

EXECUTIVE SUMMARY

The objective of this Interchange Operational Analysis Report (IOAR) is to provide technical documentation for review and approval of the proposed improvements at the I-95 / SR-46 interchange located in Mims, Brevard County, Florida. This IOAR has been conducted with the intention of documenting and ensuring that the proposed improvement will not create operational deficiencies or safety concerns for the Opening and Design Years. The proposed improvement includes signalization of the intersection of SR-46 and I-95 Southbound Ramps and signalization of the southbound right yield condition.

The interchange is a tight diamond and has a total of four ramps with two off-ramps and two on-ramps. Both the Northbound and Southbound Off-Ramps have a yield control right-turn movement onto SR-46. The Southbound Off-Ramp is stop controlled and the Northbound Off-Ramp is signal controlled.

The I-95 / SR-46 interchange serves as an access point for directional rush hour traffic during the AM and PM peak hours. Land directly adjacent to the interchange is currently semi-developed with a gas /convenience store in the northwest and southwest quadrants. The northeastern quadrant serves residential land-uses and the southeast quadrant serves residential as well as fast food land-uses.

I-95 currently experiences an Annual Average Daily Traffic (AADT) of 36,000 north of SR-46 and an AADT of 45,000 south of SR-46. The Southbound On-Ramp is currently experiencing an AADT of 7,400, the largest of all ramps. Existing AADT data for the I-95 mainline and SR-46 interchange ramps as well as for SR-46 within the influence area were obtained from FDOT's FTO 2019 database and SCTPO Interactive Traffic Count Database. TMC data was collected on October 10, 2018 for the intersections of SR-46 at North Carpenter Road, at I-95 Southbound Ramps, and at I-95 Northbound Ramps; and on November 13, 2018 for the intersections of SR-46 at Hammock Trail / Australian Way and at Holder Road / Pine Avenue. All data used in this report was collected prior to the COVID-19 pandemic; therefore, adjustments to the existing traffic counts to account for a presumed decrease in traffic volumes were not necessary. Growth within the interchange is expected due to population increase as well as an addition of commercial establishments in the immediate northwestern quadrant of the interchange.

The proposed Southbound Off-Ramp improvement is recommended due to the anticipated delays to the southbound left-turn movement, to provide better progression along SR-46, and to better accommodate the southbound right traffic entering the westbound SR-46 traffic stream.

There will be two alternatives studied in this IOAR. The two alternatives will be referred to as the No-Build Alternative and the Build Alternative. The No-Build Alternative will be analyzed as representative of build-out of the Love's Travel Plaza Development without the Southbound Off-Ramp improvements. The Build Alternative will be analyzed as representative of the Southbound Off-Ramp improvements in place. These alternatives have been evaluated in an Opening Year of 2021 and a Design Year of 2031.

The Love's Travel Plaza development will be located in the northwest quadrant of the intersection of SR-46 and North Carpenter Road and the anticipated opening date is July 2021. At ultimate Build-Out, in addition to super convenience market/gas station, tire super store, and fast food restaurant with drive-through land-uses, the development will also consist of a hotel. Access to the Love's Travel Plaza will be via a full access driveway on the northern leg of the SR-46 at Carpenter intersection. A certain portion of project trips are expected to remain internal to the site and a portion of the new trips, known as pass-by or diverted trips, will be attracted to the project from the existing traffic on the adjacent roadways and interstate.

The Build Opening Year 2021 and Design Year 2031 analyses do not show LOS deficiencies at the Southbound Ramps intersection, ramp approaches, or other study intersections. The Build Alternative also shows an improvement for the southbound left-turn movement on the I-95 Southbound Off-Ramp LOS versus the No-Build Alternative. The anticipated LOS for the southbound left-turn movement for the Build Opening Year 2021 is D during the AM and PM peak hours; the anticipated LOS for the Build Design Year 2031 AM and PM peak hours is D.

Crash analyses conducted with the last five years of data indicate that the calculated crash rates on SR-46 west of I-95 and between the southbound and northbound interstate ramps are higher than the statewide average. Intersection crash rates at the study intersections are lower than the statewide average for

comparable facilities. Additionally, per results of the anticipated crash reductions analysis, installation of a new traffic signal is anticipated to reduce the number of crashes by 1.638 crashes/year.

FDOT Policy No. 000-525-015 (Approval of New or Modified Access to Limited Access Highways on the State Highway System/SHS), FDOT Procedure No. 525-030-160 (New or Modified Interchanges), and FDOT Procedure No. 525-030-120 (Project Traffic Forecasting) were utilized in the development of this IOAR.

FHWA Policy Points

Per Federal Highway Administration (FHWA) general requirements and the 2020 FDOT Interchange Access Request User's Guide, the following two FHWA policy points with respective responses have been provided to demonstrate IOAR compliance.

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, and 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 (Title 23, Code of Federal Regulations (CFR), paragraphs 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)).*

The operation needs being addressed by this IOAR can only be addressed by adding a signal to the I-95 Southbound Ramps intersection with SR-46. The Southbound Off-Ramp is operating below the target LOS and the southbound left-turn is experiencing high delays due to the existing stop control condition. Expected growth of traffic and proposed developments in the northwest quadrant of the interstate will increase the anticipated delays for the southbound left movement. Improvements will alleviate the anticipated delays. A crash modification factor (CMF) corresponding to the installation of a new traffic signal on a two-lane road (rural and suburban) countermeasure applicable to all crash types and severities was identified and applied to the existing crash rates and crash frequencies. Per results of the anticipated crash reductions analysis, installation of a new traffic signal is anticipated to reduce the number of crashes by 1.638 crashes/year.

A detailed operational analysis for 2020 Existing Year, 2021 Opening Year, and 2031 Design Year was conducted in this IOAR to address this policy point. As indicated in Table E-1, the future No-Build analyses show that delays and LOS at the Southbound Off-Ramp will continue to worsen without signalization; and the future Build analyses show anticipated improvements in delays and LOS at the Southbound Off-Ramp. The analyses show a decrease in delay from 2021 to 2031 for the southbound left-turn movement. Traffic is being metered at the Northbound Ramps and SR-46 intersection. This can result in the signal phases on SR-46 at the Southbound Ramps intersection gaping out, and the unused green time being inherited by the southbound approach. Therefore, even though the splits remain unchanged, there is a reduction in delay from 2021 to 2031. The delay decrease from 2021 to 2031 for the southbound left-turn movement is shown in Table E-1.

Table E-2 shows an increase in 95th percentile queue lengths; this is anticipated due to the replacement of yield/free-flow conditions with signalized conditions, however, even with an increase in queue lengths, the queues do not extend to the mainline. The ramp lengths of the I-95 Southbound and Northbound Off-Ramps are approximately 1,625 feet and 1,825 feet, respectively. The total ramp lengths are measured as the distance from the stop bar to the painted nose of the gore. Storage for the turn lanes was measured from the stop bar to the point where the ramp narrows to less than 24-ft wide.

**Table E-1
Operational Analysis Results
I-95 at SR-46 IOAR**

Intersection	Movement/ Intersection	2020		2021				2031			
		Existing Year		Opening Year		Build		Design Year		Build	
		Delay (sec.) ¹	LOS ¹	Delay (sec.) ¹	LOS ¹	Delay (sec.) ¹	LOS ¹	Delay (sec.) ¹	LOS ¹	Delay (sec.) ¹	LOS ¹
AM Peak-Hour											
I-95 Southbound Ramps at SR-46	SBL	30.0	D	41.0	E	39.2	D	122.6	F	39.0	D
	Intersection ²	2.9	--	3.3	--	6.1	A	5.6	--	6.3	A
PM Peak-Hour											
I-95 Southbound Ramps at SR-46	SBL	39.3	E	57.4	F	40.8	D	103.5	F	40.5	D
	Intersection ²	2.6	--	3.7	--	6.4	A	5.2	--	6.5	A

Notes:

- 1) Signalized intersection results from Synchro HCM 6th Edition Signalized Report. Unsignalized intersection results from Synchro HCM 6th Edition TWSC Report.
- 2) HCM 6th Edition TWSC methodology does not support LOS analysis for the intersection.

**Table E-2
I-95 Southbound Off-Ramp 95th Percentile Length
I-95 at SR-46 IOAR**

Intersection	Existing Turn Lane Storage (ft.) ¹		Ramp Length (ft.) ²	95 th Percentile Queue Length (ft.)				
	Southbound Left	Southbound Right		2020 Existing	2021 Opening Year		2031 Design Year	
					No-Build	Build	No-Build	Build
AM Peak-Hour								
I-95 Southbound Off-Ramps	100	130	1,625	25	50	200	100	225
PM Peak-Hour								
I-95 Southbound Off-Ramps	100	130	1,625	50	75	175	100	200

Notes:

- 1) Turn lane storage is measured from the stop bar to the point where the ramp narrows to less than 24-ft wide.
- 2) The total ramp lengths are measured as the distance from the stop bar to the painted nose of the gore.

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 or high occupancy vehicle and high occupancy toll 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.*

Existing access points to/from I-95 will remain, no change is proposed and it only connects to a public road. The proposed improvements do not have a negative impact on the mainline or ramp operations and meet FHWA policy points, purpose, and need.