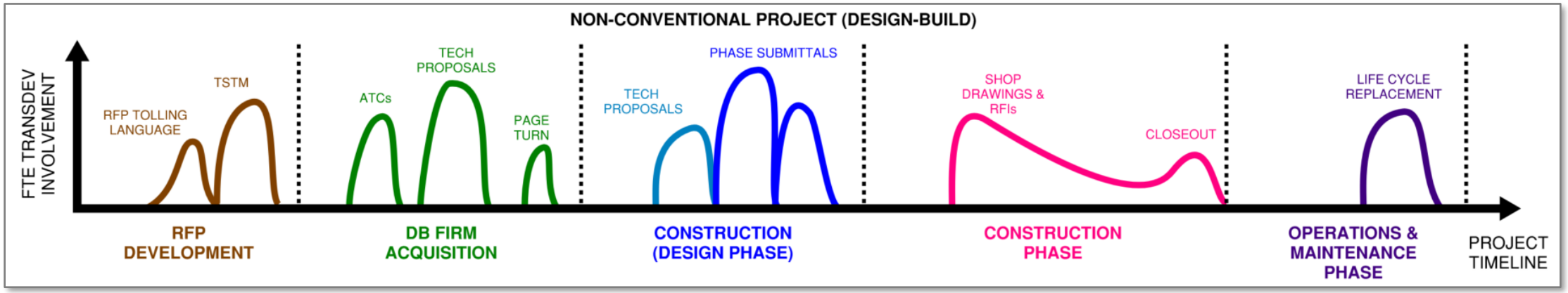
Non-Conventional Projects

- Supports Districts' (D-B, PD-B, and MPD-B projects)
  - Review RFP and Toll Siting Technical Memorandum (TSTM)
  - Review and provide comments on LORs, ATCs, Tech proposals, Q&A, etc.
  - FTE TransDev assigns a Production PM and Toll Systems PM
- Supports all project phases including lifecycle replacement



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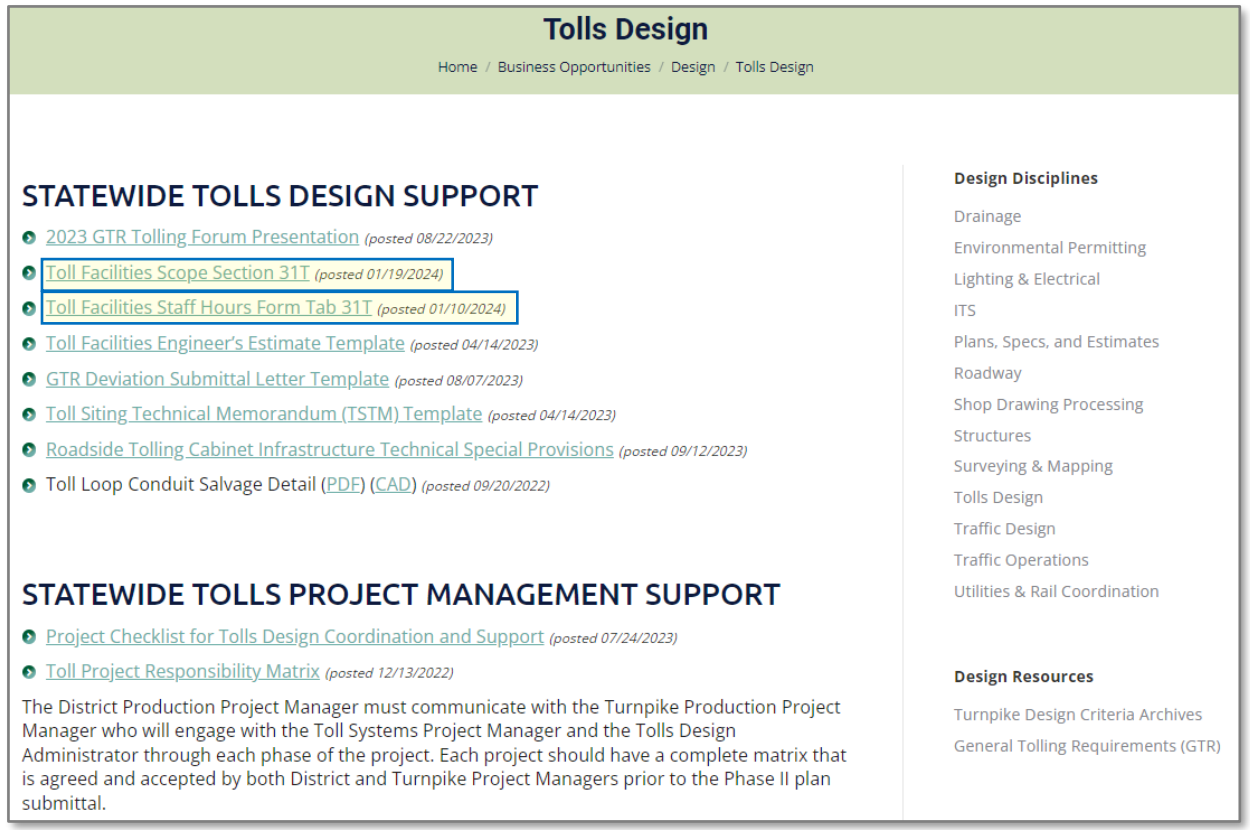
Project Scope and Templates

- PD&E Section 4.7 and TAB 31T Toll Facility Development
  - Scope, units, and hours templates



Tolls Design

Home / Business Opportunities / Design / Tolls Design

STATEWIDE TOLLS DESIGN SUPPORT

- 2023 GTR Tolling Forum Presentation *(posted 08/22/2023)*
- Toll Facilities Scope Section 31T *(posted 01/19/2024)*
- Toll Facilities Staff Hours Form Tab 31T *(posted 01/10/2024)*
- Toll Facilities Engineer's Estimate Template *(posted 04/14/2023)*
- GTR Deviation Submittal Letter Template *(posted 08/07/2023)*
- Toll Siting Technical Memorandum (TSTM) Template *(posted 04/14/2023)*
- Roadside Tolling Cabinet Infrastructure Technical Special Provisions *(posted 09/12/2023)*
- Toll Loop Conduit Salvage Detail (PDF) (CAD) *(posted 09/20/2022)*

STATEWIDE TOLLS PROJECT MANAGEMENT SUPPORT

- Project Checklist for Tolls Design Coordination and Support *(posted 07/24/2023)*
- Toll Project Responsibility Matrix *(posted 12/13/2022)*

The District Production Project Manager must communicate with the Turnpike Production Project Manager who will engage with the Toll Systems Project Manager and the Tolls Design Administrator through each phase of the project. Each project should have a complete matrix that is agreed and accepted by both District and Turnpike Project Managers prior to the Phase II plan submittal.

Design Disciplines

Drainage
Environmental Permitting
Lighting & Electrical
ITS
Plans, Specs, and Estimates
Roadway
Shop Drawing Processing
Structures
Surveying & Mapping
Tolls Design
Traffic Design
Traffic Operations
Utilities & Rail Coordination

Design Resources

Turnpike Design Criteria Archives
General Tolling Requirements (GTR)

Public facing Tolls Design webpage link:
[Tolls Design - Webpage https://floridasturnpike.com/business-opportunities/design/tolls-design/](https://floridasturnpike.com/business-opportunities/design/tolls-design/)

PD&E Section 4.7 scope, units, and hours necessary for projects with a tolling component available upon request.

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Documents for Tolling Managed Lanes

- Project Management Guide (PMG)
- Managed Lanes Guidebook (MLG)
- PD&E Manual
- FDOT Design Manual (FDM)
- General Tolling Requirements (GTR)
- Traffic Engineering Manual (TEM)
- Manual on Uniform Traffic Control Devices (MUTCD)
- Concept of Operations (ConOps)

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Project Management Guide

- Link: Project Management Resource Page

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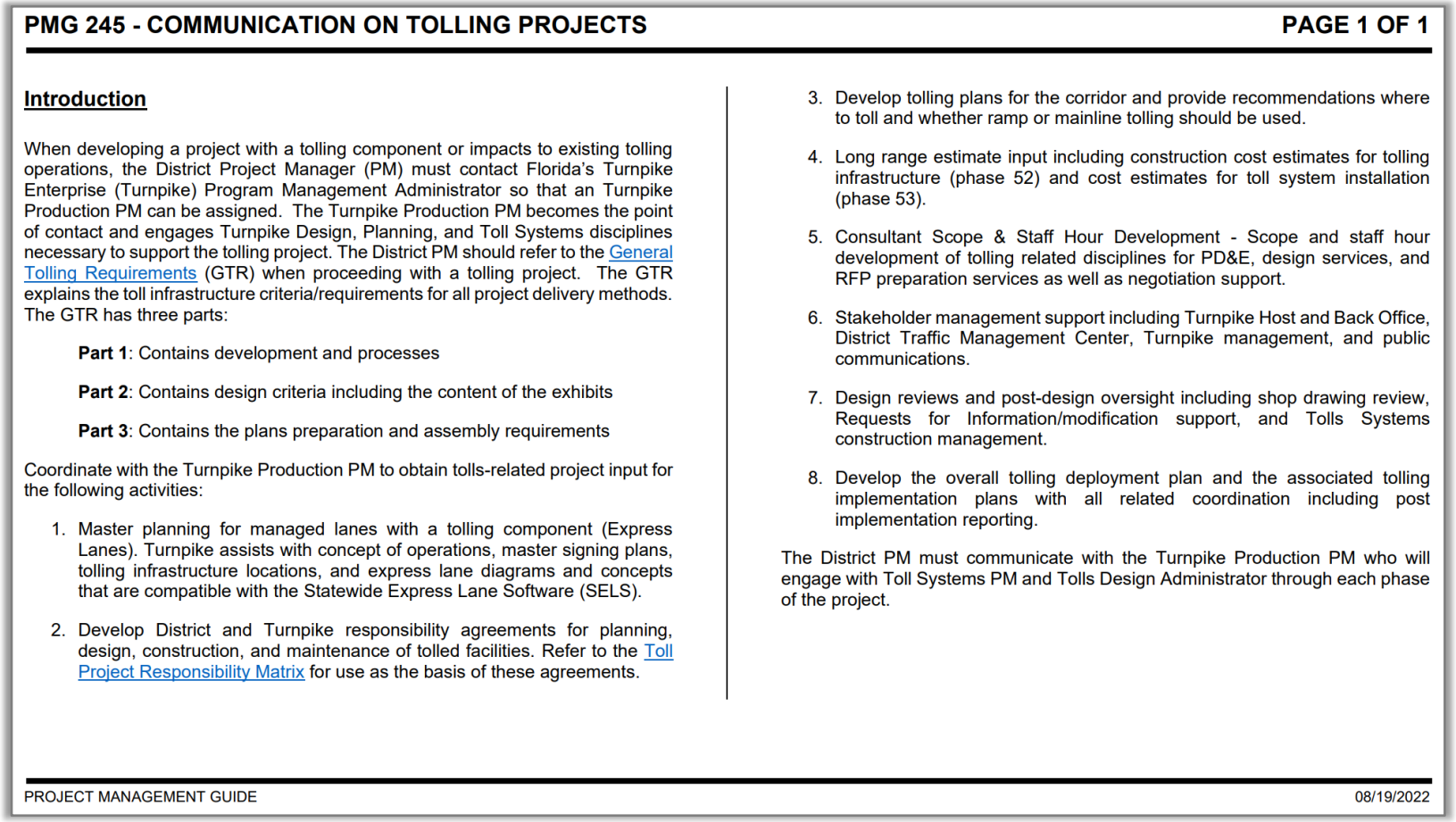
Section 245 – Communication on Tolling Projects

- Toll Coordination
- Coordinate with Turnpike Production PM
  - Provide input for the (8) activities
- Toll Project Responsibility Matrix



PMG 245 - COMMUNICATION ON TOLLING PROJECTS **PAGE 1 OF 1**

Introduction

When developing a project with a tolling component or impacts to existing tolling operations, the District Project Manager (PM) must contact Florida's Turnpike Enterprise (Turnpike) Program Management Administrator so that an Turnpike Production PM can be assigned. The Turnpike Production PM becomes the point of contact and engages Turnpike Design, Planning, and Toll Systems disciplines necessary to support the tolling project. The District PM should refer to the General Tolling Requirements (GTR) when proceeding with a tolling project. The GTR explains the toll infrastructure criteria/requirements for all project delivery methods. The GTR has three parts:

Part 1: Contains development and processes

Part 2: Contains design criteria including the content of the exhibits

Part 3: Contains the plans preparation and assembly requirements

Coordinate with the Turnpike Production PM to obtain tolls-related project input for the following activities:

1. Master planning for managed lanes with a tolling component (Express Lanes). Turnpike assists with concept of operations, master signing plans, tolling infrastructure locations, and express lane diagrams and concepts that are compatible with the Statewide Express Lane Software (SELS).
2. Develop District and Turnpike responsibility agreements for planning, design, construction, and maintenance of tolled facilities. Refer to the Toll Project Responsibility Matrix for use as the basis of these agreements.
3. Develop tolling plans for the corridor and provide recommendations where to toll and whether ramp or mainline tolling should be used.
4. Long range estimate input including construction cost estimates for tolling infrastructure (phase 52) and cost estimates for toll system installation (phase 53).
5. Consultant Scope & Staff Hour Development - Scope and staff hour development of tolling related disciplines for PD&E, design services, and RFP preparation services as well as negotiation support.
6. Stakeholder management support including Turnpike Host and Back Office, District Traffic Management Center, Turnpike management, and public communications.
7. Design reviews and post-design oversight including shop drawing review, Requests for Information/modification support, and Tolls Systems construction management.
8. Develop the overall tolling deployment plan and the associated tolling implementation plans with all related coordination including post implementation reporting.

The District PM must communicate with the Turnpike Production PM who will engage with Toll Systems PM and Tolls Design Administrator through each phase of the project.

PROJECT MANAGEMENT GUIDE 08/19/2022

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Toll Project Responsibility Matrix

- Requires CO, District and Turnpike coordination
- Link: [Tolls Design – Florida's Turnpike]

Recommended to be completed and accepted by all stakeholders prior to Phase II design.

Express Lanes: FDOT District (Non-Turnpike)

District and Turnpike Tolling and Mananged Lanes Responsibility Matrix TEMPLATE

Turnpike (R): Limited Design and Shop Drawing Review by Turnpike

GTR: The State's General Tolling Requirements

(NA): Not Applicable

No.	Element	Description	Ownership	Design Delivery	Submittal Reviews		Construction/ Implementation/ Testing	Maintenance		RCI/BMS/ Asset Mgmt	Notes
					Design Plans	Shop Drawings		Funding District	Perform		
1	**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.
2	**Traffic & Revenue Forecasting**	Traffic and revenue (T&R) forecasting of District toll projects as requested by Central Office and/or the District.	Central Office	NA	NA	NA	NA	District or Central Office	Turnpike	NA	Turnpike will manage the preparation of T&R forecasts for the District and/or Central Office, as requested.
3	**Project Systems Engineering Management Plan (PSEMP)**	A plan for the implementation of the express lanes project using Systems Engineering Process (SEP) principles.	District	District & Turnpike	District & Turnpike	NA	NA	District & Turnpike	District & Turnpike	NA	

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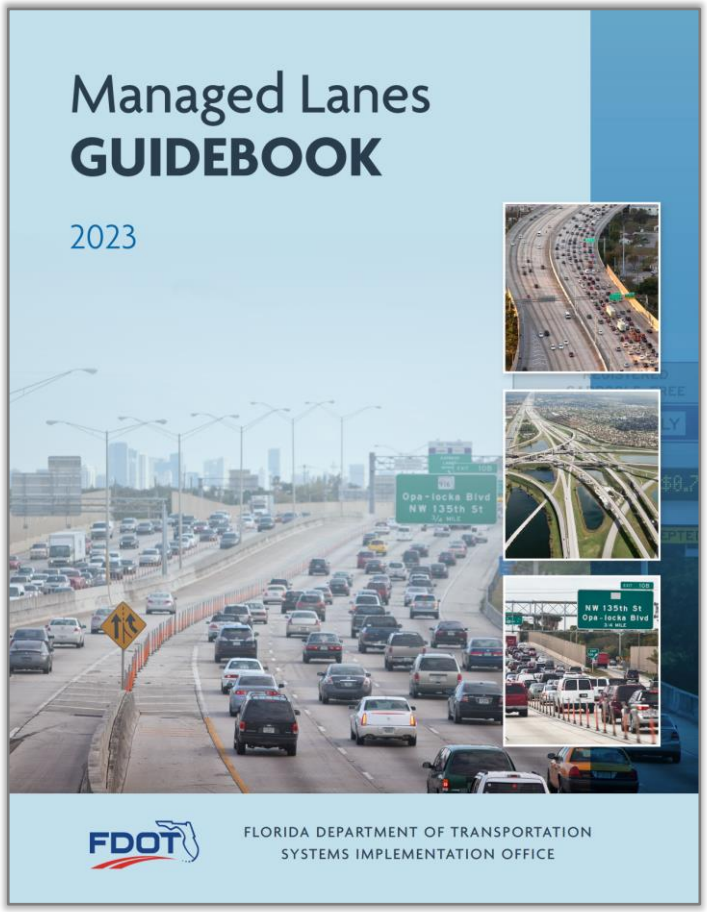
Managed Lanes Guidebook

- Link: [Systems Management Documents]
- Online and print version



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Key Figures and Appendices

- Figure 2-2 Manage Lanes Diagram Example
- Figure 2-3 Major Elements of a ConOps
- Figures 6-2 – 6-5 Toll Segments
- Figure 9-3 ESS Concept
- Appendix C

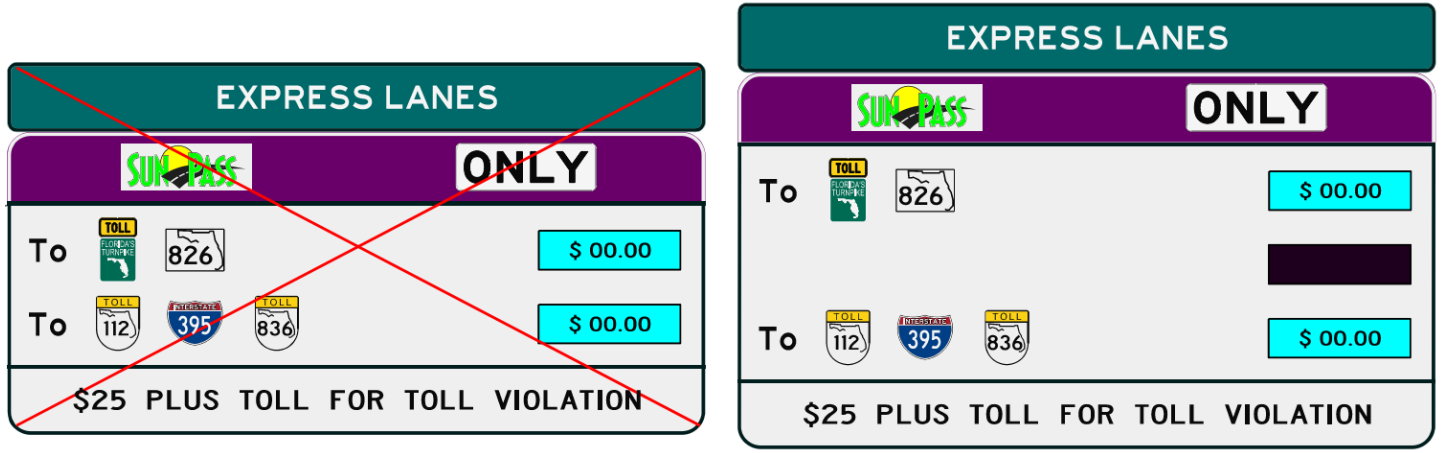

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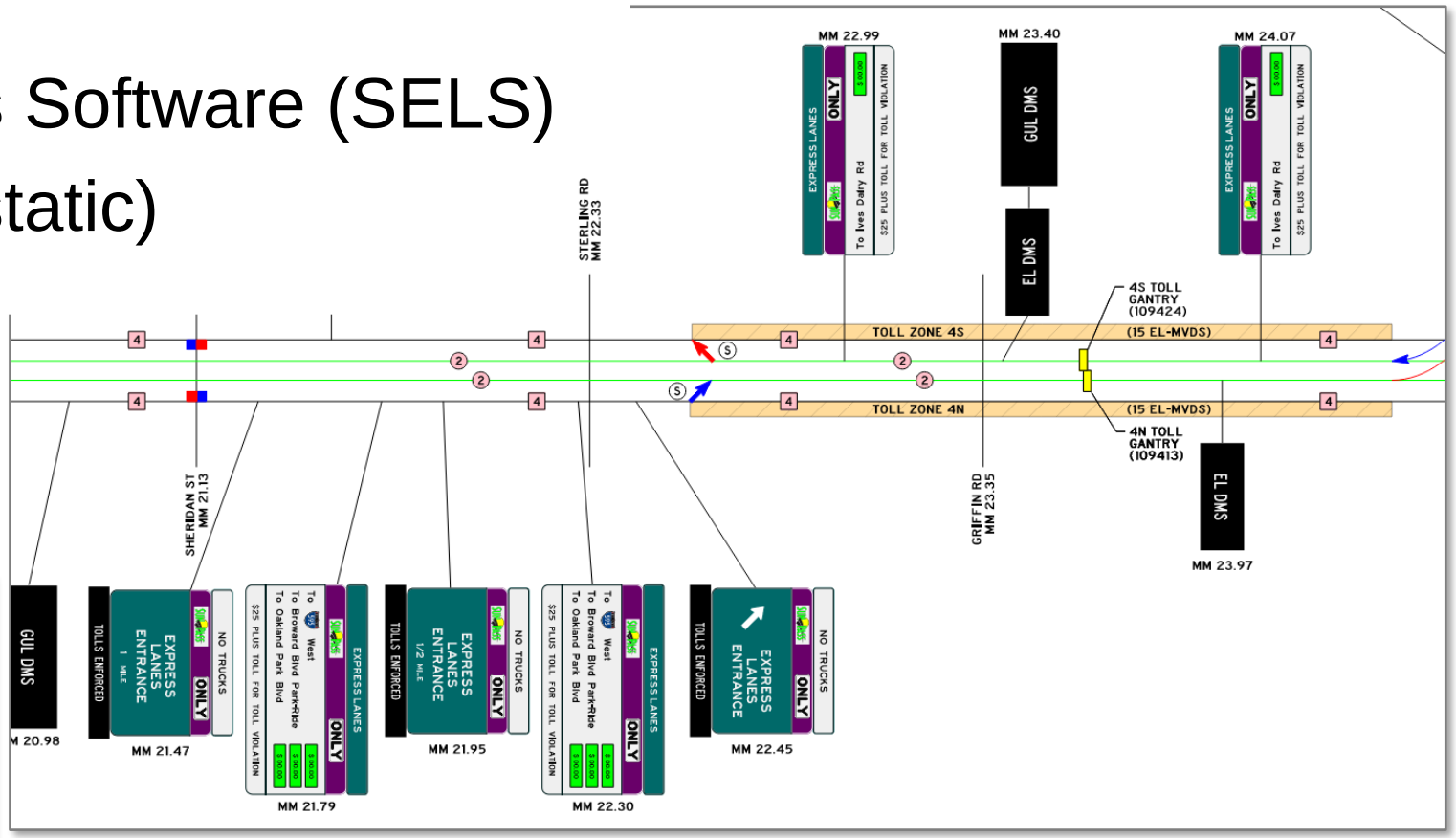
Figure 2-2 Managed Lanes Diagram Example

- Complete segment
- Statewide Express Lanes Software (SELS)
- Advance signage (DMS/static)
- Supporting ITS/CCTV
- TMC District control
- Incident management



LEGEND

- 1st Accessible Ramp After EL Egress
- 1st Accessible Ramp Before EL Ingress
- GUL / Thru Lane Ingress/Egress
- EL Ingress
- EL Egress
- XGX Gantry ID
- # Number of Express Lanes / Thru Lanes
- # Number of General Use Lanes
- General Use Lane (GUL)
- Express Lane (EL)
- Thru Lane
- Variable Toll Gantry
- Data Gantry
- Existing Variable Toll Gantry
- Existing Data Gantry
- (S) Slip Ramp Ingress/Egress
- (DC) Direct Connect Ingress/Egress

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Figure 2-2 Managed Lanes Diagram Example

- Recommended Diagram enhancements

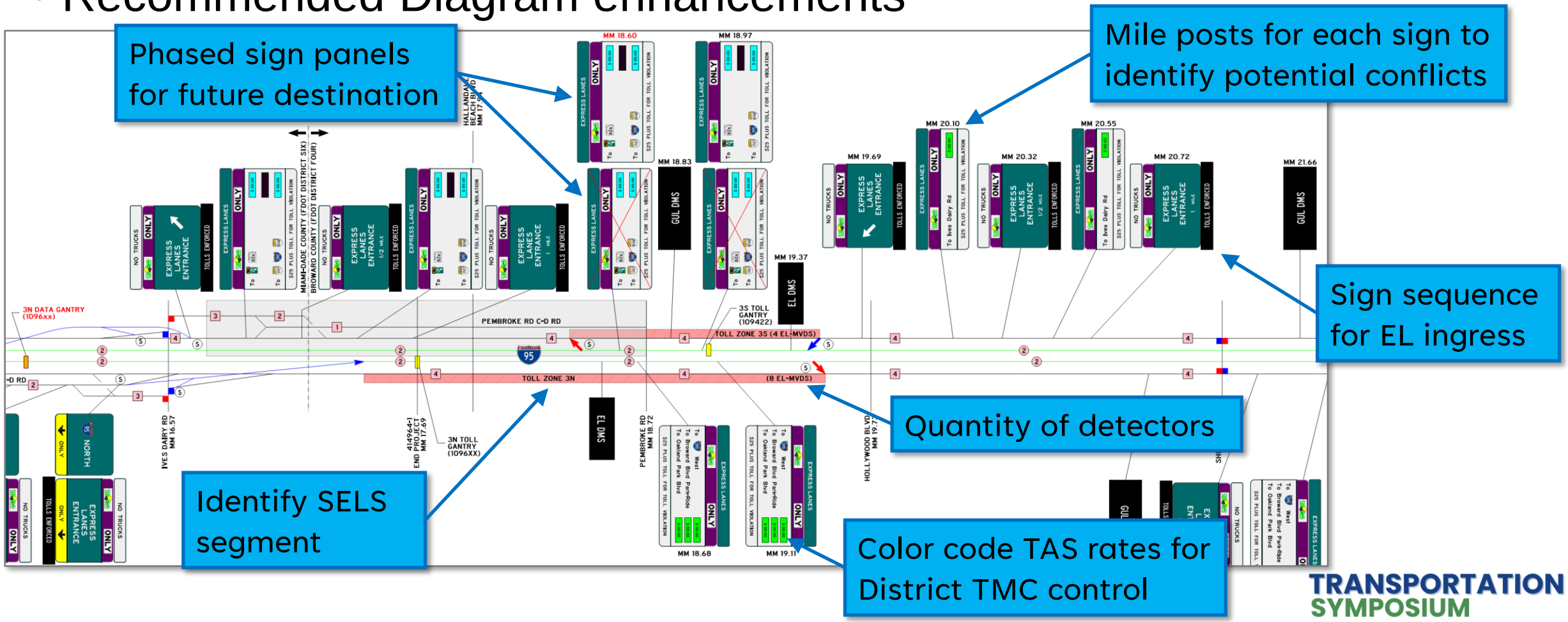

Figure 2-3 Major Elements of a ConOps

- Developed during the PD&E phase
- Regional, corridor, and project levels
- Phased implementation
- Maintenance of tolling
- Incident management

REGIONAL CONOPS (RCTO)

- High-Level Network Map
- Stakeholder Roles and Responsibilities
- Coordination
- Planning and Policy Framework
- Operations Objectives and Strategies
- Project Delivery Approach
- Relationships and Procedures
- Design of Physical Improvements
- Resource Needs
- Project Phasing
- Risk Analysis

PROJECT CONOPS

- Project Goals and Objectives
- Refinement of Elements in Regional ConOps
- Managed Lanes Implementation Plan and Project Phasing
- Operational Scenarios
- Toll Project Responsibility Matrix (if applicable)
- Stakeholder Needs
- Roles and Responsibilities
- System Concept
- User Requirements
- Managed Lanes Diagram
- Telecommunications Concept
- ITS Concept
- Risk Analysis

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Figures 6-2 – 6-5 Toll Segments

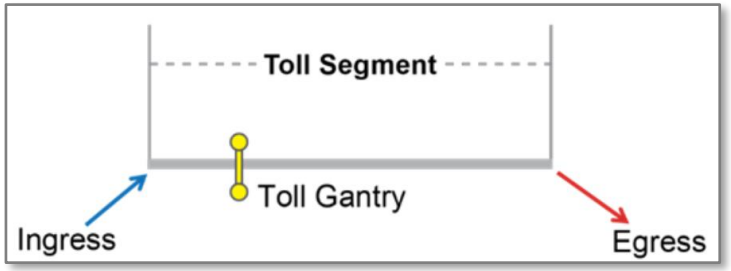

Figure 6-2

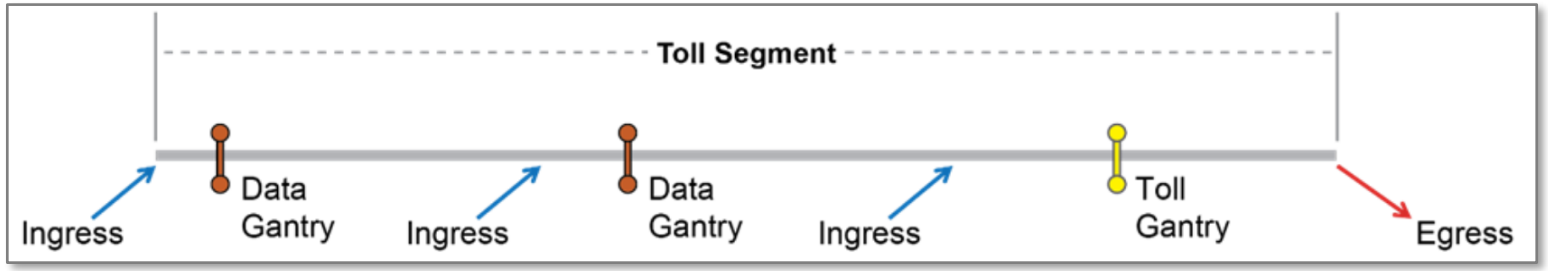

Figure 6-4

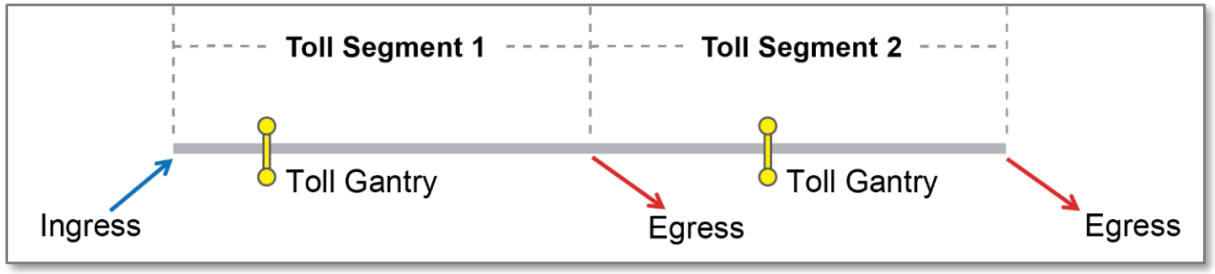

Figure 6-3

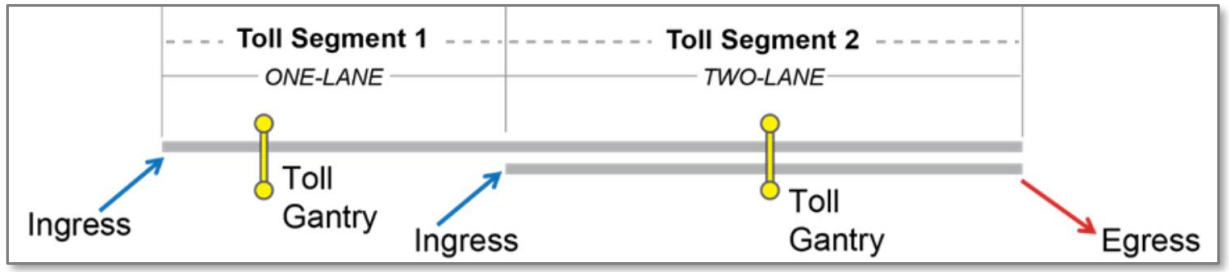

Figure 6-5

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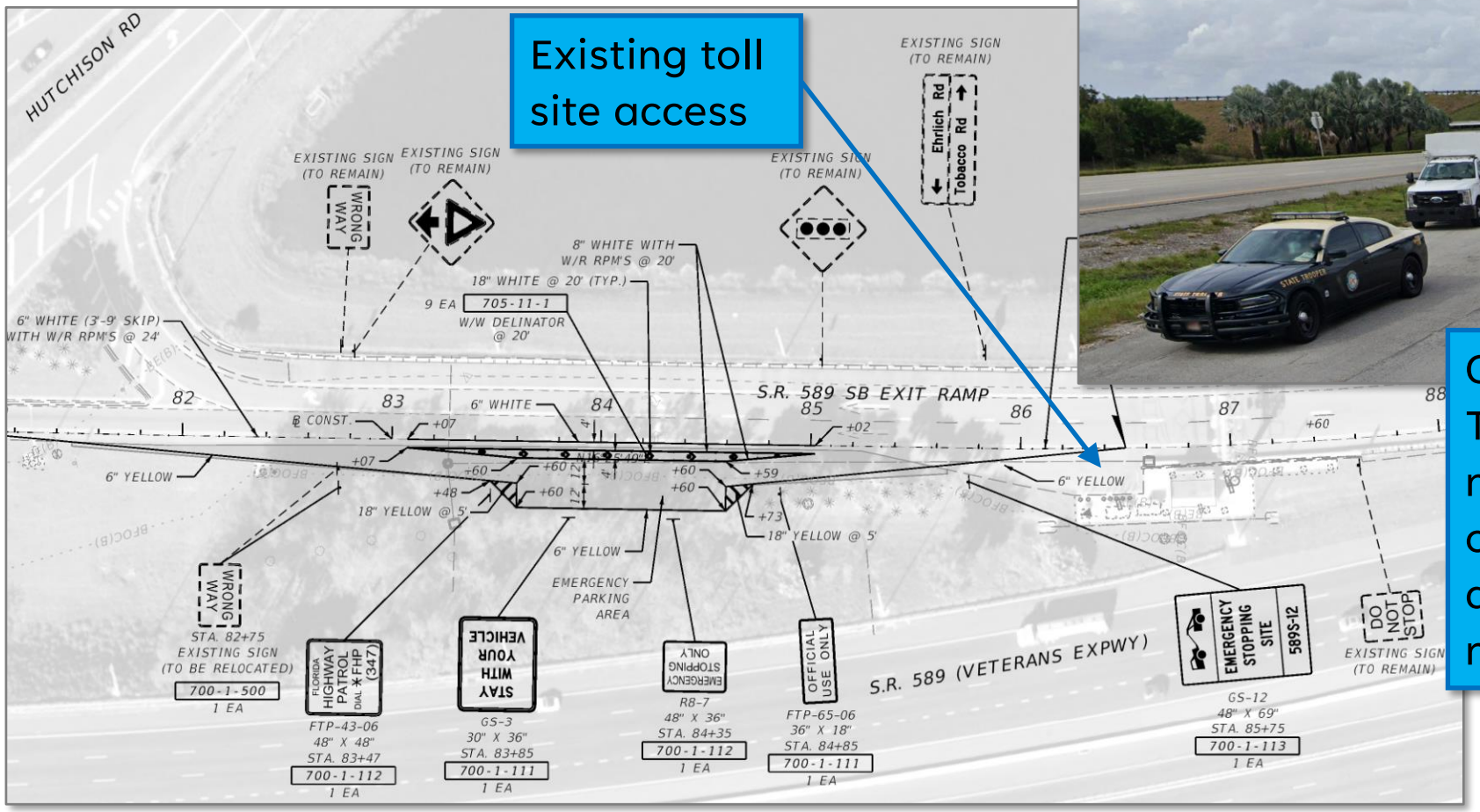
Figure 9-3 ESS Concept

- Avoid toll site access conflicts



GTR 231.2.1(8)
The maintenance pull-off parking must be dedicated to Tolls use only and must not be designed as a shared access for any other maintenance vehicles.

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Part 2, Chapter 3 – Engineering Analysis

- Managed lanes type and strategy
- GTR sketch level toll sites for each concept alternative
- Preliminary Toll Siting Technical Memorandum (TSTM)

Toll Road

For projects that are on or within the vicinity of a toll road, the Project Manager must coordinate with the FTE Environmental Management Office's Project Development Engineer or responsible authority for the toll road. Project alternatives must be reviewed for conformance to the ***General Tolling Requirements (GTR) Toll Siting 202 and 300 Toll Submittal Requirements***. Alternatives must be coordinated with FTE's Tolls Design. After a preferred alternative is selected, a ***Toll Siting Technical Memorandum (TSTM)*** is prepared per the ***GTR*** using FTE's ***Toll Siting Technical Memorandum Template***.

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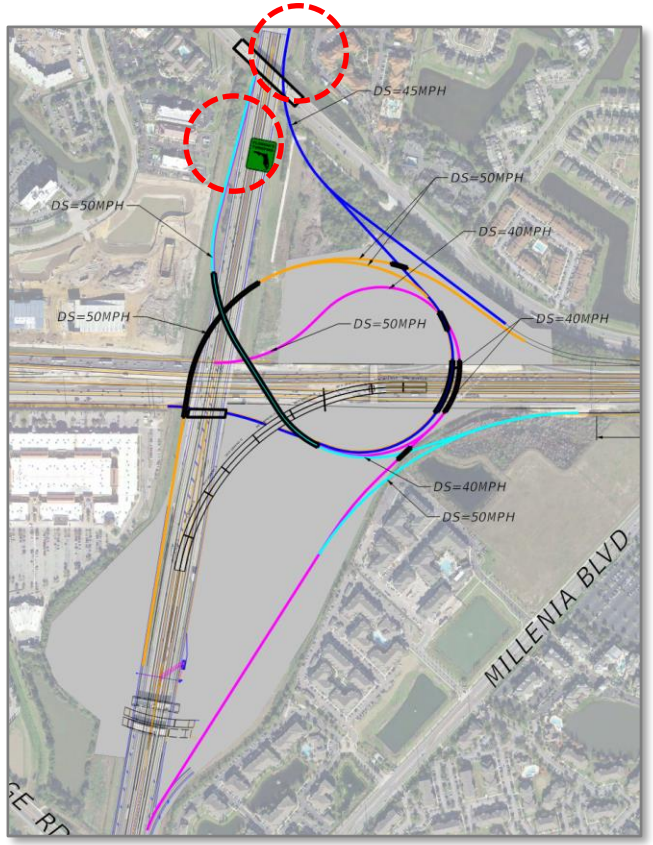
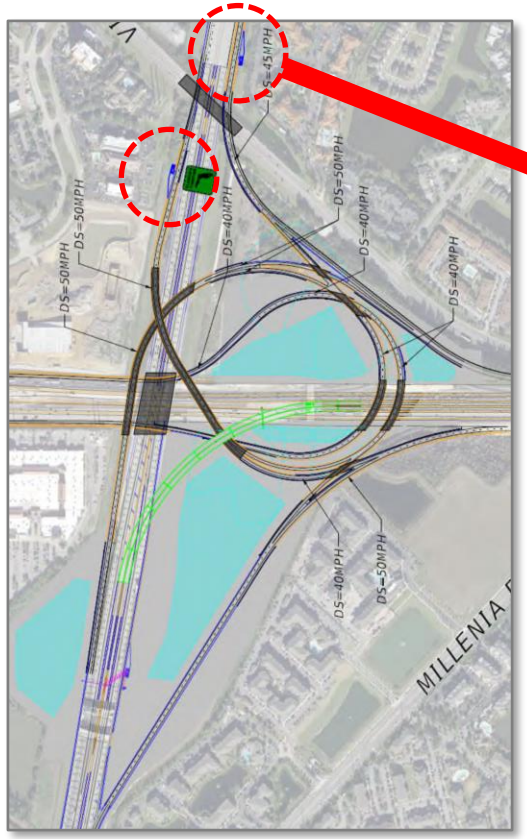
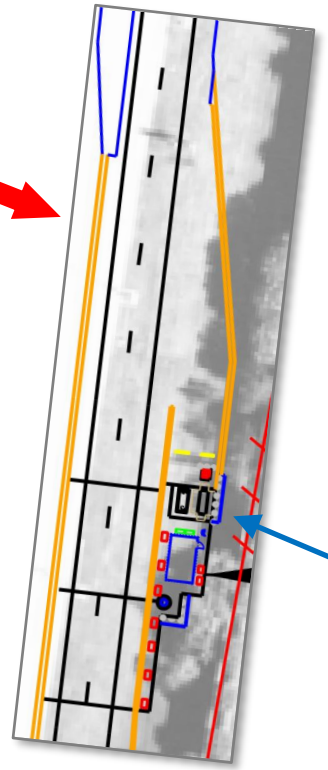
PD&E concept and GTR sketch level toll site



One Line diagram



Concept Level (PD&E)



Sketch Level (GTR)

Key Considerations:

1. Retaining wall?
2. Right-of-way impacts?
3. Wetland impacts?
4. Drainage impacts?
5. Maintenance access?

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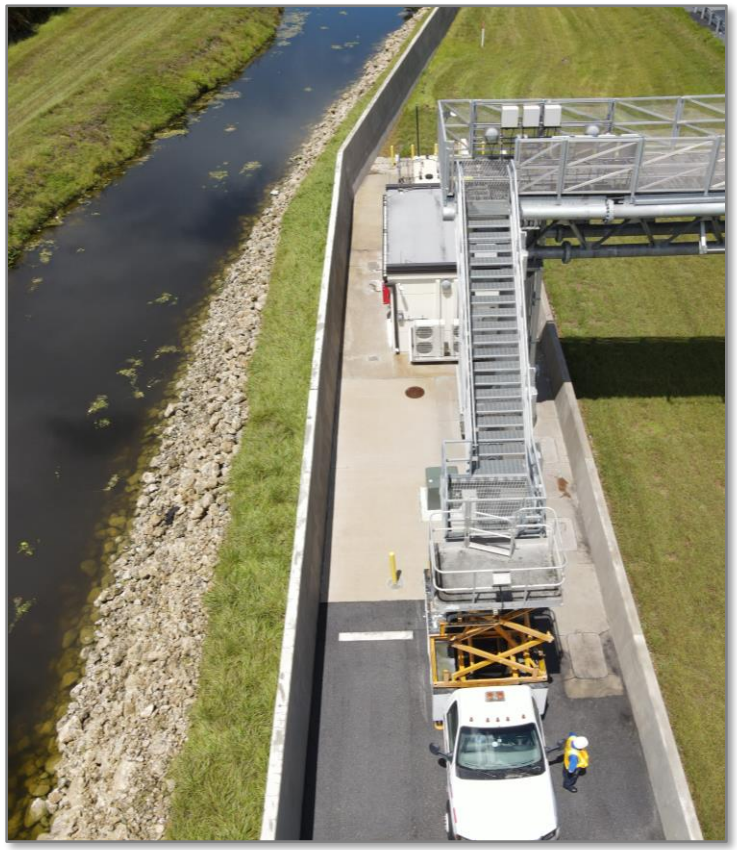
Potential Cost and Schedule Risks

- Roadway geometry redesign
- Right-of-way impacts
- Drainage permitting and/or wetland impacts
- Maintenance access (noise/pond) conflicts
- Utilities/utility easement conflicts
- Toll system performance/maintenance impacts
  - Proximity to existing toll sites
  - Proximity to overhead power and cell towers
- MOT transition from existing to new toll site
- Traffic operations at toll sites



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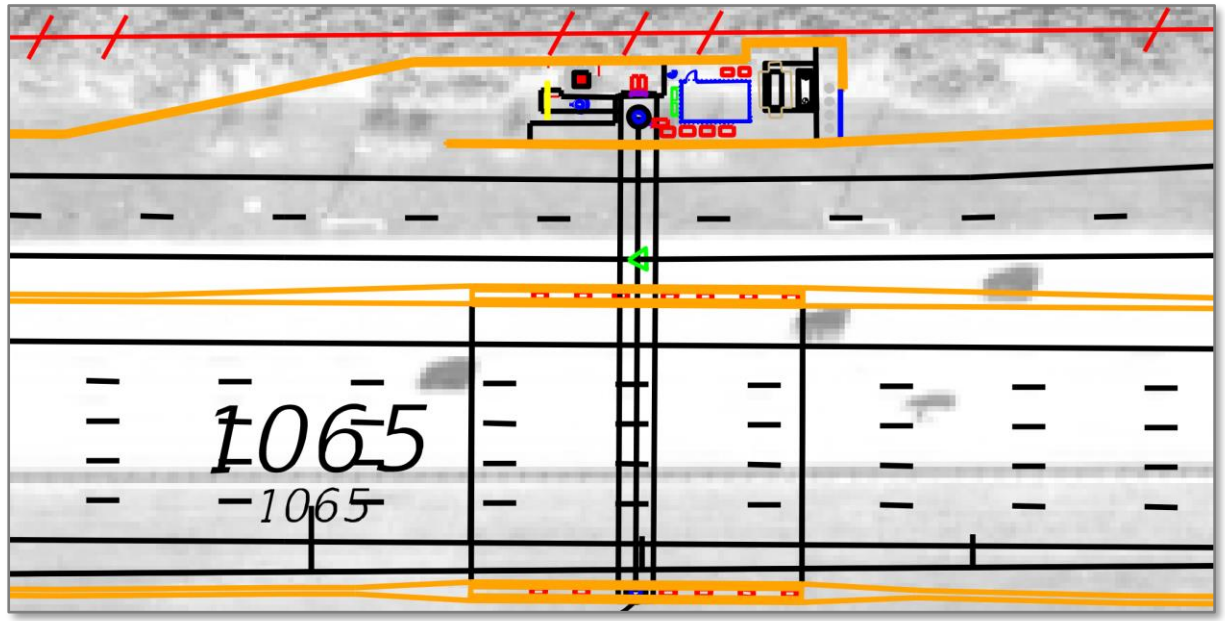
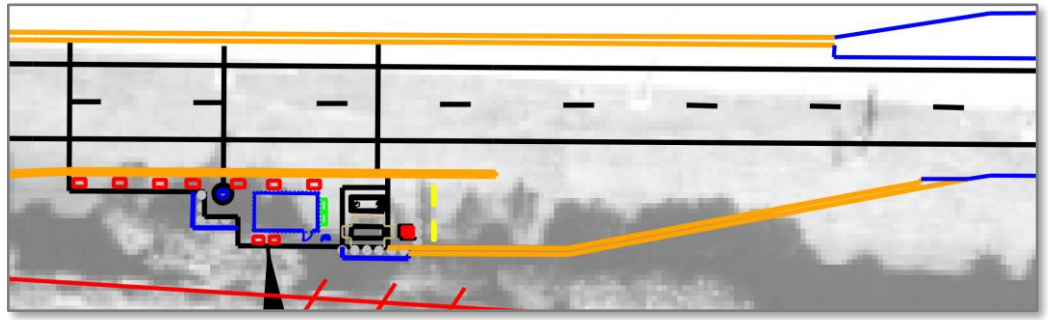
GTR Sketch Level Toll Site Infrastructure

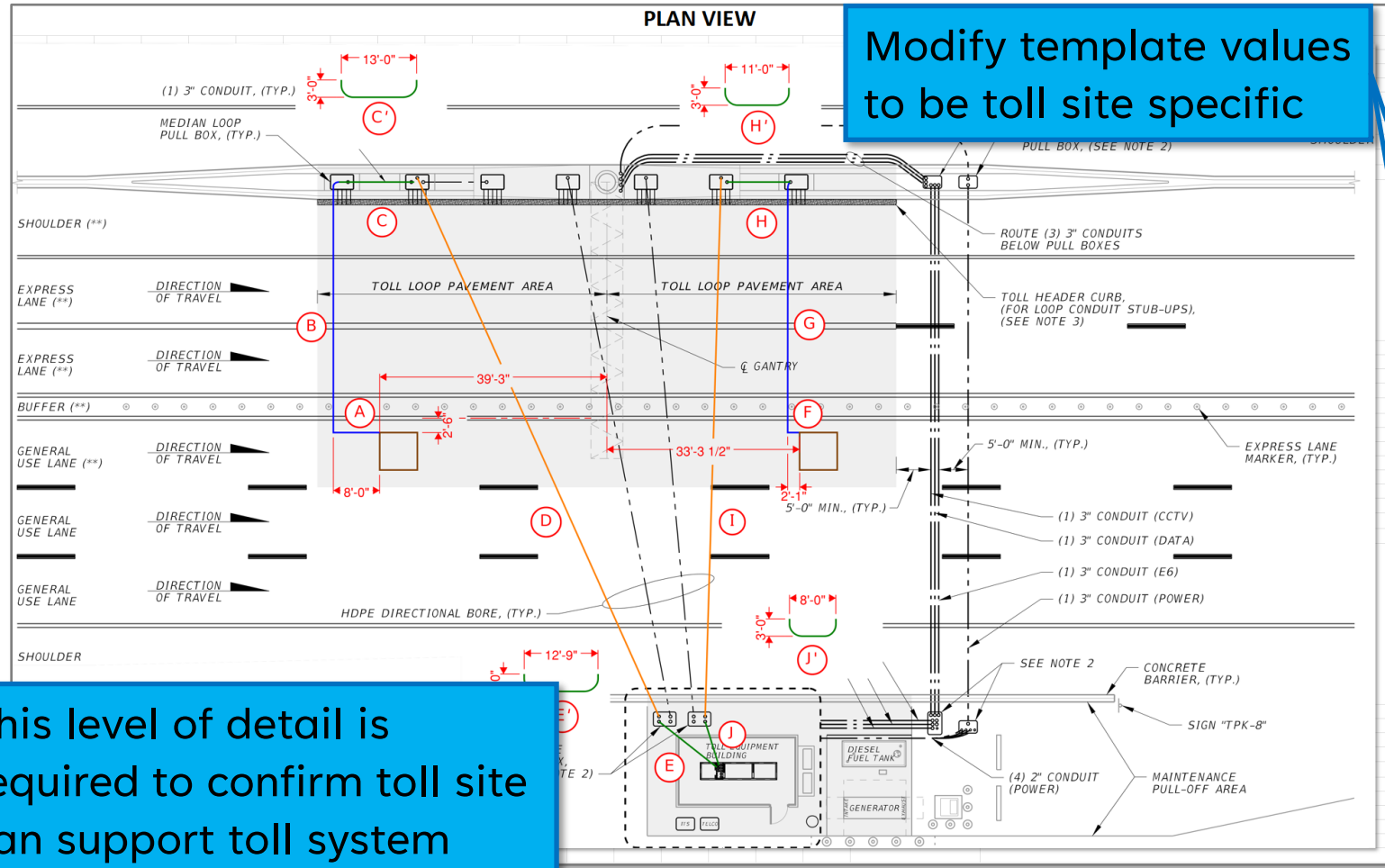
- Toll loop pavement area
- Gantry type and span limits
- Loop pull boxes
- Retaining wall (if applicable)
- Proximity to LA right-of-way
- Maintenance access pull-off area
- Cable distances (actual)
  - Gantry equipment
  - Toll loops





TRANSPORTATION SYMPOSIUM

Cable Distance Template - Loops



Modify template values to be toll site specific

GTR Section 234.3(3)

Condition 1: Approach loop furthest cable distance.

A	+	B'	+	C'	+	D'	+	R1	+	R2	+	E'	= TOTAL CABLE DISTANCE
8		41		19		156		4		4		16	248.0 FEET
		From face of concrete barrier to furthest lane or shoulder stripe. Add 2.5' for loop homerun and 4.5' to center of loop pull box.		Add 3' for each conduit end sweep.		Add 15% for Directional Bore		Depth of conduit burial to 1 foot above the bottom of the loop pull box.		Depth of conduit burial to 1 foot above the bottom of the loop pull box.		Add 3' for each conduit end sweep.	Cable Distance is Acceptable
		B		C		D						E	
		34		13		135		4		4		9	

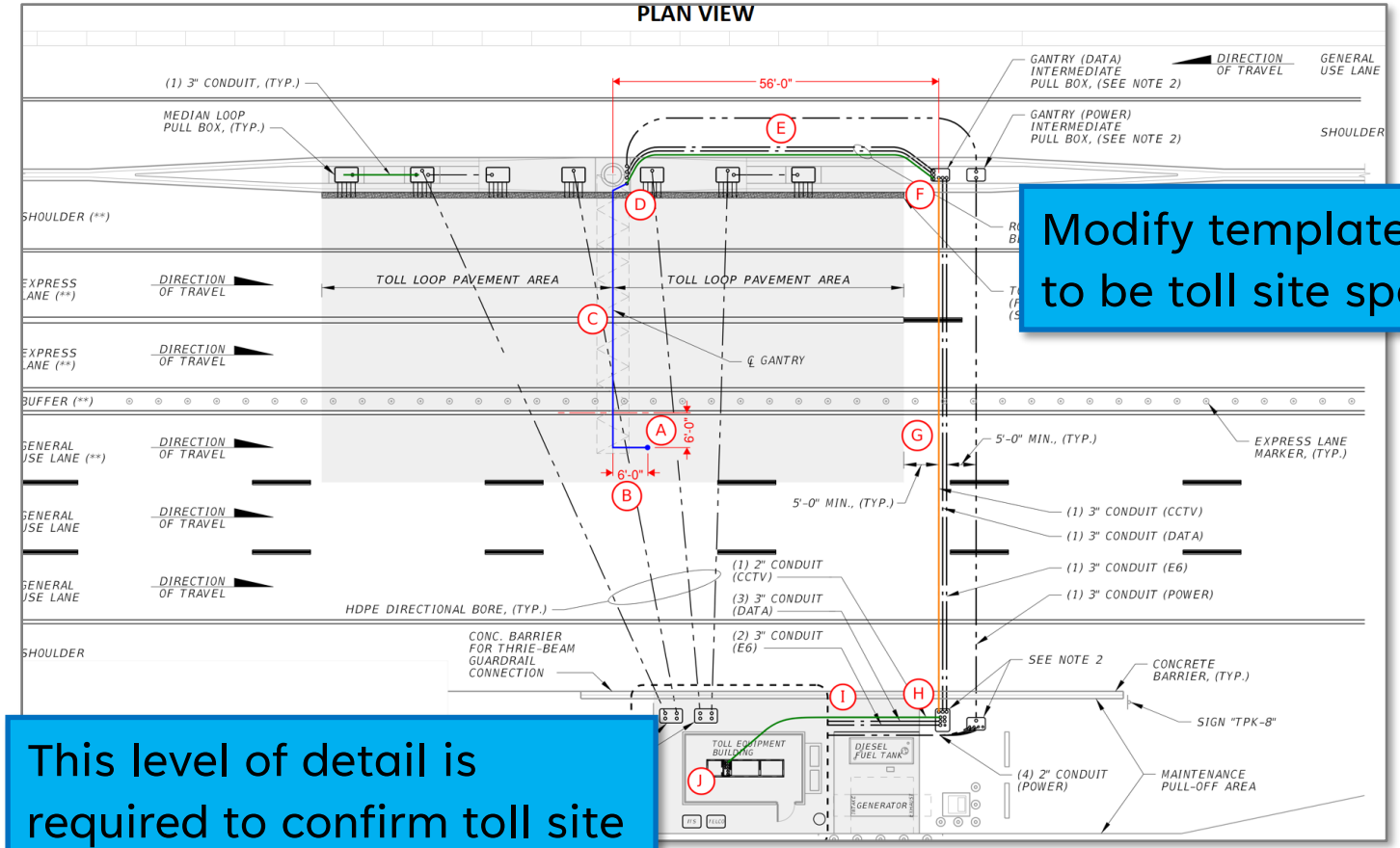
Condition 2: Departure loop furthest cable distance.

F	+	G'	+	H'	+	I'	+	R3	+	R4	+	J'	= TOTAL CABLE DISTANCE
2.083		44		17		150		5		5		14	237.1 FEET
		From face of median barrier to furthest lane or shoulder stripe. Add 2.5' for loop homerun and 3.5' to center of loop pull box.		Add 3' for each conduit end sweep.		Add 15% for Directional Bore		Depth of conduit burial to 1 foot above the bottom of the loop pull box.		Depth of conduit burial to 1 foot above the bottom of the loop pull box.		Add 3' for each conduit end sweep.	Cable Distance is Acceptable
		G		H		I						J	
		38		11		130		5		5		8	

This level of detail is required to confirm toll site can support toll system performance requirements

TRANSPORTATION SYMPOSIUM

Cable Distance Template - Gantry



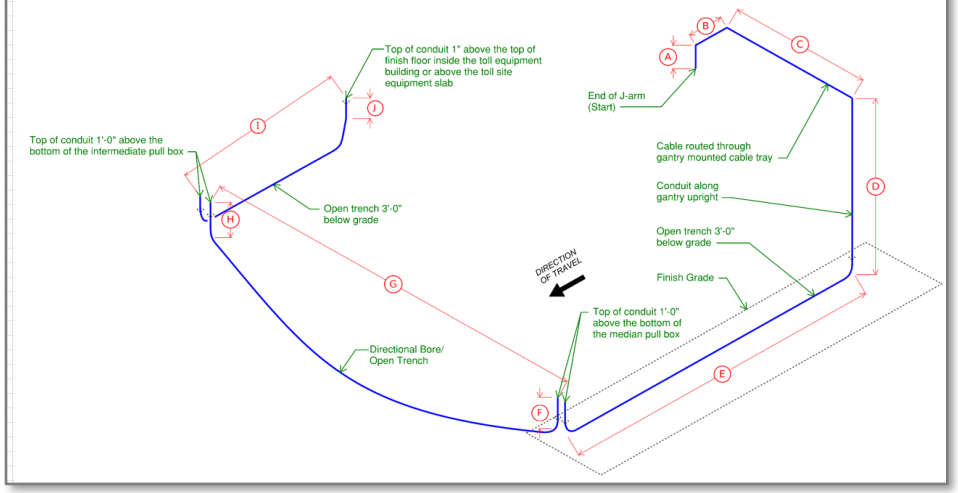
Modify template values to be toll site specific

Option 1: Top of median pull boxes are HIGHER than toll equipment building finish floor elevation.

A	+	B	+	C	+	D	+	E'	+ (2) x	F	+	G'	+ (2) x	H	+	I'	+	J	= TOTAL CABLE DISTANCE
4		6		44		30		61		8		76		8		9.9		3	249.9 FEET
				Measured distance from center of furthest equiped lane to center of gantry upright.		Measured distance from gantry mounted cable tray to 3 feet below grade.		Add 10% for Open Trench		Depth of conduit burial to 1-foot above the bottom of the loop pull box.		Add 15% for Directional Bore		Depth of conduit burial to 1-foot above the bottom of the loop pull box.		Add 10% for Open Trench			Cable Distance is Acceptable
								E		F		G		H		I			
								55		4		66		4		9			

NOTE:
1. E', G', and I' are calculated values which include the percentage of open trench or directional bore installations.

ISOMETRIC VIEW



This level of detail is required to confirm toll site can support toll system performance requirements

TRANSPORTATION SYMPOSIUM

Figures 110.1.1 & 111.1.1 Major Activities

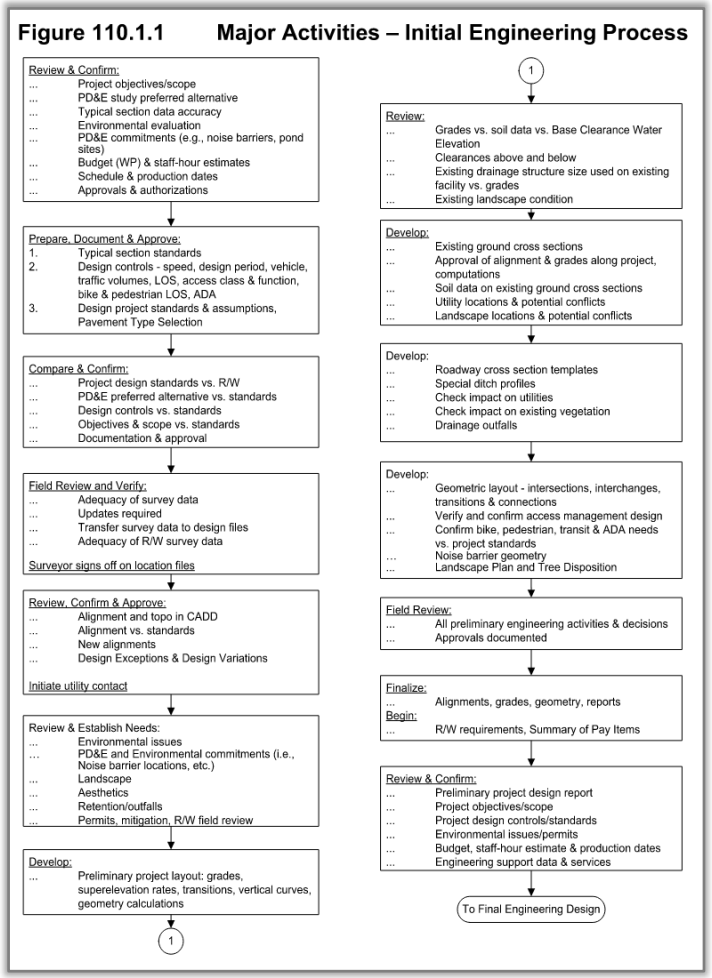


Figure 110.1.1 Major Activities – Initial Engineering Process

Review & Confirm:
... Project objectives/scope
... PD&E study preferred alternative
... Typical section data accuracy
... Environmental evaluation
... PD&E commitments (e.g., noise barriers, pond sites)
... Budget (WP) & staff-hour estimates
... Schedule & production dates
... Approvals & authorizations

Prepare, Document & Approve:
1. Typical section standards
2. Design controls - speed, design period, vehicle, traffic volumes, LOS, access class & function, bike & pedestrian LOS, ADA
3. Design project standards & assumptions, Pavement Type Selection

Compare & Confirm:
... Project design standards vs. R/W
... PD&E preferred alternative vs. standards
... Design controls vs. standards
... Objectives & scope vs. standards
... Documentation & approval

Field Review and Verify:
... Adequacy of survey data
... Updates required
... Transfer survey data to design files
... Adequacy of R/W survey data

Surveyor signs off on location files

Review, Confirm & Approve:
... Alignment and topo in CADD
... Alignment vs. standards
... New alignments
... Design Exceptions & Design Variations

Initiate utility contact

Review & Establish Needs:
... Environmental issues
... PD&E and Environmental commitments (i.e., Noise barrier locations, etc.)
... Landscape
... Aesthetics
... Retention/outfalls
... Permits, mitigation, R/W field review

Develop:
... Preliminary project layout: grades, superelevation rates, transitions, vertical curves, geometry calculations

1

1

Review:
... Grades vs. soil data vs. Base Clearance Water Elevation
... Clearances above and below
... Existing drainage structure size used on existing facility vs. grades
... Existing landscape condition

Develop:
... Existing ground cross sections
... Approval of alignment & grades along project, computations
... Soil data on existing ground cross sections
... Utility locations & potential conflicts
... Landscape locations & potential conflicts

Develop:
... Roadway cross section templates
... Special ditch profiles
... Check impact on utilities
... Check impact on existing vegetation
... Drainage outfalls

Develop:
... Geometric layout - intersections, interchanges, transitions & connections
... Verify and confirm access management design
... Confirm bike, pedestrian, transit & ADA needs vs. project standards
... Noise barrier geometry
... Landscape Plan and Tree Disposition

Field Review:
... All preliminary engineering activities & decisions
... Approvals documented

Finalize:
... Alignments, grades, geometry, reports
Begin:
... R/W requirements, Summary of Pay Items

Review & Confirm:
... Preliminary project design report
... Project objectives/scope
... Project design controls/standards
... Environmental issues/permits
... Budget, staff-hour estimate & production dates
... Engineering support data & services

To Final Engineering Design

[FDM 110 Initial Engineering Design Process]

120.1.1 Initial Engineering Design Process

Tolling projects must have additional major activities included in the various steps of the flow chart presented in ***FDM Figure 110.1.1*** as follows:

(1) Add to the activities in the fifth step of the flow chart "Review, Confirm, & Approve" the following:

(a) …Conceptual locations for toll facilities (Express lane toll sites are dependent on the ingress / egress locations.)

(2) Add to the activities in seventh step of the flow chart "Develop" the following:

(a) …Toll site locations based on GTR toll siting requirements vs. project geometry

(b) …Draft of the Preliminary TSTM

(3) Add to the activities in the last step of the flow chart "Review and Confirm" the following:

(a) …Toll site locations (Express lane toll sites are dependent on the ingress / egress locations.)

(b) …GTR Deviation Submittal Letter

(c) …Preliminary TSTM

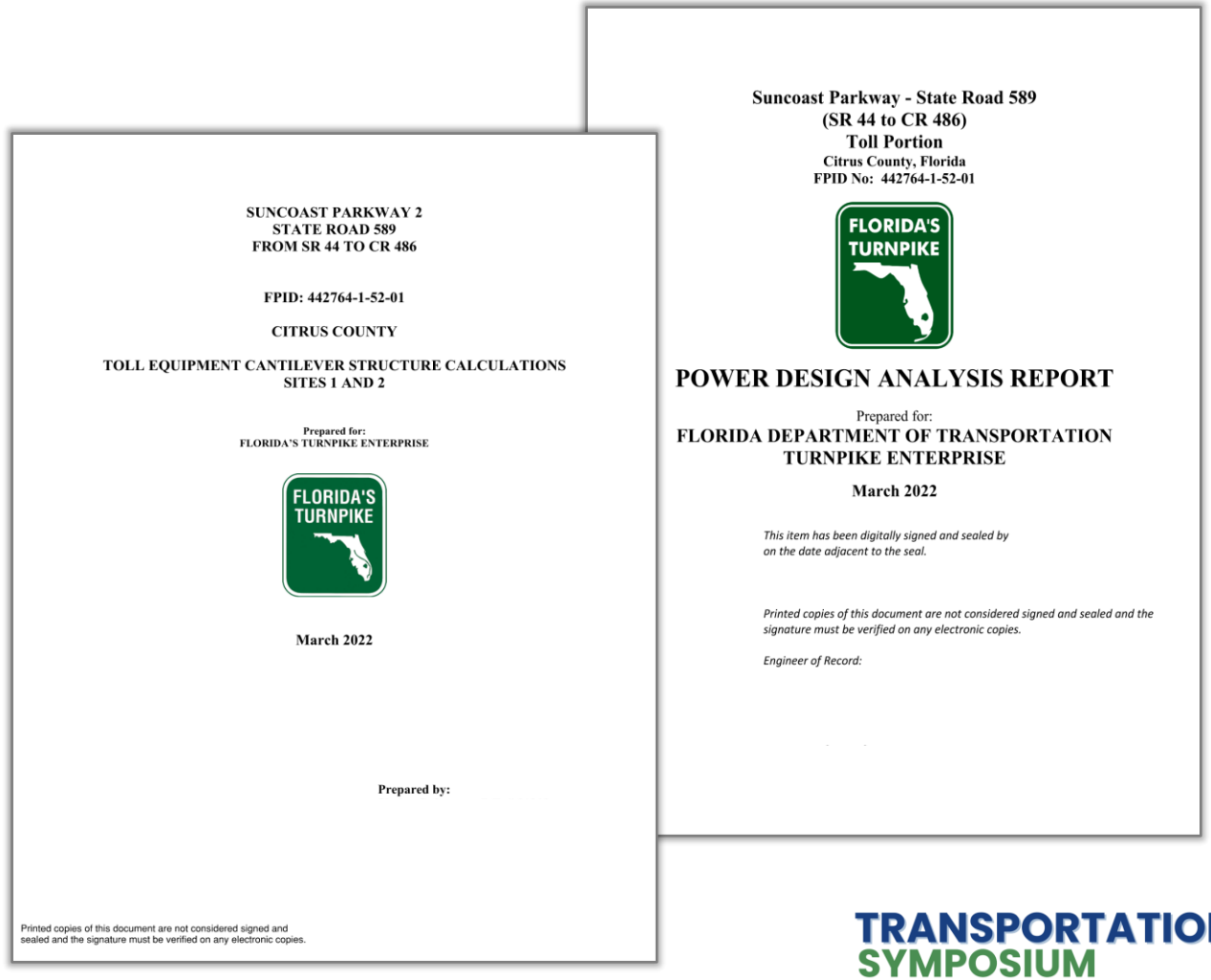
[GTR 120 Plan Development Process]

TRANSPORTATION SYMPOSIUM

Table 111.7.1 (Tolls Documents)

Table 111.7.1 – Document Summary Table Cont.

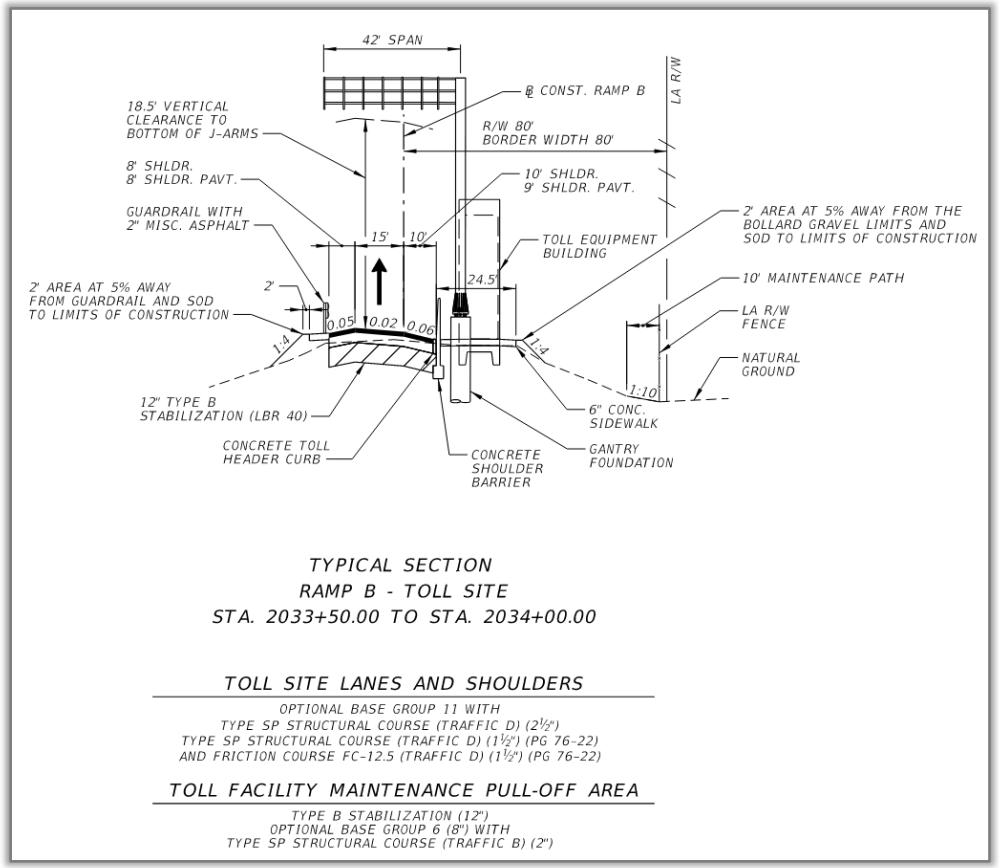
PSEE Folder	Document Type	Document	File Name
TOLLS	Tolls Docs	Toll Siting Technical Memorandum	TollSitingTechMemo
		Express Lanes Diagrams and Concept Plans	ELDiagramsAndConceptPlans
		Tolls Mechanical Design Analysis	TollMechanicalDAR (required for Toll Equipment Buildings Only)
		Tolls Structural Design Analysis Report	TollStructuralDAR
		Tolls Gantry Design Analysis Report	TollGantryDAR
		Tolls Power Design Analysis Report	TollPowerDAR
		GTR Deviations	GRTDev_XX
ARCHTECTURAL	Architect Docs	Electrical Calculations	ElectricalCalculations
		Mechanical Calculations	MechanicalCalculations



TRANSPORTATION SYMPOSIUM

120.2.3.3 Typical Section Sheet

- Exhibits 913-11 and 913-12



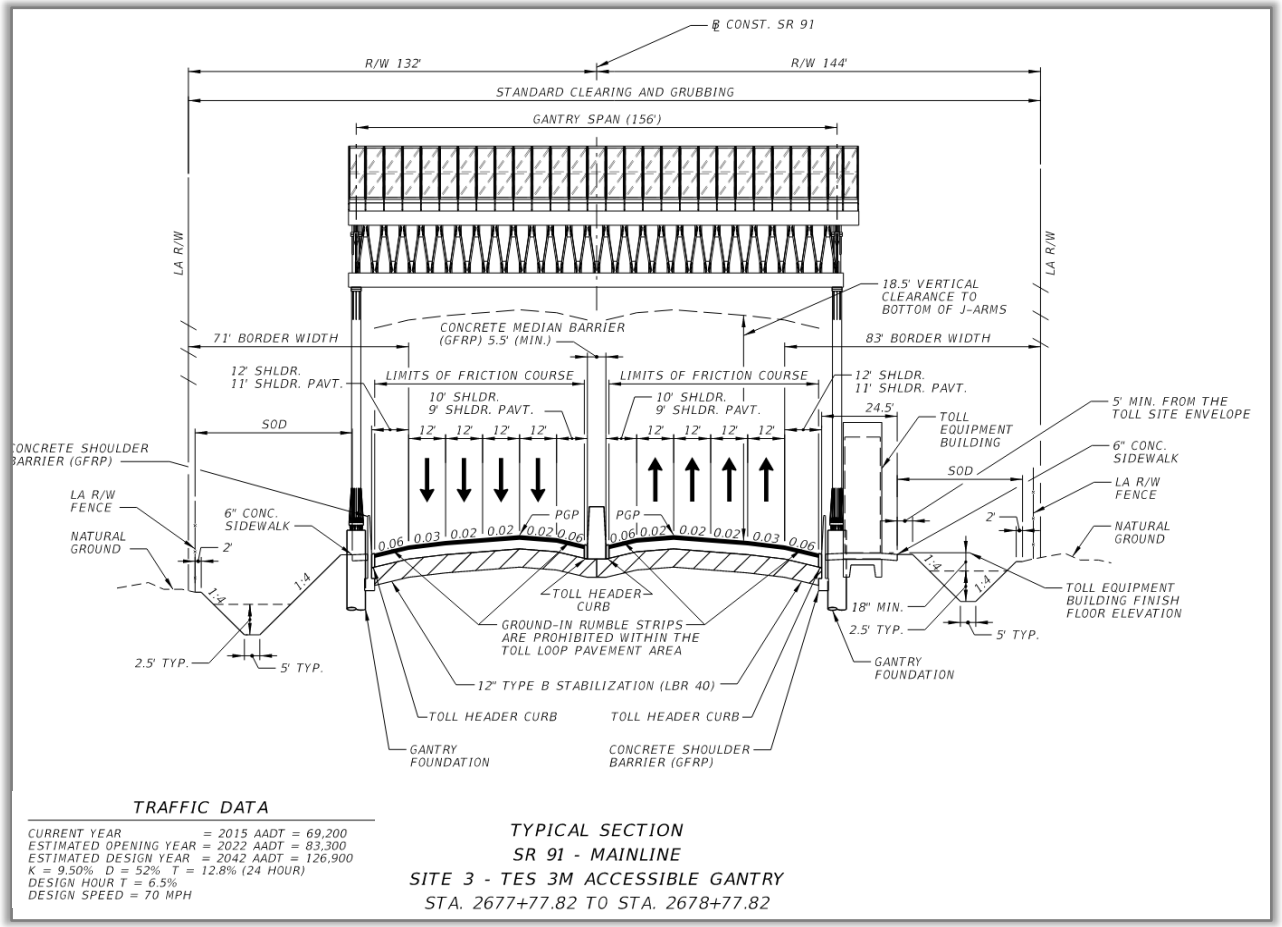
TYPICAL SECTION
RAMP B - TOLL SITE
STA. 2033+50.00 TO STA. 2034+00.00

TOLL SITE LANES AND SHOULDERS

OPTIONAL BASE GROUP 11 WITH
TYPE SP STRUCTURAL COURSE (TRAFFIC D) (2½")
TYPE SP STRUCTURAL COURSE (TRAFFIC D) (1½") (PG 76-22)
AND FRICTION COURSE FC-12.5 (TRAFFIC D) (1½") (PG 76-22)

TOLL FACILITY MAINTENANCE PULL-OFF AREA

TYPE B STABILIZATION (12")
OPTIONAL BASE GROUP 6 (8") WITH
TYPE SP STRUCTURAL COURSE (TRAFFIC B) (2")



TRAFFIC DATA

CURRENT YEAR = 2015 AADT = 69,200
ESTIMATED OPENING YEAR = 2022 AADT = 83,300
ESTIMATED DESIGN YEAR = 2042 AADT = 126,900
K = 9.50% D = 52% T = 12.8% (24 HOUR)
DESIGN HOUR T = 6.5%
DESIGN SPEED = 70 MPH

TYPICAL SECTION
SR 91 - MAINLINE
SITE 3 - TES 3M ACCESSIBLE GANTRY
STA. 2677+77.82 TO STA. 2678+77.82

TRANSPORTATION SYMPOSIUM

201.5.1.2 Express Lanes – Table 201.5.2

Table 201.5.2 Ramp Design Speeds

Ramp Connection Type	Minimum Design Speed (mph)
Loops and Semi-Direct	30
Outer Cloverleaf	35
Intermediate Portions of Long Ramps	40
Direct Connection	50

Express Lane Direct Connections:

(1) Design Speeds higher than the minimum shown above should be used when practical. A Design Speed of 60 mph is desirable.

(2) Design Variations for Design Speed will not be approved for Express Lane Direct Connections with a Design Speed below 40 mph.

Influences traffic operations

TRANSPORTATION SYMPOSIUM

211 Limited Access Facilities

Managed lanes design is an iterative process best performed in a collaborative environment involving various disciplines (e.g., managed lanes planning, PD&E, construction, maintenance, traffic operations, transportation systems management and operations). Coordinate with the Turnpike Toll Systems and Tolls Design Offices in Phase I of the design process. An explanation of the process and considerations is given in the ***FDOT Managed Lanes Guidebook***.

Many design criteria are related to design speed (e.g., vertical and horizontal geometry, sight distance). When the minimum design values are not met, an approved Design Exception or Design Variation is required. See ***FDM 201.5*** for information on Design Speed. See ***FDM 122*** for information on Design Exceptions and Design Variations.

The following manuals and documents provide additional information for the design of LA Facilities:

- ***General Tolling Requirements (GTR)*** -Use this document for design criteria and requirements for tolling on Turnpike and Non-Turnpike projects.
- ***AASHTO's A Policy on Geometric Design of Highways and Streets (AASHTO Green Book)***
- ***A Policy on Design Standards – Interstate System, 2016 Edition (AASHTO)***
- ***FDOT Managed Lanes Guidebook***
- ***Traffic Engineering Manual (TEM)*** - This manual is used to supplement the ***Manual on Uniform Traffic Control Devices (MUTCD)***'s standards and guidelines with Florida specific signs and pavement markings used on the State Highway System by the Department's Traffic Operations Offices.

Example roadway typical sections are included in the exhibits in ***FDM 913***. Criteria regarding lanes, medians, and shoulders for bridges are illustrated in ***FDM 260.1.1.*** Subsequent sections of this chapter contain specific information and criteria regarding these and other typical section elements, as well as geometric features.

Existing project features which were constructed to meet minimum metric design criteria but are mathematically slightly less than equivalent minimum English design criteria, do not require Design Exceptions or Design Variations to remain. On reconstruction projects, every effort should be made to use current criteria and standards.

Specific requirements for toll site design (e.g., toll siting, toll facility demolition/renovation, toll facility site, toll facility building, and toll facility gantry) are given in the ***General Tolling Requirements (GTR)***.

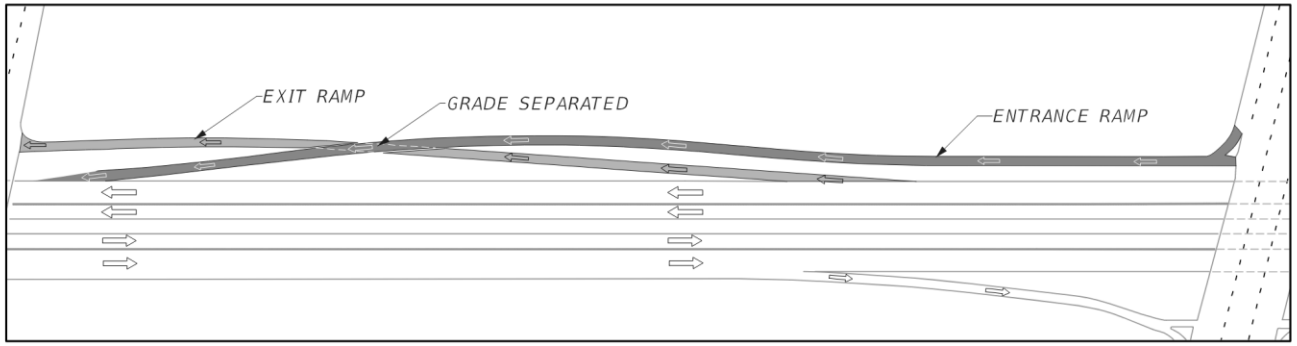
211.10.2 Decision Sight Distance

- Tolls maintenance vehicle access
- Decision points (ingress/egress)

TRANSPORTATION SYMPOSIUM

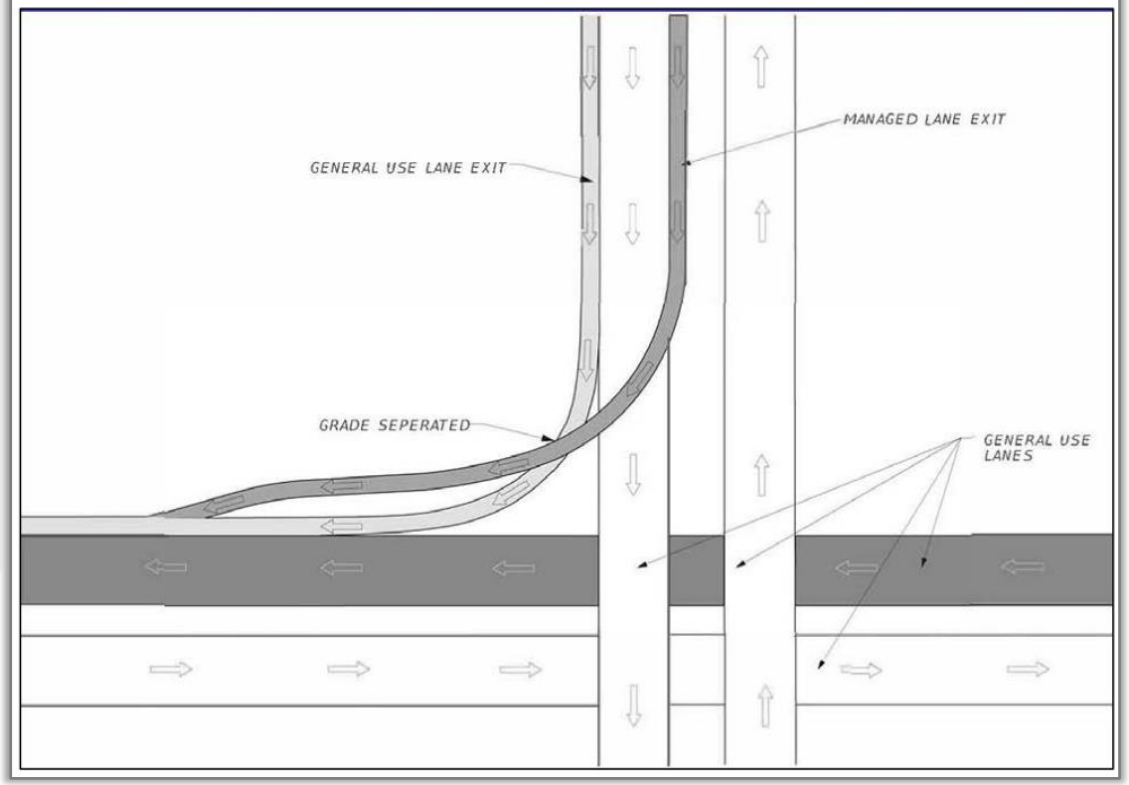
211.12.2 Braided Ramps

Figure 211.12.2 Braided Ramp Configuration



When combining general use lane or general toll lane exits and managed lane exits in a braided ramp configuration, the managed lane exit merges on the right side of the general use lanes as illustrated in ***Figure 211.12.3***. Operational analysis determines the actual lane configuration. Refer to ***Traffic Analysis Handbook*** and ***Interchange Access Request User's Guide*** for guidance on analysis requirements.

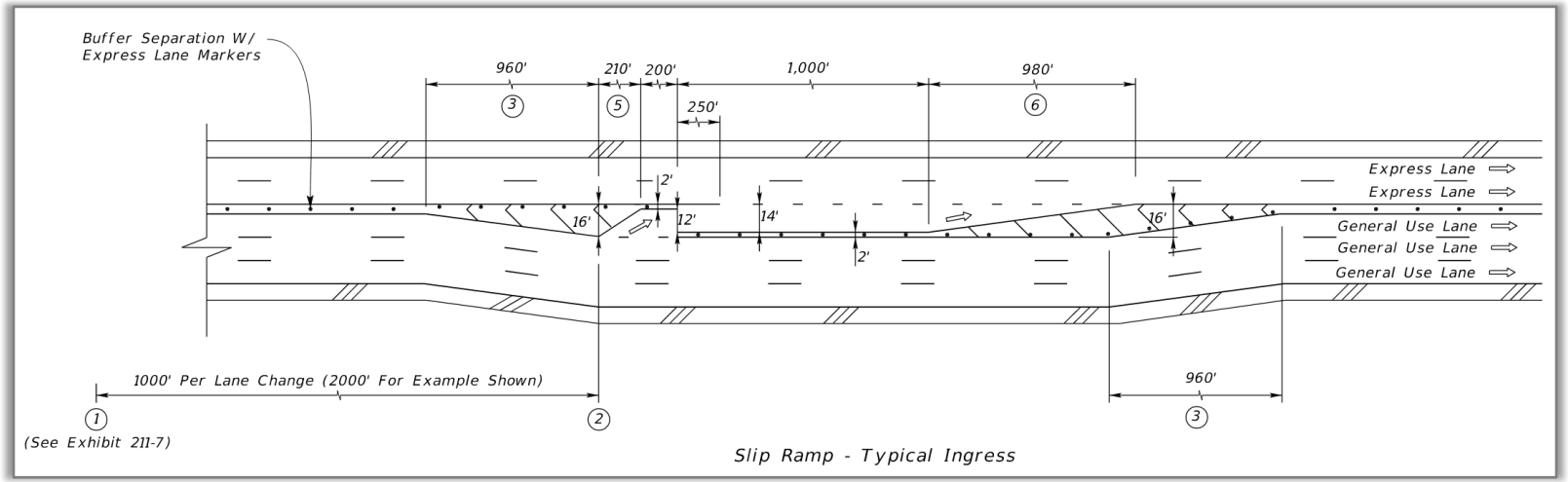
Figure 211.12.3 Braided Managed Lane and General Use Lane Exits



TRANSPORTATION SYMPOSIUM

211.14 Managed Lanes Access Points/Types

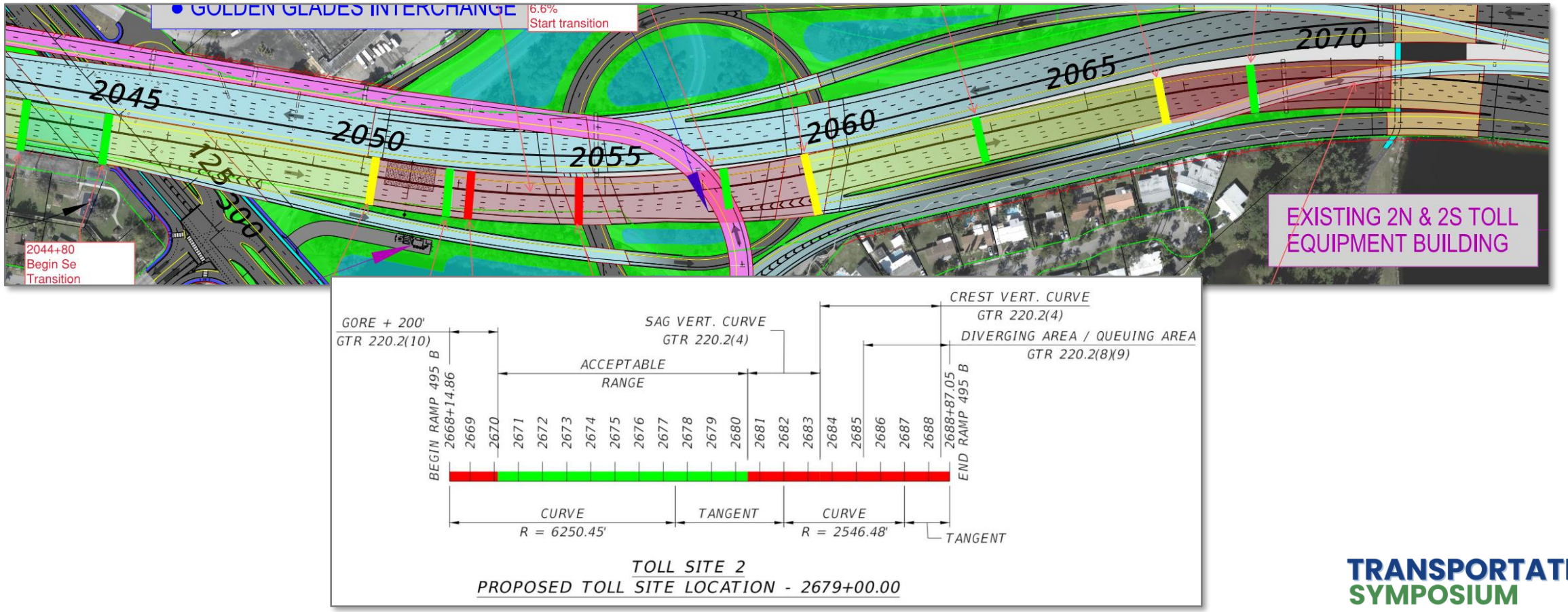
- TEM Section 2.42 signs and sign sequence
- Access Types – Exhibits 211-3 – 211-12 (in order of best traffic ops)
  - Slip Ramps
  - Direct Connect Ramps
  - Weave Lanes
  - Weave Zones
  - *Continuous Access (not for tolling)*



TRANSPORTATION SYMPOSIUM

GTR Part 2

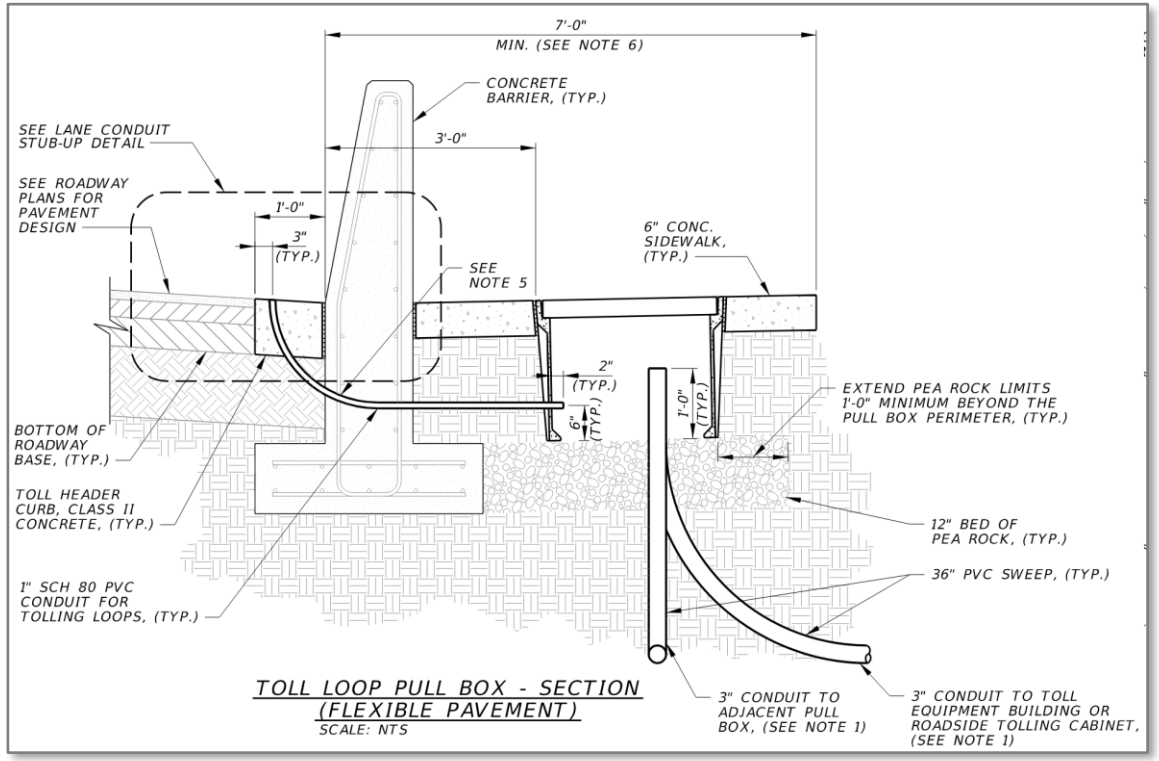
- Section 220 Toll Site Roadway

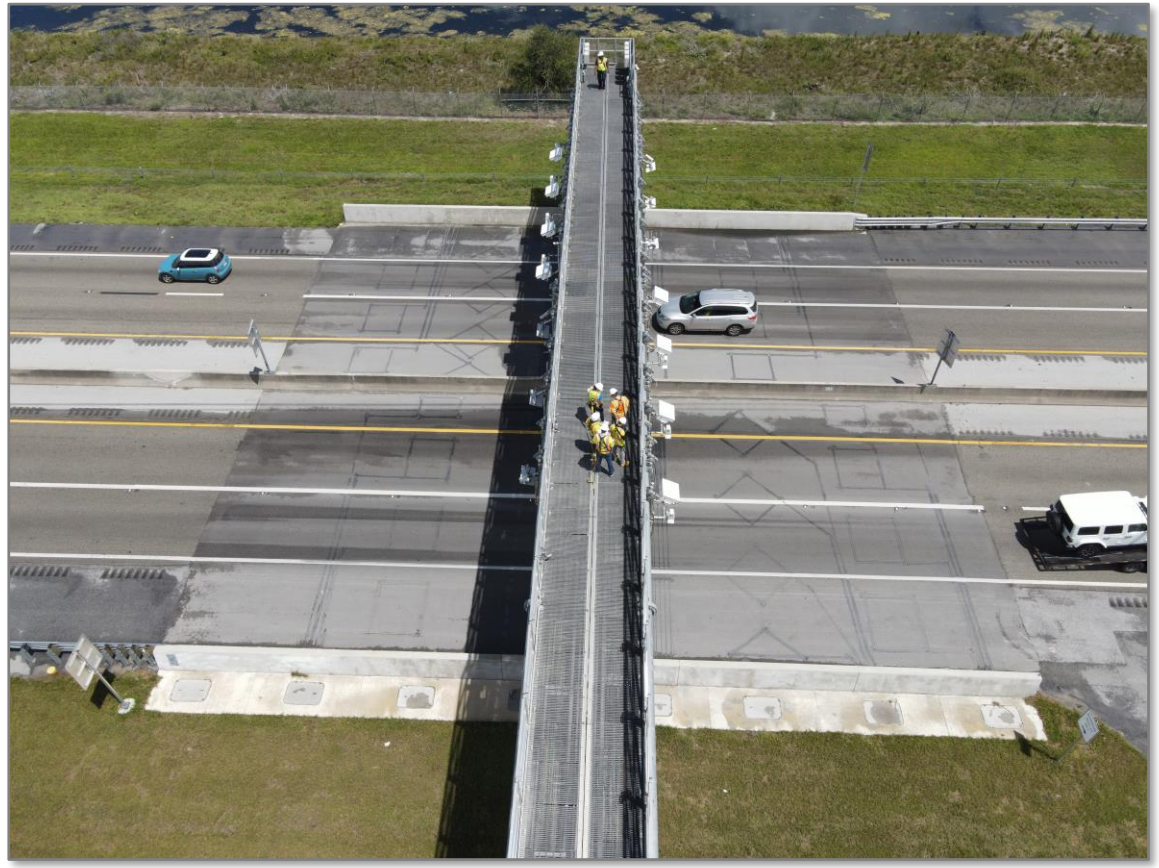


TRANSPORTATION SYMPOSIUM

GTR Part 2

- Section 221 Toll Pavement Design
  - Asphalt with FC-12.5 (1.5”)
  - Concrete with fiber mesh and GFRP





TRANSPORTATION SYMPOSIUM

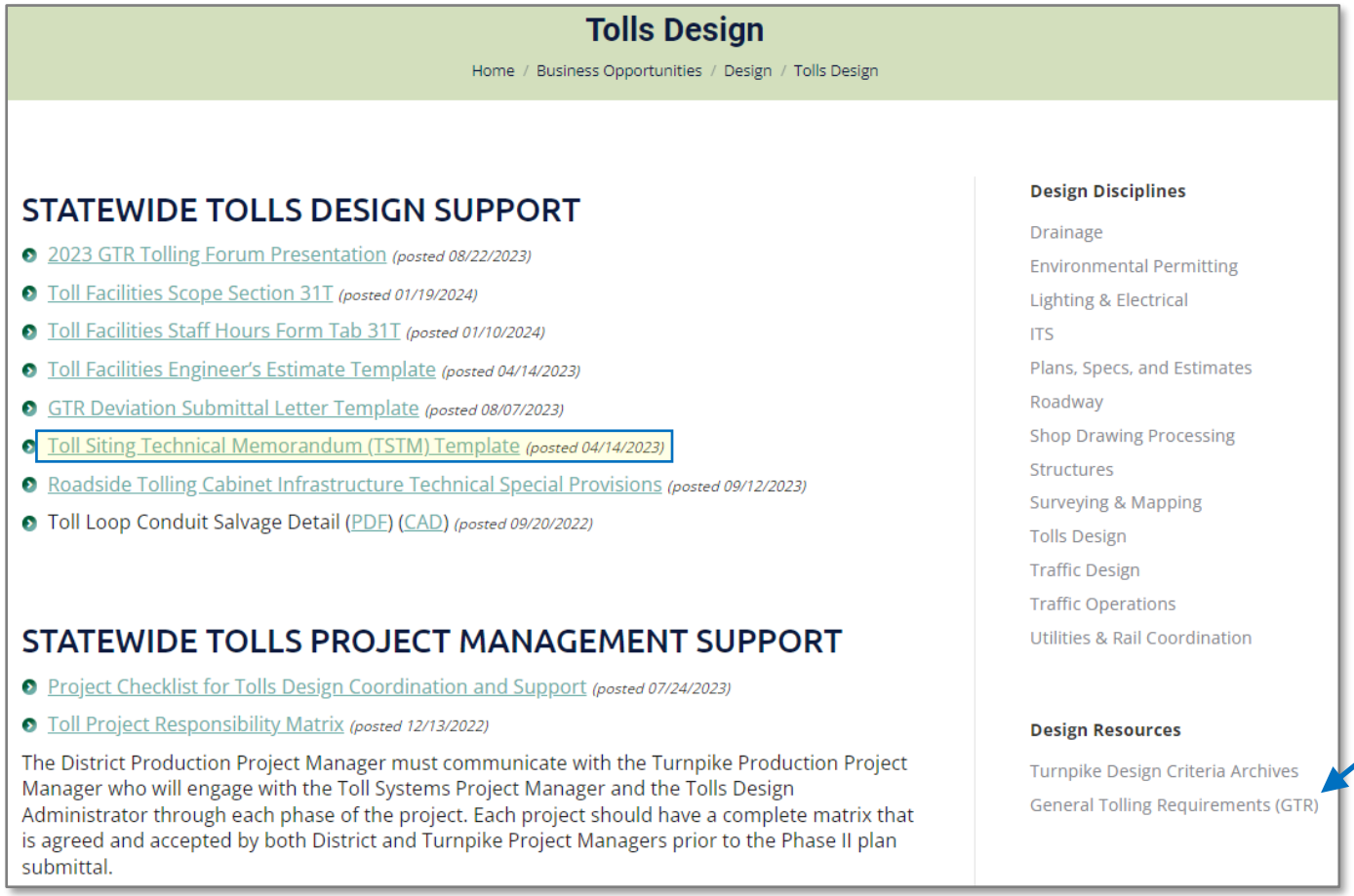
GTR Part 2

- Section 223 Toll Site Construction Phasing Requirements

TRANSPORTATION SYMPOSIUM

Section 202 Toll Siting

- Preliminary Toll Siting Technical Memorandum (TSTM)



Tolls Design

Home / Business Opportunities / Design / Tolls Design

STATEWIDE TOLLS DESIGN SUPPORT

- 2023 GTR Tolling Forum Presentation *(posted 08/22/2023)*
- Toll Facilities Scope Section 31T *(posted 01/19/2024)*
- Toll Facilities Staff Hours Form Tab 31T *(posted 01/10/2024)*
- Toll Facilities Engineer's Estimate Template *(posted 04/14/2023)*
- GTR Deviation Submittal Letter Template *(posted 08/07/2023)*
- Toll Siting Technical Memorandum (TSTM) Template *(posted 04/14/2023)*
- Roadside Tolling Cabinet Infrastructure Technical Special Provisions *(posted 09/12/2023)*
- Toll Loop Conduit Salvage Detail (PDF) (CAD) *(posted 09/20/2022)*

STATEWIDE TOLLS PROJECT MANAGEMENT SUPPORT

- Project Checklist for Tolls Design Coordination and Support *(posted 07/24/2023)*
- Toll Project Responsibility Matrix *(posted 12/13/2022)*

The District Production Project Manager must communicate with the Turnpike Production Project Manager who will engage with the Toll Systems Project Manager and the Tolls Design Administrator through each phase of the project. Each project should have a complete matrix that is agreed and accepted by both District and Turnpike Project Managers prior to the Phase II plan submittal.

Design Disciplines

Drainage
Environmental Permitting
Lighting & Electrical
ITS
Plans, Specs, and Estimates
Roadway
Shop Drawing Processing
Structures
Surveying & Mapping
Tolls Design
Traffic Design
Traffic Operations
Utilities & Rail Coordination

Design Resources

Turnpike Design Criteria Archives
General Tolling Requirements (GTR)

Public facing Tolls Design webpage link:
[Tolls Design - Webpage https://floridasturnpike.com/business-opportunities/design/tolls-design/](https://floridasturnpike.com/business-opportunities/design/tolls-design/)

Link to current "redacted" GTR. Contact Turnpike PM for unredacted publication

TRANSPORTATION SYMPOSIUM

TSTM – Table Criteria

- Supports ideal toll site locations

Criteria	*Description*	*Site 1 Station MP Toll Site ID* *Site 1*	*Site 2 Station MP Toll Site ID* *Site 2 Interim*
220.2(1)	Located on tangent or curve greater than 3000'.	Pass	Fail
220.2(2) & (3)	Centerline of gantry must be perpendicular or radial to travel lanes.		
220.2(4)	Located outside of sag and crest vertical curves or areas susceptible to standing water. (Toll loop pavement area may be located within sag and crest vertical curves only when the vertical grade is at least 0.3% at any point within the toll loop pavement area.)		
220.2(5)	Lane, shoulder, and buffer widths are constant through the toll loop pavement area.		
220.2(6)	Minimum 10 foot separation is provided between equipped lanes/shoulders and any adjacent non-tolled lanes, except where EL buffers are used.		
220.2(7)	Toll sites must not be located within a superelevation transition/cross slope transition, except shoulder rocking.		
220.2(8)	Toll sites must not be located within queuing areas as identified by the design year traffic analysis.		
220.2(9) & (10)	No merge or weave conditions (min. 200 ft upstream of the first lane drop sign or 50 ft beyond end of merge area.)		

Criteria	*Description*	*Site 1 Station MP Toll Site ID* *Site 1*	*Site 2 Station MP Toll Site ID* *Site 2 Interim*
220.2(11)	The gantry centerline must be located a minimum of 200 feet from nearby sign structures, bridges, or toll plaza canopies. More distance required for: - The taper of the maintenance pull-off area must tie into the shoulder a minimum of 25' before bridges or similar roadside features - MOT for bridge/sign structure inspection and maintenance that may extend into the toll site. - MOT for bridge widening and/or replacements that may extend into the toll site.		
220.2(12) & 101.2(2)	Roadway cross slope under gantry must not result in an elevation difference of more than 26" between the highest and lowest j-arm.		
220.2(13)	Gantry must be located within 1 mile of express lane entry points.		
220.2(14)	Gantry must not block an overhead sign. At least 800 feet for static panels and 1000 feet for DMS.		
221.1.1(1) & (2)	Tolling point must be 100 feet with gantry at the midpoint.		
221.1.2(1) (2) (3) & (4)	Lane and shoulder widths at the toll site meet GTR requirements.		
221.5(2)	Tolling pavement must be free of metal objects at or below grade.		

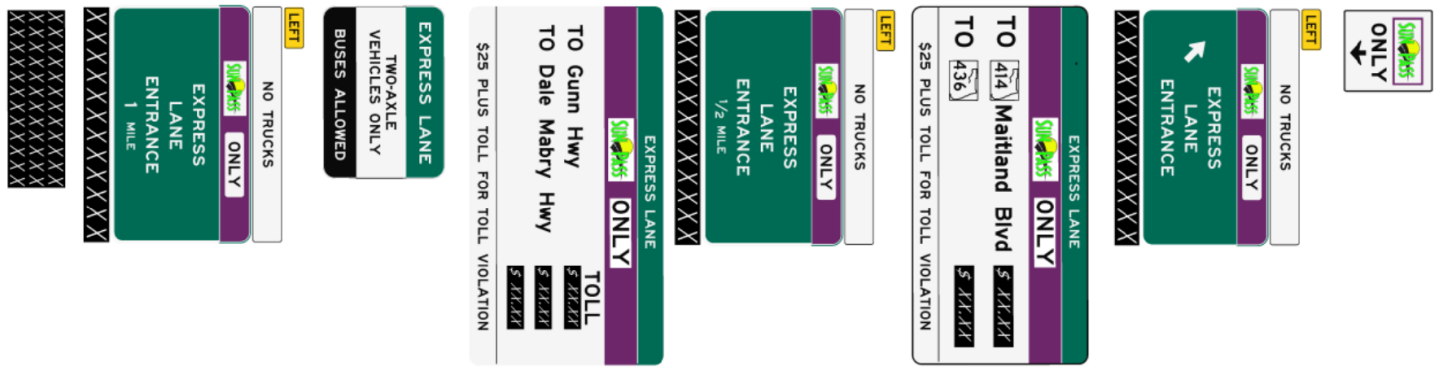
TRANSPORTATION SYMPOSIUM

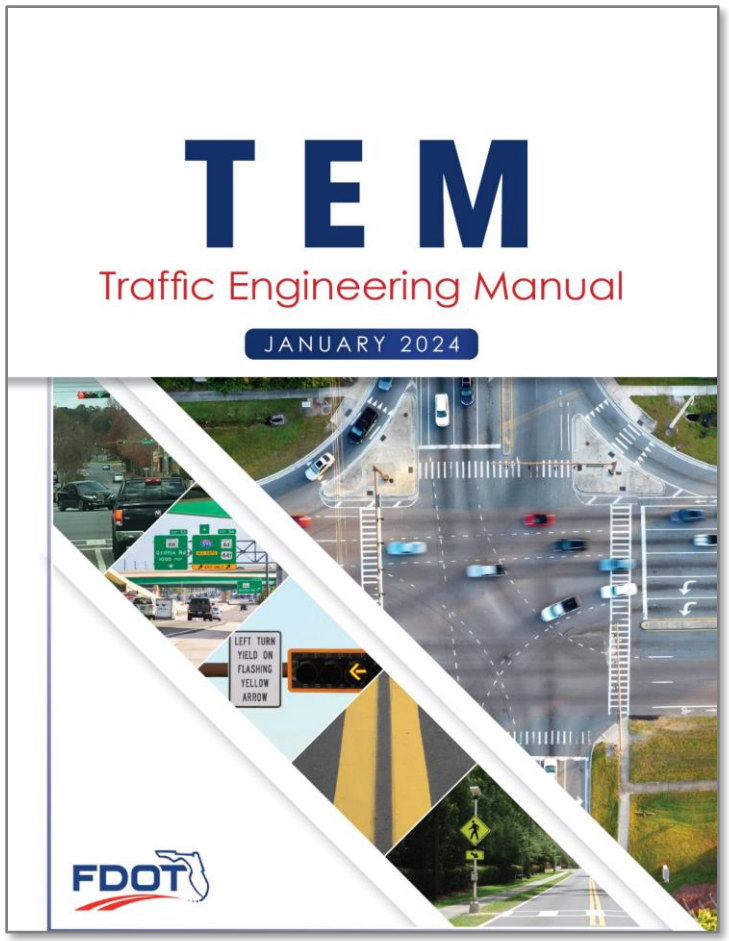
Section 2.42 Express Lanes Signing

2.42.4 SIGN SEQUENCE

(1) There shall be seven signs installed for an express lane entrance, as follows: three advanced guide signs, two TASs, one vehicle eligibility sign, and one regulatory ***R3-44*** (***Section 2G.17 of the MUTCD***). One 3-line full-matrix Dynamic Message Sign (DMS) shall also be included if space is available. The order in which the signs should be installed is shown in ***Figure 2.42-7***. ***Note: The R3-44 sign shall be the last sign in the sequence. The DMS shall be the first sign in the sequence, if installed***.

Figure 2.42-7. Express Lanes Entrance Sign Sequence





TRANSPORTATION SYMPOSIUM

Section 4.5 Express Lanes Markings

Figure 4.5-1. Buffer Area Detail

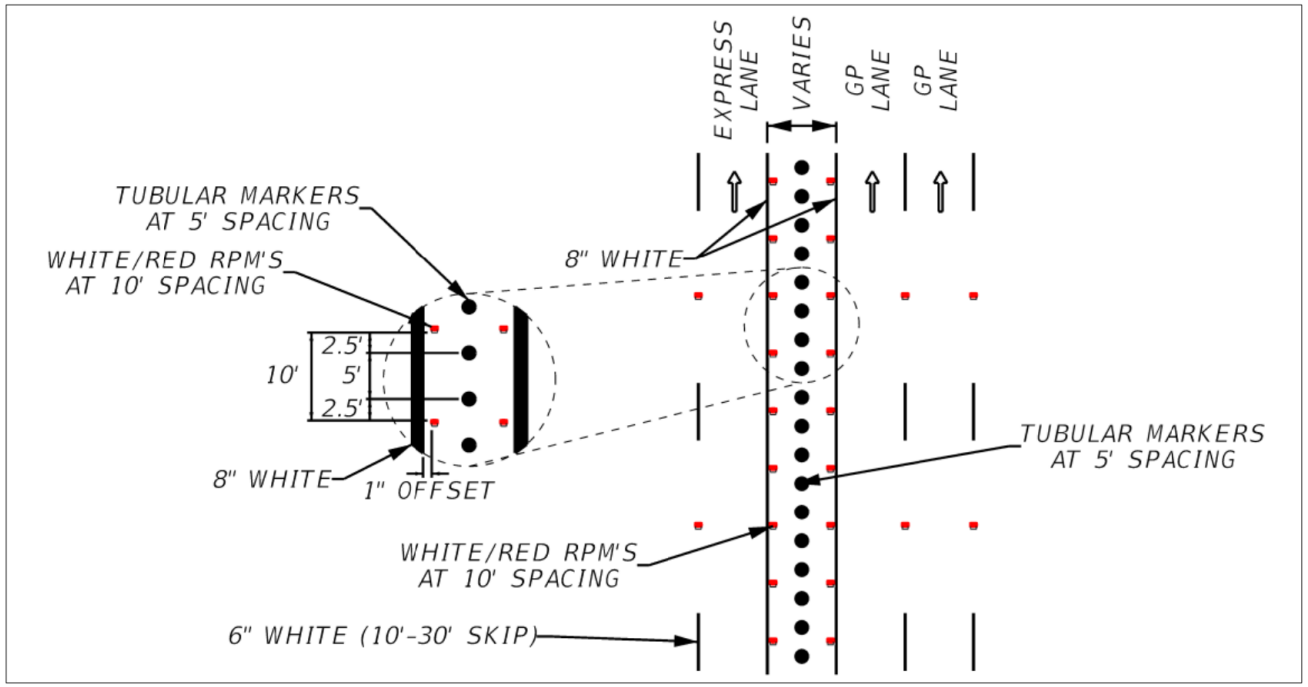
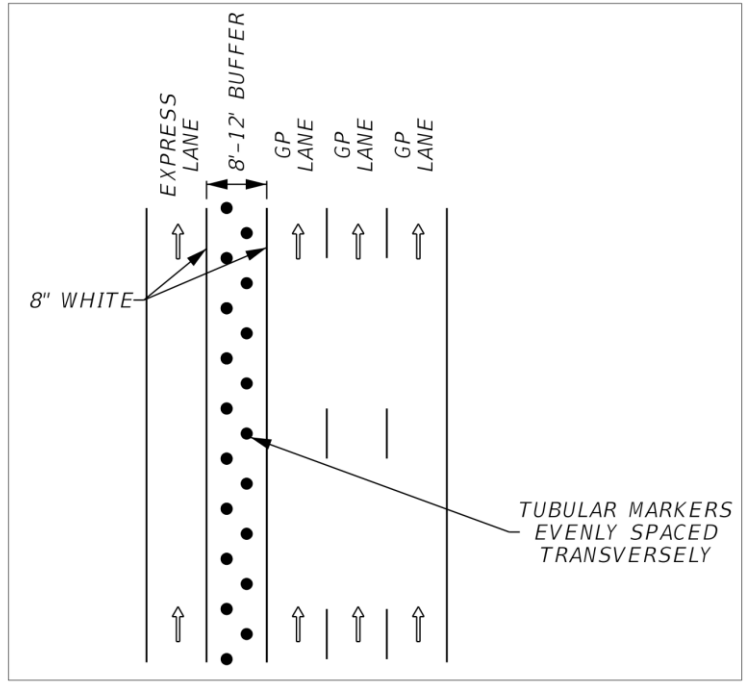
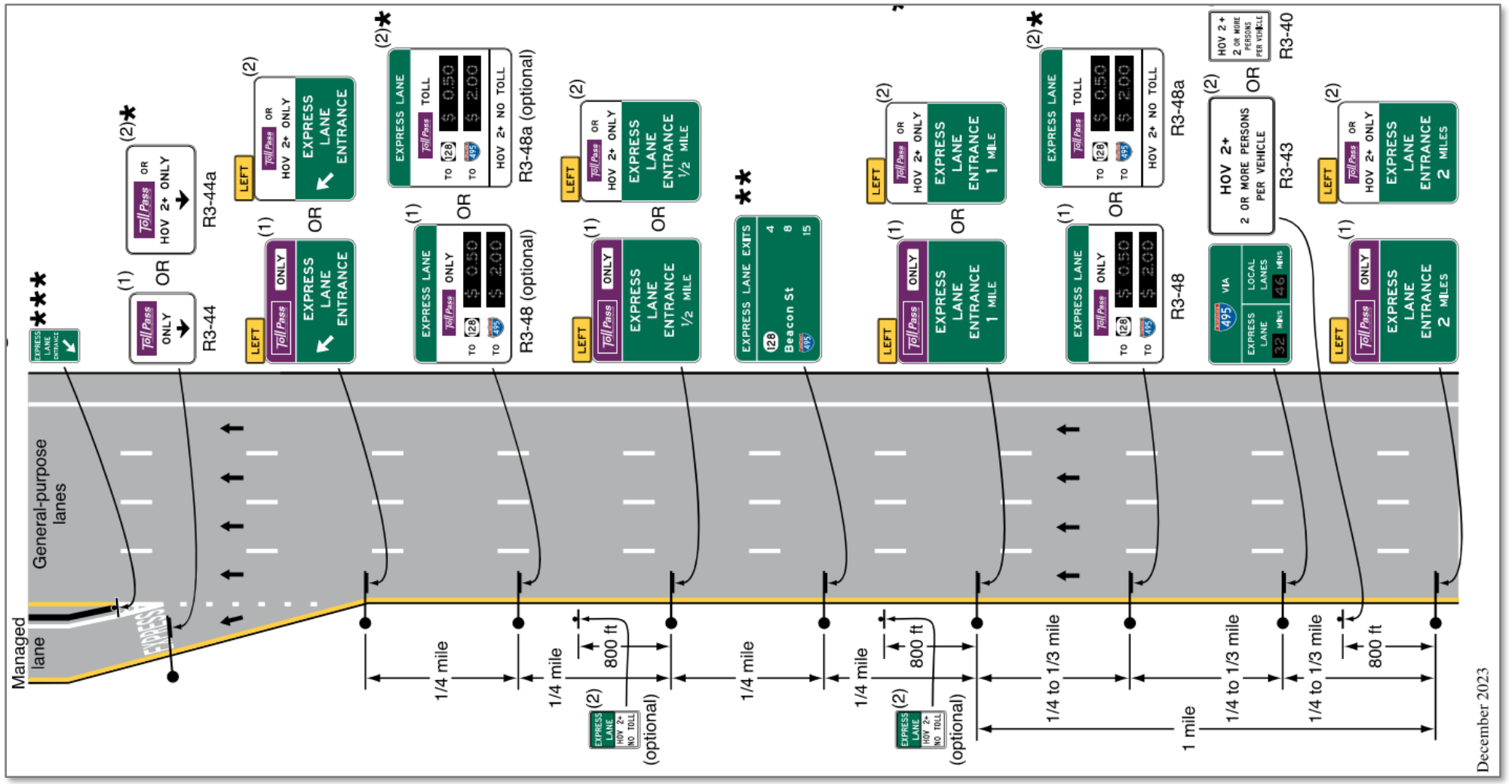


Figure 4.5-3. Tubular Marker Placement within the Tolling Area for Buffer Widths between 8 and 12 feet



TRANSPORTATION SYMPOSIUM

Figure 2G-21 – Priced Managed Lane



TRANSPORTATION SYMPOSIUM

Best Practices

- Coordinate with FTE PM, Tolls PM, and Tolls Design
  - Early (planning phase)
  - Often (establish schedules with milestones and deliverables)
  - Scope, units, and hours
  - RFP with TSTM
- Follow the documented processes and procedures
- Ask questions (tolling has unique processes and procedures)
- We are here to support you and our customers

TRANSPORTATION SYMPOSIUM

Safety Message

- Florida law requires you to **Move Over** a lane — when you can safely do so — for stopped law enforcement, emergency, sanitation, utility service vehicles, tow trucks or wreckers, maintenance or construction vehicles with displaying warning lights, **and any disabled vehicle on the side of the road**. If you can't move over — or when on a two-lane road — slow to a speed that is 20 mph less than the posted speed limit.

TRANSPORTATION SYMPOSIUM

Contact Us

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Tolls Design Administrator

Florida's Turnpike Enterprise

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