EXECUTIVE SUMMARY

This Executive Summary presents the key findings of the analysis supporting the proposed interchange modification for the SR 9/I-95 at Lantana Road Interchange in Palm Beach County, Florida, and a discussion of the two Federal Highway Administration (FHWA) Policy Points.

1. Project Background

The Florida Department of Transportation (FDOT) completed the I-95 Interchange Master Plan for Palm Beach County in December 2015 to identify short-term and long-term needs at the interchange locations within the County through the 2040 design year horizon, and to develop design concepts to address traffic spillback onto I-95, improve interchange operations, reduce congestion, and increase safety at 17 interchanges from Linton Boulevard to Northlake Boulevard. SR 9/I-95 at Lantana Road Interchange was one of the interchange locations evaluated as part of the I-95 Interchange Master Plan.

The Concept Development Report prepared for this interchange identified several preliminary short-term and long-term improvements based on the traffic operations analysis conducted for the SR-9/I-95 at Lantana Road interchange and adjacent signalized intersections. The preliminary improvements at this location were recommended to be further evaluated as part of the Project Development and Environment (PD&E) Study.

This Interchange Modification Report (IMR) prepared as part of the PD&E Study will focus on the development and evaluation of alternatives for the proposed improvements at the SR-9/I-95 at Lantana Road interchange. This IMR has been developed in accordance with FDOT's Policy No. 000-525-015 and Procedure No. 525-030-160, including the FDOT Publication: Interchange Access Request User's Guide (IARUG), January 2018. It outlines the technical procedures, assumptions, traffic data, analyses, and documentation required for this process.

2. Project Description, Purpose & Need

The SR 9/I-95 at Lantana Road interchange is located along SR 9/I-95 (MP 18.420 to MP 19.158) between the Hypoluxo Road interchange (1.04 miles to the south) and the 6th Avenue South interchange (1.54 miles to the north) within the Town of Lantana in eastern Palm Beach County. The interchange is a tight urban diamond configuration. Based on the future traffic forecast, the interchange will have insufficient capacity to accommodate the projected travel demand.

Consequently, conditions at the interchange and along Lantana Road are anticipated to deteriorate below acceptable LOS targets if no improvements occur by the 2045 design year.

The purpose of the project is to enhance the overall traffic operations and safety at the existing interchange of SR 9/I-95 and Lantana Road. The study evaluated alternatives and recommended improvements for implementation to eliminate traffic spillback onto SR 9/I-95, enhance interchange operations and safety, reduce congestion, while providing for multimodal accommodations at this interchange location. The study also provides accommodation for potential extension of the I-95 Managed Lanes through Palm Beach County.

3. Methodology

The methodology applied in this IMR is based on the Methodology Letter of Understanding (MLOU) approved in September 2019. The MLOU is a companion document to this IMR Study and was approved by FDOT District Four and FDOT Central Office. The MLOU outlines the criteria, assumptions, processes, analyses, and documentation requirements for the project. A copy of the approved MLOU is provided in **Appendix A**. The MLOU was prepared in accordance with the FDOT's Interchange Access Request Users Guide.

4. Existing Traffic Conditions

The segment of SR 9/I-95 within the vicinity of the Lantana Road interchange is a ten-lane north-south Urban Interstate. It is part of the National Highway System (NHS) and serves as an integral part of the Strategic Intermodal System (SIS) highway network. Lantana Road within the project limits is primarily a four-lane divided east-west roadway classified as an Urban Principal Arterial under the jurisdiction of Palm Beach County.

The existing (2017) annual average daily traffic (AADT) along SR 9/I-95 is approximately 235,000 vehicles per day. Along Lantana Road, the existing AADT ranges from 29,000 to 52,000 vehicles per day. The existing AM and PM peak hour operating conditions for the SR 9/I-95 mainline sections show Level of Service (LOS) D or worse for the weaving segments and LOS D or better for the basic freeway segments.

The operational analysis for the signalized intersections indicated that most of the existing signalized intersections are operating at an overall LOS D or better during the peak periods. For the SR 9/I-95 ramp terminals, the northbound approach at the NB off-ramp operates at LOS D during both the AM and PM Peak periods. The southbound approach at the SB off-ramp terminal operates at LOS E and LOS F during the AM Peak and PM Peak period, respectively.

The vehicle queue analysis indicated that approximately 4 out of the 20 turn lanes (20%) have deficient storage lengths. Although the analysis results indicate that I-95 NB and SB ramps approaches queue lengths currently do not exceed the available storage length, significant queues were observed during the field reviews for the southbound off-ramps. It should be noted that the off-ramps were recently widened in 2015 as part of a short-term improvement project. As such, although the existing queues observed in the field were significant, they did not extend into I-95 mainline.

5. Future Conditions and Alternatives Considered

The alternatives considered as part of the SR 9/I-95 at Lantana Road Interchange PD&E Study include a No-Action Alternative and three Build Alternatives. The No-Action Alternative assumes no proposed improvements and serves as a baseline for comparison against the Build Alternatives.

Based on the future operational analysis, the No-Action Alternative will result in LOS F at both the I-95 northbound and southbound ramp terminals with extended queues backing onto the I-95 mainline during the AM and PM peak periods, if no additional improvements are done. In addition, the weaving freeway segments within the project limit will all operate at LOS F and the basic freeway segments between the on and off-ramps will operate at LOS D or worse. Consequently, it was determined that the No-Action Alternative will be inadequate to accommodate the future travel demand within this interchange.

In order to accommodate the future travel demand while enhancing safety within the interchange area, three Build Alternatives were developed as part of the alternatives analysis and include the following:

- Build Alternative 1 – Tight Urban Diamond Interchange (TUDI)
- Build Alternative 2 - Diverging Diamond Interchange (DDI)
- Build Alternative 3 – Single Point Urban Interchange (SPUI)

A qualitative evaluation of the Build Alternatives based on operational improvements, safety improvements, potential right of way impacts, environmental impacts, construction costs and public comments was performed as part of the study.

6. Build Alternatives

A detailed operational evaluation of the Build Alternatives was performed. The results from the analysis indicated that the Build Alternatives perform substantially better than the No-Action Alternative for all future year scenarios, particularly for the Lantana Road interchange ramp terminal approaches. However, it should be noted that some of the southbound movements along the side streets at High Ridge Road will operate at LOS F for the 2025 opening year for all the Build Alternatives. This is because the east-west movements along Lantana Road are prioritized due to the relatively higher traffic volumes. Given that the volume of traffic on these side streets is relatively small compared to the volume along Lantana Road, the delays do not significantly affect the entire intersection operation. In addition, the focus of the project is the SR 9/I-95 ramp terminal intersections to address spill back onto SR 9/I-95. The table below shows a comparison of the No-Action and Build Alternatives for the SR 9/I-95 ramp terminal intersections during the 2045 design year.

Performance Criteria		No-Action Alternative	Build Alternative 1 - TUDI	Build Alternative 2 – DDI	Build Alternative 3 - SPUI
I-95 SB Ramp Terminal	**LOS (AM/PM)**	F/F	C/D	C/C	C/C
	Maximum Intersection Overall Delay (s)	AM: 123.4 PM: 84.8	AM: 27.6 PM: 35.8	AM: 23.0 PM: 23.2	AM: 25.5 PM: 32.3
	Delay Reduction over No-Action Alternative	-	AM: 78% PM: 58%	AM: 81% PM: 73%	AM: 79% PM: 62%
	Maximum Queue Length (ft)	#1,015	#534	264	343
	Storage Deficiency	Yes (9%)	No	No	No
	Queue Length Reduction over No-Action Alternative	-	-47%	-74%	-66%
I-95 NB Ramp Terminal	**LOS (AM/PM)**	F/F	C/C	C/C	C/C
	Maximum Intersection Overall Delay (s)	AM: 104.4 PM: 104.1	AM: 27.2 PM: 32.4	AM: 20.5 PM: 24.0	AM: 25.5 PM: 32.3
	Delay Reduction over No-Action Alternative	-	AM: 74% PM: 69%	AM: 80% PM: 77%	AM: 76% PM: 69%
	Maximum Queue Length (ft)	#1,191	#488	140	448
	Storage Deficiency	Yes (27%)	No	No	No
	Queue Length Reduction over No-Action Alternative	-	-59%	-88%	-62%

- 95th percentile volume exceeds capacity; queue may be longer. Queue shown is maximum after two cycles.

Based on the evaluation results, The SR 9/I-95 ramp terminals will operate at LOS C or D during the AM and PM peak periods in Build Alternative 1. However, the northbound approach and movements as well as the southbound approach and movements will operate at LOS E during both the AM and PM peak periods which does not meet the FDOT LOS targets. For Build Alternative 2 and Build Alternative 3, the SR 9/I-95 SB ramp terminal will operate at LOS C during both the AM and PM peak periods. It is anticipated that the Build Alternatives will provide 78% to 81% and 58% to 73% reduction in delays for the I-95 SB ramp terminal during the AM and PM peak periods, respectively compared to the No-Action Alternative. At the I-95 NB ramp terminal, the Build Alternatives will provide 74% to 80% and 69% to 77% reduction in delays during the AM and PM peak periods, respectively, compared to the No-Action Alternative. Alternative 2 provides the best operations at the ramp terminals compared to the other Alternatives due to the DDI configuration which reduces the number of signal phases.

A comparison of the queue lengths at the ramp terminal approaches indicate that all the Build Alternatives provide significant reduction in queues compared to the No-Action Alternative. It is anticipated that the Build Alternatives will result in a 47% to 74% reduction in queue length at the I-95 SB off-ramp and 59% to 88% reduction in queue length at the I-95 NB off-ramp. However, for Build Alternative 1, the queue lengths may be longer as indicated in the table below due to residual queues remaining after each cycle which may extend beyond the gore point. Further analysis using the SIMTRAFFIC microsimulation tool indicated that the queues for the SB ramp terminal intersection may be longer due to residual queues remaining after each cycle which may extend beyond the gore point during the AM peak period.

Build Alternative 2 resulted in the lowest number of expected total crashes with an overall crash reduction of 35.6% compared to the No-Action Alternative at the Lantana Interchange. Build Alternative 1 and Build Alternative 3 provide similar overall crash reduction of 15% compared to the No-Action Alternative at the Lantana Road Interchange. Build Alternatives 1 and 3 will require additional right of way from 9 properties along Lantana Road to accommodate the proposed improvements while Build Alternative 2 requires right of way from 6 properties.

A benefit-cost analysis prepared as part of the study indicated that Build Alternative 2 has the highest benefit-cost ratio of 1.70, followed by Build Alternative 1 with a benefit-cost ratio of 1.16, and Build Alternative 3 with the least benefit-cost ratio of 0.77. Overall, the results demonstrate that the Build Alternatives can accommodate the future travel demand while providing overall better traffic operating conditions, enhancing safety, and accommodating multimodal modes compared to the No-Action Alternative. In addition, Build Alternative 2 provides the best operational and safety performance among the three Build Alternatives.

7 Preferred Alternative

Based on the comprehensive evaluation presented in this IMR study, Build Alternative 2 with the Diverging Diamond Interchange (DDI) configuration was selected as the preferred alternative due to the significantly higher safety and traffic operational benefits it provides compared to the other alternatives. Build Alternative 2 also satisfies the purpose and need of this project and provides the highest benefit-cost ratio making it the most cost-effective alternative. In addition, it provides opportunity for additional landscape and aesthetic improvements and has the highest public support.

ASSESSMENT OF FHWA'S POLICY

The following requirements serve as the primary decision criteria used in approval of interchange modification projects. Responses to each of the FHWA 2 policy points are provided to show that the proposed modification for the SR 9/I-95 at Lantana Road interchange is viable based on the conceptual analysis performed to date. The following demonstrate compliance with the FHWA's requirements and justification for the proposed modifications to the SR 9/I-95 at Lantana Road Interchange.

Policy Point 1:

An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis should, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (23 CFR 625.2(a), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, should be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625.2(a) and 655.603(d)). Requests for a proposed change in access should include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect distribute, and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad, and local street network (23 CFR 625.2(a) and 655.603(d)). Each request should also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d)).

Response: An in-depth operational and safety analysis was conducted to study the impacts of the proposed improvements. Several performance measures were used to compare the operations and safety of the existing system under the No-Action and Build conditions. Key measures included freeway densities, freeway V/C ratios, intersection delays, level of service and 95th percentile queue lengths, crash rates and frequency, predominant crash patterns, expected crashes, and potential crash reduction using crash modification factors. Based on the results of this comprehensive evaluation, Build Alternative 2 with the Diverging Diamond Interchange (DDI) configuration was selected as the preferred alternative due to the significantly higher safety and traffic operational benefits it provides to offset its relatively higher construction cost.

From an operational perspective, the traffic analysis performed for the study indicated that Build Alternative 2 performs substantially better than the No-Action Alternative for all future year scenarios, particularly for the SR 9/I-95 ramp terminal intersections, which are the primary focus for this study. Under Build Alternative 2, both SR 9/I-95 ramp terminals will operate at LOS C during both the AM and PM peak periods for the 2045 design year compared to LOS F for the No-Action Alternative. The southbound ramp terminal intersection will experience 81% and 73% reduction in delay for the AM and PM peak periods, respectively, whereas the northbound ramp terminal will experience 80% and 77% reduction in delay during the AM and PM peak periods, respectively compared to the No-Action Alternative. Build Alternative 2 also results in 74% and 88% reduction in queue length at the I-95 southbound and northbound off-ramp approaches, respectively, with no spillback onto the I-95 mainline compared to the No-Action Alternative. The No-Action Alternative will exceed the existing ramp storage by 9% and 27% at the southbound and northbound off-ramp approaches, respectively.

From a safety perspective, a total of 470 crashes occurred along I-95 and the ramps at Lantana Road within the study area from 2014 to 2018. and a total of 172 crashes occurred along Lantana Road within the same period. The predominant crash types that occurred within the study area were rear-end collisions, sideswipe collisions and angled collisions. Crashes of these types are typically attributed to congested conditions along the arterials and interchange ramps and terminals. The proposed improvements under Build Alternative 2 is anticipated to result in an overall crash reduction of 35.6% compared to the No-Action Alternative due to the significant reduction in delays and improved mobility resulting from the DDI configuration. This will significantly enhance safety within the interchange area. In addition, Build Alternative 2 provides access management improvements along Lantana Road by closing the eastbound left-turn at Sunset Road and providing a new access road underneath the reconstructed Lantana Road bridge over the SFRC/CSX Railroad. This proposed underpass road provides an alternative access for the

existing movements at the Sunset Road Intersection. It also improves traffic operations and safety along Lantana Road by eliminating some of the vehicle conflicts at the intersection. In addition, it also eliminates traffic from the Costco to the adjacent residential communities.

Policy Point 2:

The proposed access connects to a public road only and will provide for all traffic movements. *Less than "full interchanges" may be considered on a case-by-case basis for applications requiring special access, such as managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2), and 655.603(d)). In rare instances where all basic movements are not provided by the proposed design, the report should include a full-interchange option with a comparison of the operational and safety analyses to the partial-interchange option. The report should also include the mitigation proposed to compensate for the missing movements, including wayfinding signage, impacts on local intersections, mitigation of driver expectation leading to wrong-way movements On-Ramps, etc. The report should describe whether future provision of a full interchange is precluded by the proposed design.*

Response: The proposed improvements to the I-95 at Lantana Road interchange and adjacent intersections will provide full access and accommodates all traffic movements from Lantana Road to and from SR 9/I-95. Lantana Road is a County Road and no private-only access is being sought on this interchange modification.