

**INTERCHANGE OPERATIONAL ANALYSIS REPORT (IOAR)  
EASTBOUND NW 138 STREET TO SOUTHBOUND I-75 ON-RAMP**



Prepared for:  
Florida Department of Transportation  
District Six  
1000 NW 111 Avenue  
Miami, FL 33172

# **INTERCHANGE OPERATIONAL ANALYSIS REPORT (IOAR)**

**EASTBOUND NW 138  
STREET TO SOUTHBOUND  
I-75 ON-RAMP**

**Miami-Dade County, Florida**

# Interchange Operational Analysis Report (IOAR)

## EASTBOUND NW 138 STREET TO SOUTHBOUND I-75 ON-RAMP



441836-1

### Florida Department of Transportation

#### Determination of Safety, Operational and Engineering Acceptability

Acceptance of this document indicates successful completion of the review and determination of safety, operational and engineering acceptability of the Interchange Access Request. Approval of the access request is contingent upon compliance with applicable Federal requirements, specifically the National Environmental Policy Act (NEPA) or Department's Project Development and Environment (PD&E) Procedures. Completion of the NEPA/PD&E process is considered approval of the project location design concept described in the environmental document.

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SYSTEMS IMPLEMENTATION OFFICE

**QUALITY CONTROL CERTIFICATION FOR INTERCHANGE ACCESS REQUEST SUBMITTAL**

Submittal Date: 10/26/2020

FM Number: 441836-1

Project Title: Eastbound NW 138 Street to Southbound I-75 On-Ramp IOAR

District: Six

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Document Type: ☐ MLOU ☐ IJR ☐ IMR ☒ IOAR ☐ OTHER \_\_\_\_\_ (Specify)

Status of Document (Only complete documents will be submitted for review; however, depending on the complexity of the project, interim reviews may be submitted as agreed upon in the MLOU)

Quality Control (QC) Statement

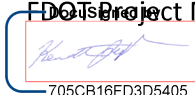
This document has been prepared following FDOT Procedure Topic No. 525-030-160 (New or Modified Interchanges) and complies with the FHWA two policy requirements. Appropriate District level quality control reviews have been conducted and all comments and issues have been resolved to their satisfaction. A record of all comments and responses provided during QC review is available in the project file or Electronic Review Comments (ERC) system.

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### 1 PROJECT OVERVIEW

#### 1.1 INTRODUCTION

In an effort to preserve and extend the service life of the roadway, improve operations, and enhance safety, the Florida Department of Transportation (FDOT) District 6 is proposing a series of improvements along the I-75 (SR 93) ramps at the interchange of NW 138 Street and Hialeah Gardens Boulevard in northwestern Miami-Dade County. The improvements will be constructed through a Resurfacing, Restoration, and Rehabilitation (RRR) project, namely FM 441836-1, programmed for construction in Fiscal Year 2023. The RRR project FM 441836-1 covers the improvements on four (4) ramps, specifically:

- Ramp 87075600, Northbound I-75 (SR 93) Off-ramp to NW 138 Street
- Ramp 87075601, NW 138 Street and Hialeah Gardens Boulevard On-ramp to Southbound I-75 (SR 93)
- Ramp 87075602, NW 138 Street On-ramp to Northbound I-75 (SR 93)
- Ramp 87075603, Southbound I-75 (SR 93) Off-ramp to NW 138 Street

An RRR Scoping Report was prepared in April 2020 to identify and document the recommended improvements for the Design project. In June 2020, a 3R Safety Review was also performed to further evaluate the existing and proposed safety conditions at the ramps. Excerpts from the Scoping Report and a copy of the 3R Safety Review in its entirety are included in **Appendix 1 and 2**, respectively.

Per the Scoping Report, the improvements along the NW 138 Street On-ramp to Southbound I-75 (SR 93) consist primarily of the following:

#### Roadway Improvements

- Milling and resurfacing the existing pavement
- Installing sod on the existing unpaved shoulders
- Shoulder widening and re-grading the side slopes
- Replacing all sub-standard ground-mounted signs and pavement markings

#### Safety Improvements

- Providing additional signage and pavement markings
- Replacing damaged pole delineators

Supplementary to the enhancements listed above, the Scoping Report recommended the existing yield ramp entry from Hialeah Gardens Boulevard to the NW 138 Street On-ramp (Ramp 87075601) be removed and replaced with a tapered entry to improve safety on the on-ramp. The improvement will require the addition of an acceleration lane on the ramp that merges prior to the gore at Southbound I-75.

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Per FDOT's *January 2018 version of the Interchange Access Request User's Guide (IARUG)*<sup>1</sup>, the roadway improvements listed above fall under a Non-Interchange Access Request (Non-IAR), with the exception of the addition of the acceleration lane on the Eastbound NW 138 Street to Southbound I-75 On-ramp (Ramp 87075601). Although this proposed alteration will not change the existing interchange configuration or travel patterns, any access point modification that results in "*the addition of a lane to an existing on-ramp while maintaining existing lanes at gore point*" requires an Interchange Operational Analysis Report (IOAR). This IOAR is being prepared in accordance with the IARUG guidance to document the traffic and safety analysis of the proposed minor modification to the Eastbound NW 138 Street On-ramp to I-75; namely, the replacement of the yield condition with an acceleration lane for the Hialeah Gardens Boulevard northbound right-turn movement.

### 1.2 PURPOSE AND NEED FOR THE PROJECT

The main purpose of this project is to improve safety conditions at the existing northbound right-turn yield condition at the Eastbound NW 138 Street to Southbound I-75 On-ramp, while maintaining operational functionality. This IOAR documents the safety, operational, and engineering (SO&E) acceptability of adding an acceleration lane on the Eastbound NW 138 Street to Southbound I-75 On-ramp. Replacing the existing yield condition with an acceleration lane is anticipated to improve safety and operations for traffic entering the on-ramp from northbound Hialeah Gardens Boulevard.

Numerous crashes have been reported at the northbound yield at the entrance to Eastbound NW 138 Street to Southbound I-75 On-ramp, indicating an unsafe condition. Crash data extracted from FDOT's Crash Analysis Reporting System (CARS) revealed 52 crashes had occurred on this ramp between 2012 and 2016, of which the most predominate types of crashes were rear-end and sideswipe. About 95% of the rear-end crashes occurred at the gore of the northbound channelized right-turn lane from Hialeah Gardens Boulevard to the NW 138 Street On-ramp. An additional 11 rear-end crashes were also reported in Signal 4 Analytics for the years 2017 through 2019. The considerable number of rear-end crashes at this location were mainly attributed to careless/negligent driving and high traffic volumes.

The ramp modification will provide a smoother transition allowing vehicles to accelerate before entering the through traffic lanes on the ramp, as opposed to the abrupt yield condition that currently exists, thereby improving operations and safety conditions at this location.

### 1.3 PROJECT LOCATION

The interchange of I-75 and NW 138 Street/Hialeah Gardens Boulevard is located within the City of Hialeah and Town of Miami Lakes in northwestern Miami-Dade County. The interchange is located at the southern end of I-75, just prior to its terminus at the Palmetto Expressway (SR 826). The subject on-ramp is one of four (4) ramps that comprise the interchange as shown in Figure 1-1.

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<sup>1</sup> January 2018 version of the *Interchange Access Request User's Guide (IARUG)* was the active edition of the publication when this report was initiated.



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FIGURE 1-1: LOCATION MAP

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### 2 METHODOLOGY

The required criteria, assumptions, processes, and documentation for this IOAR are discussed in the following sections. Whenever possible, information obtained from the April 2020 RRR Scoping Report and June 2020 3R Safety Review was utilized in the preparation of this report.

#### 2.1 AREA OF INFLUENCE

The extent of the analysis area for this IOAR was discussed during the District 6 Interchange Review Meeting held on July 16, 2020 and the subsequent meeting with FHWA on August 13, 2020. The area of influence consists of the Eastbound NW 138 Street to Southbound I-75 On-ramp (Ramp 87075601) from mile post (MP) 0.0 to 0.385.

Although the area of influence (AOI), according to the *IARUG*, typically extends at least one-half mile along the crossroad and one signalized intersection, a condensed AOI was applied for this IOAR based on the following considerations:

- the existing northbound right-turn to the ramp is channelized with yield control is being replaced with an acceleration lane (i.e., traffic does not stop at the upstream intersection in either the existing or Build condition),
- the two-lane segment of the ramp has sufficient capacity; therefore, there is not expected any negative impact to the queue or delay at the upstream intersection,
- the extent of the improvement falls within the limits of the on-ramp,
- the number of lanes at the gore with I-75 does not change, and
- the improvement does not alter the configuration of the interchange or change the travel patterns in the area; therefore, the volumes on the on-ramp and at the upstream intersection are the same between No Build and Build condition.

The area of influence is illustrated in Figure 1-1.

#### 2.2 ANALYSIS YEARS

The analysis years for this IOAR include:

- Existing Year 2020
- Opening Year 2023
- Design Year 2043

Per the *January 2018 Interchange Access Request User's Guide (IARUG)*, Interim Year analysis is not required "if no phased improvements are planned or the preferred alternative provides acceptable operation until the design year", which is the case for the improvement presented in this IOAR.

#### 2.3 PROJECT TRAFFIC FORECASTING

A project traffic forecast will be developed for Existing Year (2020), Opening Year (2023), and Design Year (2043). Year 2020 traffic count data is unavailable due to the changing travel patterns occurring during the COVID-19 Pandemic. Therefore, historical data provided by FDOT was utilized to develop the Existing Year 2020 volumes.



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Existing Year AM and PM peak hour traffic volumes for the on-ramp were computed by applying a linear growth rate to an average peak hour volume from the 2016 Average Daily Traffic (ADT) counts, which were the most current applicable synopsis reports available. Historical traffic count data from the past four (4) years (2016-2019) was reviewed to estimate the average annual rate of growth occurring between 2016 and 2020.

Opening and Design Year AM and PM peak hour ramp volumes were developed in a similar fashion but using a long-term growth rate. The long-term growth rate was determined based on historical traffic growth; University of Florida, Bureau of Economic and Business Research (BEBR) population projections; and highway assignment growth from the current travel demand model - Southeast Florida Regional Planning Model (SERPM) 8.503 2015/2045. The long-term growth rate was applied to the estimated 2020 volumes to obtain the Design Year and Opening Year AADT and peak hour volumes (AM and PM).

The reasonableness of the calculated AADTs and peak hour volumes were verified using additional sources and methods. The 2019 AADTs computed using 2016 synopsis reports and growth rates were compared against 2019 AADTs obtained from FDOT's Florida Traffic Online (FTO). Year 2019 was used for the reasonableness check since it was the latest data available on FTO. In addition, the peak hour volumes were checked for reasonableness against the ramp design hour volume (DHV). A Standard K Factor of 8.0 for urbanized core freeways<sup>2</sup> was used to compute the DHVs. Since this is a one-way directional ramp, the Directional Distribution factor (D Factor) is not applicable.

The turning movements entering the ramp (i.e., northbound right and eastbound through) from the Hialeah Gardens Boulevard and NW 138 Street intersection were estimated by applying a distribution percentage to the ramp peak hour volume.

The project traffic volumes have been rounded in accordance with the rounding conventions stipulated in FDOT's *2019 Project Traffic Forecasting Handbook*, except for the ramp turning movement volumes that were rounded to the nearest 50 vehicles to preserve a balanced peak hour ramp volume.

## 2.4 OPERATIONAL ANALYSIS

A ramp capacity analysis was performed for AM and PM peak hour Existing Year (2020), as well as Opening Year (2023) and Design Year (2043) No Build conditions following HCM (Highway Capacity Manual), 6<sup>th</sup> Edition methodology.

In addition, the operational level-of-service (LOS) of the proposed acceleration lane merge was analyzed for the AM and PM peak hours following the methodology in Chapter 14 of the Highway Capacity Manual, 6<sup>th</sup> Edition. This analysis was conducted for Opening Year and Design Year Build scenario using Highway Capacity Software version 7 (HCS7). Since HCM does not include an analysis procedure for analyzing merge conditions on a ramp, the collector-distributor (C-D) road module was used.

All analyses were conducted in accordance with the procedures and criteria stated in the *January 2018 FDOT IARUG* and the guidance published in FDOT's *2014 Traffic Analysis Handbook (March 2014)*. Input

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<sup>2</sup> A K factor of 8.0 was also listed for 2019 in the Historical AADT Traffic Report.

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data was obtained from recent aerials, vehicle classification counts, design traffic factors from FDOT's FTO, and preliminary design plans.

The following measures of effectiveness (MOEs) were used to evaluate the operational performance of existing conditions, as well as the No Build and Build scenarios in the future horizon years:

- Ramp Capacity Analysis: volume-to-capacity ratio (v/c)
- Merge Analysis:
  - Density (pc/mi/ln)
  - Level of Service (LOS)

### 2.5 SAFETY ANALYSIS

The safety analysis was conducted as part of the 3R Safety Review in June 2020. The existing safety analysis were based upon five-years of crash data, namely 2012-2016<sup>3</sup> obtained from FDOT's Crash Analysis Reporting System (CARS). Supplemental crash data was also extracted from Signal 4 Analytics for the period between January 1, 2017 and December 31, 2019 to provide additional supporting information. The following historical crash statistics were analyzed to identify existing safety issues on the ramp:

- Crash Frequency
- Crash Severity
- Lighting Conditions
- Weather Conditions
- Surface Conditions
- Month of Year, Day of Week, and Time of Day
- Contributing Causes and Probable Causes

A confidence level analysis was not performed for the ramp due to the lack of Districtwide or Statewide Average Crash Rates for ramps. The Department's Segment High Crash List was also reviewed to determine if the ramp was listed as a high crash location between the years 2012 and 2016.

In addition to evaluating historical safety trends, a safety assessment of the proposed ramp improvement was also performed. The assessment included estimation of crash reduction.

### 2.6 LOS TARGET

FDOT has established LOS targets for the State Highway System (SHS) as documented in FDOT *Policy Topic 000-525-006-c, Level of Service Targets for the State Highway System*. According to said policy, SHS roadways in urbanized areas, such as the case of this project, shall maintain a target LOS of D during the peak hours.

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<sup>3</sup> Year 2016 was the latest available crash data in CARS at the time the June 2020 Safety Review was conducted

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**2.7 ROADWAY CHARACTERISTICS**

The Eastbound NW 138 Street On-ramp is currently a two-lane on-ramp that merges to one lane prior to its connection with Southbound I-75. Traffic from northbound Hialeah Gardens Boulevard enters the ramp from a channelized right-turn lane and must yield to the eastbound NW 138 Street through traffic as shown in the photographs in Figure 3-1. The on-ramp is approximately 0.4 miles long and the Roadway ID for the subject ramp is 87075601.



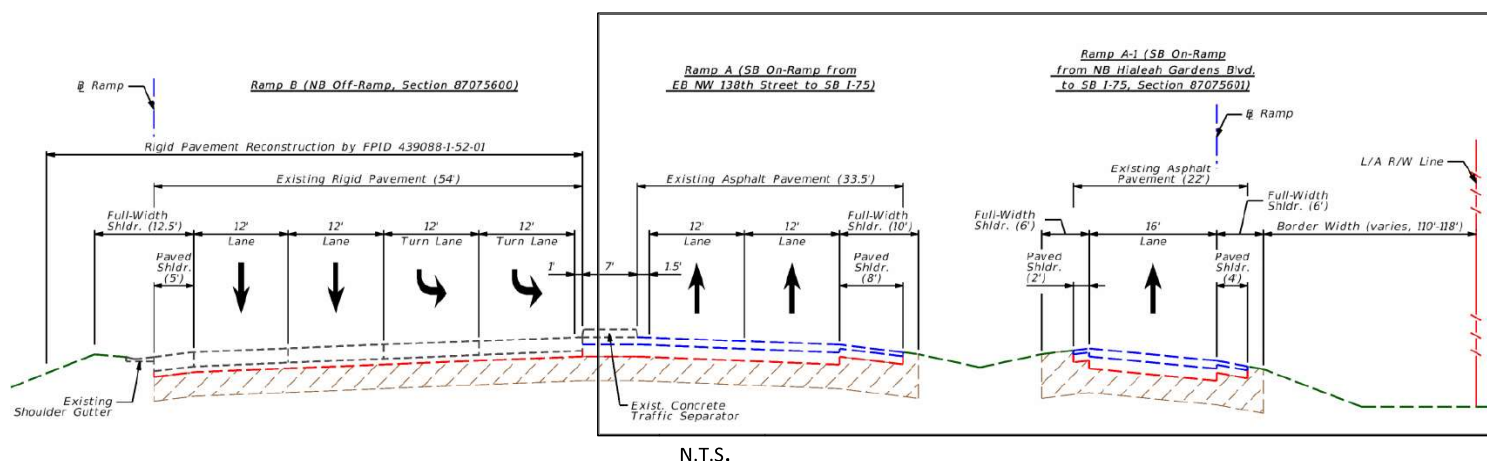
**FIGURE 3-1: HIALEAH GARDENS BOULEVARD CHANNELIZED RIGHT-TURN APPROACH TO NW 138 STREET/I-75 ON-RAMP**

The ramp connects NW 138 Street and I-75. I-75 is a designated SIS Highway Corridor with a functional classification of Principal Arterial -Interstate, while NW 138 Street is classified as a minor arterial under Miami-Dade County jurisdiction.

The existing typical section is illustrated in Figure 3-2 with the subject on-ramp identified as Ramp A and Ramp A-1.



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SR 93/ I-75 Ramps at NW 138<sup>th</sup> Street  
NB Off-Ramp 87075600 (MP 0.613-0.563), and  
SB On-Ramp 87075601 (MP 0.000-0.069)  
Design Speed = 30-45 mph

Source: Draft Scoping Report – FM 441836-1 SR 93/ I-75 Ramps at NW 138<sup>th</sup> Street and Hialeah Gardens Boulevard (April 2020)

**FIGURE 3-2: ON-RAMP EXISTING TYPICAL SECTION**

No existing speed limit signs or advisory speed signs are posted within the project limits; albeit, for the purpose of this IOAR, the posted speed on the on-ramp is assumed to be 30 mph. The design speed for the ramp at the proposed merge location is 45-50 mph. This is consistent with the design assumptions stated in the April 2020 Scoping Report.

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### 3 EXISTING CONDITIONS

#### 3.1 TRAFFIC DATA

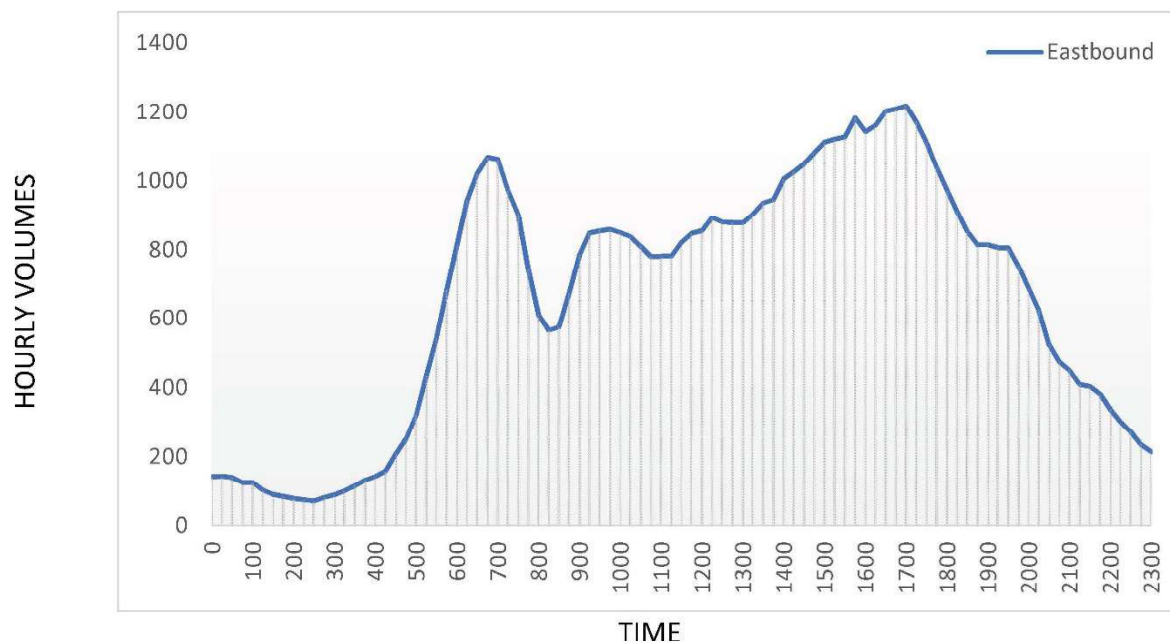
As previously mentioned, Year 2020 traffic count data is unavailable due to the changing travel patterns occurring during the COVID-19 Pandemic. Therefore, the following historical traffic count data provided by FDOT has been utilized in this IOAR:

- 2019 Historical AADT Report for Station 876076 (RAMP 87075601 FROM NB NW 92 AVE TO EB I-75, 1000') containing historical AADT volumes and design traffic factors (i.e., K, D and T factors)
- Synopsis reports including daily counts in 15-minute increments and vehicle classification counts at Station 876076 (RAMP 87075601 FROM NB NW 92 AVE TO EB I-75, 1000') for March 30, 2016 and March 31, 2016.

A copy of the raw traffic count data is provided in **Appendix 3**.

#### 3.2 TRAFFIC VOLUMES

According to the 2016 traffic counts, the AM and PM peak hours occurred at 6:45 AM and 5:00 PM, respectively. Figure 3-3 depicts the volume profile throughout the day based on the 2016 traffic counts at Station 876076.



**FIGURE 3-1: ON-RAMP DAILY VOLUME PROFILE**

Existing Year 2020 Annual Average Daily Traffic (AADT) and AM and PM peak hour ramp volumes were estimated by applying a linear growth rate to the 2016 count volume. A short-term annual growth rate of 5.6% was computed based on the historical AADT traffic counts from 2016 to 2019. Moreover, prior to adjusting the 2016 AADT to Year 2020, a seasonal factors (SF) 0.97 and axle correction factors (AF) 1.0 were applied.

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As noted in Section 2.3, checks were performed to confirm the reasonableness of the existing year volumes. The comparison found that the calculated AADTs and peak hour volumes were essentially the same as the values obtained using alternate sources. Therefore, the volumes presented herein were applied for the analyses in this IOAR.

Since recent and reliable turning movement count data was not available, the ramp peak hour turning movements were estimated by applying distribution percentages similar to the 2016 traffic volumes in the I-75 SIMR Reevaluation (November 2012).

Furthermore, according to the available traffic data, the ramp currently carries approximately 17 percent trucks on a daily basis.

The Existing Year Volumes are shown in Figure 3-4. In addition, the Historical Traffic Trends reports, along with the AADT calculations, 2019 Peak Season Factor Category Report, and supporting peak hour turning movement distribution data are included in **Appendix 4**.



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### 3.3 OPERATIONAL ANALYSIS

A capacity analysis was performed to determine if the Eastbound NW 138 Street to Southbound I-75 ramp is currently operating below capacity.

The demand flow rate on the ramp was computed and compared to the ramp roadway capacities listed in HCM 6<sup>th</sup> Edition, Exhibit 14-12. The on-ramp was analyzed as a two-lane ramp since the majority of the ramp within the project limits has two-lanes, the proposed acceleration lane is located adjacent to the two-lane ramp section, and there are no geometric improvements proposed at the two-to-one lane merge area. The ramp free flow speed was assumed to be 35 mph, which is 5 mph above the posted speed<sup>4</sup>.

The percentage of trucks traveling on the ramp during the peak hour (i.e., the design hour truck (DHT) factor) was estimated to be 8%<sup>5</sup>.

A summary of the heavy vehicle data used to determine the DHT is presented in Table 3-1.

**TABLE 3-1: PERCENTAGE OF TRUCKS**

AADT Historical Traffic Report				Vehicle Classification Count	
2019		Average 2004-2019		March 2019	
T Factor	Peak Hour Truck % (T/2)	T Factor	Peak Hour Truck % (T/2)	Daily Truck %	Peak Hour Truck % (Daily Truck %/2)
14.3	7.2	16.0	8.0	19.5	9.8
Average Daily Truck %				16.6	
Average Peak Hour Truck %				8	

The results of the capacity analysis are presented in Table 3-2, while the calculations are included in **Appendix 5** for further reference.

**TABLE 3-2: EXISTING YEAR (2020) RAMP CAPACITY ANALYSIS**

Eastbound NW 138 Street to Southbound I-75 On-ramp							
AM				PM			
Capacity (pc/h)	Demand Flow Rate (pc/h)	V/C	Demand > Capacity	Capacity (pc/h)	Demand Flow Rate (pc/h)	V/C	Demand > Capacity
4,000	1,478	0.37	No	4,000	1,705	0.43	No

V/C: Volume to Capacity Ratio

Source: HCM 6th Edition

<sup>4</sup> Per FDOT's 2014 *Traffic Analysis Handbook*, FFS can be estimated at five (5) mph above the posted speed limit, when measured data is not available.

<sup>5</sup> According to FDOT's 2019 *Project Traffic Forecasting Handbook*, the Design Hour Truck (DHT) is defined as T divided by two, based on the assumption that only half as many trucks travel on the roadway during the peak hour.

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### 3.4 SAFETY ANALYSIS

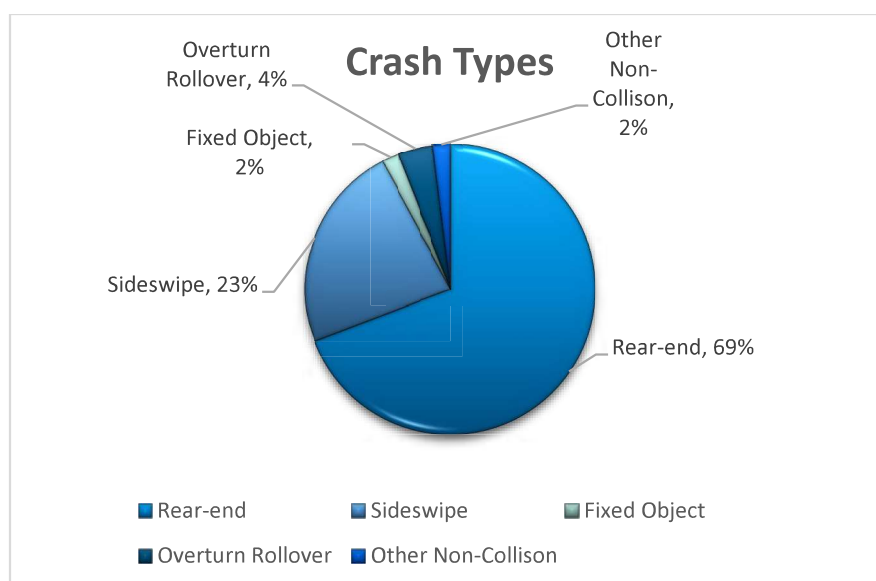
A detailed safety analysis was conducted in June 2020 as part of the scoping for the SR 93/I-75 Ramps at the NW 138 Street Interchange RRR project (FM: 250650-4-32-01). Although the analysis was performed for all four (4) ramps that comprise the interchange, the summary herein focuses primarily on the existing safety conditions on the Eastbound NW 138 Street to Southbound I-75 On-ramp (Ramp 87075601). The entire 3R Safety Review report is included in **Appendix 2** for further reference.

Historical crash data for years 2012 through 2016 was extracted from the Department's Crash Analysis Reporting System (CARS). The crash statistics for the five (5) analysis years are summarized in the following tables and figures. Table 3-3 summarizes the crash statistics for the on-ramp, including annual frequency, lighting conditions (i.e., % of crashes occurring in the dark) and surface conditions (i.e., % of crashes occurring in wet conditions). In addition, the types of crashes and percentage of occurrence are graphically depicted in Figure 3-5, while the crash severity (i.e., property damage only (PDO), injury, and fatal) is shown in Figure 3-6. A confidence level analysis for the ramp was not performed due to the lack of Districtwide or Statewide Average Crash Rates for ramps.

**TABLE 3-3: CRASH STATISTICS (YEARS 2012-2016)**

Crashes per Year					Total Crashes	Most Common Crash Types	% Dark Crashes	% Wet Crashes
2012	2013	2014	2015	2016				
4	2	13	11	22	52	Rear-End 36 (69%) Sideswipe 12 (23%)	13%	8%

Source: SR 93/I-75 Ramps at the NW 138 Street Interchange 3R Safety Review (June 2020)



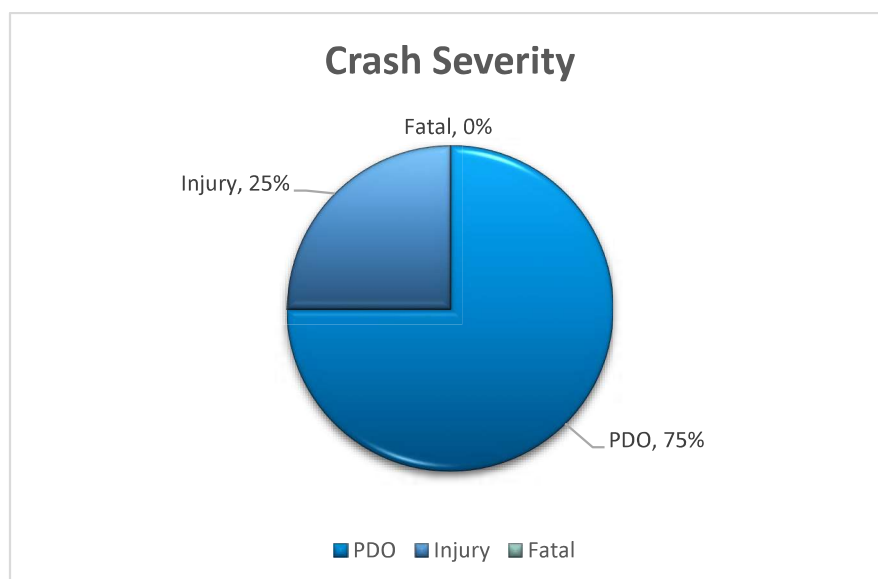
Source: SR 93/I-75 Ramps at the NW 138 Street Interchange 3R Safety Review (June 2020)

**FIGURE 3-3: CRASH TYPES**



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Source: SR 93/I-75 Ramps at the NW 138 Street Interchange 3R Safety Review (June 2020)

**FIGURE 3-4: CRASH SEVERITY**

Below is a summary of findings mentioned in the safety study:

- A total of 52 crashes were reported in CARS along the ramp over the five (5) year analysis period.
- Frequency of crashes increased from four (4) crashes in 2012 to 22 crashes in 2016.
- The crashes with the highest frequencies were rear-end (36 crashes) and sideswipe (12 crashes).
- Almost 95% of the rear-end crashes occurred at the gore of the northbound channelized right-turn lane from Hialeah Gardens Boulevard (Ramp 87075601) with NW 138 Street and almost all the sideswipe crashes occurred in the lane drop transition area preceding the entry to Southbound I-75.
- A review of the Signal 4 Analytics database showed that there were only 11 additional rear-end crashes in the period from January 1, 2017 through December 31, 2019. These additional rear-end crashes had an annual distribution of six (6) crashes in 2017, three (3) crashes in 2018 and two (2) crashes in 2019.
- According to the police crash reports, the main contributing cause for the rear-end crashes was careless/negligent driving while the sideswipe crashes were mostly attributed to improper lane changing and passing.
- The field review revealed that the channelized right connecting Hialeah Gardens Boulevard to eastbound NW 138 Street On-ramp is controlled by a YIELD sign.
- There were no fatalities reported in the five-year period; however, 13 crashes (25%) resulted in injuries.
- Seven (7) crashes (13%) occurred during nighttime conditions and four (4) crashes (7%) occurred when the road pavement surface was wet. Both percentages are lower than their respective districtwide averages of 29.5% and 15%, respectively.
- Ramp 87075601 was not listed on the Department's Segment High Crash List.

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Since CARS data for Year 2017 was released by FDOT after completion of the 3R Safety Report, the 2017 crash data was reviewed to ensure there were no abrupt changes in the crash trends between 2016 and 2017. The crash data for Years 2012-2017 summarized **Appendix 6** show there were no abrupt changes in crash patterns in 2017 as compared to previous years.

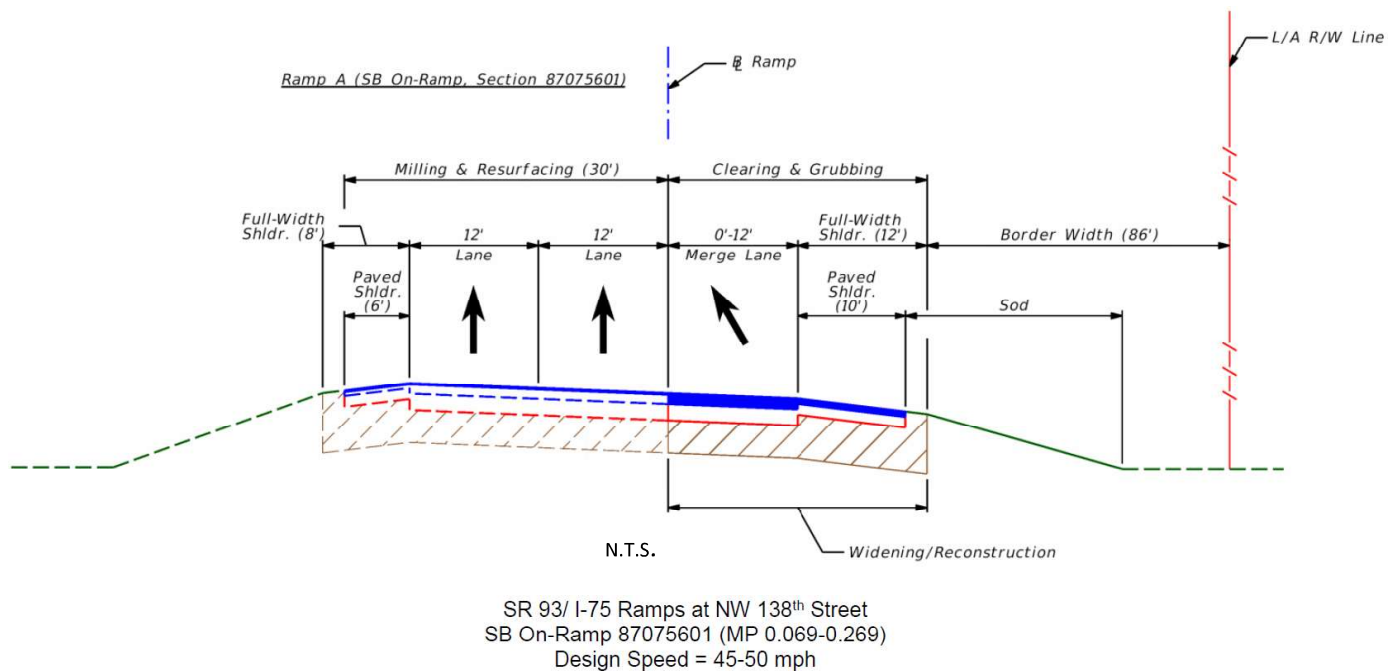


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### 4 PROPOSED PROJECT CONCEPT

#### 4.1 CONCEPTUAL IMPROVEMENT PLAN

The Build Alternative includes the replacement of the yield condition for the northbound Hialeah Gardens Boulevard channelized right turn at the intersection of NW 138 Street with an acceleration lane. The acceleration lane has a 400-foot transition with a 600-foot merging taper. The proposed typical section for the subject on-ramp is depicted in Figure 4-1.



Source: Draft Scoping Report – FM 441836-1 SR 93/ I-75 Ramps at NW 138<sup>th</sup> Street and Hialeah Gardens Boulevard (April 2020)

**FIGURE 4-1: ON-RAMP PROPOSED TYPICAL SECTION**

The proposed improvements have been identified on the 3R Safety Review preliminary plans in **Appendix 7**. As indicated on the plans, the ramp enhancements are contained within the limits of the ramp. The number of lanes remains unchanged at the gore with Southbound I-75.

Moreover, as noted in the Scoping Report in **Appendix 1**, although widening of the pavement will be required to accommodate the new acceleration lane, right-of-way acquisition is not anticipated. The design team also determined that the acceleration lane can be constructed within the available ramp length and would not be constrained by the existing downstream lane-drop preceding the entry to Southbound I-75.

#### 4.2 DESIGN VARIATIONS/EXCEPTIONS

It is important to mention that the Scoping Report identified a Design Variation (DV) for Cross Slope may be required to match the existing conditions. Additional review of the design survey is necessary to determine if this DV is needed at the Southbound On-ramp where widening is proposed. The Scoping Report also identified a variation for shoulder width for the project; however, this DV is not applicable to

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the Southbound On-ramp where widening is proposed. The Scoping Report did not identify any Design Exceptions or the Eastbound NW 138 Street On-ramp to Southbound I-75 (SR 93).

#### **4.3 PROJECT COST ESTIMATE**

The total cost (including roadway, signing and pavement itemized costs, mobilization, maintenance of traffic, contingency for unseen elements, preliminary engineering, and construction engineering inspection) to replace the existing Yield condition for the northbound channelized right-turn from Hialeah Gardens Boulevard to the NW 138 Street/I-75 On-ramp with an acceleration lane, along with the other improvements proposed on Ramp 87076501 is approximately \$545,000. This preliminary construction cost estimate was prepared using FDOT's standard pay items and historical costs from previous construction projects recently completed in Miami Dade County.

The detailed cost estimate is included in the 3R Safety Review report (Appendix D), which can be found in **Appendix 2** of this report.

#### **4.4 CONCEPTUAL FUNDING PLAN**

According to the April 2020 RRR Scoping Report, Work Mix 0012 (Resurfacing) is applicable to this project; the existing layers of pavement are to be structurally improved by milling and resurfacing, without affecting the existing base.

The project, including improvements on all four (4) interchange ramps, is programmed for construction in the current Work Program under FM 441836-1 as follows:

- Sequence -52-01, RRR Improvements at four ramps, \$1,679,926 (DDR funds)
- Sequence -52-02, Safety improvements at SB On-ramp, \$305,877 (ACSS funds)

#### **4.5 PROJECT SCHEDULE**

The project schedule is provided in **Appendix 8**. Some important dates included in the schedule are:

- Preliminary Engineering (PE) – 2/3/2020
- Notice to Proceed – 10/12/2020
- Plans Complete – 1/19/2022
- Letting Date – 8/31/2022
- CEI Consultant Contract Executed – 11/30/2022

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### 5 FUTURE CONDITIONS

The development of the project traffic forecast, as well as the results of the future conditions operational and safety analyses are discussed in the following sections.

#### 5.1 TRAFFIC FORECAST

Future year AADT and AM and PM peak hour volumes were projected for the Opening Year 2023 and Design Year 2043. Since the replacement of the existing Yield condition with a tapered acceleration lane is a minor improvement that will not result in any travel pattern changes, one set of future year volumes were developed for the evaluation of the No Build and Build scenarios.

The future year AADT and peak hour volumes were developed by applying a growth rate to the Existing Year 2020 volumes. In addition to historical traffic trends, Miami-Dade County population projections obtained from *University of Florida Bureau of Economic and Business Research (BEBR) Bulletin 18 (June 2020)* and the ramp's 2015 and 2045 highway assignment generated in SERPM 8.503 were evaluated to determine an appropriate long-term growth rate. The results of the growth rate analysis are summarized in Table 5-1.

According to the growth analysis, the annual growth rates ranged between 1.3% based on the BEBR population projections and 3.84% based on the historical trends. Considering all of the growth methods, a recommended growth rate of 3% was selected. The supporting data for the long-term growth rate analysis is included in **Appendix 9**.

The reasonableness of the future AM and PM volumes was verified by comparing them to the design hour volume computed using the Standard K value. The assessment showed that the ramp's 2023 and 2043 design hour volumes are similar to the projected PM peak hour volumes, which is the highest of the two peak periods.

The Opening Year and Design Year volumes developed for this IOAR are illustrated in Figures 5-1 and 5-2, respectively.

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**TABLE 5-1: GROWTH RATE ANALYSIS SUMMARY**

Method 1 - Historical Traffic Counts (2004-2019)								Method 2 - Population Growth	Method 3 - Travel Demand Model Assignment Growth	Recommended Growth Rate
Station	Location Description	Linear		Exponential		Decaying Exponential		Miami-Dade County Annual Projected Growth (2010-2045)	SERPM 8.503 (2015-2045)	
		R²	Annual Trend Growth Rate (2019 to Design Year)	R²	Annual Trend Growth Rate (2019 to Design Year)	R²	Annual Trend Growth Rate (2019 to Design Year)			
876076	Ramp 87075601 from NB NW 92 Ave to EB I-75, 1000'	63.12%	3.84%	57.80%	5.22%	32.40%	0.68%	1.3%	3.0%	3.0%

Best Fit

Sources: FDOT, University of Florida BEBR Bulletin 18, June 2020, and SERPM 8.503



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FIGURE 5-1: OPENING YEAR (2023) TRAFFIC VOLUMES



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**FIGURE 5-2: DESIGN YEAR (2043) TRAFFIC VOLUMES**

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## 5.2 OPERATIONAL ANALYSIS

Analyses were conducted to assess the operational performance of the Eastbound NW 138 Street to Southbound I-74 ramp roadway under No Build and Build scenarios for the AM and PM peak hours during the Opening (2023) and Design (2043) Years. The results of the future conditions analyses are summarized in the following sections, and the capacity analysis worksheets and HCM LOS output reports are included in **Appendix 10** for further reference.

Similar to the existing conditions, the on-ramp capacity analysis was performed for the two-lane ramp section because the majority of the ramp within the project limits has two-lanes, the proposed acceleration lane is located adjacent to the two-lane ramp section, and there are no geometric improvements proposed at the two-to-one lane merge area. Moreover, the No Build and Build volumes at the two-to-one lane merge and the gore to I-75 do not change since the merge for the subject acceleration lane being studied in this IOAR is completed upstream of the two-to-one lane merge.

### 5.2.1 No Build

Similar to the existing conditions, the on-ramp was analyzed as a two-lane ramp since the majority of the ramp within the project limits has two-lanes, the proposed acceleration lane is located adjacent to the two-lane ramp section, and there are no geometric improvements proposed at the two-to-one lane merge area. Moreover, the No Build and Build volumes at the two-to-one lane merge and the gore to I-75 do not change, since the merge for the subject acceleration lane being studied in this IOAR is completed upstream of the two-to-one lane merge.

The capacity of the ramp roadway was evaluated under future demand conditions, assuming its current geometric configuration. The analysis indicated that the two-lane section of the ramp will operate below its estimated ramp capacity for both Opening and Design year, under AM and PM peak hour traffic demand.

**TABLE 5-2: OPENING YEAR (2023) AND DESIGN YEAR (2043) NO BUILD RAMP CAPACITY ANALYSIS**

Eastbound NW 138 Street to Southbound I-75 On-ramp							
AM				PM			
Capacity (pc/h)	Demand Flow Rate (pc/h)	V/C	Demand > Capacity	Capacity (pc/h)	Demand Flow Rate (pc/h)	V/C	Demand > Capacity
<b>Opening Year (2023)</b>							
4,000	1,592	0.40	No	4,000	1,819	0.45	No
<b>Design Year (2043)</b>							
4,000	2,501	0.63	No	4,000	2,842	0.71	No

V/C: Volume to Capacity Ratio

Source: HCM 6<sup>th</sup> Edition

### 5.2.2 Build

The operation of the Build improvement (i.e., proposed acceleration lane) was analyzed following the procedures in HCM 6<sup>th</sup> Edition, Chapter 14. As shown in Table 5-3, the merge area is not expected to operate below LOS D, which is FDOT's target LOS for State Highways in urbanized areas.

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**TABLE 5-3: OPENING YEAR (2023) AND DESIGN YEAR (2043) BUILD LEVEL-OF-SERVICE (ACCELERATION LANE MERGE)**

Eastbound NW 138 Street to Southbound I-75 On-ramp			
AM		PM	
Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS
<b>Opening Year (2023)</b>			
11.4	B	13.2	B
<b>Design Year (2043)</b>			
18.3	B	21.1	C

Note: "Freeway" (NW 138 Street EB) Free-flow Speed (FFS) assumed minimum allowable FFS of 45 for C-D roadways.

## 5.3 BUILD ALTERNATIVE SAFETY ANALYSIS

The change in safety conditions as a result of replacing the yield condition with an acceleration lane was analyzed following the guidance provided in FDOT's Interchange Access Request User's Guide (IARUG). These improvements are mostly targeted at reducing the number of rear-end crashes at the channelized northbound right-turn that is currently controlled by a YIELD sign at the intersection of Hialeah Gardens Boulevard and the Eastbound NW 138 Street On-ramp.

The first step in the evaluation involved estimating the potential crash reduction anticipated by the proposed improvement. The analysis details are documented using FDOT's Safety Office Annual Benefit Cost Analysis worksheet in Appendix D of the 3R Safety Review included in **Appendix 2**, while Table 5-4 provides a summary of the results. The Crash Reduction Factor (CRF) and baseline crash data used in the predictive safety analysis were obtained from the FHWA's Desktop Reference dated September 2008 and FDOT's CARS database, respectively.

**TABLE 5-4: ESTIMATED CRASH REDUCTION**

Proposed Improvements		CRF	Source	Targeted Crash Type	Number of Crashes Targeted	Reduction in Number of Crashes	Total Reduction in Crashes
1	Improve Gore Area	25%	FHWA Page 60	Rear-end	12	3	3
2	Improve Horizontal and Vertical Alignment	50%			20	10	10
Total Crash Reduction in 5-Years							13
Crash Reduction Per Year							2.6

Source: SR 93/I-75 Ramps at the NW 138 Street Interchange 3R Safety Review (June 2020)

As indicated in the table, the proposed improvements are expected to improve safety conditions, with the potential to reduce crashes on the on-ramp by a rate of 13 crashes in five years, or 2.6 per year.

Furthermore, the proposed improvement at the first gore area replaces the YIELD condition with a MERGE condition downstream of the gore area. As stated in the 3R Safety Review Report, the proposed improvement will be based on Standard Index 000-528, thereby ensuring sufficient distances are provided



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for the transition and merge areas at a design speed of 40 mph. For this reason, it is not anticipated sideswipe crashes will increase provided the improvement is constructed properly.

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## **6 CONCLUSIONS**

District 6 has identified a series of improvements to enhance safety, improve operations, and extend the service life on the Eastbound NW 138 Street to Southbound I-75 On-ramp. The specific ramp improvement being addressed in this IOAR involves the addition of a new acceleration lane that merges along the on-ramp prior to the gore at I-75. The number of lanes at the gore remains unchanged.

The Build Alternative includes the replacement of the yield condition for the northbound Hialeah Gardens Boulevard channelized right turn at the intersection of NW 138 Street with an acceleration lane. The acceleration lane has a 400-foot transition with a 600-foot merging taper.

The acceleration lane is proposed to address safety issues related to the existing yield control, while maintaining operational functionality, by providing a smoother transition allowing vehicles to accelerate before entering the through traffic lanes on the ramp.

A significant amount of crashes that occur on the ramp have been attributed to careless/negligent driving and high traffic demand at the yield-controlled approach. The proposed ramp improvement is expected to enhance the safety conditions on the on-ramp by reducing the rear-end crashes. The proposed ramp improvement could reduce the number of crashes by approximately 3 crashes per year.

Although the primary purpose is to improve safety, the analysis indicates that operations will not be negatively affected by the proposed improvement. The operational analysis performed for the new acceleration lane indicates that the merge area will operate above LOS D during the AM and PM peak hour in both Opening Year (2023) and Design Year (2043). The analysis also indicated that the two-lane section of the ramp will continue to operate below capacity ( $V/C < 1.0$ ) based on the forecasted traffic demand for Opening and Design Years.

Moreover, although the 3R Safety Report indicates that the signalized intersection of NW 138 Street and Hialeah Gardens Boulevard created frequent gaps for vehicles queued in the channelized right turn lane to join NW 138 Street unimpeded, it is anticipated that the proposed improvement will further reduce the queue length from the northbound Hialeah Gardens Boulevard right-turn movement by allowing traffic to smoothly enter the traffic flow without having to accelerate from a stop condition.

The analysis presented in this IOAR confirms that the new acceleration lane is expected to improve safety, while maintaining acceptable operating conditions on the ramp without altering operations at the ramp connection with I-75.

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### 7 JUSTIFICATION

All access requests submitted for approval consideration must be substantiated by fulfilling FHWA's two (2) policy points.

#### 7.1 ASSESSMENT OF FHWA'S POLICY ON ACCESS TO INTERSTATE SYSTEM

The requirements below form the basis of approval for the access request. The criteria in both Policy points have been fully addressed as indicted below.

##### 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)).***

The main purpose of this project is to improve safety conditions at the existing northbound right-turn yield condition at the Eastbound NW 138 Street to Southbound I-75 On-ramp, while maintaining operational functionality.

The Build Alternative includes the replacement of the yield condition for the northbound Hialeah Gardens Boulevard channelized right turn at the intersection of NW 138 Street with an acceleration lane to provide a smoother transition allowing vehicles to accelerate before entering the through traffic lanes on the ramp.

The extent of the analysis area for this IOAR was discussed during the District 6 Interchange Review Meeting held on July 16, 2020 and the subsequent meeting with FHWA on August 13, 2020. The area of influence consists of the Eastbound NW 138 Street to Southbound I-75 On-ramp (Ramp 87075601) from mile post (MP) 0.0 to 0.385. Although the area of influence (AOI), according to the *IARUG*, typically extends at least one-half mile along the crossroad and one signalized intersection, a condensed AOI was applied for this IOAR based on the following considerations:

- the existing northbound right-turn to the ramp is channelized with yield control is being replaced with an acceleration lane (i.e., traffic does not stop at the upstream intersection in either the existing or Build condition),

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- the two-lane segment of the ramp has sufficient capacity; therefore, there is not expected any negative impact to the queue or delay at the upstream intersection,
- the extent of the improvement falls within the limits of the on-ramp,
- the number of lanes at the gore with I-75 does not change, and
- the improvement does not alter the configuration of the interchange or change the travel patterns in the area; therefore, the volumes on the on-ramp and at the upstream intersection are the same between No Build and Build condition.

The safety and operational analysis performed for this IOAR confirms that the proposed ramp improvements will not have a significant adverse impact on safety and operations on the Eastbound NW 138 Street to Southbound I-75 On-ramp. In addition, since the improvements are located on the ramp and there are no changes proposed at the ramp gore with I-75, the proposed improvement will not impact the safety and operations on the I-75 mainline.

A safety and operational analysis was performed for both the existing and proposed conditions. Numerous crashes (52) occurred on this ramp between 2012 and 2016, of which the most predominate types of crashes were rear-end and sideswipe. About 95% of the rear-end crashes occurred at the gore of the northbound channelized right-turn lane from Hialeah Gardens Boulevard to the NW 138 Street On-ramp. The proposed ramp improvements are expected to improve safety conditions on the on-ramp by reducing the number of rear-end crashes at a rate of 2.6 crashes per year.

Although the primary purpose of this project is to improve safety, the operational analysis also indicates that operations will not be negatively affected by the proposed improvement. The operational analysis results show that the two-lane section of the on-ramp will operate under capacity beyond Design Year 2043. Moreover, the merge created by the proposed acceleration lane will operate at or above level-of-service (LOS) D through Design Year 2043.

Moreover, although the 3R Safety Report indicates that the signalized intersection of NW 138 Street and Hialeah Gardens Boulevard created frequent gaps for vehicles queued in the channelized right turn lane to join NW 138 Street unimpeded, it is anticipated that the proposed improvement will further reduce the queue length from the northbound Hialeah Gardens Boulevard right-turn movement by allowing traffic to smoothly enter the traffic flow without having to accelerate from a stop condition.

The proposed signing improvements on the on-ramp have been identified on the preliminary plans included in **Appendix 7**.

#### 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 CFR625.2(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***

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***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.***

The improvements are located on the existing Eastbound NW 138 Street to Southbound I-75 On-ramp. Both I-75 and NW 138 Street are public roadways located in Miami-Dade County, Florida. No new access is being requested.

The existing full interchange provides for all traffic movements. There are no changes proposed at the existing freeway connections and all traffic movements will be preserved.

The improvements have been designed to meet current standards for federal-aid projects on the interstate system and conform to American Association of State Highway and Transportation Officials (AASHTO) and the FDOT Design Manual (FDM).