

# Intersection Safety Analysis Executive Summary

GPC VII – Work Order #32



Miami-Dade Transportation  
Planning Organization



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## TABLE OF CONTENTS

|                                                     |           |
|-----------------------------------------------------|-----------|
| <b>PROJECT OVERVIEW</b> .....                       | <b>3</b>  |
| <b>SAFETY SCREENING</b> .....                       | <b>5</b>  |
| <b>ALTERNATIVES EVALUATION</b> .....                | <b>7</b>  |
| Intersection Control Evaluation (ICE) Stage 1 ..... | 7         |
| ICE Stage 1 Analysis .....                          | 8         |
| Operational Analysis.....                           | 8         |
| <b>CONCEPT DEVELOPMENT</b> .....                    | <b>9</b>  |
| <b>BENEFIT/COST</b> .....                           | <b>10</b> |

## List of Tables

|                                                       |    |
|-------------------------------------------------------|----|
| Table 1. Study Location Potential Improvements.....   | 5  |
| Table 2. 2016-2020 Crash Data Screening.....          | 6  |
| Table 3. Opinion of Probable Cost.....                | 10 |
| Table 4. ICE Tool Benefit/Cost Analysis Results ..... | 10 |

## List of Figures

|                                                              |   |
|--------------------------------------------------------------|---|
| Figure 1. Study Locations.....                               | 3 |
| Figure 2. Intersection Control Evaluation (ICE) Process..... | 7 |

## PROJECT OVERVIEW

On March 18, 2021, the Miami-Dade Transportation Planning Organization (TPO) Governing Board adopted Resolution #12-2021 ratifying the issuance of notice-to-proceed for the scope of services and budget to conduct safety analysis for three (3) Miami-Dade County safety improvements projects. The study's purpose & need is to reduce crashes, most importantly fatalities and serious injuries, by evaluating the intersections and providing justification to apply for Highway Safety Improvement Program (HSIP) funding. The HSIP is a data driven program. As such, proposed projects need to meet eligibility requirements through a safety analysis and must demonstrate a benefit-cost ratio (B/C) greater than 1.0 and a positive net present value (NPV).

The process to identify the three (3) safety improvement projects discussed in this report began with thirteen (13) intersections identified by the County for safety analysis. The thirteen (13) locations were identified as roadway safety improvement projects under the TPO's adopted Fiscal Year (FY) 2026 List of Program Priorities (LOPP) approved by Resolution # 20-2020 on June 18, 2020. These intersections were identified based on existing crash patterns to address the safety issues and public feedback. These locations are considered off-system since they are not located on the State Highway System (SHS). The thirteen (13) locations were evaluated and prioritized based on historical crash data and potential safety benefits with the top three (3) selected for further concept development.

The three (3) prioritized locations are shown in **Figure 1** and are discussed in this report.

Figure 1. Study Locations



The TPO advanced the three (3) prioritized intersections, which were further included in the FY 2027 LOPP approved on June 17, 2021. The Miami-Dade Department of Transportation and Public Works (DTPW) Traffic Operations and Traffic Engineering Divisions concurred with prioritization of the three (3) locations.

This Executive Summary provides an overview of the safety analysis for the three (3) prioritized intersections and a summary of the safety improvement projects submitted to the Florida Department of Transportation (FDOT) District Six Safety Program for off-system facilities funding. FDOT further prioritize these locations with the state facilities safety improvements projects for the 2021 HSIP cycle. The summary includes an overview of the field observations findings, data collection, crash data analyses, and detailed traffic operations analyses conducted at the three study intersections. Additionally, the report includes a summary of the concepts developed for consideration and opinion of probable cost for the implementation of the suggested improvements. The benefit-cost comparison is provided for each location to determine the eligibility of each project for HSIP funding ( $B/C > 1$  and  $+ NPV$ ). The study's analyses, results, and proposed improvements were presented to the FDOT District Six for evaluation of eligibility and prioritization based on analysis results.

The study team conducted coordination meetings with DTPW - Traffic Operations and Traffic Engineering Divisions staff throughout the project to discuss the proposed alternatives. DTPW were supportive of the proposed mini-roundabout alternatives. Due to one of the prioritized intersections being located between Miami-Dade County and the City of Miami Gardens' jurisdiction, City of Miami Gardens staff were involved in the alternative's evaluation and concept development of the mini-roundabout at N Miami Avenue & N 195 Street. City of Miami Gardens staff were supportive of the proposed mini-roundabout at N Miami Avenue & N 195 Street.

On May 27, 2021, the TPO presented the Intersection Safety Analysis results and recommendations at the FDOT District Six Scoping Committee meeting. In advance of this presentation, all three (3) intersections were reviewed by FDOT District Six staff, and were found eligible for safety funds. The Intersection Safety Analysis reports were posted in the FDOT Electronic Review Comments (ERC) system, and all comments were addressed by May 24, 2021. The FDOT District Six Scoping Committee meeting minutes were approved by on August 11, 2021. The funding request for all three (3) intersections was approved and submitted to FDOT Central Office and Federal Highway Administration for HSIP funding consideration.

FDOT notified the TPO and DTPW on September 10, 2021, that the requested funds for all (3) prioritized intersections have been awarded as follows: Design phase in FY 24, and Construction and Construction Engineering & Inspection (CEI) phases in FY 26.

## SAFETY SCREENING

DTPW identified thirteen (13) potential project locations for review. These locations were identified based on existing safety issues and public feedback. DTPW identified potential improvements for each study location. **Table 1** provides a list of the 13 locations and the potential improvements identified for each by DTPW.

**Table 1. Study Location Potential Improvements**

| Location                                            | Potential Improvement                               |
|-----------------------------------------------------|-----------------------------------------------------|
| N Miami Avenue & N 163 Street                       | Traffic Circle                                      |
| NW 62 Street from NW 21 Avenue to NW 20 Avenue      | Rectangular Flashing Beacons and Directional Median |
| NW 127 Avenue & NW 17 Street                        | Lengthening of Left Turn Lane                       |
| SW 125 Avenue between SW 264 Street & SW 259 Street | Median Treatment                                    |
| SW 84 Avenue & SW 38 Street                         | Traffic Circle                                      |
| NW 173 Drive & NW 75 Place                          | New Traffic Signal                                  |
| N Miami Avenue & N 195 Street                       | Traffic Circle                                      |
| NE 2 Avenue & NE 1 Street                           | Concrete Island                                     |
| SW 132 Avenue & SW 136 Street                       | New Traffic Signal                                  |
| SW 142 Avenue & SW 100 Terrace                      | Rectangular Flashing Beacons                        |
| 2601 NE 151 Street                                  | Rectangular Flashing Beacons                        |
| Ingraham Highway & SW 37 Avenue                     | Add Pedestrian Features & Bike Improvements         |
| N Waterway Drive from SW 62 Avenue to SW 61 Avenue  | Traffic Diverter                                    |

To prioritize these locations, historical crash data was collected from FDOT's State Safety Office Geographic interface software (SSOGis) and Signal Four Analytics (Signal 4). SSOgis was used in place of FDOT's Crash Analysis Reporting (CAR) System due to the study locations being located on off-system roadways. SSOgis provided verified crash data for 2016 - 2018 and data from Signal 4 was used to supplement the SSOgis for 2016 - 2020. **Table 2** provides the total number of crashes that occurred at each location from 2016 - 2020, along with a high-level screening of the crash data.

A high-level safety screening was conducted of the crash data at the 13 locations. The purpose of the review was to prioritize three (3) locations with safety issues supported by historical crash data and have the best chance to qualify for HSIP funding. The three (3) locations identified for further study are highlighted in green in Table 2. The remaining ten (10) locations that were not selected to be submitted for HSIP funding this year can be further analyzed by DTPW for submission during the next funding cycle.

**Table 2. 2016-2020 Crash Data Screening**

| Location                                            | Crashes | Crash Data Screening                                             | Recommended for Study |
|-----------------------------------------------------|---------|------------------------------------------------------------------|-----------------------|
| N Miami Avenue & N 163 Street                       | 29      | 70-75% angle / left turn related crashes                         | Yes                   |
| NW 62 Street from NW 21 Avenue to NW 20 Avenue      | 40      | 55-65% angle / left-turn related crashes                         | No                    |
| NW 127 Avenue & NW 17 Street                        | 54      | 65% rear-end / sideswipe related crashes                         | No                    |
| SW 125 Avenue between SW 264 Street & SW 259 Street | 7       | Lower number of crashes compared to alternative locations        | No                    |
| SW 84 Avenue & SW 38 Street                         | 35      | 97% angle / left-turn / sideswipe related crashes                | Yes                   |
| NW 173 Drive & NW 75 Place                          | 46      | 40-50% angle / left-turn related crashes. Meets signal warrants. | No                    |
| N Miami Avenue & N 195 Street                       | 40      | 50-60% angle / left-turn related crashes                         | Yes                   |
| NE 2 Avenue & NE 1 Street                           | 52      | 45-50% sideswipe related crashes, many with parked vehicles      | No                    |
| SW 132 Avenue & SW 136 Street                       | 19      | Lower number of crashes compared to alternative locations        | No                    |
| SW 142 Avenue & SW 100 Terrace                      | 5       | Lower number of crashes compared to alternative locations        | No                    |
| 2601 NE 151 Street                                  | 5       | Lower number of crashes compared to alternative locations        | No                    |
| Ingraham Highway & SW 37 Avenue                     | 16      | Lower number of crashes compared to alternative locations        | No                    |
| N Waterway Drive from SW 62 Avenue to SW 61 Avenue  | 6       | Lower number of crashes compared to alternative locations        | No                    |

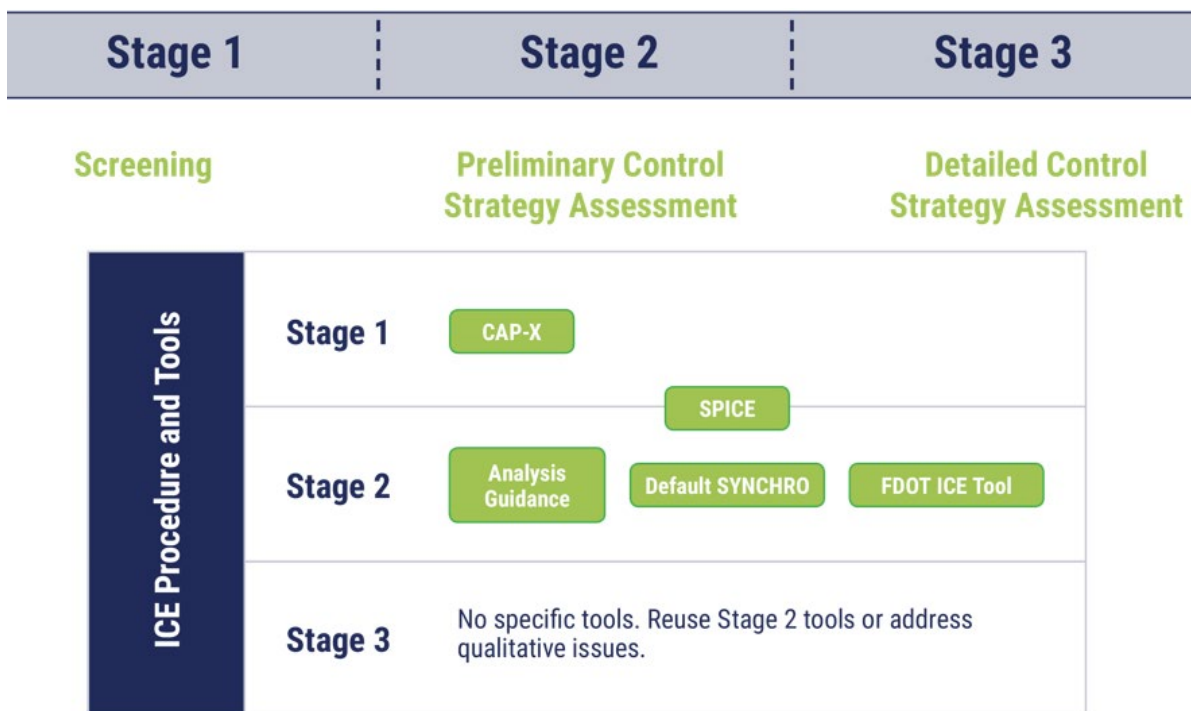
## ALTERNATIVES EVALUATION

### Intersection Control Evaluation (ICE) Stage 1

Following the selection of the three (3) intersections to be evaluated, an Intersection Control Evaluation (ICE) was conducted at each location. ICE is an evaluation process used to consider context-sensitive intersection control strategies when identifying a new or modified intersection. The goal of ICE is to provide a quantitative decision-making process to identify and select a control strategy that fits the location's context, provides safe travel facilities for all road users, and offers the best overall value. An ICE Stage 1 analysis was performed at the three (3) prioritized intersections.

ICE Stage 1 involves two (2) analysis components: 1) A planning level volume-to-capacity (V/C) ratio assessment using the Capacity Analysis at Junctions (CAP-X) tool; and 2) a planning level safety assessment using Safety Performance for Intersection Control Evaluation (SPICE) tool. These assessments are high level in nature. **Figure 2** provides an outline of the ICE procedure, including all three potential stages. Only ICE Stage 1 was needed to determine the preferred alternative at the three study intersections.

Figure 2. Intersection Control Evaluation (ICE) Process



Source: FDOT District ICE Training Slides, 2018

## ICE Stage 1 Analysis

To determine the alternatives that should be included in the ICE Stage 1 analysis signal warrants were evaluated at each study intersection to understand the need for a traffic signal. The following provides the results of the signal warrant analyses:

- N Miami Avenue & N 195 Street – meets Warrant 2 (Four-Hour Vehicular Volume)
- N Miami Avenue & N 163 Street – does not meet signal warrants
- SW 84 Avenue & SW 38 Street – does not meet signal warrants

Although signal warrants were only met at one (1) of the three (3) study intersections, it was determined that a traffic signal alternative would be evaluated as part of ICE Stage 1 for comparison at all three (3) intersections. The following intersection control types were evaluated in ICE Stage 1 at each of the study intersections:

- Two-Way Stop Control (TWSC)
- All-Way Stop Control (AWSC)
- Signalized Control
- 1x1 Roundabout (one-lane major road and one-lane minor road)
- 50' Inscribed Circle Diameter (ICD) Mini-Roundabout
- 75' ICD Mini-Roundabout

Following the completion of the ICE Stage 1 analyses, the alternatives were compared based on safety and capacity results. Due to the safety emphasis of the projects, mini-roundabouts were selected as the preferred alternative at all three (3) intersection locations. In addition to safety benefits, the mini-roundabouts balanced right-of-way (ROW) constraints and design vehicle access at each location. The inscribed circle diameter was determined for each study location during concept development. ICE Stage 2 was not needed.

## Operational Analysis

A detailed Level of Service (LOS) analysis was conducted to compare the existing intersection control types' operational performance with a mini-roundabout. The control types were evaluated using future 2045 weekday AM and PM peak hour traffic volume conditions. The land use surrounding the intersection consists of single family residential. Low traffic volume growth is anticipated due to the surrounding land use being fully built-out. A growth rate of 1.0 percent was selected as a conservative estimate to develop future volumes. The 2045 volumes were developed by applying a linear 1.0 percent growth rate to all intersection approaches.

The mini-roundabout was compared to the existing all-way stop control at the intersection of N Miami Avenue & N 195 Street and it was compared to the existing two-way stop control at N Miami Avenue & N 163 Street and SW 84 Avenue & SW 38 Street. The mini-roundabout reduced delay on all four (4) approaches at N Miami Avenue & N 195 Street and SW 84 Avenue & SW 38 Street in both the AM and PM peak hours. The mini-roundabout reduced delay on all four (4) approaches at N Miami Avenue & N 163 Street in the AM peak hour and on three (3) out of the four (4) approaches in the PM peak hour. Although operations are not the primary focus of the study, the mini-roundabouts reduce overall intersection delay at all three (3) intersections.

## CONCEPT DEVELOPMENT

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Planning level concepts were developed for the mini-roundabouts to understand impacts and to develop an opinion of probable cost to be used in the benefit-cost analysis at each intersection. The following elements were included in each of the concepts:

- 75' inscribed circle diameter (at N Miami Avenue & N 195 Street and N Miami Avenue & N 163 Street).
- 60' inscribed circle diameter (at SW 84 Avenue & SW 38 Street).
- 15' circulatory roadway width.
- Raised splitter islands on all four approaches with pedestrian refuge areas.
- The design vehicle used was a 34 feet Fire Pumper Tanker.
- Light poles for each corner of the intersections.
- Entry speeds were designed for 25 miles per hour (mph) to provide low speeds for bicyclists to travel through the roundabout with vehicular traffic.

The following utility impacts were identified at each of the intersection locations:

### N MIAMI AVENUE & N 195 STREET

- Utility relocation:
  - Fiber location pole (1)
  - Valve assembly (3)
  - Junction Box (3)

### N MIAMI AVENUE & N 163 STREET

- Utility relocation:
  - Wood utility pole (1)
  - Telephone pedestal (1)
  - Valve assembly (3)

### SW 84 AVENUE & SW 38 STREET

- Utility relocation:
  - Wood utility pole (1)
  - Valve assembly (3)
  - Manhole (3)
  - Curb inlet (1)
  - Junction box (1)

## BENEFIT/COST

An opinion of probable cost was developed for each intersection based on the planning level concepts. A 30% contingency cost was included in the opinion of probable cost. **Table 3** provides a summary of the opinion of probable cost based on the mini-roundabout concepts.

**Table 3. Opinion of Probable Cost**

| Location                                              | Cost Item                             | Cost               |
|-------------------------------------------------------|---------------------------------------|--------------------|
| N Miami Avenue & N 195 Street                         | Total Estimated Construction Costs    | \$296,887          |
|                                                       | Total Estimated Capital Support Costs | \$142,530          |
|                                                       | Total Estimated Right-of-Way Costs    | \$0                |
|                                                       | <b>Total Project Cost</b>             | <b>\$439,417</b>   |
| N Miami Avenue & N 163 Street                         | Total Estimated Construction Costs    | \$299,069          |
|                                                       | Total Estimated Capital Support Costs | \$143,570          |
|                                                       | Total Estimated Right-of-Way Costs    | \$0                |
|                                                       | <b>Total Project Cost</b>             | <b>\$442,639</b>   |
| SW 84 Avenue & SW 38 Street                           | Total Estimated Construction Costs    | \$264,757          |
|                                                       | Total Estimated Capital Support Costs | \$127,100          |
|                                                       | Total Estimated Right-of-Way Costs    | \$0                |
|                                                       | <b>Total Project Cost</b>             | <b>\$391,857</b>   |
| <b>Total Project Cost for the three Intersections</b> |                                       | <b>\$1,273,913</b> |

The FDOT ICE Tool was used to conduct a benefit-cost analysis. The ICE Tool is used to compare the operational and safety analyses, along with the opinion of probable cost to develop a B/C ratio and NPV of the selected alternative. **Table 4** provides the ICE Tool overall, delay, and safety B/C analysis results and NPV for each study intersection.

**Table 4. ICE Tool Benefit/Cost Analysis Results**

| Location                      | Alternative     | Overall B/C | Delay B/C | Safety B/C | Net Present Value |
|-------------------------------|-----------------|-------------|-----------|------------|-------------------|
| N Miami Avenue & N 195 Street | Mini-Roundabout | 23.99       | 16.64     | 7.35       | \$11,446,052      |
| N Miami Avenue & N 163 Street | Mini-Roundabout | 11.13       | 1.87      | 9.26       | \$5,074,817       |
| SW 84 Avenue & SW 38 Street   | Mini-Roundabout | 10.40       | 1.84      | 8.56       | \$4,231,835       |

All three (3) study intersections have a safety B/C greater than 1.0 and a positive NPV, which meets the requirements for HSIP funding. In addition to the safety improvements, the mini-roundabouts improve overall traffic operations at each intersection. FDOT notified the TPO and DTPW on September 10, 2021, that the requested funds at all (3) study intersections have been awarded for Design, Construction & CEI phases. Further analysis details can be found in the reports completed for each study intersection.