Request for Research Funding for FY 2022-2023			
SPR Subpart B Project: TEO-23-10			
Requesting Office	District 4 Traffic Operations and District 6 Traffic Operations	**Priority**	10 of 23
Proposed Title	Integrated Corridor Management (ICM) on Limited Access Facilities: A Case Study of I-95		
Justification	Integrated Corridor Management (ICM) focuses on strategically deploying proactive traffic management strategies to improve mobility, enhance safety, maximize efficiency, optimize resources, and provide alternate routes and modes. Congestion, both recurrent and non-recurrent, has a detrimental effect on the performance of the transportation network. Since we cannot build our way out of congestion, agencies are focusing on maximizing the utilization of available capacity. The Florida Department of Transportation (FDOT) has deployed several Intelligent Transportation Systems (ITS) technologies and Transportation Systems Management & Operations (TSM&O) strategies to mitigate congestion. Some commonly deployed strategies include ramp metering, congestion-responsive dynamic tolling on managed lanes, Road Ranger Service Patrol (RRSP), Rapid Incident Scene Clearance (RISC), Severe Incident Response Vehicle (SIRV) operators, time-sensitive messaging on Dynamic Message Signs (DMS), and detour advisory messaging on the FL511 application. These strategies, to an extent, have been evaluated independently and are proven to be effective in improving the operational and safety performance of the freeway network. However, it is unclear how these strategies work together, in synergy, to alleviate non-recurrent congestion in real-time. How can FDOT respond to a planned lane closure, a severe incident, or heavy rain to have minimal disruption to traffic? A robust Decision Support System (DSS) with seamless integration of all the available TSM&O strategies and resources could result in a coordinated response that is timely, reliable, effective, and efficient. The ICM approach may be considered to have two perspectives. The first perspective considers all the available strategies in a hierarchical structure and identifies the most suitable strategy for deployment. The second perspective creates a uniform platform for the agency to deploy multiple strategies based on specific criteria such as event location, event type, available strategies, and resource accessibility and readiness. Since both perspectives have their own merits, agencies need to identify the best approach to alleviate congestion based on real-world data. This research effort aims to develop a Decision Support System to maximize utilization of I-95 capacity in Miami-Dade and Broward counties through the localized and area-wide application of the Integrated Corridor Management (ICM) strategies. This research will develop a framework to deploy ICM, potentially based on best practices from other state DOTs and FDOT Districts (specifically, D5 and D7), for using the existing TSM&O strategies alone or in combination. Triggers for initiating ICM would also be identified, and recommendations would be made for their integration into the FDOT's SunGuide™ software and the existing Transportation Management Center (TMC) Standard Operating Guidelines (SOGs). The specific objectives include: • Identify and understand the issues along the I-95 corridor in South Florida. • Develop a *Decision Support System (DSS) Lite* to determine the most suitable TSM&O strategies to address the issues. • Develop specific Standard Operating Guidelines (SOGs) to help prioritize resource allocation and response strategy. • Integrate *DSS Lite* into the SunGuide™ system.		

	The research goal and objectives will be achieved in two phases. Phase 1 focuses on developing the concept and implementation/sustainability plan for a '*Decision Support System (DSS) Lite*' that reflects operational realities in D4 and D6 (e.g., TMC staff capabilities, Information Technology (IT) resources, what is currently feasible through deployed systems without extensive integration, etc.); Phase 1 could be considered as a proof-of-concept where the *DSS Lite* concept could be tested under a variety of traffic scenarios to assess its effectiveness. Phase 2 focuses on *transforming* the *DSS Lite* into a more sophisticated DSS along with an estimate of the resources needed to implement/sustain. Integrating the developed DSS into the SunGuide™ system would also be explored. The *DSS Lite* (and *ultimate DSS*) application, once developed and deployed, could also support the extensive and on-going I-95 construction in the South Florida region, including the Smart Work Zones (SWZ) applications. **Objective 1: Identify and Understand the Issues Along I-95** The I-95 corridor in South Florida (Miami-Dade and Broward counties, in particular) is one of the most congested sections in the entire state. The non-recurrent congestion is primarily due to planned and unplanned events such as work zones, special events, incidents, and adverse weather. With the advent of new data collection technologies, there is a wealth of information regarding the operational performance of the I-95 facility. We can use real-time traffic data from the Regional Integrated Transportation Information System (RITIS) detectors, weather data from the National Oceanic and Atmospheric Administration (NOAA), and incident data from SunGuide™ to better understand the traffic operations during congestion. Extensive processing and analysis of these datasets would provide us with a rich data-based intelligence to get a full-scale understanding of the mobility and safety issues along the I-95 corridor. The study could consider several non-traditional safety performance measures, including secondary crashes, reduction in average speeds at 5-min intervals, etc. The following mobility performance measures could also be evaluated: average travel time, incident-induced delay, and travel time reliability. **Objective 2: Develop a *Decision Support System (DSS) Lite*** Several TSM&O strategies could be deployed along the I-95 corridor to alleviate congestion. However, the facility's performance is affected by the timely and effective deployment of these strategies and resources. This objective focuses on developing, assessing, and refining coordinated application of various TSM&O strategies such as ramp metering, congestion-responsive dynamic tolling on managed lanes, RRSP, RISC, time-sensitive messaging on DMSs, and detour advisory messaging on the FL511 application. The research team will develop a framework to assist the agencies in selecting the most suitable proactive TSM&O strategy for deployment in response to various planned and unplanned events. The framework may incorporate decision trees using real-world data for predicting traffic breakdown and recovery time. As part of this effort, the District 5's Regional Integrated Corridor Management System (R-ICMS) software will be reviewed to better understand the intricacies in developing and deploying the *DSS Lite* application. The best practices from the D5's R-ICMS software deployment will be incorporated in the *DSS Lite* application. **Objective 3: Provide Language for Incorporating in the Standard Operating Guidelines (SOGs)** This objective focuses on developing recommendations to integrate the ICM strategies into the FDOT's SunGuide™ software and specific standard operating procedures to help prioritize resource allocation and response strategy. The research team will develop the necessary resources to assist the FDOT District 4 to improve the operational performance of the I-95 corridor based on real-time data and prevailing traffic conditions. **Objective 4: Integrate *DSS Lite* Into the SunGuide™ System**

	Once the proof-of-concept is developed and tested, the *DSS Lite* application will be transformed into a more sophisticated DSS along with an estimate of the resources needed to implement the application at the TMC. The final outcome of this objective is to integrate the developed DSS into the SunGuide™ system.		
Impact	The study results will help FDOT D4 and D6 deploy ICM strategies to alleviate congestion on I-95 in Miami-Dade and Broward counties. The Decision Support System (DSS) that will be developed as a proof-of-concept will assist D4 and D6 in strategically and proactively deploying TSM&O strategies to improve the operational performance of I-95 corridor in South Florida. Furthermore, the study will create guidance to assist FDOT District 4 in incorporating the ICM strategies in the TMC's Standard Operating Guidelines (SOGs). The DSS application, once integrated into the SunGuide™ system will have significant positive impact on the operational and safety performance of the I-95 corridor in South Florida.		
Affected Offices	D4 and D6 District Traffic Operations Offices; State Traffic Engineering and Operations Office		
Existing Work	This project focuses specifically on the ICM strategies to alleviate congestion on I-95 corridor in South Florida. There is no other project that focuses on the ICM strategies on this corridor.		
Keywords Used In Existing Work Search **(Cannot leave blank)**	• Integrated Corridor Management (ICM): 60 – none are related to I-95 corridor in South Florida. • Decision support system + TSM&O: 1 – this study focuses on the economic impacts and not on the mobility and safety impacts of TSM&O strategies. • NCHRP 17-95 – this project focuses on developing crash modification factors for ITS applications. But, it does not focus on creating a framework or a decision support system.		
Related Contracts (Give contract numbers)	• BDV29 977-36: Developing Florida-specific Mobility Enhancement Factors (MEFs) and Crash Modification Factors (CMFs) for TSM&O Strategies • BDV29 977-62: Guidelines for Activating Ramp Meters During Off-Peak Hours and Weekends • BDV29-977-64: Performance Evaluation of CV and TSM&O Projects in Florida • BDV29 977-48: Strategies to Identify and Mitigate Secondary Crashes using Real-time Traffic Data on Florida's Turnpike System		
Funding Request	$195,000	**Anticipated Duration**	24 months
Project Managers	**Mark Plass, P.E.** D4 Traffic Operations Engineer **Co-PM:** **Fred Heery, P.E.** State TSM&O Program Engineer	**Contracting Method**	Direct contract with Florida International University (Dr. Alluri)
Equipment	Estimated equipment cost (or N/A)	Not Applicable	
Urgency	1	The I-95 corridor in South Florida is heavily congested. This research is needed urgently to ensure that the available TSM&O strategies can be deployed proactively to alleviate congestion both timely and effectively.	
Implementability	1	The research results will be readily implementable. The results will be disseminated to the DTOEs, District TSM&O Engineers, and other stakeholders for immediate adoption.	
Project Benefits (Succinct, complete explanation)			

The project anticipates creating a comprehensive Integrated Corridor Management (ICM) strategy to alleviate congestion on I-95. It focuses on developing a data-driven Decision Support System to determine the most suitable TSM&O strategies to address the mobility issues on the I-95 corridor in South Florida. The project outputs could be considered as a proof-of-concept for a comprehensive ICM deployment on a major freeway facility. This project will have a huge scaling-up option for the rest of the state as well.		
Project Benefits **(Select all that apply and explain)**	**Quantifiable Benefits (units, dollars, etc…if applicable)**	**Methodology or Data Sources Used to Determine Quantifiable Benefits. If not applicable, please give justification of project benefits**
o Materials Enhancement	NA	
o Materials Savings	NA	
o Time Savings	Benefit: The Decision Support System will assist in improving travel time reliability, average travel time, throughput, and incident-induced delay.	The research team will adopt data-driven methodologies to quantify the mobility benefits of the recommended TSM&O strategies.
o Lives Saved/Injuries Prevented	Benefit: The Decision Support System will assist in primarily reducing secondary crashes.	The research team will adopt data-driven methodologies to quantify the safety benefits of the recommended TSM&O strategies.
o Other (Explain)		

*Comments should explain and support urgency, financial benefit, and implementability scores