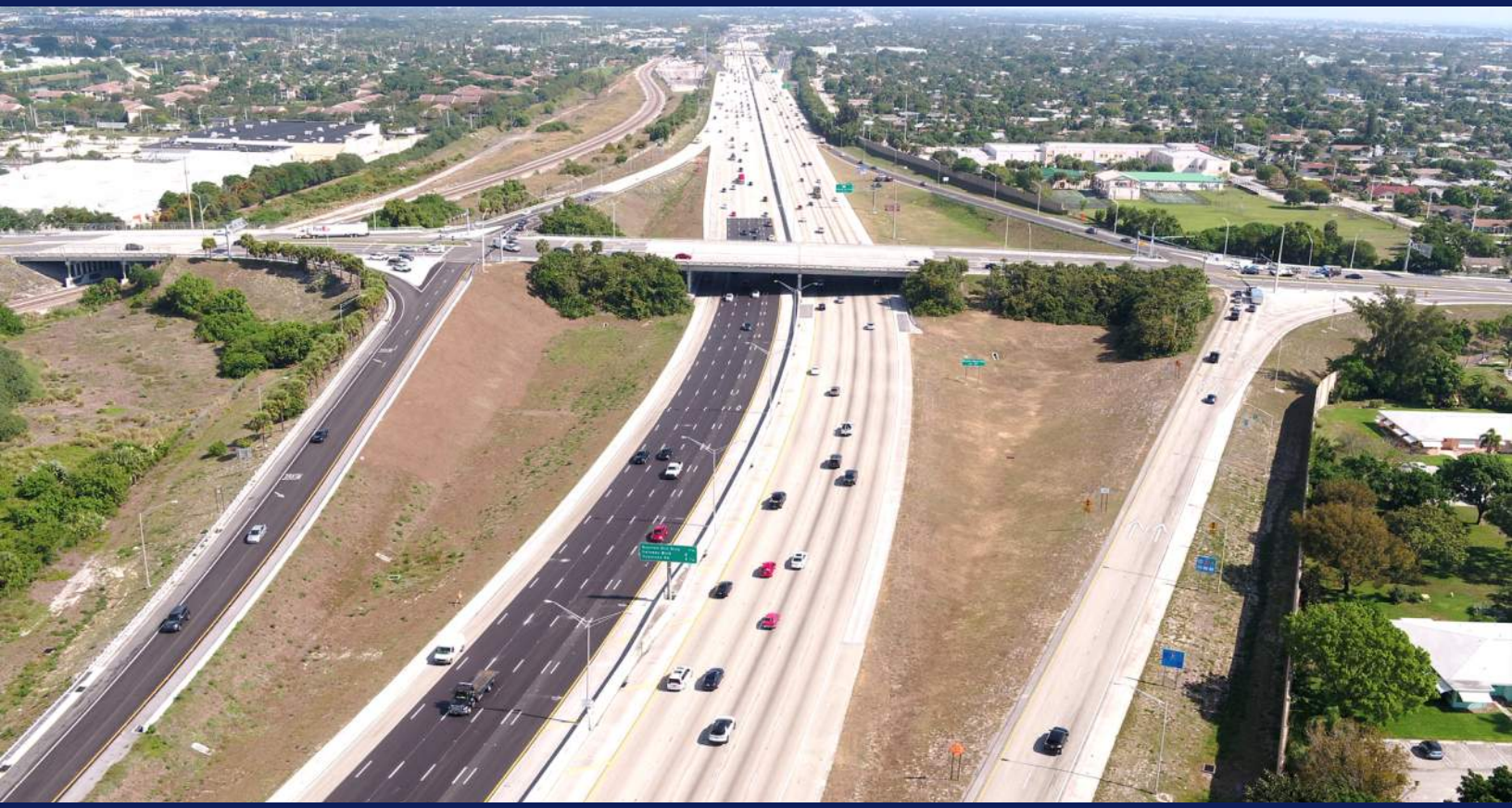
SR 9/I-95 Project Development and Environment (PD&E) Study from S. of Woolbright Road to N. of Woolbright Road Palm Beach County, Florida

FPID No.: 437279-1-22-02 | ETDM No.: 14341



INTERCHANGE MODIFICATION REPORT

June 2021

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by FDOT pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated December 14, 2016 and executed by FHWA and FDOT.

INTERCHANGE MODIFICATION REPORT

SR 9/I-95 Project Development and Environment Study
From S. of Woolbright Road to N. of Woolbright Road
Palm Beach County, Florida
(From Mile Post 13.560 to Mile Post 13.995)

FPID: 437279-1-22-02
ETDM #: 14341

Prepared for:

Florida Department of Transportation
District Four

Broward, Florida

June 2021

Interchange Modification Report (IMR)

SR 9/I-95 at Woolbright Road Interchange PD&E Study

FPID: 437279-1-22-02

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.

Requestor	DocuSigned by: Humberto Arrieta F20CB13C158648D...	7/8/2021 | 7:42 AM EDT
	Humberto Arrieta, P.E. FDOT District 4 Project Manager	Date
Interchange Review Coordinator	DocuSigned by: Cesar Martinez DC7B7B72D0BD4A2...	7/8/2021 | 8:43 AM EDT
	Cesar Martinez, P.E. District Four	Date
Systems Management Administrator	DocuSigned by: Jenna Bowman 4AD03E6A337F4C1...	7/20/2021 | 1:44 PM EDT
	Jenna Bowman, PE Systems Implementation Office – Central Office	Date
State Chief Engineer	DocuSigned by: 022F6284290B41A...	7/22/2021 | 2:42 PM EDT
	Will Watts, P.E. Central Office	Date

SYSTEMS IMPLIMENTATION OFFICE

QUALITY CONTROL CERTIFICATION FOR INTERCHANGE ACCESS REQUEST SUBMITTAL

Submittal Date: June 2021

FM Number: 437279-1-22-02

Project Title: SR 9/I-95 Project Development and Environment Study
From S. of Woolbright Road to N. of Woolbright Road

District: District 4

Requestor: Humberto Arrieta, P.E. Phone: (954) 777-4242

District IRC: Cesar Martinez, P.E. Phone: (954) 777-4653

Document Type: ☐ MLOU ☐ IJR ☒ IMR ☐ IOAR ☐ OTHER_____

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.

Requestor DocuSigned by: Humberto Arrieta F20CB13C158648D... Date: 7/8/2021 | 7:42 AM EDT

Humberto Arrieta, P.E.
FDOT District 4 Project Manager

IRC DocuSigned by: Cesar Martinez DC7B7B72D0BD4A2... Date: 7/8/2021 | 8:43 AM EDT

Cesar Martinez, P.E.
FDOT District 4 Project Development Manager

PROFESSIONAL ENGINEER CERTIFICATE

I hereby certify that I am a registered professional engineer in the State of Florida practicing with Hanson Professional Services, Inc., a Florida corporation authorized under the provisions of Section 471.023, Florida Statutes, to offer engineering services to the public through a Professional Engineer, duly licensed under Chapter 471, Florida Statutes, (CA Lic. No. 7961) by the State of Florida Board of Professional Engineers and I have prepared or approved the evaluation, findings, opinions, conclusions or technical advice hereby reported for:

PROJECT: SR 9/I-95 Project Development and Environment Study
From S. Woolbright Road to N. of Woolbright Road

LOCATION: Palm Beach County, FL

FINANCIAL PROJECT ID: 437279-1-22-02

This report includes a summary of data collection effort, traffic analysis, discussion of preferred alternative and summary of conclusions. I acknowledge that the procedures and references used to develop the results contained in this report are standard to the professional practice of transportation engineering and planning as applied through professional judgement and experience.

Name: Jeff V. Easley, P.E.

Florida P.E. No.: 45199

Signature: _____

Date: 6/28/2021

EXECUTIVE SUMMARY

The purpose of this study is to identify long-term needs of I-95 and develop concepts to address traffic spillback onto I-95, reduce congestion on I-95 and Woolbright Road, improve interchange operations, and improve safety at the I-95 and Woolbright Road interchange through the 2045 design year horizon.

The primary need of the project is to alleviate existing and future traffic congestion and improve safety at the interchange. Recent studies completed in the region such as the Concept Development Report completed in 2014 and I-95 Interchange Master Plan for Palm Beach County completed in 2015 identified operational deficiencies at ramps, the terminal intersections, and the adjacent intersections.

A Methodology Letter of Understanding (MLOU) was prepared to document the methodology for the analysis and evaluation of this Interchange Modification Report (IMR). The MLOU was approved in by the Florida Department of Transportation (FDOT) District 4 Interchange Review Coordinator (IRC) and FDOT Central Office in October 2019. The primary basis for traffic projections in this IMR is existing field traffic counts and the Southeast Regional Planning Model 7.062 (SERPM 7.062) with base year 2010 and horizon year 2040. The analysis years for this study include Existing Year 2019, Opening Year 2025, and Design Year 2045. The operational analysis for this study was performed using the Highway Capacity Software (HCS 7.7) and Synchro 10.3. All operational analysis followed the guidelines of the Highway Capacity Manual 6th Edition (HCM 6th Edition).

As part of this study, an existing crash analysis was performed. The data provided from FDOT State Safety Office Map Based Query Tool (SSOGis) shows along I-95 and Woolbright Road rear-end crashes, sideswipe, and angle crashes are the most prominent crashes within the project area.

The existing (2019) annual average daily traffic (AADT) along I-95 south of Woolbright Road is approximately 228,000, and I-95 north of Woolbright Road is approximate 237,000. Along Woolbright Road, the existing AADT ranges from 40,500 to 42,500 vehicles per day. The existing AM and PM peak hour operating conditions for the I-95 mainline sections show Level of Service (LOS) D or better for the ramps, LOS E for the I-95 NB mainline segment south of Woolbright Road during the PM peak hour, LOS E for the I-95 SB mainline segment south of Woolbright Road during the AM peak hour, LOS E for the I-95 NB mainline segment between Woolbright Road ramp during the PM peak hour, LOS F for the I-95 NB

weave segment during the PM peak hour and LOS E for the I-95 SB weave segment during the AM peak hour.

The Existing Year 2019 intersection analysis results indicated that Woolbright Road at SW 8th street intersection operates at overall LOS D in the AM and PM peak hours. The Woolbright Road at Seacrest Boulevard intersection operates at overall LOS D in the AM peak hour and overall LOS E in the PM peak hour. For the ramp terminal intersections, both operate at LOS E or worse during the AM and PM peak hours.

Four alternatives were evaluated to address the purpose and needs identified for this project. These include the No-Build Alternative and three Build Alternatives. The No-Build Alternative assumes as a baseline for comparison against the Build Alternatives. The three Build Alternatives developed as part of the alternative's analysis include the following:

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

Based on the future operational analysis, the 2045 No-Build Alternative will result in LOS F at both the I-95 NB and SB ramp terminals with extended queues backing onto the I-95 exit ramps during the AM and PM peak hours, 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 C or worse. Consequently, it was determined that the No-Build 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, a Tight Diamond Interchange (TDI) configuration was recommended as the primary Build Alternative.

The Build Alternative shows improved traffic operations and safety within the project study area when compared to the No-Build Alternative due to reduction in congestion and improved geometric design to improve safety.

Based on the evaluations of the No-Build and Build Alternatives, the recommended alternative, for approval in this study, is the Build Alternative.

This IMR has been developed in accordance with the 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, Interchange Access Request User's Guide (IARUG), FDOT Policy No. 000-525-006: Level of Service Targets for the SHS, and the FDOT Procedure No. 520-030-120: Project Traffic Forecasting.

E.1 Compliance with FHWA General Requirements

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 I-95 at Woolbright 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 I-95 at Woolbright Road Interchange.

E.1.1 FHWA 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)).

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 No-Build 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 1 with the Tight Diamond Interchange (TDI) 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 signalized intersections indicated that the all the study intersections will operate at an overall LOS F during the peak hours by Design Year 2045 if no improvements are done. Under Build Alternative 1, the study indicated that TDI Interchange performs substantially better than the No-Build Alternative for all future year scenarios, particularly for the I-95 ramp terminal intersections, which are the primary focus for this study. Both I-95 ramp terminals will operate at LOS D during both AM and PM peak hours for the 2045 design compared to LOS F for the No-Build Alternative. The southbound (SB) ramp terminal intersection will experience 66.6% and 69.7% reduction in delay for the AM and PM peak hours, respectively, whereas the northbound (NB) ramp terminal will experience 58.2% and 75.5% reduction in delay during the AM and PM peak hourss, respectively compared to the No-Build Alternative. Significant queuing will also be observed at the ramp terminals and adjacent intersections.

From a safety perspective, a total of 734 crashes occurred along I-95 and the ramps at Woolbright Road within the study area from 2013 to 2017. And a total of 341 crashes occurred along Woolbright 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 the preferred Build Alternative 1 is anticipated to result in an overall crash reduction of approximately 1% compared to the No-Build Alternative due to the significant reduction in delays resulting from the TDI configuration. This will enhance safety within the interchange area.

Overall, the preferred Build Alternative 1 provides significantly better traffic operations and enhanced safety when compared to the No-Build Alternative.

E.1.2 FHWA 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.

The proposed improvements to the I-95 at Woolbright Road interchange and adjacent intersections will provide full access and cater to all traffic movements from Woolbright Road to and from I-95. The proposed modifications are designed to meet current standards for federal-aid projects on the interstate system and conform to the American Association of State Highway and Transportation Officials (AASHTO) and the FDOT Design Manual.

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1. INTRODUCTION

The Florida Department of Transportation (FDOT) District Four is conducting a Project Development and Environment (PD&E) study for the interchange of Woolbright Road and I-95 to evaluate an alternative to improve traffic operations and safety at this critical interchange located in the City of Boynton Beach, Palm Beach County. This Interchange Modification Report (IMR) is being prepared to seek engineering, safety and operational acceptability for the proposed improvements to the I-95 and Woolbright Road interchange. The proposed improvements will include operational and safety improvements to the Interchange. This IMR will document the existing and future conditions in the study area, the analysis of future conditions, ramps and merge/diverge junctions between the interstate mainline and the interchange within the project limits. A Concept Development Report was completed in December 2014 that evaluated improvements at this interchange. I-95 and Woolbright Road interchange is a diamond type configuration. Woolbright Road is a Divided Urban Minor Arterial within the study area, and I-95 is classified as an Urban Principal Arterial Interstate. This IMR has been prepared as part of the PD&E Study to address the proposed improvements at the I-95 Interchange with Woolbright Road. The proposed improvements will include operational and safety improvements to the Interchange. This IMR is prepared in accordance with the approved Methodology Letter of Understanding (MLOU). The MLOU was approved on October 28, 2019, summarizing and documenting all methodology agreements reached between the Requestor, FDOT's District Four Interchange Review Team and FDOT Central Office. This MLOU is provided in **Appendix A**.

1.1 Background

The I-95 at Woolbright Road interchange serves as an important access point in Palm Beach County. FDOT District 4 evaluated several alternatives to improve traffic operations and safety at this key interchange as part of the Concept Development Report (CDR). This IMR will evaluate the recommendations from the CDR and propose ultimate improvements to enhance the movement of people and goods at the interchange. Woolbright Road is currently a 6-lane divided arterial west of I-95 and 5-lane arterial with a 2-way left turn lane east of I-95 within the project limits. Within the project limits, I-95 is a ten-lane divided interstate freeway north-south of Woolbright Road with four general purpose lanes and one High Occupancy Vehicle (HOV) lane. Auxiliary lanes are provided north of Study Interchange on both NB (one

lane) and SB (two lanes) directions. At the Woolbright Road interchange, the I-95 NB and SB ramp terminals are signalized intersections.

Bicycle lanes are located along Woolbright Road in the eastbound and westbound directions from SW 8th Street to I-95 NB ramp terminal intersection. There are no bike lanes along Woolbright Road east of I-95 interchange. Within the study area, sidewalks are present along Woolbright Road in the eastbound and westbound direction.

The project is listed in the FDOT Strategic Intermodal System (SIS) Adopted 5-Year Plan (FY 2019/2020 to 2023/2025). The SIS First Five-Year Plan illustrates projects on the SIS that are funded by the legislature in the Work Program (Year 1) and projects that are programmed for proposed funding in the next 2 to 5 years.

The IMR stems from a recently completed Project Traffic Analysis Report (PTAR), dated June 2020. The PTAR is part of the PD&E Study done to evaluate the proposed improvements at the I-95 interchange with Woolbright Road.

This IMR is being prepared to seek approval for the proposed improvements to the interstate access point of I-95 at Woolbright Road in Palm Beach County. This IMR has been developed in accordance with the FDOT Policy Statement 000-525-015: Approval of New or Modified Access to Limited Access Highways on the State Highway System (SHS), FDOT Procedure Topic 525-030-160: New or Modified Interchanges, Interchange Access Request User's Guide (IARUG), and the FDOT Procedure Topic 525-030-120: Project Traffic Forecasting.

1.2 Purpose and Need

The purpose of this study is to identify long-term needs of I-95 and develop concepts to address traffic spillback onto I-95, reduce congestion on I-95 and Woolbright Road, improve interchange operations, and improve safety at the I-95 and Woolbright Road interchange through the 2045 design year horizon. This project will also consider SIS connector improvements needed within the project area and will be consistent with plans for the I-95 mainline, including the potential extension of I-95 Express lanes through Palm Beach County.

Additional considerations for the purpose and need for this project are further described in the following sections that include System Linkage, Capacity, Transportation Demand, Social Demands/Economic Development, Modal Interrelationships, and Safety.

System Linkage: I-95 is a part of the state's Strategic Intermodal System (SIS) and the National Highway System (NHS). A need exists to ensure that I-95 continues to meet the minimum requirements as a component of those two systems. The project is not proposing to change system linkage; however, the interchange modifications would improve movements within the existing systems. The proposed project at I-95 and Woolbright Road will help improve connectivity and capacity within the roadway network by addressing traffic spillback onto I-95 and improving interchange connections.

Capacity: Using field review data collected in 2018, A.M. and P.M. peak conditions were observed at all intersections in the study area. At the Corporate Drive/SW 8th Street intersection, during the P.M. peak hour, all approaches experienced minimal queues, except for the westbound and eastbound directions. The westbound left-turn queue experienced spillback into the through lanes and the eastbound direction experienced long queues. During the P.M. peak hour on the I-95 southbound ramp intersection, the eastbound approach experienced long queues, but all queues cleared the intersection during each signal cycle. The southbound approach experienced significant queues, with the queue not clearing during one signal cycle. During the P.M. peak hour at the I-95 northbound ramps intersection, the eastbound approach experienced minimal queue buildup and the northbound and westbound approaches experienced long queues; however, all queues cleared the intersection in one signal cycle for all approaches.

Transportation Demand: Interchange improvements to I-95 at Woolbright Road is included in the Palm Beach County TPA's 2045 LRTP under projects funded with SIS revenues, which includes federal funds. The project is consistent with the plans for the I-95 mainline, including the extension of express lanes into Palm Beach County.

Social Demands/Economic Development: Social and economic demands on the I-95 corridor will continue to increase as population and employment increase. The Palm Beach County TPA 2040 LRTP states that the population would grow 27 percent from 1.32 million in 2010 to 1.68 million in 2040. The employment was also forecasted to grow from 571,000 to 820,000 employees in the same 30 year period for an

increase of nearly 44 percent. The predicted increase in population and employment will increase congestion in the study area.

Modal Interrelationships: Currently, sidewalks and crosswalks are provided on both sides of Woolbright Road. Palm Tran Route 70 services Seacrest Boulevard both north and south of Woolbright Road east of the interchange, as well as the Boynton Beach Tri-Rail station 2.68 miles north of Woolbright Road. The project proposes to provide undesignated bicycle lanes on both sides of Woolbright Road. Capacity improvements at the interchange will enhance the mobility of people and goods by alleviating current and future congestion at the interchange and the surrounding freight and transit networks. Reduced congestion will serve to maintain and improve viable access to the major transportation facilities and businesses in the area.

Safety: The crash data for the latest available five-year period (2013 to 2017) along Woolbright Road (93220000) from SW 8 Street to S. Seacrest Boulevard was retrieved from the FDOT SSOGis Tool. SSOGis is a database maintained annually by FDOT for crashes reported along the state highway facilities. The database provides information on various characteristics associated with each crash including: collision type, severity, weather conditions, road surface conditions and date/time information.

Overall, there was a total of 1076 crashes along I-95 mainline, ramps and Woolbright Road during the 5-year period. Of the 1076 crashes reported, 341 crashes occurred along Woolbright Road. Based on crash severity, front to rear (rear-end) crashes were the most common type of crash accounting for 163 (47.8%) of total crashes along Woolbright Road followed by 76 angle crashes accounting for (22.3%), and 27 sideswipe crashes (7.9%), 2 pedestrian crashes (0.6%) of total crashes. Majority of the crashes (256 crashes 75.1%) occurred under daylight conditions with 73 crashes (21.4%) occurred during nighttime. The percentage of nighttime crashes is lower than the statewide percentage of 33%. Poor surface conditions contributed only marginally to the number of crashes recorded over the five-year period as 289 (84.8%) of the total crashes occurred during clear weather conditions and on dry pavement surface. 52 of crashes (15.2%) occurred on wet pavement. This is lower than the statewide average of 15%.

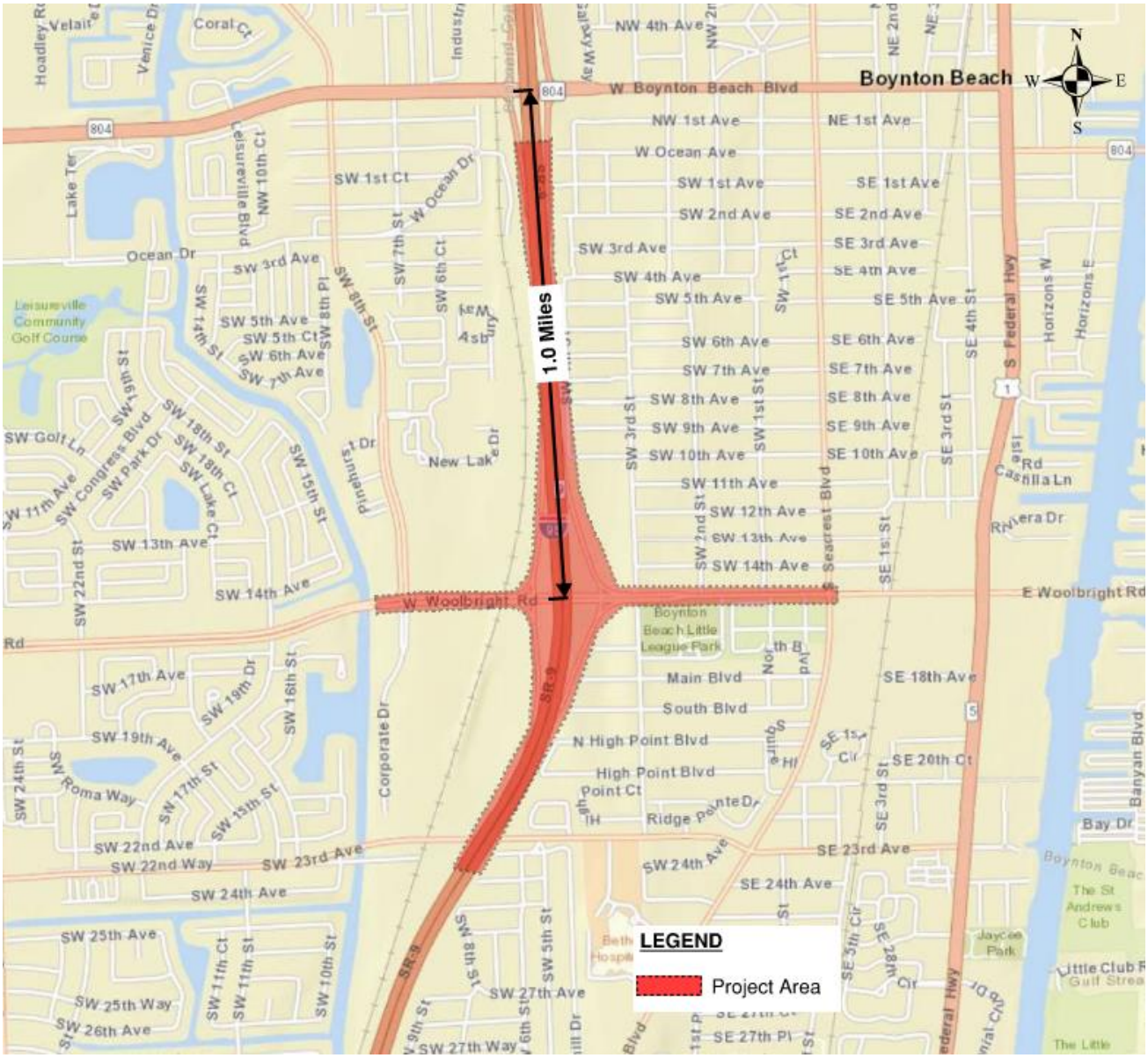
One (1) fatal crash occurred within the study limits during the five-year period. Property Damage Only (PDO) crashes accounted for 192 (56.3%) of all crashes; 148 crashes resulted in Injury. Among the contributing causes documented in the crash data, “carelessness of negligent manner” (119 crashes, 34.9%), resulted in the most crashes. Other contributing causes included “failed to yield right-of-way” (45

crashes, 13.2%), "followed too closely" (22 crashes, 6.5%), "ran red light" (23 crashes, 6.7%). A significant number of crashes were documented to have been the result of "no contributing action" (21 crashes, 6.2%) and "other contributing action" (26 crashes, 7.6%).

1.3 Project Location

The subject interchange is located in Palm Beach County along I-95 at Milepost 13.75, Section number 93220000. The I-95 at Woolbright Road interchange is located between of the I-95 at Boynton Beach Boulevard interchange to the north and I-95 at Atlantic Avenue interchange to the south. Woolbright Road is approximately 1.0 mile south of Boynton Beach Boulevard and 3.8 miles north of Atlantic Avenue. All signalized intersections along Woolbright Road from Corporate Drive/SW 8th Street to Seacrest Boulevard are included in the study area. The project location and the study area are shown in **Figure 1-1**. The study area does not extend to Atlantic Avenue interchange because it is over 3.5 miles south of the study interchange.

Figure 1-1: Project Location and Study Area Map



2. METHODOLOGY

2.1 Overview

An MLOU was prepared to document the methodology for the analysis and evaluation of this IMR. The MLOU was approved in October 2019 by the FDOT District 4 IRC and FDOT Central Office in October 2019. A signed copy of the MLOU is provided in **Appendix A**. The following sections summarize the methodology outlined in the MLOU.

The methodology used for travel demand forecasting and development of design hour traffic is consistent with the FDOT Project Traffic Forecasting Handbook. The primary basis for traffic projections is traffic tube counts and intersection turning counts, FDOT Traffic Online (FTO) and the SERPM 7.062 with the base year 2010 and horizon year 2040. The AADT volumes and traffic data collection was previously performed in the *Traffic Data Collection and Traffic Projections for I-95 at Woolbright Road*, dated December 2017. This report was made available by FDOT, and is provided in **Appendix B**.

2.2 Analysis Years

The following study years are established for this IMR:

Traffic Forecasting

- Base Year: 2010
- Horizon Year: 2040

Traffic Operational Analysis

- Existing Year: 2019
- Opening Year: 2025
- Design Year: 2045

A year of failure analysis shall be coordinated with FDOT and shall be performed for the Recommended Alternative if there is failing Level of Service (LOS) in the Design Year. The analysis years proposed for the IMR are consistent with the PTAR.

2.3 Area of Influence

The area of influence (AOI) for the IMR includes the study interchange of I-95 and Woolbright Road located in Palm Beach County's urbanized area. As per the requirements in the IARUG, the NB off and SB on ramps

of Boynton Beach Boulevard are included in the AOI along with the I-95 at Woolbright Road study interchange, the ramps are approximately 1.6 miles from the study interchange. Atlantic Avenue interchange is not included within the AOI as it is over 3.5 miles from the study interchange and will not be impacted by alternatives at Woolbright Road Interchange. The MLOU included the intersection of Woolbright Road and Seacrest Boulevard within the AOI. The intersection is located 0.45 miles east of the interchange and based on preliminary traffic analysis, it was determined to be outside the AOI for this IMR. No improvements were developed at this intersection. Traffic operations and safety analysis results for this intersection are included for informational purposes only.

The major study corridor is Woolbright Road: Between SW 8th Street and Seacrest Boulevard

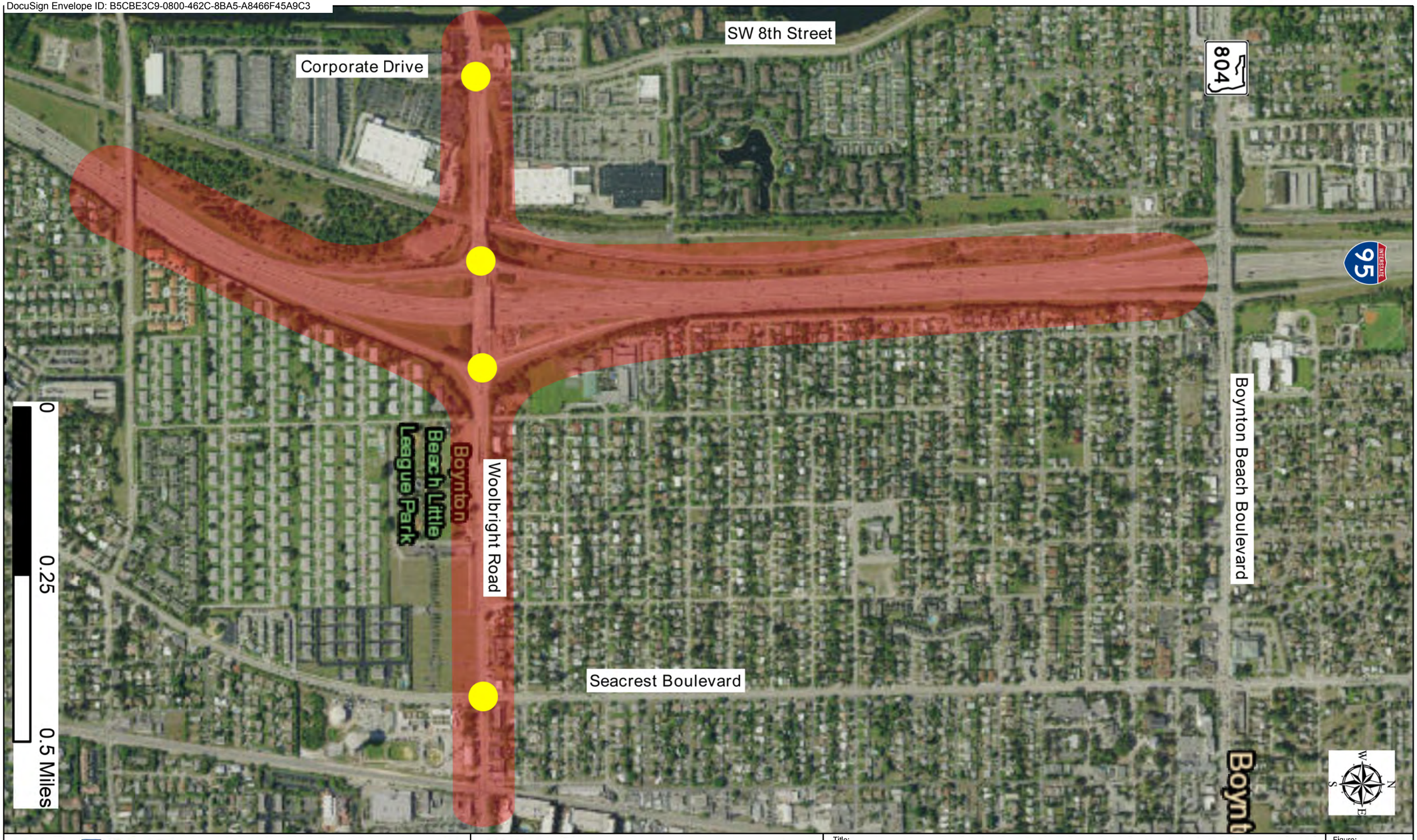
- Woolbright Road is a 6-lane divided arterial west of I-95 and a 5-lane arterial with a 2-way left turn lane east of I-95 within the study area. Bicycle lanes are located along Woolbright Road in the eastbound and westbound directions from SW 8th Street to I-95 NB ramp terminal intersection. There are no bike lanes along Woolbright Road east of I-95 interchange. The speed limit is 40 miles per hour.

The area of influence also includes the intersections associated with all study ramps. The intersections and traffic impacts analyzed within the area of influence are listed below.

- Intersections
  - Woolbright Road at Corporate Drive/SW 8th Street (Signalized)
  - Woolbright Road at I-95 SB ramp terminal (Signalized)
  - Woolbright Road at I-95 NB ramp terminal (Signalized)
  - Woolbright Road at Seacrest Boulevard (Signalized)
- Mainline through movements
  - I-95 NB and SB between Boynton Beach Boulevard and Woolbright Road Interchange
  - I-95 NB and SB between Woolbright Road Interchange and Atlantic Avenue Interchange
- Ramp merge and diverge junctions
  - I-95 SB Off-Ramp at Boyton Beach Boulevard
  - I-95 NB On-Ramp at Boyton Beach Boulevard
  - I-95 SB Off-Ramp at Woolbright Road
  - I-95 SB On-Ramp at Woolbright Road

- I-95 NB Off-Ramp at Woolbright Road
- I-95 NB On-Ramp at Woolbright Road

The area of influence is shown in **Figure 2-1**.



Florida Department of Transportation *District Four* *3400 West Commercial Boulevard* *Fort Lauderdate, FL 33309*	I-95/SR 9 Interchange at Woolbright Road Project Development & Environment Study FPID No.: 437279-1-22-02 ETDM No.: 14341	Title: Area of Influence	Figure: 2-1

2.4 Data Collection

The analysis conducted for this IMR is based on a combination of data that include recent data collection efforts and additional data available from FDOT. The data sources within the project study area included:

- Field Traffic Counts
- Existing Traffic Data from FTO
- Land Use Data from the Florida Geographic Data Library (FGDL)
- Existing Plan, Programs, and Project Lists from FDOT and Palm Beach County
- Environmental impacts are being evaluated in the PD&E study
- Traffic Data Collection and Traffic Projections for I-95 at Woolbright Road, dated December 2017
- FDOT Roadway Characteristic Inventory (RCI)
- FDOT SSOGis Tool
- Palm Beach TPA
- Palm Beach County Traffic and Engineering Division

Existing travel time runs were not performed as part of this IMR. This is because no microsimulation models were used to analyze existing or future traffic conditions.

2.5 Base Traffic Data and Traffic Factors

The primary sources of the traffic data for this IMR are the 2017 *Traffic Data Collection & Traffic Projections for I-95 at Woolbright Road Report*, field traffic counts, FTO, and the SERPM 7.062 model with base year 2010 and horizon year 2040.

Existing daily vehicle counts and turning movement counts were obtained from the 2017 Report and additional field counts performed in 2019 to validate the 2017 data. The 2017 data was collected in September 2017 on typical weekdays (Tuesday, Wednesday, and Thursday) at the intersections within the vicinity of the I-95 at Woolbright Road interchange. This data collection effort was performed during the peak season for traffic. In general, the traffic data for each intersection included 6-hour turning movement counts (6:00 AM to 9:00 AM, and 4:00 PM to 7:00 PM), including the Right-Turn-On-Red (RTOR) volumes, for three consecutive weekdays, 72-hour approach/departure machine counts for all the approaches, and vehicle classification counts for selected approaches at selected intersections. In addition, the 72-hour classification counts from Tuesday to Thursday were collected for all the I-95 on and off ramps.

The 2019 traffic data collected for this study was performed on April 10-11, 2019. The counts occurred on typical weekdays (Wednesday and Thursday) at the I-95 ramp terminal intersections and Seacrest Boulevard intersection for spot validation of 2017 data. This data collection effort was performed during the peak season for traffic. In general, the traffic data for each intersection included 6-hour turning movement counts (6:00 AM to 9:00 AM, and 4:00 PM to 7:00 PM), including the Right-Turn-On-Red (RTOR) volumes, for two consecutive weekdays. Both weekday counts were comparable, however for consistency Wednesday counts were used for this study. 7:30 AM and 4:45 PM were adopted as the prevailing peak hours at the study intersections based on the traffic counts. No counts were conducted at SW 8th Street intersection; therefore, existing traffic was developed by factoring and balancing the 2017 volumes mentioned above. The 2019 traffic counts are in provided in **Appendix B**.

Information from the FTO was used to obtain the remaining mainline and ramps traffic data and to check reasonableness with previous studies volumes. Information from the FTO was used to confirm the growth rate used to develop future traffic. Adjustments were made if necessary, to ensure that turning movement volumes at ramp terminals sum to the peak hour ramp volumes.

The factors used for design traffic analysis include the K, D, T_{Daily}, and Peak Hour (PHF) Factors.

- The K factor is the proportion of the AADT occurring during the peak hour of the design year, depending upon the area type and facility type.
- The D factor is the proportion of the 30th highest hour of the design year traveling in the peak direction.
- The T_{Daily} factor is the adjusted, annual daily percentage of truck traffic. The DHT factor is the percentage of truck traffic during the peak hour and can be estimated as half of the T_{Daily} factor.
- The PHF is applied to convert hourly flow to peak 15-minute flow rate for capacity analysis.

The traffic factors from the approved MLOU are recommended for use in this IMR are presented in **Table 2-1**. Additional details regarding the development of traffic factors can be found in the *Project Traffic Forecast Memorandum*.

Table 2-1: Summary of Traffic Factors

Roadway	K	D	T_{24}	DHT	PHF
I-95 S of Woolbright Road	8.5%	50.4-61.2%	6.1%	3.1%	0.95
I-95 N of Woolbright Road	8.5%	50.4-61.2%	7.4%	3.7%	0.95
Boynton Beach Boulevard Ramps	9.0%	99.9%	4.7%	2.4%	0.95
Woolbright Road Ramps	9.0%	99.9%	4.6%	2.3%	0.95
Woolbright Road E of I-95	9.0%	50.8-67.1%	5.2%	2.6%	0.92
Woolbright Road W of I-95	9.0%	50.8-67.1%	3.3%	1.7%	0.92
Corporate Drive/SW 8th Street	9.0%	50.8-67.1%	4.6%	2.3%	0.92
Seacrest Boulevard	9.0%	50.8-67.1%	4.6%	2.3%	0.92

Source: 2017 FDOT FTO

2.6 Selected Travel Demand Model

The 2045 future daily forecasts were developed under a separate study – *Traffic Data Collection & Traffic Projections*, dated December 2017. This study is included in **Appendix B**.

2.6.1 Southeast Regional Planning Model

The SERPM 7.062 model with base year of 2010 and horizon year of 2040 was available at the initiation of this study and reviewed for the study area. Year 2010 and 2040 volumes were obtained from the model. The base year model validation was performed by the Department and daily forecasts were provided for use in the PD&E Study and IMR. Modifications to the model were made as part of the travel demand forecasting effort performed in the *Traffic Data Collection & Traffic Projections Report*. The future daily volumes and travel patterns were checked for reasonableness. Any changes made to the model volumes were submitted to the Department for review and approval.

2.7 LOS Target

FDOT maintains minimum acceptable operating LOS targets for the State Highway System as well as the SIS. I-95 is an SIS facility. The term LOS is defined as the system of six designated ranges from “A” (best) to “F” (worst) used to evaluate roadway facility performance. The FDOT minimum acceptable operating LOS targets as detailed in the MLOU were used for this IMR. The LOS targets for major roadways analyzed in this IMR are summarized below:

- I-95 Interstate Mainline: LOS D
- Ramps Merge/Diverge: LOS D
- Signalized Intersections: LOS D

2.8 Analysis Procedures

AM and PM peak hour operations within the study area were assessed under existing conditions, No-Build, and Build conditions. Analysis of I-95 and Woolbright Road arterial, including the interchange ramps and intersections, were based on criteria and policies detailed in the FDOT Traffic Analysis Handbook, March 2014 Edition. The methods, tools and assumptions are described in the section as follows.

The analysis of I-95 mainlines and interchange ramps within the study area were conducted using the most recent version of the Highway Capacity Software (HCS). The HCS analysis was performed using the AM and PM peak hour volumes and the lane configuration for I-95 and the ramps.

The intersection analysis was conducted using the most recent version of Synchro software (version 10). The delay and level of service (LOS) for signalized intersections analysis was reported based on Highway Capacity Manual (HCM 6th Edition) Methodology. The 95th percentiles queues reported are based on Synchro methodology. The intersections within the study area are all signalized, and the analysis was performed using balanced turning movement volumes and intersection lane configuration for existing/No-Build conditions and proposed build alternatives. The peak hour factors used for the existing conditions analysis were based on Table 2-1 and for future conditions a peak hour factor of 0.95 was used for AM and PM peak hour intersections analysis.

2.9 Alternatives Considered

The following scenarios were considered for this project:

- Existing Year 2019 – AM and PM peak hours.
- No-Build Alternative – Opening Year 2025 and Design Year 2045 – AM and PM peak hours.
- Build Alternatives – Opening Year 2025 and Design Year 2045 – AM and PM peak hours.

3. EXISTING CONDITIONS

The following section provides a discussion and evaluation of the existing conditions within the area of influence. This discussion includes existing land use data, transportation systems data, existing traffic data, and existing operating conditions.

3.1 Existing Land Use

The interchange falls within Palm Beach County. According to the FDOT District Four Generalized Land Use Map, the primary land uses along I-95 and Woolbright Road is a mix of commercial, residential, and education etc. **Figure 3-1** shows the existing land use within the study area.

Land use directly adjacent to the I-95 at Woolbright Road interchange between SW 8th Street and the interstate on the northwest and southwest quadrant are primary commercial. Residential uses are located behind the adjacent commercial uses on the northwest quadrant.

Educational uses with some residential uses are located northeast quadrant of the interchange. More additional residential uses are located on the southeast quadrant of the interchange.

3.2 Existing Transportation Network

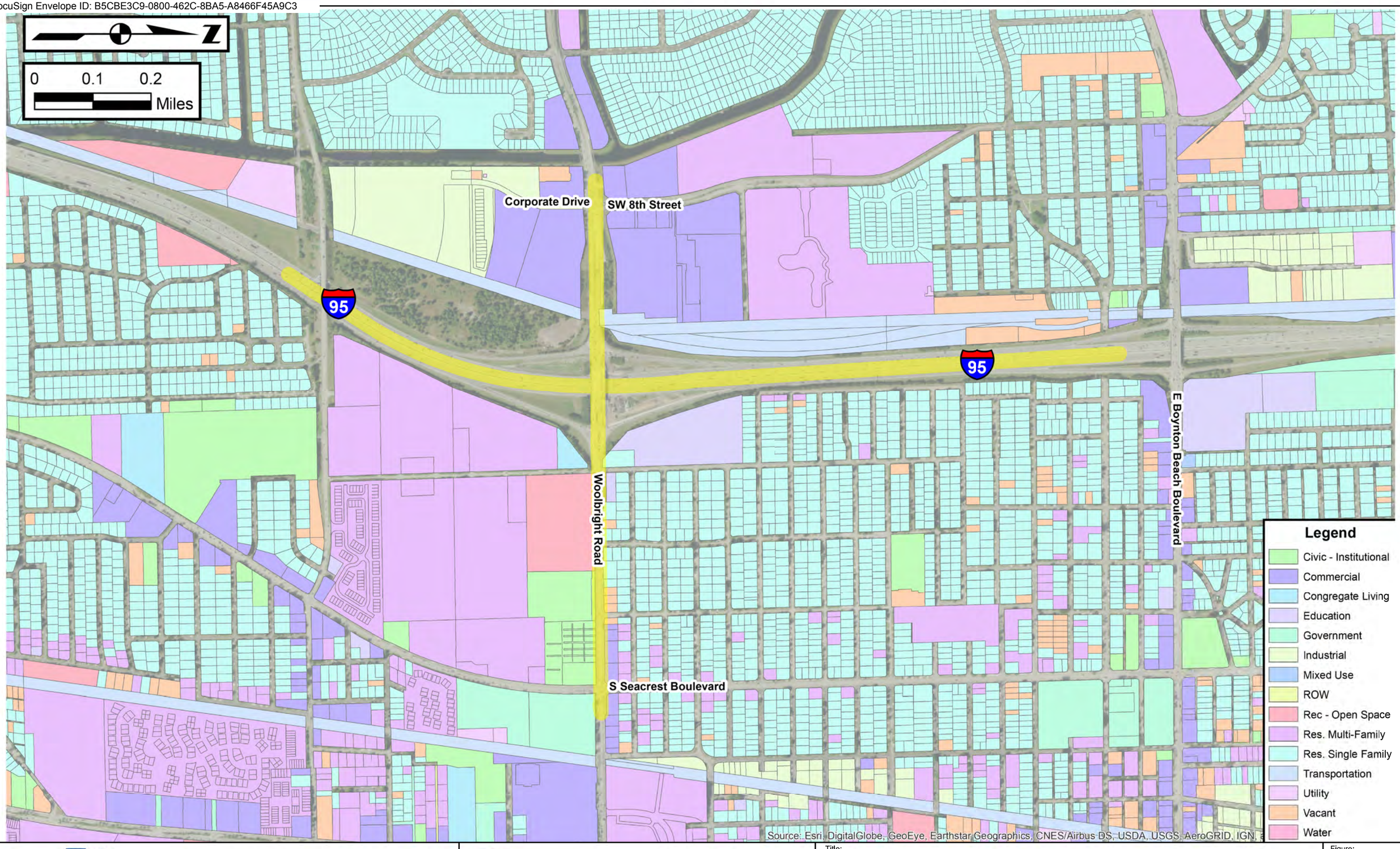
3.2.1 Existing Roadway Network

The existing transportation network along I-95 within the area of influence consists of a ten-lane urban principal arterial - interstate freeway with four general purpose lanes and one high occupancy vehicle (HOV) lane in each direction. Woolbright Road is a six lane Divided Urban Minor Arterial west of I-95 and five lane Urban Minor Arterial with a two-way left turn lane east of I-95. **Table 3-1** summarizes the functional classification and number of lanes for I-95, Woolbright Road, Corporate Drive/SW 8th Street and Seacrest Boulevard within the project area of influence.

Table 3-1: Functional Classification of Area Roadways

Roadway	Functional Classification[1]	Number of Lanes
I-95 South of Woolbright Road	Urban Principal Arterial - Interstate	8 GUL + 2 HOV
I-95 North of Woolbright Road	Urban Principal Arterial - Interstate	8 GUL + 2 HOV + 3 AUX
Woolbright Road West of I-95	Urban Minor Arterial	6
Woolbright Road East of I-95	Urban Minor Arterial	4 + 1 Shared Left Turn
Corporate Drive/SW 8th Street	Local Road/Urban Major Collector	2/4
Seacrest Boulevard	Urban Minor Collector	2

[1]Source: 2010 Federal Functional Classification and Urban Area Boundaries Map for Palm Beach County



Florida Department of Transportation *District Four* *3400 West Commercial Boulevard* *Fort Lauderdate, FL 33309*	I-95/SR 9 Interchange at Woolbright Road Project Development & Environment Study FPID No.: 437279-1-22-02 ETDM No.: 14341	Title: Existing Land Use	Figure: 3-1

I-95 – I-95 within the study area is a ten-lane north-south Urban Principle Arterial Interstate providing four general purpose lanes and one HOV lane in each direction with inside and outside shoulders. Auxiliary lanes are provided on both NB (one-lane) and SB (two-lane) directions between Woolbright Road and Boynton Beach Boulevard to the north. The median within this section is approximately 32 feet with a concrete barrier throughout. The posted speed limit along I-95 is 65 mph.

Woolbright Road – Woolbright Road is an Urban Minor Arterial consisting of three-lanes in each direction west of I-95 and two-lanes in each direction with a shared left turn lane east of I-95. Bike lanes are provided from SW 8th Street to I-95 interchange. There are no bike lanes along Woolbright Road east of I-95 interchange. Sidewalks are provided in each direction of the road. The posted speed limit along Woolbright Road is 40 mph.

Corporate Drive/SW 8th Street – Corporate Drive, south of Woolbright Road, is a local road that provides access to office complexes. SW 8th Street, north of Woolbright Road, is a four-lane Urban Major Collector with a grass median. There is a sidewalk in each direction with no bike lanes.

Seacrest Boulevard – Seacrest Boulevard is a four-lane Urban Minor Collector. Seacrest Boulevard is undivided, and there is a sidewalk in each direction with no bike lanes.

The existing lane configuration is provided in **Figure 3-2**.

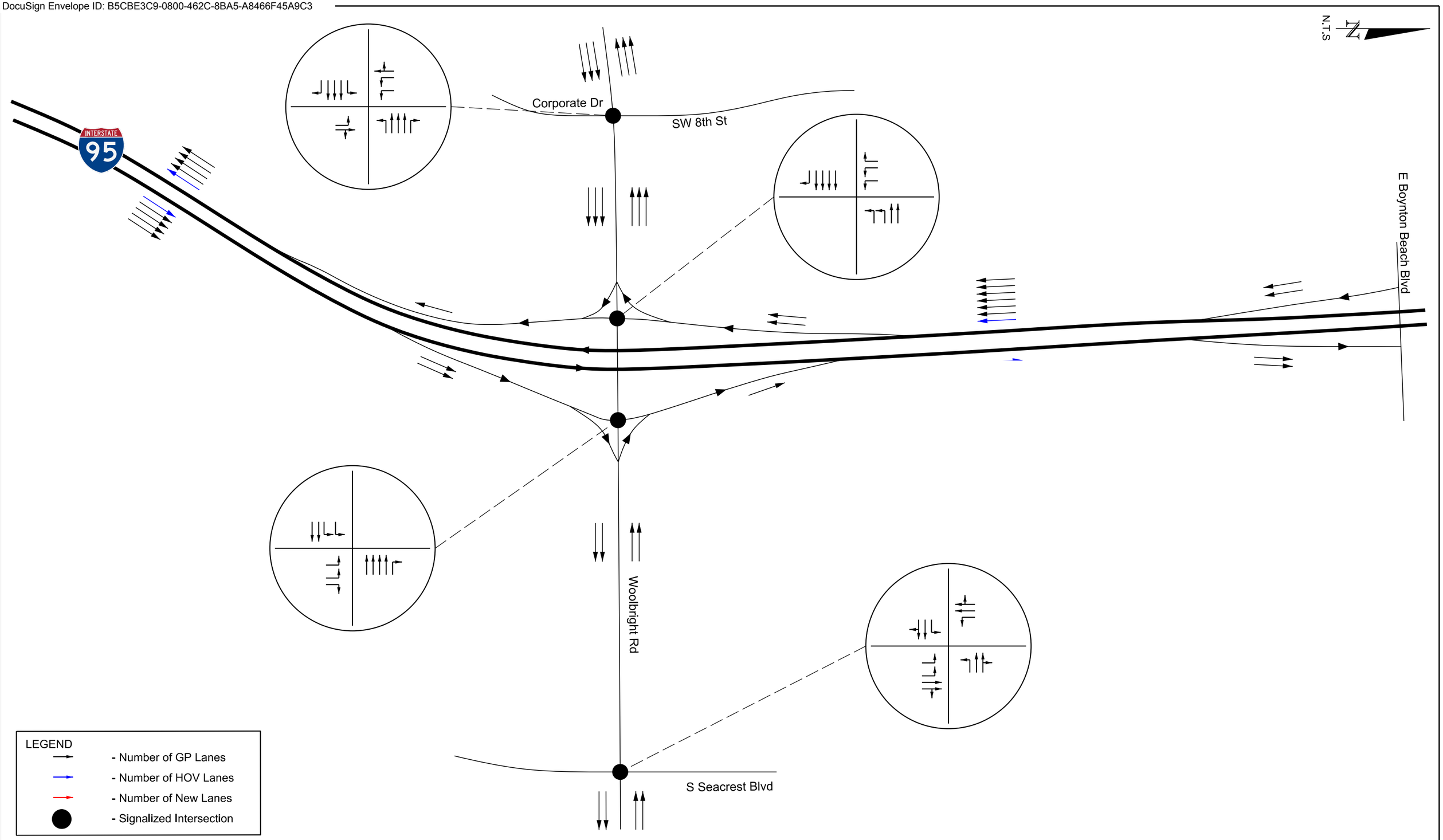
3.3 Existing Operational Performance

This section summarizes the existing traffic and operational analysis performed within the area of influence to assess the mobility conditions. This facility accommodates interstate and regional mobility for commuter and freight traffic.

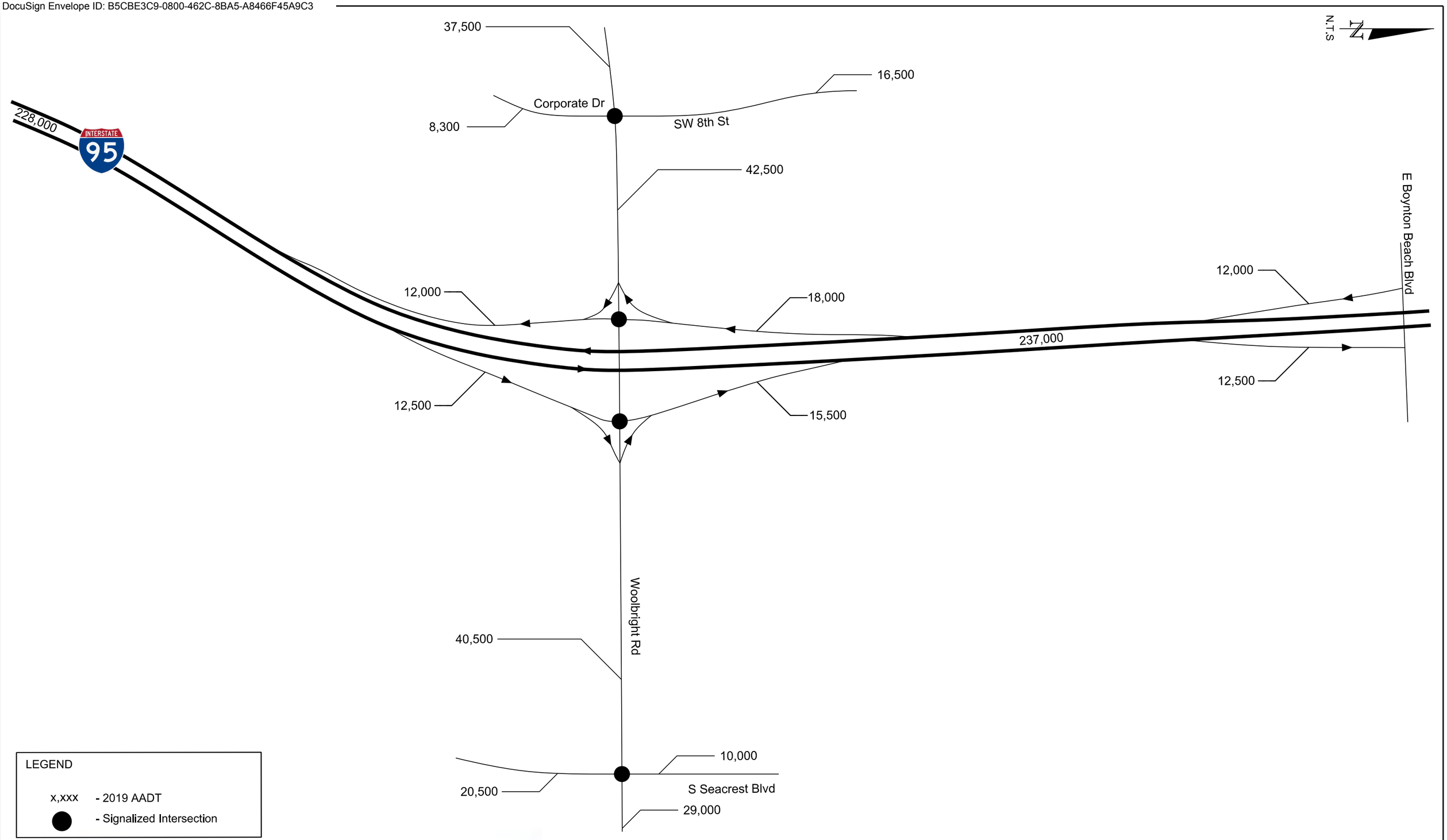
3.3.1 Existing Traffic Data

The existing traffic data was provided in the *Traffic Data Collection and Traffic Projections for I-95 Woolbright Road* report. The existing traffic data from the report was validated to the IMR Existing Year 2019 using additional counts collected in 2019. The final Existing Year 2019 volumes used for the IMR were checked for reasonableness and adjusted and balanced as needed.

AADTs along I-95 were adjusted to attain a balanced flow and depicted in **Figure 3-3**



Florida Department of Transportation *District Four* *3400 West Commercial Boulevard* *Fort Lauderdate, FL 33309*	I-95/SR 9 Interchange at Woolbright Road Project Development & Environment Study FPID No.: 437279-1-22-02 ETDM No.: 14341	Title: Existing Year 2019 Lane Configuration	Figure: 3-2



Florida Department of Transportation *District Four* *3400 West Commercial Boulevard* *Fort Lauderdate, FL 33309*	I-95/SR 9 Interchange at Woolbright Road Project Development & Environment Study FPID No.: 437279-1-22-02 ETDM No.: 14341	Title: Existing Year 2019 Annual Average Daily Traffic (AADT)	Figure: 3-3

3.3.2 HCM Based Operational Analysis

A detailed operational analysis for the Existing Year 2019 performed for individual roadway elements, i.e., mainline segments, ramp junctions, weaving segment and study intersections. HCS 7.7 was used for the operational analysis of mainline segments and ramps. Synchro 10 was used for the analysis of study intersections. Documentation for the Existing Conditions analysis is provided in **Appendix C**.

Mainline Analysis

The Existing Year 2019 mainline analysis results are summarized in **Table 3-2**. The results of the operational analysis show that all the mainline segments operate at LOS D or better except the following segments:

- I-95 NB south of Woolbright Road at LOS E (PM peak hour).
- I-95 SB south of Woolbright Road at LOS E (AM peak hour).
- I-95 NB between Woolbright Road Ramps at LOS E (PM peak hour).

Figure 3-4 illustrates the peak hour volumes and LOS results for the Existing Year 2019 mainline analysis.

Table 3-2: Existing Year 2019 Mainline Capacity Analysis Summary

Freeway Segment	Direction	Number of Lanes	AM Peak Hour			PM Peak Hour		
			Volume	Density[1]	LOS	Volume	Density[1]	LOS
I-95 South of Woolbright Road	NB	4	5,641	22.8	C	8,744	44.8	E
	SB	4	8,335	40.5	E	5,878	24	C
I-95 Between Woolbright Off-Ramp and On-Ramp	NB	4	4,987	20.4	C	7,707	35.7	E
	SB	4	7,186	32.4	D	5,143	21.6	C

1. Density = passenger cars/mile/lane

Ramp Analysis

The Existing Year 2019 ramp analysis results are summarized in **Table 3-3**. The results of the operational analysis show that all study ramps have adequate capacity based on the volume. **Figure 3-4** illustrates the peak hour volumes and v/c ratios for the Existing Year 2019 ramp analysis.

Table 3-3: Existing Year 2019 Ramp Analysis Summary

Interchange	Ramp	Analysis Type	AM Peak Hour				PM Peak Hour			
			Volume	Density [1]	LOS	V/C	Volume	Density[1]	LOS	V/C
I-95 at Woolbright Road	NB Off	Diverge	654	11.8	B	0.18	1,037	25.9	C	0.28
	SB On	Merge	1,255	30.6	D	0.68	719	19.3	B	0.39

1. Density = passenger cars/mile/lane

Weaving Analysis

The Existing Year 2019 weaving analysis results are summarized in **Table 3-4**. The weave volumes were estimated using weighted average of upstream mainline and relevant on ramp volume to establish downstream split for off ramp and mainline volumes. The maximum length of a weaving segment (in feet) is computed from the follow equation:

$$L_{MAX} = [5{,}728\ (1 + VR^{1.6})] - [1{,}566\ N_W]$$

L_{MAX} = Maximum weaving segment length (using the short length definition)
VR = volume ratio
NWL = Number of lanes from which weaving maneuvers may be made with either one or no lane changes

The results of the weaving operational analysis show that all the weaving segments operate at acceptable LOS of C or better expect the following segments:

- I-95 NB weave between Woolbright Road and Boynton Beach Boulevard at LOS F (PM peak hour).
- I-95 SB weave between Boynton Beach Boulevard and Woolbright Road at LOS F (AM peak hour).

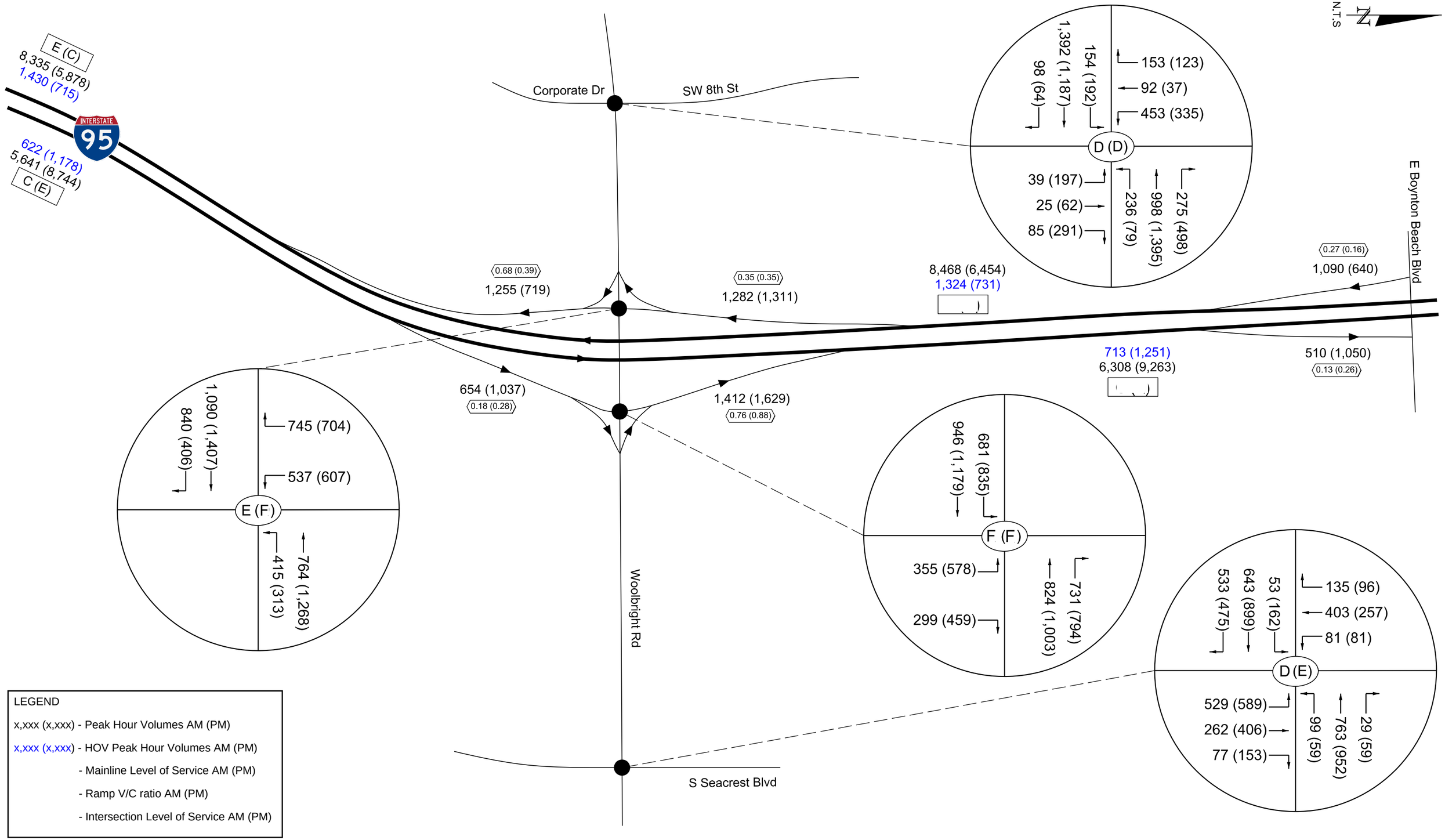
Figure 3-4 illustrates the peak hour volumes and LOS results for the Existing Year 2019 weaving analysis.

Table 3-4: Existing Year 2019 Weaving Analysis Summary

Weaving Segment	Direction	AM Peak Hour				PM Peak Hour			
		Volume	Density[1]	LOS	V/C	Volume	Density[1]	LOS	V/C
I-95 between Woolbright Road and Boynton Beach Boulevard	NB	6,399	27.2	C	0.62	9,336	-- *	F	0.9
	SB	8,468	36.4	E	0.93	6,454	22.2	C	0.77

1. Density = passenger cars/mile/lane

*HCS analysis does not report densities for LOS F results. The missing densities have LOS F, as shown in the output files.



LEGEND

x,xxx (x,xxx) - Peak Hour Volumes AM (PM)

x,xxx (x,xxx) - HOV Peak Hour Volumes AM (PM)

- Mainline Level of Service AM (PM)

- Ramp V/C ratio AM (PM)

- Intersection Level of Service AM (PM)

Florida Department of Transportation *District Four* *3400 West Commercial Boulevard* *Fort Lauderdale, FL 33309*	I-95/SR 9 Interchange at Woolbright Road Project Development & Environment Study FPID No.: 437279-1-22-02 ETDM No.: 14341	Title: Existing Year 2019 Peak Hour Volumes and LOS/VC Ratios	Figure: 3-4

Intersection Analysis

The Existing Year 2019 intersection analysis results are summarized in **Table 3-5**. All study intersections are signalized and were analyzed using field signal timing and phasing plans for AM and PM peak hours. Traffic signal timing information was obtained from the Palm Beach County Traffic Engineering Division for the study intersections. No signal optimization was performed when analyzing Existing Year 2019 conditions. In Existing Year 2019, the results indicate several operational deficiencies along Woolbright Road within the study area. The following intersections operate at LOS E or worse during AM and PM peak hours:

- Woolbright Road at I-95 SB On/Off-Ramps
- Woolbright Road at I-95 NB On/Off-Ramps

There are several individual movements at these intersections that will operate at LOS F. These movements are listed below:

Woolbright Road at I-95 SB On/Off-Ramps

- EB right-turn (AM and PM peak hours)
- SB left-turn (AM and PM peak hours)

Woolbright Road at I-95 NB On/Off-Ramps

- WB right-turn (AM and PM peak hours)
- NB left-turn (AM and PM peak hours)

Figure 3-4 illustrates the peak hour volumes and LOS results for the Existing Year 2019 intersection analysis. Details of the signal phasing and timing plans are provided in **Appendix C**.

Table 3-5: Existing Year 2019 Intersection Analysis Summary

Intersection	Intersection Approach					Overall Intersection	
	Approach	Movement	Peak Hour Volumes	Delay (sec)	LOS	Delay (sec)	LOS
				AM (PM)	AM (PM)	AM (PM)	AM (PM)
Woolbright Road at Corporate Drive/SW 8th Street	Eastbound	Left	154 (192)	19.0 (61.9)	B (E)	37.6 (43.5)	D (D)
		Through	1,392 (1,187)	35.7 (32.1)	D (C)		
		Right	98 (64)	24.6 (23.8)	C (C)		
	Westbound	Left	236 (79)	55.8 (36.0)	E (D)		
		Through	998 (1,395)	28.0 (49.0)	C (D)		
		Right	275 (498)	0.0 (5.1)	A (A)		
	Northbound	Left	39 (197)	56.6 (44.9)	E (D)		
		Through/ Right	110 (353)	62.0 (79.1)	E (E)		
	Southbound	Left	453 (335)	69.9 (72.3)	E (E)		
		Through/ Right	245 (160)	55.2 (48.2)	E (D)		
Woolbright Road at I-95 Southbound Ramps	Eastbound	Through	1,090 (1.407)	30.7 (43.8)	C (D)	65.0 (90.4)	E (F)
		Right	840 (406)	116.9 (128.4)	F (F)		
	Westbound	Left	415 (313)	26.6 (36.0)	C (D)		
		Through	764 (1,268)	31.1 (49.3)	C (D)		
	Southbound	Left	537 (607)	219.6 (390.7)	F (F)		
		Right	745 (704)	1.1 (1.0)	A (A)		
Woolbright Road at I-95 Northbound Ramps	Eastbound	Left	681 (835)	24.4 (27.7)	C (C)	86.4 (96.7)	F (F)
		Through	946 (1,179)	16.9 (19.6)	B (B)		
	Westbound	Through	824 (1,003)	53.7 (46.1)	D (D)		
		Right	731 (794)	132.7 (142.1)	F (F)		
	Northbound	Left	355 (578)	443.4 (455.9)	F (F)		
		Right	299 (459)	0.3 (0.5)	A (A)		
Woolbright Road at Seacrest Boulevard	Eastbound	Left	53 (162)	16.9 (74.7)	B (E)	54.8 (58.0)	D (E)
		Through/ Right	1,176 (1,374)	59.9 (55.7)	E (E)		
	Westbound	Left	99 (59)	36.5 (38.4)	D (D)		
		Through/ Right	792 (1,011)	35.9 (51.9)	D (D)		
	Northbound	Left	529 (589)	78.5 (70.4)	E (E)		
		Through/ Right	339 (559)	39.1 (50.4)	D (D)		
	Southbound	Left	81 (81)	67.8 (72.5)	E (E)		
		Through/ Right	538 (353)	63.5 (68.5)	E (E)		

In the existing year, the Available Storage accommodates the 95th Percentile queue at all intersection approaches except the following (marked as red in Table 3-6):

- EB left-turn at Woolbright Road and Corporate Drive/SW 8th Street (PM peak hour)
- WB right-turn at Woolbright Road and I-95 NB ramp terminal (AM and PM peak hours)

Table 3-6 summarizes the queue analysis for Existing Year 2019.

Table 3-6: 95th Intersection Percentile Queue Length Summary – Existing Year 2019

Intersection	Time Period	95th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Woolbright Road at Corporate Drive /SW 8th Street	AM Peak	110	534	0	284	267	0	54	86	-	288	266	-
	PM Peak	251	484	0	m72	#777	m25	185	334	-	233	99	-
	Existing Storage (feet)	***250***	***1,300***	***225***	***300***	***1,250***	***375***	***400***	***>1,000***		***>1000***	***>1,000***	
Woolbright Road at I-95 Southbound Ramps	AM Peak	-	284	#924	m69	m122	-	-	-	-	#460	-	0
	PM Peak	-	463	315	m77	m192	-	-	-	-	#596	-	0
	Existing Storage (feet)	***-***	***1,250***	***1,350***	***900***	***2,750***	***-***	***-***	***-***	***-***	***>1,700***	***-***	***400***
Woolbright Road at I-95 Northbound Ramps	AM Peak	m126	m105	-	-	m266	m#775	#368	-	0	-	-	-
	PM Peak	m152	m127	-	-	242	#848	#585	-	0	-	-	-
	Existing Storage (feet)	***900***	***1,750***	***-***	***-***	***2,250***	***675***	***>1,300***	***-***	***400***	***-***	***-***	***-***
Woolbright Road at Seacrest Boulevard	AM Peak	m66	#842	-	117	450	-	#375	172	-	133	313	-
	PM Peak	m219	#1,041	-	69	#774	-	386	320	-	143	227	-
	Existing Storage (feet)	***300***	***2,250***		***300***	***900***		***475***	***>1,000***		***180***	***>1,000***	

95th percentile volume exceeds capacity, queue maybe longer.
m: Volume for 95th percentile queue is metered by upstream signal.
Storage length noted above is turn pocket length for left/right turn movements or link distance per lane to adjacent signalized intersection for through movements.
Storage length for arterial left turns at ramp terminals is distance ramp terminal plus extended defacto left turn pocket length.

3.4 Crash and Safety Information

Vehicular crash data along I-95, Woolbright Road and at the interchange ramps were obtained from the FDOT SSOGis Tool. SSOGis is a database maintained annually by FDOT for crashes reported along the state highway facilities. The database provides information on various characteristics associated with each crash including: collision type, severity, weather conditions, road surface conditions and date/time information. The crash data was collected for the most recent five years available (2013-2017). The crashes were analyzed to assess safety conditions along I-95, Woolbright Road and at the interchange ramps within the project limits. The existing crash analysis performed for the IMR is consistent with the methods outlined in the Highway Safety Manual 1st Edition (HSM). The raw crash data is provided in **Appendix D**. The following section summarizes the crash analysis performed.

3.4.1 I-95 Mainline

The crash analysis results reveal that there was a total of 704 crashes on I-95 within the project area during the five study years (2013-2017). Of these 704 crashes, front to rear (rear-end) crashes were the most common type of crash accounting for 287 (40.8%) of total crashes followed by 129 sideswipe crashes accounting for (18.3%), and 57 angle crashes (8.1%) of total crashes. Majority of the crashes (449 crashes 63.8%) occurred under daylight conditions with 221 crashes (31.4%) occurred during nighttime. The percentage of nighttime crashes is lower than the statewide percentage of 33%. Poor surface conditions contributed only marginally to the number of crashes recorded over the five-year period as 533 (75.7%) of the total crashes occurred during clear weather conditions and on dry pavement surface. 171 of crashes (24.3%) occurred on wet pavement. This is higher than the statewide average of 15%.

There were two (2) fatal crashes that occurred within the study limits during the five-year period. Property Damage Only (PDO) crashes accounted for 407 (57.7%) of all crashes; 296 crashes resulted in Injury. Among the contributing causes documented in the crash data, “carelessness of negligent manner” (246 crashes, 34.9%), resulted in the most crashes. Other contributing causes included “drove too fast for conditions” (37 crashes, 5.3%), “failed to keep in proper lane” (28 crashes, 4.0%), “followed too closely” (26 crashes, 3.7%) “over-correcting/over-steering” (22 crashes, 3.1%), “swerved or avoided” (18 crashes, 2.6%), “improper passing” (13 crashes, 1.8%). A significant number of crashes were documented to have been the result of “no contributing action” (134 crashes, 19.0%) and “other contributing action” (85 crashes, 12.1%). **Table 3-7** and **Figure 3-5** show the crash summary along I-95 mainline within the study area.

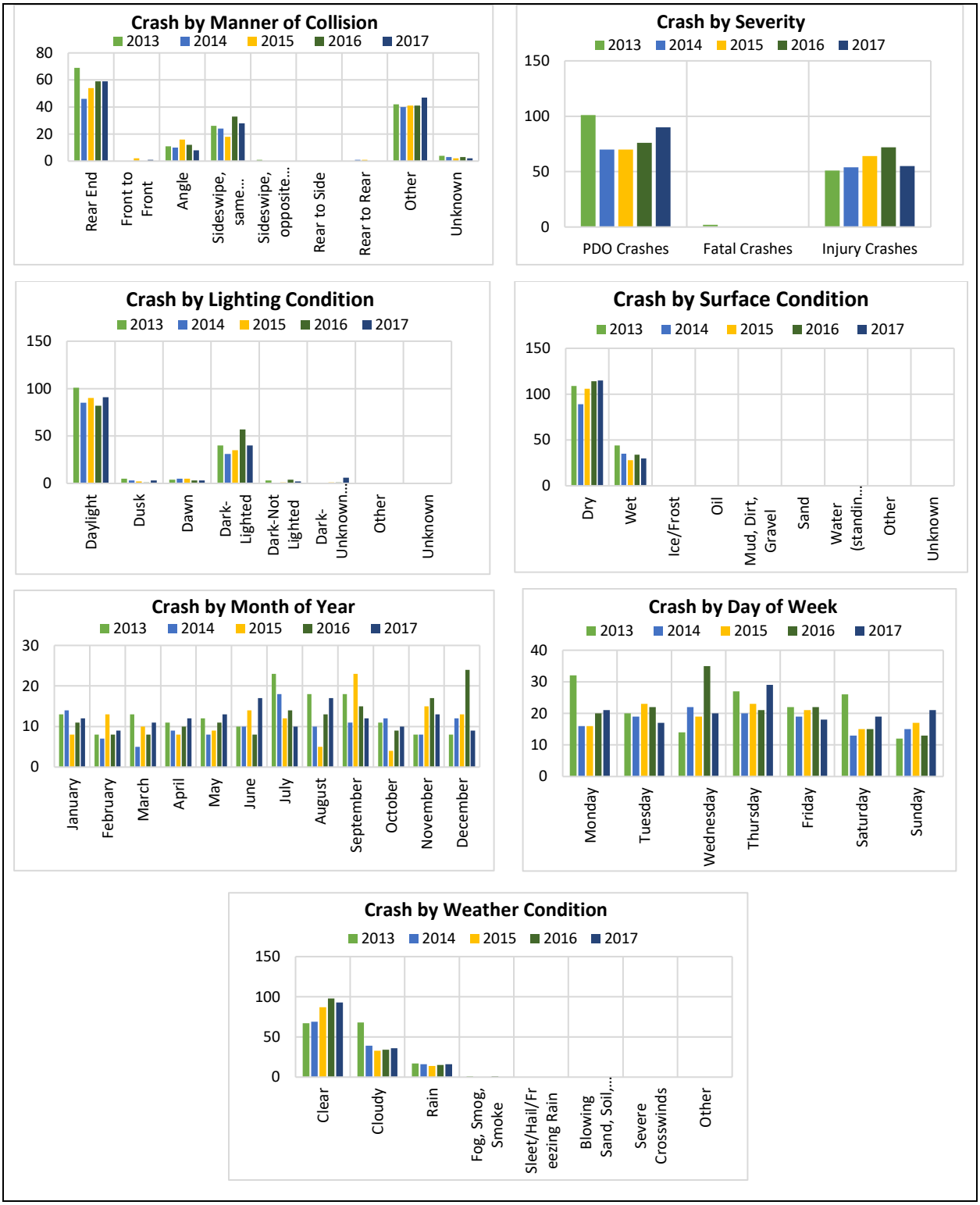
Table 3-7: I-95 Severity Summary (2013 to 2017)

I-95 at Woolbright Road			Number of Crashes Year					5 Year Total Crashes	Mean Crashes Per Year	Percentage
			2013	2014	2015	2016	2017			
Manner of Collision/Impact		Rear End	69	46	54	59	59	287	57.4	40.8%
		Front to Front	0	0	2	0	1	3	0.6	0.4%
		Angle	11	10	16	12	8	57	11.4	8.1%
		Sideswipe, same direction	26	24	18	33	28	129	25.8	18.3%
		Sideswipe, opposite direction	1	0	0	0	0	1	0.2	0.1%
		Rear to Side	0	0	0	0	0	0	0	0.0%
		Rear to Rear	0	1	1	0	0	2	0.4	0.3%
		Other	42	40	41	41	47	211	42.2	30.0%
		Unknown	4	3	2	3	2	14	2.8	2.0%
		Total Crashes	153	124	134	148	145	704	140.8	100.0%
Harmful Events	Collision w/ Non-Fixed Object	Pedestrian	0	0	0	0	0	0	0	0.0%
		Pedalcycle	0	0	0	0	0	0	0	0.0%
		Railway Vehicle	0	0	0	0	0	0	0	0.0%
		Animal	0	0	0	0	0	0	0	0.0%
		Motor Vehicle in Transport	113	88	97	112	99	509	101.8	72.3%
		Parked Motor Vehicle	2	0	1	0	2	5	1	0.7%
		Work Zone/Maintenance Equipment	0	0	0	1	0	1	0.2	0.1%
		Struck by Falling, Shifting Cargo	1	2	3	3	1	10	2	1.4%
		Other Non-Fixed Object	7	6	4	4	4	25	5	3.6%
	Collision w/ Fixed Object	Impact Attenuator/Crash Cushion	0	0	0	0	1	1	0.2	0.1%
		Bridge Overhead Structure	0	0	0	0	0	0	0	0.0%
		Bridge Pier or Support	0	0	0	0	0	0	0	0.0%
		Bridge Rail	0	0	0	0	0	0	0	0.0%
		Culvert	0	0	0	0	0	0	0	0.0%
		Curb	0	0	0	0	0	0	0	0.0%
		Ditch	2	2	0	0	0	4	0.8	0.6%
		Embankment	0	0	0	0	0	0	0	0.0%
		Guardrail Face	1	0	2	2	1	6	1.2	0.9%
		Guardrail End	0	0	0	0	0	0	0	0.0%
		Cable Barrier	0	0	0	0	0	0	0	0.0%
		Concrete Traffic Barrier	17	14	15	14	27	87	17.4	12.4%
		Other Traffic Barrier	0	0	0	0	0	0	0	0.0%
		Tree (standing)	1	1	2	2	2	8	1.6	1.1%
		Utility Pole/Light Support	0	0	0	1	1	2	0.4	0.3%
		Traffic Sign Support	1	0	0	0	0	1	0.2	0.1%
		Traffic Signal Support	0	0	0	0	0	0	0	0.0%
		Other Post, Pole, or Support	1	0	0	0	0	1	0.2	0.1%
		Fence	0	1	0	0	0	1	0.2	0.1%

		Mailbox	0	0	0	0	0	0	0	0.0%
		Other Fixed Object	0	0	2	1	2	5	1	0.7%
	Non-Collision	Overturn/Rollover	2	4	3	3	3	15	3	2.1%
		Fire/Explosion	0	0	0	0	0	0	0	0.0%
		Immersion	0	0	0	0	0	0	0	0.0%
		Jackknife	0	0	0	0	0	0	0	0.0%
		Cargo/Equipment Loss or Shift	0	0	2	1	0	3	0.6	0.4%
		Fell/Jumped From Motor Vehicle	0	2	0	1	0	3	0.6	0.4%
		Thrown or Falling Object	1	0	1	1	0	3	0.6	0.4%
		Ran into Water/Canal	0	0	0	0	0	0	0	0.0%
		Other Non-Collision	4	4	2	2	2	14	2.8	2.0%
Severity		PDO Crashes	101	70	70	76	90	407	81.4	57.7%
		Fatal Crashes	2	0	0	0	0	2	0.4	0.7%
		Injury Crashes	51	54	64	72	55	296	59.2	42.0%
Lighting Conditions		Daylight	101	85	90	82	91	449	89.8	63.8%
		Dusk	5	3	2	1	3	14	2.8	2.0%
		Dawn	4	5	5	3	3	20	4	2.8%
		Dark-Lighted	40	31	35	57	40	203	40.6	28.8%
		Dark-Not Lighted	3	0	1	4	2	10	2	1.4%
		Dark-Unknown lighting	0	0	1	1	6	8	1.6	1.1%
		Other	0	0	0	0	0	0	0	0.0%
		Unknown	0	0	0	0	0	0	0	0.0%
Surface Conditions		Dry	109	89	106	114	115	533	106.6	75.7%
		Wet	44	35	28	34	30	171	34.2	24.3%
		Ice/Frost	0	0	0	0	0	0	0	0.0%
		Oil	0	0	0	0	0	0	0	0.0%
		Mud, Dirt, Gravel	0	0	0	0	0	0	0	0.0%
		Sand	0	0	0	0	0	0	0	0.0%
		Water (standing/moving)	0	0	0	0	0	0	0	0.0%
		Other	0	0	0	0	0	0	0	0.0%
		Unknown	0	0	0	0	0	0	0	0.0%
Month of Year		January	13	14	8	11	12	58	11.6	8.2%
		February	8	7	13	8	9	45	9	6.4%
		March	13	5	10	8	11	47	9.4	6.7%
		April	11	9	8	10	12	50	10	7.1%
		May	12	8	9	11	13	53	10.6	7.5%
		June	10	10	14	8	17	59	11.8	8.4%
		July	23	18	12	14	10	77	15.4	10.9%
		August	18	10	5	13	17	63	12.6	8.9%
		September	18	11	23	15	12	79	15.8	11.2%
		October	11	12	4	9	10	46	9.2	6.5%
		November	8	8	15	17	13	61	12.2	8.7%
		December	8	12	13	24	9	66	13.2	9.4%
Day of Week		Monday	32	16	16	20	21	105	21	14.9%
		Tuesday	20	19	23	22	17	101	20.2	14.3%

	Wednesday	14	22	19	35	20	110	22	15.6%
	Thursday	27	20	23	21	29	120	24	17.0%
	Friday	22	19	21	22	18	102	20.4	14.5%
	Saturday	26	13	15	15	19	88	17.6	12.5%
	Sunday	12	15	17	13	21	78	15.6	11.1%
Contributing Circumstances (Vehicle Only)	Not Coded	18	20	18	17	4	77	15.4	10.9%
	NO Contributing Action	27	25	35	27	20	134	26.8	19.0%
	Operated MV in Careless or Negligent Manner	51	45	44	44	62	246	49.2	34.9%
	Failed to Yield Right-of-way	1	0	0	0	1	2	0.4	0.3%
	Improper Backing	0	0	0	0	0	0	0	0.0%
	Improper Turn	0	0	0	1	1	2	0.4	0.3%
	Followed too Closely	1	1	5	12	7	26	5.2	3.7%
	Ran Red Light	0	0	1	0	0	1	0.2	0.1%
	Drove too Fast for Conditions	19	9	5	0	4	37	7.4	5.3%
	Ran Stop Sign	0	0	0	0	0	0	0	0.0%
	Improper Passing	3	1	4	3	2	13	2.6	1.8%
	Exceed Posted Speed	2	0	0	0	0	2	0.4	0.3%
	Wrong Side or Wrong Way	0	0	0	0	0	0	0	0.0%
	Failed to Keep in Proper Lane	4	4	4	11	5	28	5.6	4.0%
	Ran Off Roadway	1	2	0	3	3	9	1.8	1.3%
	Disregarded Other Traffic Sign	0	0	0	0	0	0	0	0.0%
	Disregarded other Road Markings	0	0	0	0	0	0	0	0.0%
	Over-Correcting/Over-Steering	5	3	2	2	10	22	4.4	3.1%
	Swerved or Avoided	3	3	5	5	2	18	3.6	2.6%
	Operated MV Erratic, Reckless or Aggressive	0	0	0	1	1	2	0.4	0.3%
	Other Contributing Action	18	11	11	22	23	85	17	12.1%
Weather Condition	Clear	67	69	87	98	93	414	82.8	58.8%
	Cloudy	68	39	33	34	36	210	42	29.8%
	Rain	17	16	14	15	16	78	15.6	11.1%
	Fog, Smog, Smoke	1	0	0	1	0	2	0.4	0.3%
	Sleet/Hail/Freezing Rain	0	0	0	0	0	0	0	0.0%
	Blowing Sand, Soil, Dirt	0	0	0	0	0	0	0	0.0%
	Severe Crosswinds	0	0	0	0	0	0	0	0.0%
	Other	0	0	0	0	0	0	0	0.0%

Figure 3-5: I-95 Crash Summary Statistics Histograms (2013-2017)



3.4.2 I-95 Ramps at Woolbright Road

The crash analysis results reveal that there was a total of 30 crashes on the I-95 ramps at Woolbright Road interchange within the project area during the five study years (2013-2017). Of these 30 crashes, most of the crashes are located along the NB on-ramp. Of these 30 crashes, the front to rear (rear-end) crashes were the most common type of crash accounting for 16 (53.3%) of total crashes followed by 4 sideswipe crashes accounting for (13.3%), and 1 angle crash (3.3%) of total crashes. Majority of the crashes (19 crashes, 63.3%) occurred under daylight conditions with 8 crashes (26.7%) occurred during nighttime. The percentage of nighttime crashes is lower than the statewide percentage of 33%. Poor surface conditions contributed only marginally to the number of crashes recorded over the five-year period as 21 (70.0%) of the total crashes occurred during clear weather conditions and on dry pavement surface. Nine crashes (30.0%) occurred on wet pavement; this is higher than the statewide average of 15%.

There were no fatal crashes that occurred within the study limits during the five-year period. PDO crashes accounted for 19 (63.3%) of all crashes; 11 crashes resulted in Injury. Among the contributing causes documented in the crash data, “carelessness of negligent manner” (13 crashes, 43.3%), resulted in the most crashes. Other contributing causes included “failed to keep in proper lane” (3 crashes, 10.0%), “improper passing” (2 crashes, 6.7%). A significant number of crashes were documented to have been the result of “no contributing action” (2 crashes, 6.7%) and “other contributing action” (3 crashes, 10.0%). **Table 3-8** and **Figure 3-6** show the crash summary along I-95 ramps within the study area.

A summary of crash analysis for each I-95 ramp is as shown below:

I-95 at NB Off-Ramp

The crash analysis results reveal that there was a total of 6 crashes at the I-95/NB On-Ramp intersection during the five study years (2013-2017). Of these 6 crashes, front to rear (rear-end) crashes were the most common crash type accounting 2 (33%), and 2 sideswipes (33%) of total crashes. There were 3 injuries and no fatalities.

I-95 at NB On-Ramp

The crash analysis results reveal that there was a total of 11 crashes at the I-95/NB On-Ramp intersection during the five study years (2013-2017). Of these 11 crashes, front to rear (rear-end) crashes were the most common crash type accounting 8 (73%) of total crashes. There were 4 injuries and no fatalities.

I-95 at SB Off-Ramp

The crash analysis results reveal that there was a total of 8 crashes at the I-95/NB On-Ramp intersection during the five study years (2013-2017). Of these 8 crashes, front to rear (rear-end) crashes were the most common crash type accounting 3 (38%) of total crashes. There were 3 injuries and no fatalities.

I-95 at SB On-Ramp

The crash analysis results reveal that there was a total of 5 crashes at the I-95/NB On-Ramp intersection during the five study years (2013-2017). Of these 5 crashes, front to rear (rear-end) crashes were the most common crash type accounting 3 (60%) of total crashes. There were 1 injury and no fatalities.

Table 3-8: I-95 Ramps at Woolbright Road Crash Summary Statistics (2013 to 2017)

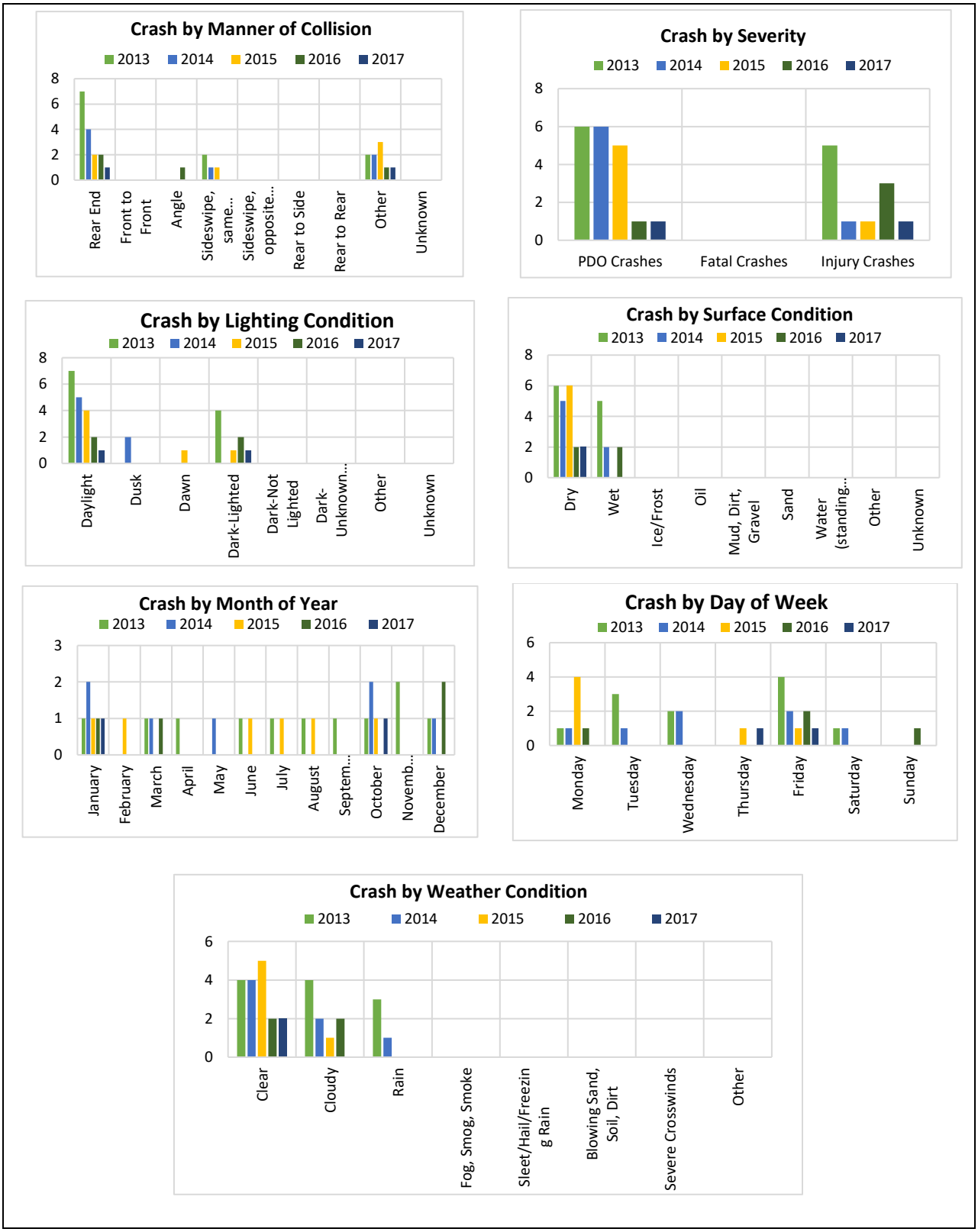
I-95 Ramps at Woolbright Road			Number of Crashes					5 Year Total Crashes	Mean Crashes Per Year	Percentage
			Year							
			2013	2014	2015	2016	2017			
Manner of Collision/Impact		Rear End	7	4	2	2	1	16	3.2	53.3%
		Front to Front	0	0	0	0	0	0	0	0.0%
		Angle	0	0	0	1	0	1	0.2	3.3%
		Sideswipe, same direction	2	1	1	0	0	4	0.8	13.3%
		Sideswipe, opposite direction	0	0	0	0	0	0	0	0.0%
		Rear to Side	0	0	0	0	0	0	0	0.0%
		Rear to Rear	0	0	0	0	0	0	0	0.0%
		Other	2	2	3	1	1	9	1.8	30.0%
		Unknown	0	0	0	0	0	0	0	0.0%
		Total Crashes	11	7	6	4	2	30	6	100.0%
Harmful Events	Collision w/ Non-Fixed Object	Pedestrian	0	0	0	0	0	0	0	0.0%
		Pedalcycle	0	0	0	0	0	0	0	0.0%
		Railway Vehicle	0	0	0	0	0	0	0	0.0%
		Animal	0	0	0	0	0	0	0	0.0%
		Motor Vehicle in Transport	9	5	3	4	1	22	4.4	73.3%
		Parked Motor Vehicle	0	0	0	0	0	0	0	0.0%
		Work Zone/Maintenance Equipment	0	0	0	0	0	0	0	0.0%
		Struck by Falling, Shifting Cargo	0	0	0	0	0	0	0	0.0%
		Other Non-Fixed Object	0	0	0	0	0	0	0	0.0%
	Collision w/	Impact Attenuator/Crash Cushion	0	0	0	0	0	0	0	0.0%

	Fixed Object	Bridge Overhead Structure	0	0	0	0	0	0	0	0.0%
		Bridge Pier or Support	0	0	0	0	0	0	0	0.0%
		Bridge Rail	0	0	0	0	0	0	0	0.0%
		Culvert	0	0	0	0	0	0	0	0.0%
		Curb	0	0	0	0	0	0	0	0.0%
		Ditch	0	0	1	0	0	1	0.2	3.3%
		Embankment	0	0	0	0	0	0	0	0.0%
		Guardrail Face	1	0	1	0	0	2	0.4	6.7%
		Guardrail End	0	0	0	0	0	0	0	0.0%
		Cable Barrier	0	0	0	0	0	0	0	0.0%
		Concrete Traffic Barrier	0	0	0	0	0	0	0	0.0%
		Other Traffic Barrier	0	0	0	0	0	0	0	0.0%
		Tree (standing)	0	0	0	0	0	0	0	0.0%
		Utility Pole/Light Support	0	1	1	0	0	2	0.4	6.7%
		Traffic Sign Support	0	1	0	0	0	1	0.2	3.3%
		Traffic Signal Support	0	0	0	0	0	0	0	0.0%
		Other Post, Pole, or Support	0	0	0	0	0	0	0	0.0%
		Fence	0	0	0	0	0	0	0	0.0%
		Mailbox	0	0	0	0	0	0	0	0.0%
		Other Fixed Object	0	0	0	0	0	0	0	0.0%
	Non-Collision	Overturn/Rollover	0	0	0	0	1	1	0.2	3.3%
		Fire/Explosion	0	0	0	0	0	0	0	0.0%
		Immersion	0	0	0	0	0	0	0	0.0%
		Jackknife	0	0	0	0	0	0	0	0.0%
		Cargo/Equipment Loss or Shift	0	0	0	0	0	0	0	0.0%
		Fell/Jumped from Motor Vehicle	0	0	0	0	0	0	0	0.0%
		Thrown or Falling Object	0	0	0	0	0	0	0	0.0%
		Ran into Water/Canal	0	0	0	0	0	0	0	0.0%
		Other Non-Collision	1	0	0	0	0	1	0.2	3.3%
Severity		PDO Crashes	6	6	5	1	1	19	3.8	63.3%
		Fatal Crashes	0	0	0	0	0	0	0	0.0%
		Injury Crashes	5	1	1	3	1	11	2.2	36.7%
Lighting Conditions		Daylight	7	5	4	2	1	19	3.8	63.3%
		Dusk	0	2	0	0	0	2	0.4	6.7%
		Dawn	0	0	1	0	0	1	0.2	3.3%
		Dark-Lighted	4	0	1	2	1	8	1.6	26.7%
		Dark-Not Lighted	0	0	0	0	0	0	0	0.0%
		Dark-Unknown lighting	0	0	0	0	0	0	0	0.0%
		Other	0	0	0	0	0	0	0	0.0%
		Unknown	0	0	0	0	0	0	0	0.0%
Surface Conditions		Dry	6	5	6	2	2	21	4.2	70.0%
		Wet	5	2	0	2	0	9	1.8	30.0%

	Ice/Frost	0	0	0	0	0	0	0	0.0%
	Oil	0	0	0	0	0	0	0	0.0%
	Mud, Dirt, Gravel	0	0	0	0	0	0	0	0.0%
	Sand	0	0	0	0	0	0	0	0.0%
	Water (standing/moving)	0	0	0	0	0	0	0	0.0%
	Other	0	0	0	0	0	0	0	0.0%
	Unknown	0	0	0	0	0	0	0	0.0%
Month of Year	January	1	2	1	1	1	6	1.2	20.0%
	February	0	0	1	0	0	1	0.2	3.3%
	March	1	1	0	1	0	3	0.6	10.0%
	April	1	0	0	0	0	1	0.2	3.3%
	May	0	1	0	0	0	1	0.2	3.3%
	June	1	0	1	0	0	2	0.4	6.7%
	July	1	0	1	0	0	2	0.4	6.7%
	August	1	0	1	0	0	2	0.4	6.7%
	September	1	0	0	0	0	1	0.2	3.3%
	October	1	2	1	0	1	5	1	16.7%
	November	2	0	0	0	0	2	0.4	6.7%
	December	1	1	0	2	0	4	0.8	13.3%
Day of Week	Monday	1	1	4	1	0	7	1.4	23.3%
	Tuesday	3	1	0	0	0	4	0.8	13.3%
	Wednesday	2	2	0	0	0	4	0.8	13.3%
	Thursday	0	0	1	0	1	2	0.4	6.7%
	Friday	4	2	1	2	1	10	2	33.3%
	Saturday	1	1	0	0	0	2	0.4	6.7%
	Sunday	0	0	0	1	0	1	0.2	3.3%
Contributing Circumstances	Not Coded	1	0	0	1	1	3	0.6	10.0%
	NO Contributing Action	2	0	0	0	0	2	0.4	6.7%
	Operated MV in Careless or Negligent Manner	3	4	2	3	1	13	2.6	43.3%
	Failed to Yield Right-of-way	0	0	1	0	0	1	0.2	3.3%
	Improper Backing	0	1	0	0	0	1	0.2	3.3%
	Improper Turn	0	0	0	0	0	0	0	0.0%
	Followed too Closely	1	0	0	0	0	1	0.2	3.3%
	Ran Red Light	0	0	0	0	0	0	0	0.0%
	Drove too Fast for Conditions	0	0	0	0	0	0	0	0.0%
	Ran Stop Sign	0	0	0	0	0	0	0	0.0%
	Improper Passing	1	0	1	0	0	2	0.4	6.7%
	Exceed Posted Speed	0	0	0	0	0	0	0	0.0%
	Wrong Side or Wrong Way	0	0	0	0	0	0	0	0.0%
	Failed to Keep in Proper Lane	2	1	0	0	0	3	0.6	10.0%
	Ran Off Roadway	0	0	1	0	0	1	0.2	3.3%

	Disregarded Other Traffic Sign	0	0	0	0	0	0	0	0.0%
	Disregarded other Road Markings	0	0	0	0	0	0	0	0.0%
	Over-Correcting/Over-Steering	0	0	0	0	0	0	0	0.0%
	Swerved or Avoided	0	0	0	0	0	0	0	0.0%
	Operated MV Erratic, Reckless or Aggressive	0	0	0	0	0	0	0	0.0%
	Other Contributing Action	1	1	1	0	0	3	0.6	10.0%
Weather Condition	Clear	4	4	5	2	2	17	3.4	56.7%
	Cloudy	4	2	1	2	0	9	1.8	30.0%
	Rain	3	1	0	0	0	4	0.8	13.3%
	Fog, Smog, Smoke	0	0	0	0	0	0	0	0.0%
	Sleet/Hail/Freezing Rain	0	0	0	0	0	0	0	0.0%
	Blowing Sand, Soil, Dirt	0	0	0	0	0	0	0	0.0%
	Severe Crosswinds	0	0	0	0	0	0	0	0.0%
	Other	0	0	0	0	0	0	0	0.0%

Figure 3-6: I-95 Ramps at Woolbright Road Crash Summary Statistics Histograms (2013-2017)



3.4.3 Woolbright Road

The crash analysis results reveal that there was a total of 341 crashes on Woolbright Road within the project area during the five study years (2013-2017). Of these 341 crashes, front to rear (rear-end) crashes were the most common type of crash accounting for 163 (47.8%) of total crashes followed by 76 angle crashes accounting for (22.3%), and 27 sideswipe crashes (7.9%), 2 pedestrian crashes (0.6%) of total crashes. Majority of the crashes (256 crashes 75.1%) occurred under daylight conditions with 73 crashes (21.4%) occurred during nighttime. The percentage of nighttime crashes is lower than the statewide percentage of 33%. Poor surface conditions contributed only marginally to the number of crashes recorded over the five-year period as 289 (84.8%) of the total crashes occurred during clear weather conditions and on dry pavement surface. 52 of crashes (15.2%) occurred on wet pavement. This is lower than the statewide average of 15%.

One (1) fatal crash occurred within the study limits during the five-year period. Property Damage Only (PDO) crashes accounted for 192 (56.3%) of all crashes; 148 crashes resulted in Injury. Among the contributing causes documented in the crash data, "carelessness of negligent manner" (119 crashes, 34.9%), resulted in the most crashes. Other contributing causes included "failed to yield right-of-way" (45 crashes, 13.2%), "followed too closely" (22 crashes, 6.5%), "ran red light" (23 crashes, 6.7%). A significant number of crashes were documented to have been the result of "no contributing action" (21 crashes, 6.2%) and "other contributing action" (26 crashes, 7.6%). **Table 3-9** and **Figure 3-7** show the crash summary along Woolbright Road within the study area.

Table 3-9: Woolbright Road Crash Summary Statistics (2013 to 2017)

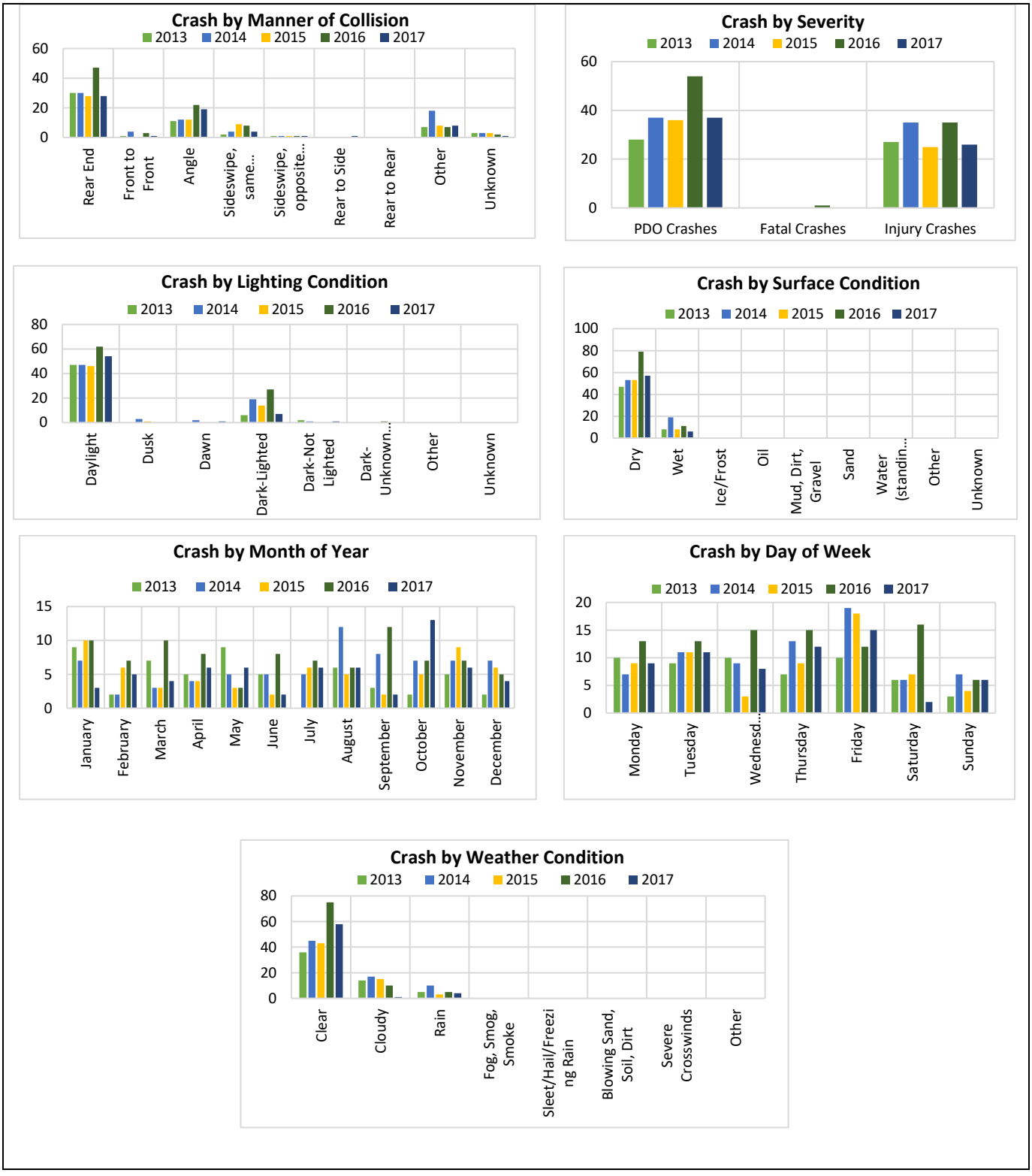
Woolbright Road		Number of Crashes					5 Year Total Crashes	Mean Crashes Per Year	Percentage
		Year							
		2013	2014	2015	2016	2017			
Manner of Collision/Impact	Rear End	30	30	28	47	28	163	32.6	47.8%
	Front to Front	1	4	0	3	1	9	1.8	2.6%
	Angle	11	12	12	22	19	76	15.2	22.3%
	Sideswipe, same direction	2	4	9	8	4	27	5.4	7.9%
	Sideswipe, opposite direction	1	1	1	1	1	5	1	1.5%
	Rear to Side	0	0	0	0	1	1	0.2	0.3%
	Rear to Rear	0	0	0	0	0	0	0	0.0%
	Other	7	18	8	7	8	48	9.6	14.1%
	Unknown	3	3	3	2	1	12	2.4	3.5%
	Total Crashes	55	72	61	90	63	341	68.2	100.0%

Harmful Events	**Collision w/ Non-Fixed Object**	Pedestrian	1	0	0	0	1	2	0.4	0.6%
		Pedalcycle	0	0	0	0	0	0	0	0.0%
		Railway Vehicle	0	0	0	0	0	0	0	0.0%
		Animal	0	0	0	0	0	0	0	0.0%
		Motor Vehicle in Transport	47	60	55	86	59	307	61.4	90.0%
		Parked Motor Vehicle	0	0	0	0	0	0	0	0.0%
		Work Zone/Maintenance Equipment	0	0	0	0	0	0	0	0.0%
		Struck by Falling, Shifting Cargo	0	0	0	0	0	0	0	0.0%
		Other Non-Fixed Object	0	0	0	0	0	0	0	0.0%
	Collision w/ Fixed Object	Impact Attenuator/Crash Cushion	0	0	0	0	0	0	0	0.0%
		Bridge Overhead Structure	0	0	0	0	0	0	0	0.0%
		Bridge Pier or Support	0	0	0	0	0	0	0	0.0%
		Bridge Rail	0	0	0	0	0	0	0	0.0%
		Culvert	0	0	0	0	0	0	0	0.0%
		Curb	1	2	0	0	1	4	0.8	1.2%
		Ditch	0	1	1	1	0	3	0.6	0.9%
		Embankment	0	0	0	0	0	0	0	0.0%
		Guardrail Face	0	1	1	1	0	3	0.6	0.9%
		Guardrail End	0	1	0	0	0	1	0.2	0.3%
		Cable Barrier	0	0	0	0	0	0	0	0.0%
		Concrete Traffic Barrier	0	0	0	0	1	1	0.2	0.3%
		Other Traffic Barrier	1	0	0	0	0	1	0.2	0.3%
		Tree (standing)	1	2	0	1	0	4	0.8	1.2%
		Utility Pole/Light Support	1	3	0	0	1	5	1	1.5%
		Traffic Sign Support	0	0	1	0	0	1	0.2	0.3%
		Traffic Signal Support	0	0	0	0	0	0	0	0.0%
		Other Post, Pole, or Support	1	0	0	0	0	1	0.2	0.3%
		Fence	0	0	0	0	0	0	0	0.0%
		Mailbox	0	0	0	0	0	0	0	0.0%
		Other Fixed Object	0	0	2	0	0	2	0.4	0.6%
	Non-Collision	Overturn/Rollover	0	2	0	1	0	3	0.6	0.9%
		Fire/Explosion	0	0	0	0	0	0	0	0.0%
		Immersion	0	0	0	0	0	0	0	0.0%
		Jackknife	0	0	0	0	0	0	0	0.0%
		Cargo/Equipment Loss or Shift	0	0	0	0	0	0	0	0.0%
		Fell/Jumped From Motor Vehicle	0	0	0	0	0	0	0	0.0%

		Thrown or Falling Object	0	0	0	0	0	0	0	0.0%
		Ran into Water/Canal	0	0	0	0	0	0	0	0.0%
		Other Non-Collision	2	0	1	0	0	3	0.6	0.9%
Severity		PDO Crashes	28	37	36	54	37	192	38.4	56.3%
		Fatal Crashes	0	0	0	1	0	1	0.2	0.3%
		Injury Crashes	27	35	25	35	26	148	29.6	43.4%
Lighting Conditions		Daylight	47	47	46	62	54	256	51.2	75.1%
		Dusk	0	3	1	0	0	4	0.8	1.2%
		Dawn	0	2	0	0	1	3	0.6	0.9%
		Dark-Lighted	6	19	14	27	7	73	14.6	21.4%
		Dark-Not Lighted	2	1	0	0	1	4	0.8	1.2%
		Dark-Unknown lighting	0	0	0	1	0	1	0.2	0.3%
		Other	0	0	0	0	0	0	0	0.0%
		Unknown	0	0	0	0	0	0	0	0.0%
Surface Conditions		Dry	47	53	53	79	57	289	57.8	84.8%
		Wet	8	19	8	11	6	52	10.4	15.2%
		Ice/Frost	0	0	0	0	0	0	0	0.0%
		Oil	0	0	0	0	0	0	0	0.0%
		Mud, Dirt, Gravel	0	0	0	0	0	0	0	0.0%
		Sand	0	0	0	0	0	0	0	0.0%
		Water (standing/moving)	0	0	0	0	0	0	0	0.0%
		Other	0	0	0	0	0	0	0	0.0%
		Unknown	0	0	0	0	0	0	0	0.0%
Month of Year		January	9	7	10	10	3	39	7.8	11.4%
		February	2	2	6	7	5	22	4.4	6.5%
		March	7	3	3	10	4	27	5.4	7.9%
		April	5	4	4	8	6	27	5.4	7.9%
		May	9	5	3	3	6	26	5.2	7.6%
		June	5	5	2	8	2	22	4.4	6.5%
		July	0	5	6	7	6	24	4.8	7.0%
		August	6	12	5	6	6	35	7	10.3%
		September	3	8	2	12	2	27	5.4	7.9%
		October	2	7	5	7	13	34	6.8	10.0%
		November	5	7	9	7	6	34	6.8	10.0%
		December	2	7	6	5	4	24	4.8	7.0%
Day of Week		Monday	10	7	9	13	9	48	9.6	14.1%
		Tuesday	9	11	11	13	11	55	11	16.1%
		Wednesday	10	9	3	15	8	45	9	13.2%
		Thursday	7	13	9	15	12	56	11.2	16.4%
		Friday	10	19	18	12	15	74	14.8	21.7%
		Saturday	6	6	7	16	2	37	7.4	10.9%
		Sunday	3	7	4	6	6	26	5.2	7.6%
Contributing Circumstances (Vehicle Only)		Not Coded	6	13	8	10	9	46	9.2	13.5%
		NO Contributing Action	2	6	3	8	2	21	4.2	6.2%

	Operated MV in Careless or Negligent Manner	26	23	24	28	18	119	23.8	34.9%
	Failed to Yield Right-of-way	3	8	9	13	12	45	9	13.2%
	Improper Backing	0	1	1	0	1	3	0.6	0.9%
	Improper Turn	1	0	1	0	0	2	0.4	0.6%
	Followed too Closely	6	1	3	12	0	22	4.4	6.5%
	Ran Red Light	6	2	5	4	6	23	4.6	6.7%
	Drove too Fast for Conditions	2	4	1	1	3	11	2.2	3.2%
	Ran Stop Sign	0	0	0	0	0	0	0	0.0%
	Improper Passing	0	0	0	0	1	1	0.2	0.3%
	Exceed Posted Speed	0	0	0	0	0	0	0	0.0%
	Wrong Side or Wrong Way	1	0	0	0	0	1	0.2	0.3%
	Failed to Keep in Proper Lane	0	1	2	1	5	9	1.8	2.6%
	Ran Off Roadway	0	0	1	2	1	4	0.8	1.2%
	Disregarded Other Traffic Sign	0	0	0	0	0	0	0	0.0%
	Disregarded other Road Markings	0	0	0	0	0	0	0	0.0%
	Over-Correcting/Over-Steering	2	1	0	1	0	4	0.8	1.2%
	Swerved or Avoided	0	0	0	0	0	0	0	0.0%
	Operated MV Erratic, Reckless or Aggressive	0	3	1	0	0	4	0.8	1.2%
	Other Contributing Action	0	9	2	10	5	26	5.2	7.6%
Weather Condition	Clear	36	45	43	75	58	257	51.4	75.4%
	Cloudy	14	17	15	10	1	57	11.4	16.7%
	Rain	5	10	3	5	4	27	5.4	7.9%
	Fog, Smog, Smoke	0	0	0	0	0	0	0	0.0%
	Sleet/Hail/Freezing Rain	0	0	0	0	0	0	0	0.0%
	Blowing Sand, Soil, Dirt	0	0	0	0	0	0	0	0.0%
	Severe Crosswinds	0	0	0	0	0	0	0	0.0%
	Other	0	0	0	0	0	0	0	0.0%

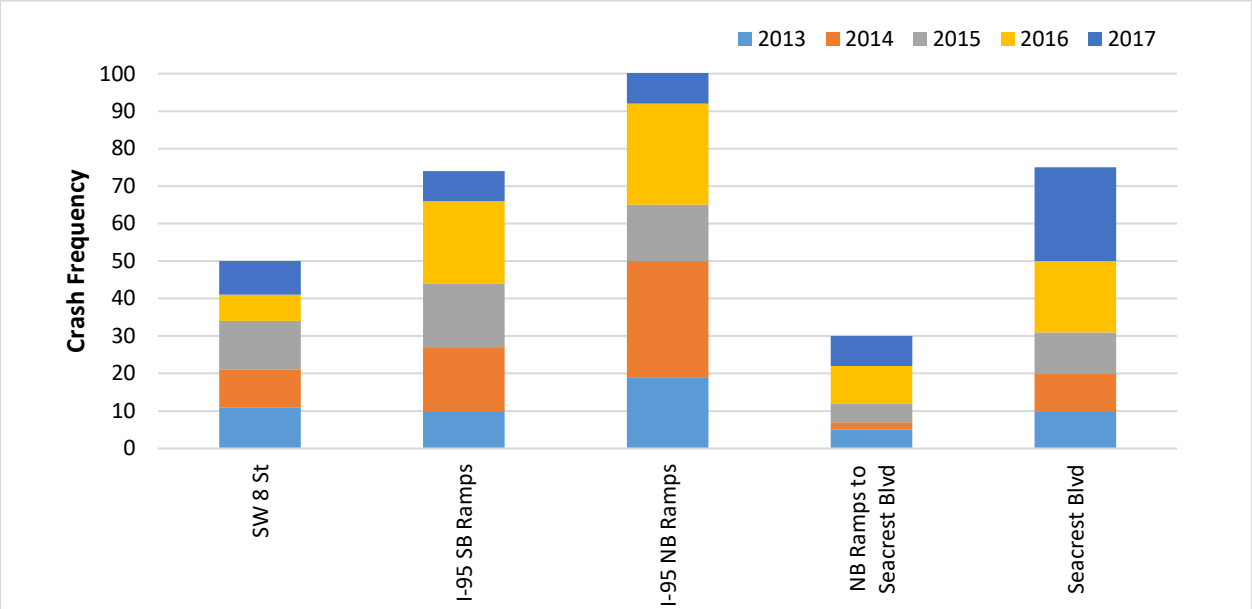
Figure 3-7: Woolbright Road Crash Summary Statistics Histograms (2013-2017)



3.4.4 Crash Hotspots

A crash accumulation analysis was conducted along Woolbright Road to identify specific segments or intersections with high crash frequencies and identify possible roadway deficiencies that can be improved. The crash accumulation analysis is graphically illustrated in **Figure 3-8**. Based on analysis, the following locations were identified as high crash frequency locations with greater than 10 crashes for the five-year period. These locations are not among the high crash locations classified in the most recent FDOT High-Crash List (2009-2013).

Figure 3-8: Safety Hotspots along Woolbright Road



SW 8th street provides access to the Lowe's Home Improvement store, The Home Depot as well as several residentials and businesses. Seacrest Boulevard provides access to Boynton Beach Utilities Department as well as residential neighborhoods and businesses.

Based on the crash analysis, a total of 332 crashes occurred within this hotspot areas identified from 2013 to 2017. Rear-end crashes were the predominant crash type accounting for 158 crashes (47.6%) of the total crashes followed by 76 angle crashes (22.9%), 24 sideswipe crashes (7.2%), and 25 fixed object crashes (7.5%). Among the contributing causes documented in the crash data, 'carelessness or negligent manner' (112 crashes, 33.7%), 'failed to yield right of way' (45 crashes, 13.6%), 'no contributing action' (20 crashes, 6.0%), 'followed too Closely' (22 crashes, 6.6%), 'improper turn' (2 crashes, 0.6%) and 'ran red light' (23 crashes, 6.9%) were among the highest.

Most of the rear-end crashes occurring at I-95 NB ramp terminal intersection were mainly due to drivers following too closely and failing to yield the right of way, which may be attributed to inadequate signal timing for the intersection. At Seacrest Boulevard intersection, most of the angle crashes were attributed to 'failed to yield right of way' which could also be due to difficulty in judging correctly adequate gaps for the Woolbright Road traffic stream in order to make left-turn maneuver at this intersection.

3.4.5 Fatal Crashes

Fatal crashes are a major concern in the roadway safety analysis. Based on the crash data, there were a total of 3 fatal crashes within the study area. Two fatal crashes occurred on I-95 and one fatal crash on Woolbright Road.

The SSOGis crash data was reviewed to identify specific contributing factors that may have caused these fatal crashes. The two fatal crashes that occurred along I-95 NB S of Woolbright Road were caused when the vehicles lost control while driving careless. These fatal crashes occurred under dry surface conditions and during the daytime. The fatal crash on Woolbright Road that occurred between NB ramp terminal and Seacrest Boulevard, this crash occurred under dry surface condition and during the nighttime.

3.4.6 Crash Frequencies and Rates

I-95 and Woolbright Road within the study area were segmented into 20 areas as presented in **Table 3-10**, This was done to further analyze the crash frequencies and rates at different sections of the roadway within the project limits to provide a better understanding of the existing crash patterns. **Table 3-11** provides the existing crash frequencies and rates along the different roadway sections as described in **Table 3-10**.

After segmenting I-95, Woolbright Road and the interchange ramps, the crash frequency and crash rate were calculated for each segment. The 'Average Crash Rate Method' of crash analysis, based on segment length, AADT and number of crashes occurred, was used for calculating the actual crash rate for the roadway segments. The actual crash rate for the study corridors from year 2013 to 2017 was compared with the statewide average crash rate for the same type of facility.

Based on the analysis presented in Table 3-10, on Woolbright Road, segment 5 have the highest crash rate of 1.540 crashes per million vehicle miles travelled whilst section 6 has the lowest with crash rate of 0.331 crashes per million vehicle miles travelled. The actual crash rate for segment 15 and 20 are higher than the statewide average. The crash rate at Woolbright Road and Seacrest Boulevard intersection, 1.015, is

higher than the statewide average, 0.623. The intersection at Woolbright Road and SW 8th Street has a crash rate of 0.640, which is higher than the statewide average, 0.562.

Table 3-10: Roadway Segmentation for Crash Analysis

Segment	Description
1	I-95 NB S of Woolbright Road
2	I-95 NB Diverge Area S of Woolbright Road
3	Woolbright Road NB Off-Ramp
4	I-95 NB between Off and On-Ramps
5	Woolbright Road NB On-Ramp
6	I-95 NB Weaving Area N of Woolbright Road
7	I-95 SB Weaving Area N of Woolbright Road
8	Woolbright Road SB Off-Ramp
9	I-95 SB between Off and On-Ramps
10	Woolbright Road SB On-Ramp
11	I-95 SB Merge Area S of Woolbright Road
12	I-95 SB S of Woolbright Road
15	Woolbright Road at SW 8 Street
16	Woolbright Road between SW 8 Street and SB Ramps
17	Woolbright Road at SB Ramps
18	Woolbright Road at NB Ramps
19	Woolbright Road between NB Ramps and Seacrest Boulevard
20	Woolbright Road at Seacrest Boulevard

Table 3-11: Existing Crash Frequencies and Rates

Segment Description	Total Number of Crashes	Number of Crashes			Traffic Volume (AADTs)**	Crash Frequency (Crash/year)	Segment Type	Segment Length (Feet)	Crash Rate (Crash/MVMT)	Statewide Average Crash Rate
		Fatal	Injuries	PDO						
I-95 NB S of Woolbright Road	92	2	40	51	193900	18.4	Segment	0.42	0.619	0.924
I-95 NB Diverge Area S of Woolbright Road	108	0	41	67	193900	21.6	Segment	0.46	0.663	0.924
Woolbright Road NB Off-Ramp	6	0	3	3	11800	1.2	Segment	0.21	1.327	*
I-95 NB between Off and On-Ramps	105	0	45	60	203900	21	Segment	0.6	0.470	0.924
Woolbright Road NB On-Ramp	11	0	4	7	14500	2.2	Segment	0.27	1.540	*
I-95 NB Weaving Area N of Woolbright Road	40	0	16	24	213900	8	Segment	0.31	0.331	0.924
I-95 SB Weaving Area N of Woolbright Road	33	0	12	21	213900	6.6	Segment	0.25	0.338	0.924
Woolbright Road SB Off-Ramp	8	0	3	5	16600	1.6	Segment	0.26	1.016	*
I-95 SB between Off and On-Ramps	192	0	78	114	203900	38.4	Segment	0.71	0.727	0.924
Woolbright Road SB On-Ramp	5	0	1	4	11500	1	Segment	0.26	0.916	*
I-95 SB Merge Area S of Woolbright Road	86	0	38	48	193900	17.2	Segment	0.75	0.324	0.924
I-95 SB S of Woolbright Road	49	0	27	22	193900	9.8	Segment	0.15	0.923	0.924
Woolbright Road at SW 8 Street	50	0	25	25	42800	10	Intersection	-	0.640	0.562
Woolbright Road between SW 8 Street and SB Ramps	9	0	5	4	42800	1.8	Segment	0.24	0.480	6.575
Woolbright Road at SB Ramps	74	0	38	36	42800	14.8	Intersection	-	0.947	1.511
Woolbright Road at NB Ramps	103	0	39	64	40500	20.6	Intersection	-	1.394	1.511
Woolbright Road between NB Ramps and Seacrest Boulevard	30	1	12	18	40500	6	Segment	0.47	0.864	5.391
Woolbright Road at Seacrest Boulevard	75	0	30	45	40500	15	Intersection	-	1.015	0.623

*Statewide average crash rate not available

** AADTs are averages of historical AADTs from Florida Traffic Online from 2013 to 2017 AADTs

3.5 Consistency with Master Plans, LRTP, LFC and DRIs

This IMR considers all programmed and planned roadway improvements in the area. These capacity improvements are consistent with those specified in the regional transportation plans including the following:

- Palm Beach Transportation Planning Agency (TPA) 2040 Long Range Transportation Plan (LRTP)
- Palm Beach TPA Transportation Improvement Program (TIP)
- FDOT's SIS Second Five Year Plan
- FDOT Five-Year Work Program
- FDOT's Strategic Intermodal System Plan

In addition, this IMR is conducted in coordination with the ongoing intersection improvement at Woolbright Road at Seacrest Boulevard (Proj# 20229919), which includes adding an eastbound right turn lane on Woolbright Road at Seacrest Boulevard. This improvement is listed in the Palm Beach TPA Transportation Improvement Program (TIP) – FY 2021-2025.

4. NEED

The Woolbright Road interchange with I-95 is an important component of the SIS in Palm Beach County, Florida and provides a key transportation element. This interchange is an important connection for commuters and freight traffic in the region. The objective of the IMR is to propose improvements that will provide a safer and more operationally efficient interchange.

Operational Performance

The I-95 NB and SB ramp terminal intersections operate at LOS E or worse during AM and PM peak hours in Existing Year 2019. However, traffic congestion and long delays are experienced by some movements at the study intersections, where they operate at LOS F during the PM peak hour. At the Woolbright Road and I-95 SB ramp terminal, the eastbound right and southbound left movements operate at LOS F in the Existing Year 2019. Also, the westbound right and northbound left movements at Woolbright Road and I-95 NB ramp terminal intersection operate at LOS F during the PM peak hour. Travel demand forecasts indicate that the study area is expected to experience substantial traffic growth in future years. Based on the anticipated growth in traffic, operating conditions at the interchange and the study intersections will further deteriorate. Under No-Build Alternative, the traffic analysis performed for the signalized intersections indicated that all the study intersections will operate at an overall LOS F during the peak hours by Design Year 2045. The proposed project will address these concerns by increasing capacity at the interchange and providing acceptable operating conditions through the Design Year (2045).

Transportation Capacity

An increase in demand on I-95 and Woolbright Road interchange is anticipated in the future due to planned growth in the area. As a result, additional traffic demand on major arterials within the study area will need to be addressed. **Table 4-1** summarizes the anticipated growth within the study area.

Table 4-1: Forecasted Growth in Traffic Volumes

Segment	Existing (2019)	Opening (2025)	Design (2045)
I-95 south of Woolbright Road	228,000	232,000	242,000
I-95 north of Woolbright Road	237,000	243,000	261,000
Woolbright Road west of I-95	42,500	44,500	52,000
Woolbright Road east of I-95	40,500	42,000	46,000

The study area also has a high volume of heavy traffic along I-95. For the purpose of this study, it was assumed that trucks would increase proportionally with traffic volumes. I-95 experiences a 7.4% of daily truck percentage to the north of Woolbright Road and a 6.1% of daily truck percentage to the south of Woolbright Road. The truck volume will increase proportionally to the vehicular traffic and will result in further deteriorated conditions.

Safety

The existing safety analysis provided in **Section 3.3.3** shows that high crash locations exist within the study area. Specifically, Woolbright Road at SW 8th Street intersection and Seacrest Boulevard along Woolbright Road have higher crash rates than the statewide average. The increased traffic volumes and high travel speeds create an environment that is prone to crashes.

If no operational and safety improvements are made within the project limits, traffic operations within the study area will progressively become worse, increasing the number of crashes, and deteriorating the access to and from I-95 and Woolbright Road for users.

Emergency Evacuation and Response Times

I-95 and Woolbright Road serve as part of the emergency evacuation route network designated by the Florida Division of Emergency Management and Palm Beach County. As designated evacuation facilities, the interchange is critical in facilitating traffic flow during emergency evacuation periods. Woolbright Road is a major east-west corridor in eastern Palm Beach County providing linkage to I-95.

5. Future Traffic Forecasts

The AADT development for this project was performed as part of the *Traffic Data Collection and Traffic Projections Report*. The report is provided in **Appendix B**. A summary of the future transportation network and future traffic volume forecasting is discussed in this section.

5.1 Future Transportation Network

The TPA for Palm Beach County plays a critical role in addressing regional transportation issues, convening stakeholders, and identifying the long-term transportation needs within Palm Beach County. It also serves as the coordinating forum for all the local governments for matters relating to the maintenance and development of the county's transportation network. Together they establish long-term planning goals and objectives, set priorities, and identify the agency responsible for funding and implementing needed transportation improvements.

5.2 Travel Demand Forecasting/Development of AADTs

The AADT forecasting and development was performed in December 2017 as part of the Traffic Data Collection and Traffic Projections for I-95 at Woolbright Road report. A brief discussion of AADT development methodology is presented below.

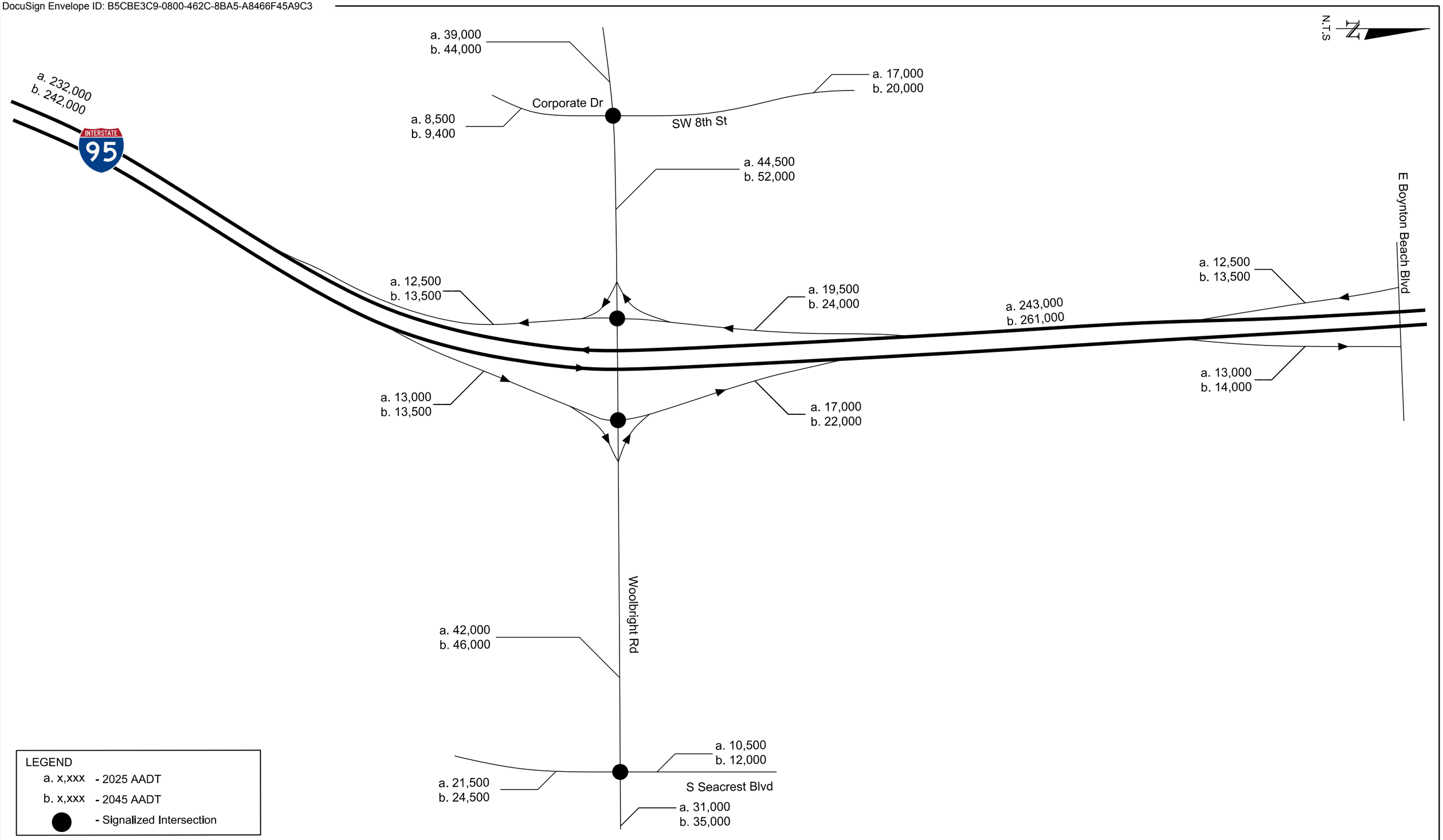
To obtain reasonable and consistent traffic projections, various traffic forecasting methodologies were evaluated. The purpose of evaluating various traffic forecasting methodologies was to recommend the most reasonable forecasting methodology for the study interchanges to develop consistent traffic projections. The forecast methodologies that were reviewed include:

- Regression analysis of at least 5 years of the most recent historical AADTs from FDOT count sites using FDOT Trend analysis spreadsheet.
- Regression analysis of at least 5 years of the most recent historical AADTs from FDOT count sites and the 2040 model volumes from the SERPM 7.062 projections using FDOT Trend analysis spreadsheet.
- Socioeconomic growth for TAZs within 2-mile buffer of the study interchanges between the SERPM 7.062 base year 2010 and future year 2040.

- Comprehensive traffic forecasting method, which first calculated the percent difference between the 2017 AADT from field data and the projected 2017 AADT interpolated from 2010 and 2040 SERPM 7.062 projections, and then maintained this percent difference and applied to 2040 SERPM 7.062 projections to calculate 2040 AADT.

The growth rates of historical counts, historical counts plus model projections, SERPM socioeconomic growth, and the comprehensive model to model projections methodology were summarized and compared with each other. Based on the comparison and discussions with FDOT Project Manager, the comprehensive traffic forecasting method was used to develop the AADT for these PD&E studies. The traffic forecasting methodology used for each approach of each intersection was based on the 2017 AADT (from field), and 2010 and 2040 SERPM 7.062 model volumes. The 2017 model volume was interpolated using 2010 and 2040 model volumes. Then the percent differences of 2017 AADT and interpolated 2017 forecasted AADT from model was calculated. The recommended 2040 AADT were calculated by applying this percent difference to the 2040 SERPM 7.062 model volumes. Then the 2020 and 2030 volumes were interpolated using 2017 AADT and recommended 2040 volumes. For the roadway segments where the SERPM 7.062 2040 model volumes are lower than the SERPM 7.062 2010 model volumes, or are not included in the SERPM 7 network, the future 2020, 2030, and 2040 AADTs were calculated using 2017 AADT and a compound growth factor of 0.5%. For all the roadway links, the 2017 and 2040 AADT has been compared, and a minimum compound growth rate of 0.5% has been adopted.

AADT volumes are developed by interpolation for Opening Year of this IMR. The AADT volumes do not change between any of the alternatives. The AADTs for 2025 and 2045 are presented in **Figure 5-1**.



Florida Department of Transportation *District Four* *3400 West Commercial Boulevard* *Fort Lauderdate, FL 33309*	I-95/SR 9 Interchange at Woolbright Road Project Development & Environment Study FPID No.: 437279-1-22-02 ETDM No.: 14341	Title: Opening Year 2025 and Design Year 2045 Annual Average Daily Traffic	Figure: 5-1

5.3 Development of DDHV Volumes

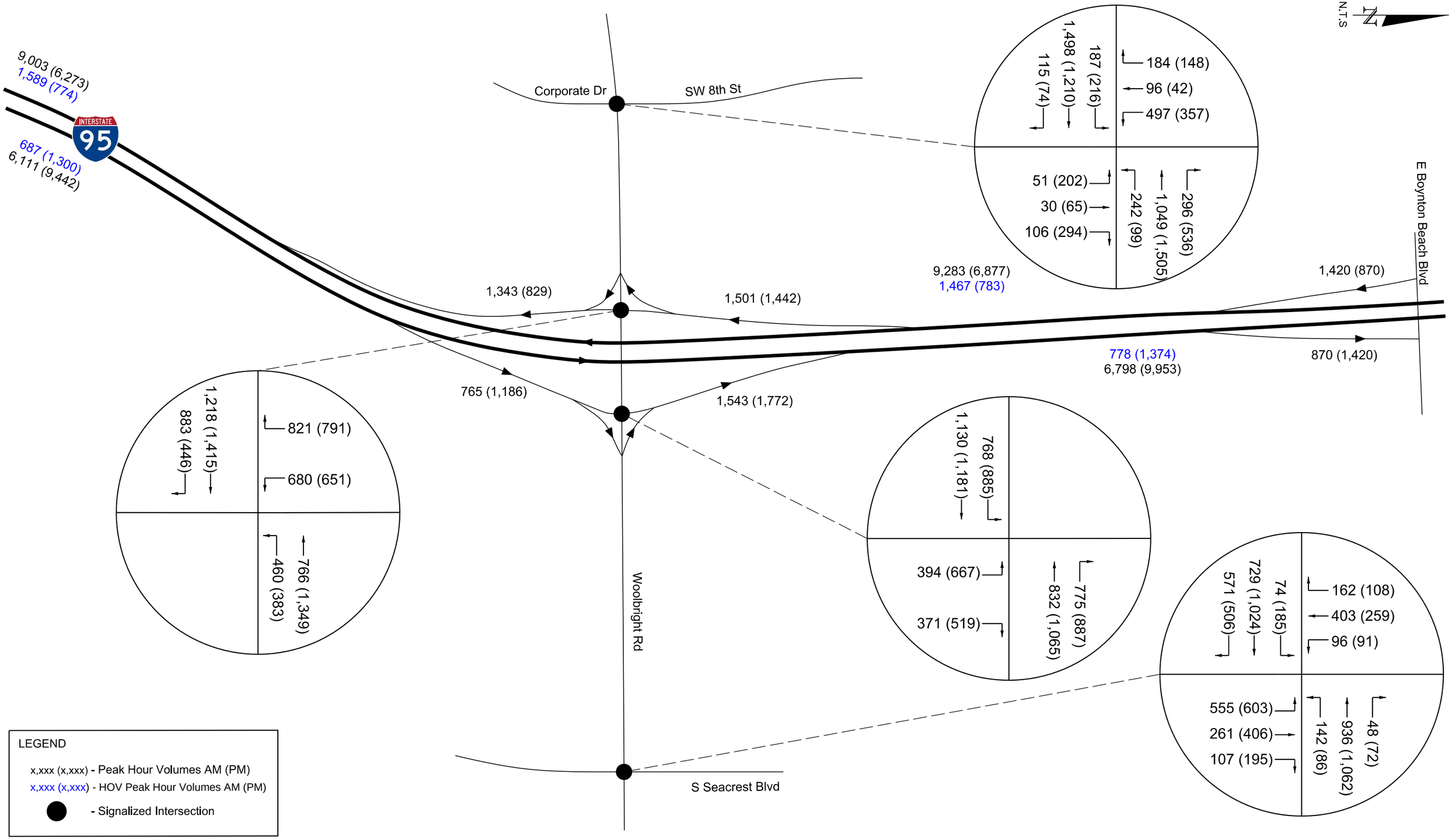
The Opening Year 2025 and Design Year 2045 DDHVs were developed using a combination of K and D factors along with the FDOT's TMTool. The No-Build 2025 and 2045 future year I-95 mainline and ramps DDHVs were estimated by applying the study K and D factors. The K and D factors presented in Section 2.4 were entered in the TMTool for Design Year 2045. The Opening Year 2025 volumes were developed by interpolation between existing year and design year.

The No-Build Alternative 2025 and 2045 future year turning movement volumes for intersections within the project study area were calculated using the FDOT's TMTool. The resulting projected traffic volumes were reviewed for reasonableness and adjustments were made as necessary to reflect growth rates consistent with the study area.

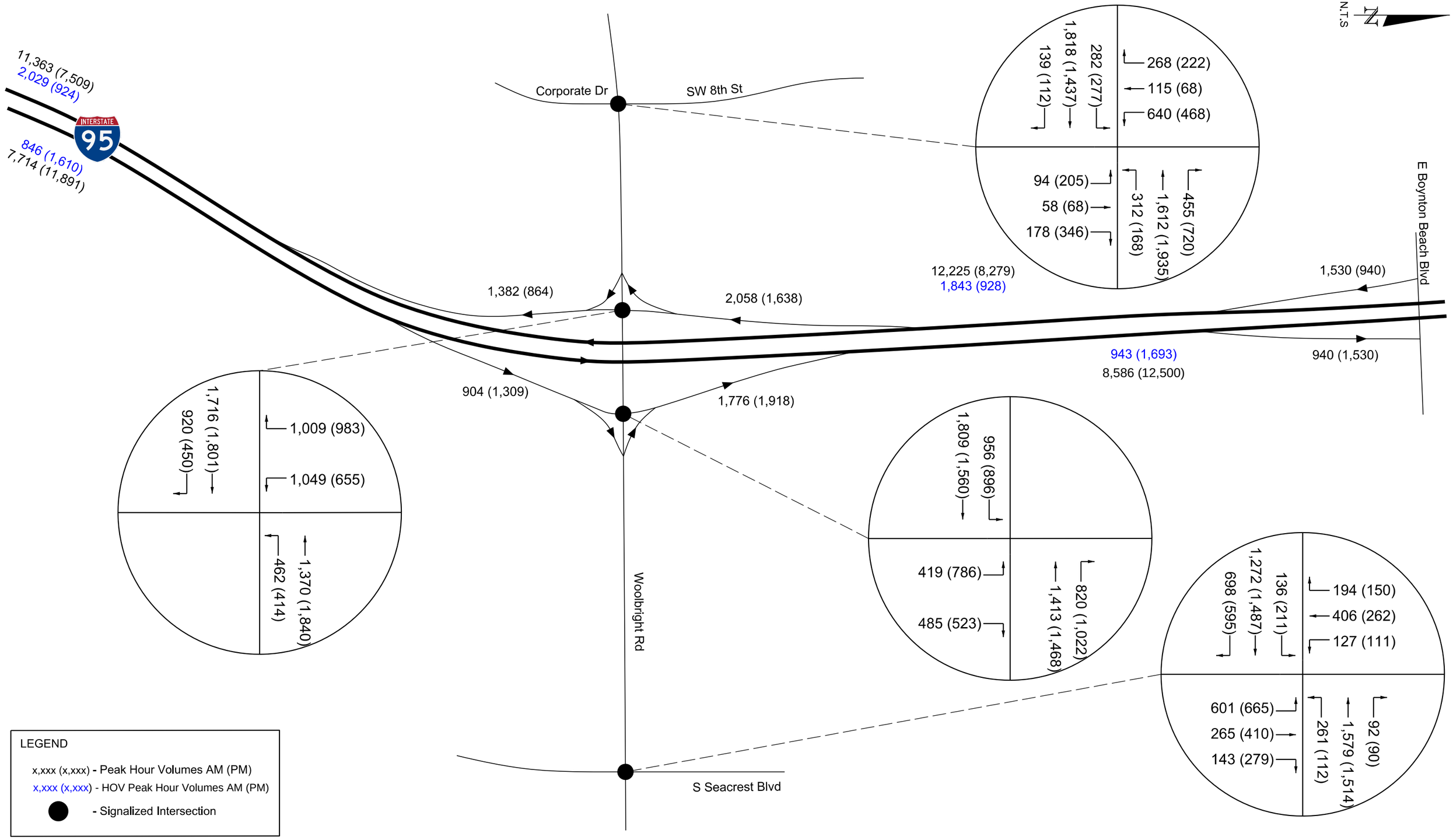
HOV lanes were accounted for in all ramp analysis. The percentage of HOV lanes compared to the total traffic on I-95 was provided via the District 4 I-95 Master Plan Study. The HOV percentage was different depending on the direction and peak hour. In the AM Peak Hour, the SB HOV percentage was between 13-18%, and in the NB direction, it was between 10-12%. In the PM Peak Hour, the SB HOV percentage was between 10-14%, and in the NB direction, it was between 12-14%. The GUL volume was calculated by subtracting the calculated HOV lane volume from the total volume. This methodology was also applied to the mainline volumes between the ramps at the interchanges.

The mainline and ramp DDHVs and intersection TMCs were then balanced and checked for reasonableness. **Figures 5-2** and **5-3** provide the future year No-Build DDHVs for 2025 and 2045, respectively.

The TMTool sheets are presented in **Appendix E**.



Florida Department of Transportation *District Four* *3400 West Commercial Boulevard* *Fort Lauderdale, FL 33309*	I-95/SR 9 Interchange at Woolbright Road Project Development & Environment Study FPID No.: 437279-1-22-02 ETDM No.: 14341	Title: Opening Year 2025 No-Build and Build Peak Hour Volumes	Figure: 5-2



Florida Department of Transportation *District Four* *3400 West Commercial Boulevard* *Fort Lauderdale, FL 33309*	I-95/SR 9 Interchange at Woolbright Road Project Development & Environment Study FPID No.: 437279-1-22-02 ETDM No.: 14341	Title: Design Year 2045 No-Build and Build Peak Hour Volumes	Figure: 5-3

6. NO-BUILD CONDITIONS

This section documents the future conditions within the I-95 at Woolbright Road interchange modification study area for the No-Build Alternative. The No-Build Alternative assumes the existing plus committed roadway network. At this time, there are three projects; I-95 Managed Lane project (FPID #: 444202-1); I-95 at Boynton Beach Boulevard Interchange Design Project (FPID #: 435804-1); and a safety project at the Woolbright Road/Seacrest Boulevard intersection. The analysis years considered under the No-Build Alternative are Opening Year 2025 and Design Year 2045. The operational analysis includes the future year peak hour traffic forecasts for the area of influence. The primary objective of this analysis was to establish the No-Build operational conditions along I-95 and at the study interchange and intersections.

The safety project at the Woolbright Road/Seacrest Boulevard intersection will change the lane configuration at this study intersection, and the No-Build lane configuration is provided in **Figure 6-1**.

6.1 Individual Element No-Build Operational Analysis

An individual element operational analysis was conducted for the No-Build Alternative using HCM methodologies. HCS was used to perform a capacity analysis for the mainline segments and ramps. Synchro 10 was used to analyze the study intersections. The results of this detailed analysis are presented in the following sections**. Figure 6-2** and **Figure 6-3** illustrate the peak hour volumes utilized for the Opening Year 2025 and Design Year 2045 No-Build Alternative HCS and Synchro analysis respectively. Documentation for the No-Build Alternative analysis is provided in **Appendix F**.

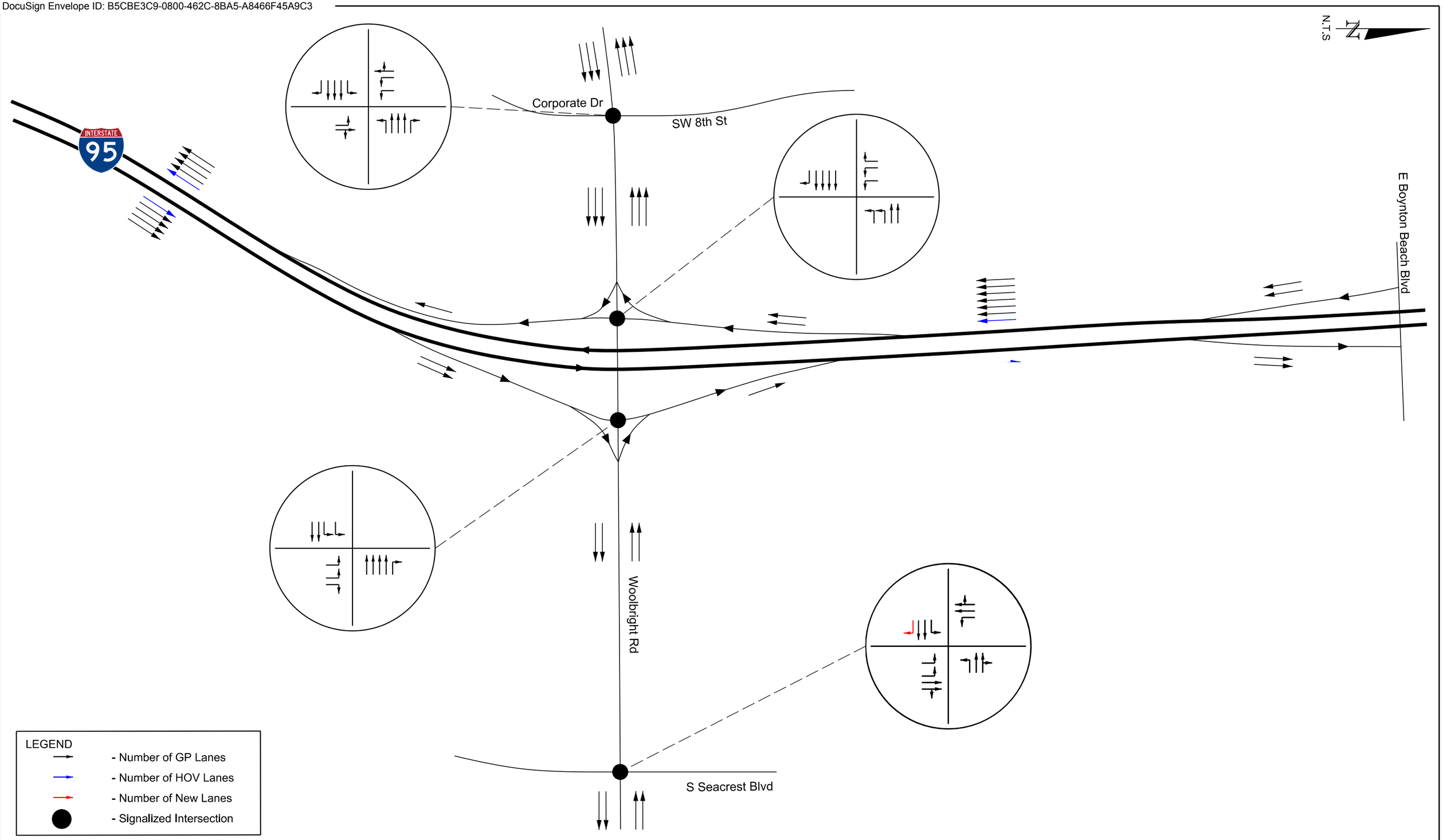
6.1.1 2025 No-Build Analysis

Mainline Analysis – Basic Segments

The results of the operational analysis show that all the mainline segments operate at an acceptable LOS D or better except the following segments (marked as red in **Table 6-1**):

- I-95 NB south of Woolbright Road at LOS F (PM peak hour)
- I-95 SB south of Woolbright Road at LOS F (AM peak hour)
- I-95 NB between Woolbright Road Ramps (PM peak hour)
- I-95 SB between Woolbright Road Ramps (AM peak hour)

Figure 6-2 illustrates the peak hour volumes and LOS results for the 2025 No-Build mainline analysis.



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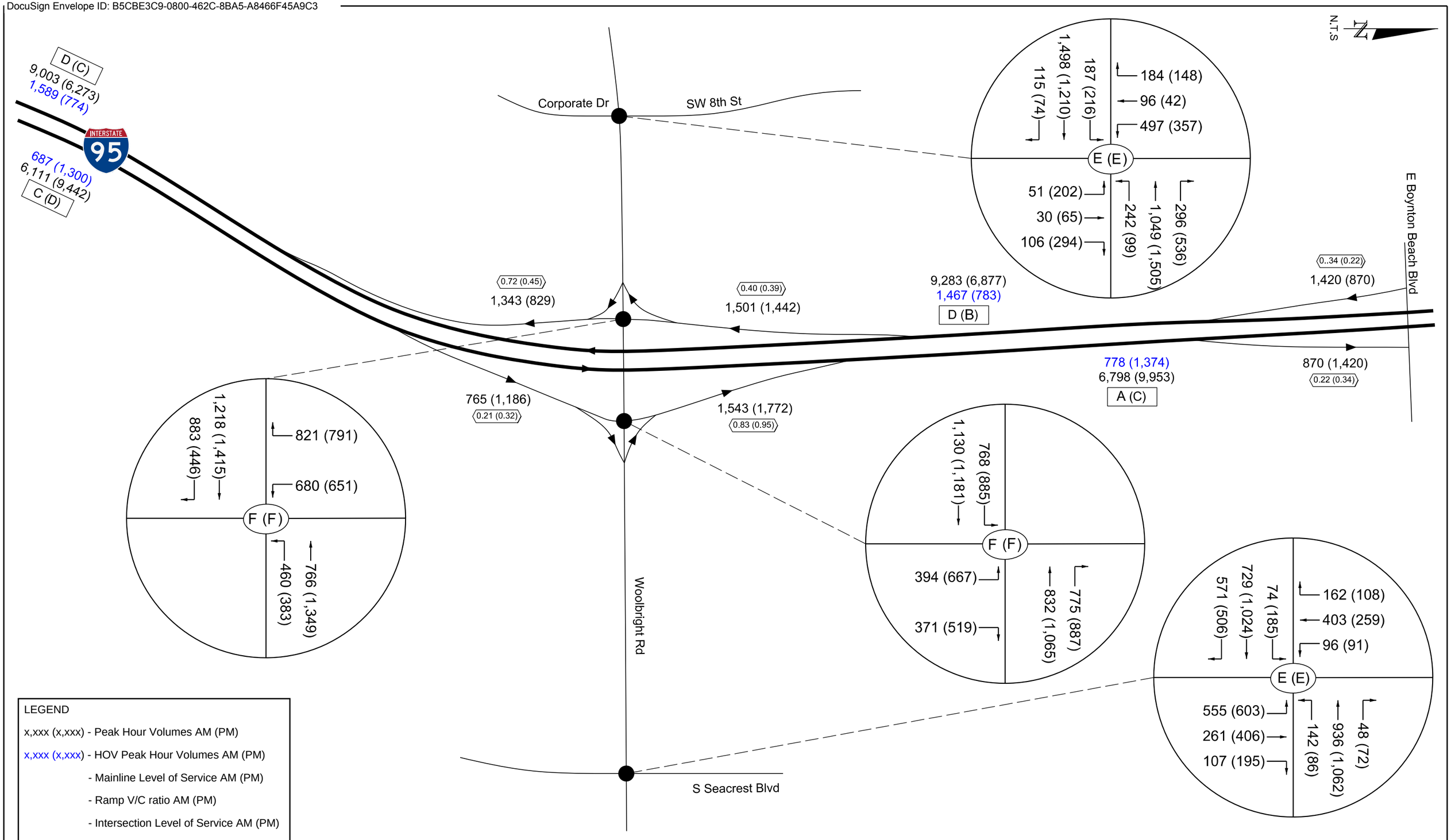
Title: Nc ·Lane Configuration

Figure:



LEGEND

x,xxx (x,xxx) - Peak Hour Volumes AM (PM)

x,xxx (x,xxx) - HOV Peak Hour Volumes AM (PM)

- Mainline Level of Service AM (PM)

- Ramp V/C ratio AM (PM)

- Intersection Level of Service AM (PM)

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Project Development & Environment Study
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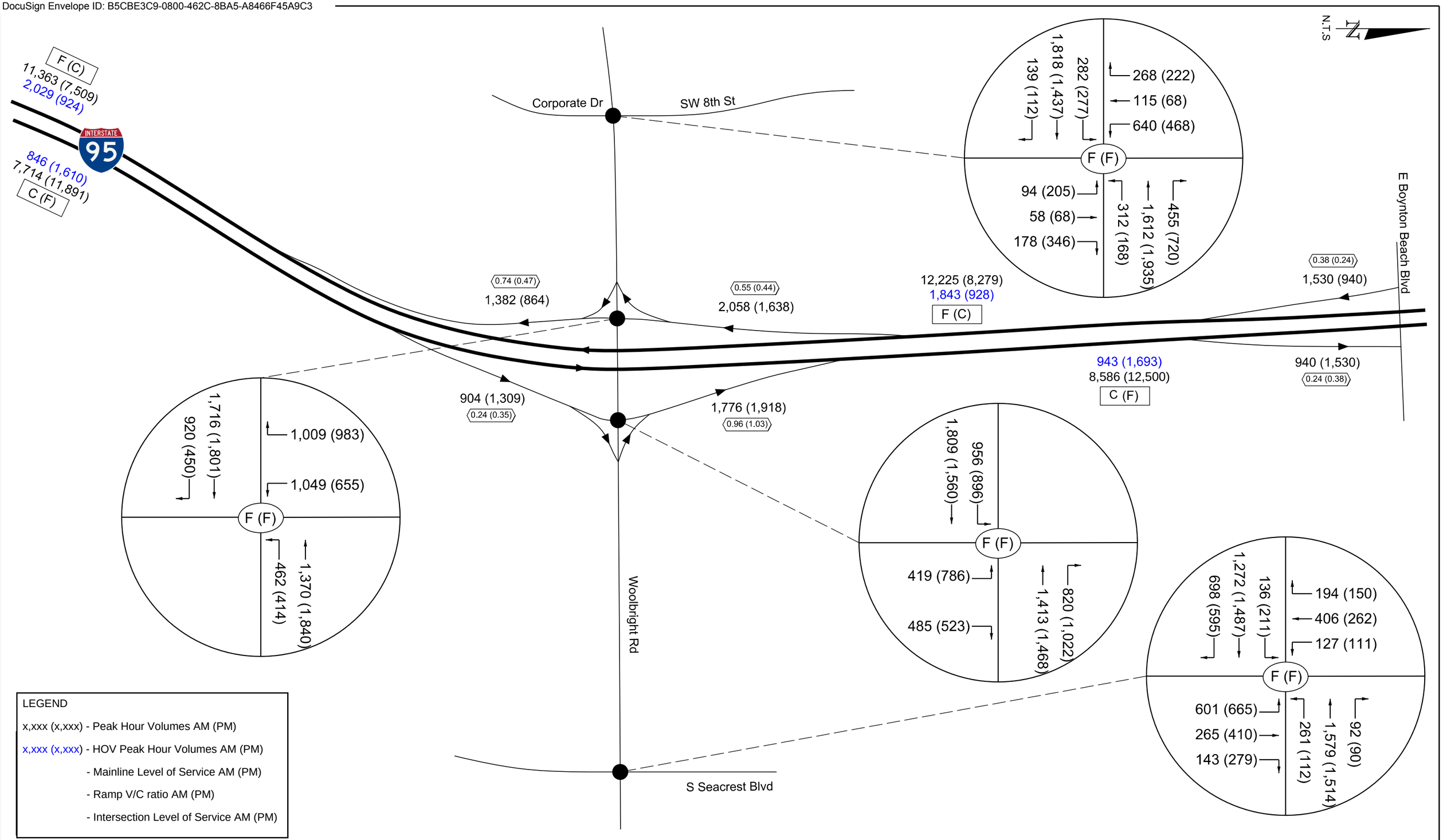
ETDM No.: 14341

Title:

Opening Year 2025 No-Build Alternative Peak Hour Volumes and LOS/V/C Ratio

Figure:



LEGEND

x,xxx (x,xxx) - Peak Hour Volumes AM (PM)

x,xxx (x,xxx) - HOV Peak Hour Volumes AM (PM)

- Mainline Level of Service AM (PM)

- Ramp V/C ratio AM (PM)

- Intersection Level of Service AM (PM)

Florida Department of Transportation
District Four
3400 West Commercial Boulevard
Fort Lauderdale, FL 33309

I-95/SR 9 Interchange at Woolbright Road
Project Development & Environment Study
FPID No.: 437279-1-22-02
ETDM No.: 14341

Title: Design Year 2045 No-Build Peak Hour Volumes and LOS/V/C Ratio

Figure: 6-3

Table 6-1: Opening Year 2025 No-Build Mainline Capacity Analysis Summary

Freeway Segment	Direction	Number of Lanes	AM Peak Hour			PM Peak Hour		
			Volume	Density[1]	LOS	Volume	Density[1]	LOS
I-95 South of Woolbright Road	NB	4	6,111	25.1	C	9,442		F
	SB	4	9,003		F	6,273	25.9	C
I-95 Between Woolbright Off-Ramp and On-Ramp	NB	4	5,346	21.9	C	8,256	40.5	E
	SB	4	7,782	36.9	E	5,435	22.9	C

1. Density = passenger cars/mile/lane

Ramp Analysis – Merge and Diverge Segments

The ramp analysis shows that the following merge and diverge segments will operate at an unacceptable LOS (marked as red in **Table 6-2**):

- I-95 NB Off-Ramp to Woolbright Road at LOS F (PM peak hour)
- I-95 SB On-Ramp from Woolbright Road at LOS F (AM peak hour)

Figure 6-2 illustrates the peak hour volumes and ramp analysis results for the Opening Year 2025 No-Build ramp analysis.

Table 6-2: Opening Year 2025 No-Build Ramp Analysis Summary

Interchange	Ramp	Analysis Type	AM Peak Hour				PM Peak Hour			
			Volume	Density [1]	LOS	V/C	Volume	Density[1]	LOS	V/C
I-95 at Woolbright Road	NB Off	Diverge	765	13.6	B	0.21	1,186	32.4	F	0.32
	SB On	Merge	1,343	33.3	F	0.72	829	21.2	C	0.45

1. Density = passenger cars/mile/lane

Weaving Analysis – Weaving Segments

The weave analysis show that the following two weave segments will operate at an unacceptable LOS (marked as red in **Table 6-3**):

- I-95 NB weave between Woolbright Road and Boynton Beach Boulevard at LOS F (PM peak hour).
- I-95 SB weave between Boynton Beach Boulevard and Woolbright Road at LOS F (AM peak hour).

Figure 6-2 illustrates the peak hour volumes and LOS results for the Opening Year 2025 weaving analysis.

Table 6-3: Opening Year 2025 No-Build Weaving Analysis Summary

Weaving Segment	Direction	AM Peak Hour				PM Peak Hour			
		Volume	Density1	LOS	V/C[1]	Volume	Density1	LOS	V/C[1]
I-95 between Woolbright Road and Boynton Beach Boulevard	NB	6,889	30.8	D	0.68	10,028	--*	F	0.98
	SB	9,283	--*	F	1.13	6,877	24.5	C	0.89

1. Density = passenger cars/mile/lane

Intersection Analysis

The Opening Year 2025 No-Build intersection analysis results are summarized in **Table 6-4**. In Opening Year 2025, all the study intersections operate at LOS E or worse in the AM and PM peak hours. In addition, there are several individual movements that operate at LOS F in the Opening Year 2025 No-Build. These movements are listed below:

Woolbright Road at Corporate Drive/SW 8th Street

- WB right-turn (AM peak hour)
- SB left-turn (AM peak hour)

Woolbright Road at I-95 SB On/Off-Ramps

- EB right-turn (AM and PM peak hours)
- WB through (PM peak hour)
- SB left-turn (AM and PM peak hours)

Woolbright Road at I-95 NB On/Off-Ramps

- WB right-turn (AM and PM peak hours)
- NB left-turn (AM and PM peak hours)

Woolbright Road at Seacrest Boulevard

- NB left-turn (AM and PM peak hours)

Figure 6-2 illustrates the peak hour volumes and LOS results for the Opening Year 2025 intersections analysis.

Table 6-4: Opening Year 2025 No-Build Intersection Analysis Summary

Intersection	Intersection Approach					Overall Intersection	
	Approach	Movement	Peak Hour Volumes	Delay (sec)	LOS	Delay (sec)	LOS
				AM (PM)	AM (PM)	AM (PM)	AM (PM)
Woolbright Road at Corporate Drive/SW 8th Street	Eastbound	Left	187 (216)	40.9 (64.9)	D (E)	56.1 (58.0)	E (E)
		Through	1,498 (1,210)	41.2 (32.4)	D (C)		
		Right	115 (74)	27.1 (24.1)	C (C)		
	Westbound	Left	242 (99)	57.8 (44.8)	E (D)		
		Through	1,049 (1,505)	48.5 (68.2)	D (E)		
		Right	296 (536)	96.3 (73.7)	F (E)		
	Northbound	Left	51 (202)	52.9 (44.4)	D (D)		
		Through/Right	136 (359)	58.7 (78.8)	E (E)		
	Southbound	Left	497 (357)	103.7 (75.7)	F (E)		
		Through/Right	280 (190)	57.5 (50.4)	E (D)		
Woolbright Road at I-95 Southbound Ramps	Eastbound	Through	1,218 (1,415)	27.3 (56.0)	C (E)	87.4 (87.0)	F (F)
		Right	883 (446)	138.6 (156.6)	F (F)		
	Westbound	Left	460 (383)	30.9 (39.2)	C (D)		
		Through	766 (1,349)	32.4 (80.4)	C (F)		
	Southbound	Left	680 (651)	332.4 (252.9)	F (F)		
		Right	821 (791)	1.4 (1.3)	A (A)		
Woolbright Road at I-95 Northbound Ramps	Eastbound	Left	768 (885)	28.0 (31.8)	C (C)	82.9 (124.8)	F (F)
		Through	1,130 (1,181)	18.7 (14.9)	B (B)		
	Westbound	Through	832 (1,065)	49.1 (62.3)	D (E)		
		Right	775 (887)	126.3 (255.7)	F (F)		
	Northbound	Left	394 (667)	437.0 (464.7)	F (F)		
		Right	371 (519)	0.4 (0.6)	A (A)		
Woolbright Road at Seacrest Boulevard	Eastbound	Left	74 (185)	55.6 (61.9)	E (E)	56.0 (57.8)	E (E)
		Through	729 (1,024)	26.9 (36.0)	C (D)		
		Right	571 (506)	71.7 (53.5)	E (D)		
	Westbound	Left	142 (86)	38.5 (37.9)	D (D)		
		Through/Right	984 (1,134)	35.7 (45.8)	D (D)		
	Northbound	Left	555 (603)	115.3 (116.9)	F (F)		
		Through/Right	368 (601)	42.4 (55.4)	D (E)		
	Southbound	Left	96 (91)	69.0 (79.8)	E (E)		
		Through/Right	565 (367)	65.6 (65.2)	E (E)		

Table 6-5 summarizes the queue analysis for Opening Year 2025 No-Build Alternative. In the Opening Year, the 95th Percentile queue length exceeds the storage at the following intersection approaches marked as red in **Table 6-5**:

- EB left-turn at Woolbright Road and SW 8th Street intersection (PM peak hour)
- WB right-turn at Woolbright Road and I-95 NB ramp terminal (PM peak hour)
- NB left-turn at Woolbright Road and Seacrest Boulevard intersection (AM and PM peak hours)

Table 6-5: 95th Intersection Percentile Queue Length Summary – Opening Year 2025 No-Build

Intersection	Time Period	95th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Woolbright Road at Corporate Drive /SW 8th Street	AM Peak	#219	#668	35	295	385	168	63	90	-	#375	288	-
	PM Peak	270	480	2	m107	m#791	m145	187	330	-	243	128	-
	Available Storage (feet)	***250***	***1,300***	***225***	***300***	***1,250***	***375***	***400***	***>1,000***		***>1,000***	***>1,000***	
Woolbright Road at I-95 Southbound Ramps	AM Peak	-	m300	m#994	m95	m129	-	-	-	-	#602	-	0
	PM Peak	-	459	376	m97	m190	-	-	-	-	#585	-	0
	Available Storage (feet)	***-***	***1,250***	***1,350***	***900***	***500***	***-***	***-***	***-***	***-***	***>1,700***	***-***	***400***
Woolbright Road at I-95 Northbound Ramps	AM Peak	m146	m120	-	-	m175	m#432	#400	-	0	-	-	-
	PM Peak	m191	m105	-	-	m356	m#1156	#664	-	0	-	-	-
	Available Storage (feet)	***900***	***500***	***-***	***-***	***2,250***	***675***	***>1,300***	***-***	***400***	***-***	***-***	***-***
Woolbright Road at Seacrest Boulevard	AM Peak	m75	384	507	111	480	-	#491	201	-	149	321	-
	PM Peak	#233	366	151	#125	#679	-	#507	341	-	157	220	-
	Available Storage (feet)	***300***	***2,250***	***600***	***300***	***900***		***475***	***>1,000***		***180***	***>1,000***	

95th percentile volume exceeds capacity, queue maybe longer.
m: Volume for 95th percentile queue is metered by upstream signal.
Storage length noted above is turn pocket length for left/right turn movements or link distance per lane to adjacent signalized intersection for through movements.
Storage length for arterial left turns at ramp terminals is distance between ramp terminals plus extended defacto left turn pocket length.

6.1.2 2045 No-Build Analysis

Mainline Analysis

The Design Year 2045 No-Build mainline analysis is summarized in **Table 6-6**. The results of the operational analysis show that all the mainline segments operate at an acceptable LOS D or better except the following segments (marked as red in **Table 6-1**):

- I-95 NB south of Woolbright Road at LOS F (PM peak hour)
- I-95 SB south of Woolbright Road at LOS F (AM peak hour)
- I-95 NB between Woolbright Road Ramps (PM peak hour)
- I-95 SB between Woolbright Road Ramps (AM peak hour)

Figure 6-3 illustrates the peak hour volumes and LOS results for the 2045 No-Build mainline analysis.

Table 6-6: Design Year 2045 No-Build Mainline Capacity Analysis Summary

Freeway Segment	Direction	Number of Lanes	AM Peak Hour			PM Peak Hour		
			Volume	Density[1]	LOS	Volume	Density[1]	LOS
I-95 South of Woolbright Road	NB	4	7,714	35.1	E	11,891	--*	F
	SB	4	11,363	--*	F	7,509	33.6	D
I-95 Between Woolbright Off-Ramp and On-Ramp	NB	4	6,810	29.5	D	10,582	--*	F
	SB	4	10,167	--*	F	6,641	29.0	D

1. Density = passenger cars/mile/lane

* HCS analysis does not report densities for LOS F results. The missing densities have LOS F, as shown in the output files.

Ramp Analysis

The Design Year 2045 No-Build ramp analysis results are summarized in **Table 6-7**. The results of the operational analysis show that all study ramps have adequate capacity based on the volume except the following ramps where the volume will exceed capacity:

- I-95 NB Off-Ramp to Woolbright Road at LOS F (PM peak hour)
- I-95 SB On-Ramp from Woolbright Road at LOS F (AM peak hour)

Figure 6-3 illustrates the peak hour volumes and ramp analysis results for the Design Year 2045 No-Build ramp analysis.

Table 6-7: Design Year 2045 No-Build Ramp Analysis Summary

Interchange	Ramp	Analysis Type	AM Peak Hour				PM Peak Hour			
			Volume	Density [1]	LOS	V/C	Volume	Density[1]	LOS	V/C
I-95 at Woolbright Road	NB Off	Diverge	904	19.5	B	0.24	1,309	55.3	F	0.35
	SB On	Merge	1,382	51.5	F	0.74	864	25.6	C	0.47

1. Density = passenger cars/mile/lane

Weaving Analysis

The Design Year 2045 weaving analysis results are summarized in **Table 6-8**. The results of the operational analysis show that the I-95 SB and NB weave segments operate at an unacceptable LOS in AM and PM peak hours (marked as red in **Table 6-8**).

Figure 6-2 illustrates the peak hour volumes and LOS results for the Design Year 2045 weaving analysis.

Table 6-8: Design Year 2045 No-Build Weaving Analysis Summary

Weaving Segment	Direction	AM Peak Hour				PM Peak Hour			
		Volume	Density[1]	LOS	V/C	Volume	Density[1]	LOS	V/C
I-95 between Woolbright Road and Boynton Beach Boulevard	NB	8,586	41.4	**E**	**0.83**	12,500	--*	F	1.2
	SB	12,225	--*	F	1.41	8,279	--*	F	1.01

1. Density = passenger cars/mile/lane

* HCS analysis does not report densities for LOS F results. The missing densities have LOS F, as shown in the output files.

Intersection Analysis

The Design Year 2045 No-Build intersection analysis results are summarized in **Table 6-9**. In Design Year 2045, all the study intersections operate at LOS E or worse in the AM and PM peak hours. In addition, there are several individual movements that operate at LOS F in the Design Year 2045 No-Build. These movements are listed below:

Woolbright Road at Corporate Drive/SW 8th Street

- EB left-turn and through (AM peak hour)
- WB left-turn (AM peak hour)
- WB through (AM and PM peak hours)
- WB right-turn (AM peak hour)
- NB through/right-turn (PM peak hour)

Woolbright Road at I-95 SB On/Off-Ramps

- EB right-turn (AM peak hour)
- WB through (AM and PM peak hours)
- SB left-turn (AM and PM peak hours)

Woolbright Road at I-95 NB On/Off-Ramps

- EB left-turn and through (AM peak hour)
- WB right-turn (PM peak hour)
- NB left-turn (AM and PM peak hours)

Woolbright Road at Seacrest Boulevard

- EB left-turn (AM peak hour)
- EB through (AM and PM peak hours)
- WB left-turn and through/right-turn (AM peak hour)
- NB left-turn and through/right-turn (PM peak hour)
- SB left-turn (AM and PM peak hours)

Figure 6-3 illustrates the peak hour volumes and LOS results for the Design Year 2045 intersections analysis.

Table 6-9: Design Year 2045 No-Build Intersection Analysis Summary

Intersection	Intersection Approach					Overall Intersection	
	Approach	Movement	Peak Hour Volumes	Delay (sec)	LOS	Delay (sec)	LOS
				AM (PM)	AM (PM)	AM (PM)	AM (PM)
Woolbright Road at Corporate Drive/SW 8th Street	Eastbound	Left	282 (277)	174.7 (73.3)	F (E)	138.4 (117.8)	F (F)
		Through	1,818 (1,437)	205.7 (50.9)	F (D)		
		Right	139 (112)	37.4 (33.0)	D (C)		
	Westbound	Left	312 (168)	250.5 (55.5)	F (E)		
		Through	1,612 (1,935)	133.0 (245.9)	F (F)		
		Right	455 (720)	87.1 (46.6)	F (D)		
	Northbound	Left	94 (205)	58.3 (70.6)	E (E)		
		Through/Right	236 (414)	72.7 (82.1)	E (F)		
	Southbound	Left	640 (468)	43.7 (67.9)	D (E)		
		Through/Right	383 (290)	39.1 (48.0)	D (D)		
Woolbright Road at I-95 Southbound Ramps	Eastbound	Through	1,716 (1,801)	69.0 (58.4)	E (E)	126.2 (120.9)	F (F)
		Right	920 (450)	181.0 (52.3)	F (D)		
	Westbound	Left	462 (414)	31.7 (52.3)	C (D)		
		Through	1,370 (1,840)	90.7 (248.1)	F (F)		
	Southbound	Left	1,049 (655)	378.8 (204.3)	F (F)		
		Right	1,009 (983)	2.3 (2.1)	A (A)		
Woolbright Road at I-95 Northbound Ramps	Eastbound	Left	956 (896)	96.5 (41.0)	F (D)	93.8 (154.7)	F (F)
		Through	1,809 (1,560)	94.9 (23.7)	F (C)		
	Westbound	Through	1,413 (1,468)	48.0 (56.9)	D (E)		
		Right	820 (1,022)	64.2 (405.2)	E (F)		
	Northbound	Left	419 (786)	402.9 (504.1)	F (F)		
		Right	485 (523)	0.5 (0.6)	A (A)		
Woolbright Road at Seacrest Boulevard	Eastbound	Left	136 (211)	117.8 (64.8)	F (E)	102.7 (104.8)	F (F)
		Through	1,272 (1,487)	31.7 (46.5)	C (D)		
		Right	698 (595)	37.4 (40.8)	D (D)		
	Westbound	Left	261 (112)	338.1 (102.7)	F (F)		
		Through/Right	1,671 (1,604)	115.2 (182.6)	F (F)		
	Northbound	Left	601 (665)	266.7 (160.6)	F (F)		
		Through/Right	408 (689)	46.4 (92.1)	D (F)		
	Southbound	Left	127 (111)	85.1 (64.3)	F (E)		
		Through/Right	600 (412)	66.4 (68.3)	E (E)		

Table 6-10 summarizes the queue analysis for Design Year 2045 No-Build Alternative. In the Design Year 2045, the 95th Percentile queue length exceeds the storage at the following intersection approaches marked as red in **Table 6-10**:

- EB left-turn at Woolbright Road and SW 8th Street intersection (AM and PM peak hours)
- WB left-turn at Woolbright Road and SW 8th Street intersection (AM peak hour)
- WB right-turn at Woolbright Road and I-95 NB ramp terminal (PM peak hour)
- WB left-turn at Woolbright Road and Seacrest Boulevard intersection (AM peak hour)
- WB through at Woolbright Road and Seacrest Boulevard intersection (AM and PM peak hours)
- NB left-turn at Woolbright Road and Seacrest Boulevard intersection (AM and PM peak hours)
- SB left-turn at Woolbright Road and Seacrest Boulevard intersection (AM peak hour)
- WB through at Woolbright Road and I-95 SB ramp terminal (AM and PM peak hours)

Table 6-10: 95th Intersection Percentile Queue Length Summary – Design Year 2045 No-Build

Intersection	Time Period	95th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Woolbright Road at Corporate Drive /SW 8th Street	AM Peak	#517	#923	15	m#473	m#745	m118	135	210	-	366	351	-
	PM Peak	#363	571	0	m133	m#821	m147	257	391	-	#441	282	-
	Available Storage (feet)	***250***	***1,300***	***225***	***300***	***1,250***	***375***	***400***	***>1,000***		***>1,000***	***>1,000***	
Woolbright Road at I-95 Southbound Ramps	AM Peak	-	m240	m242	m110	m707	-	-	-	-	#894	-	0
	PM Peak	-	#623	m341	m107	m#912	-	-	-	-	#567	-	0
	Available Storage (feet)	***-***	***1,250***	***1,350***	***900***	***500***	***-***	***-***	***-***	***-***	***>1,700***	***-***	***400***
Woolbright Road at I-95 Northbound Ramps	AM Peak	m259	m123	-	-	m279	m152	#414	-	0	-	-	-
	PM Peak	m229	m106	-	-	m388	m#880	#775	-	0	-	-	-
	Available Storage (feet)	***900***	***500***	***-***	***-***	***2,250***	***675***	***>1,300***	***-***	***400***	***-***	***-***	***-***
Woolbright Road at Seacrest Boulevard	AM Peak	m#123	m656	m558	#495	#1,130	-	#565	211	-	#220	338	-
	PM Peak	m161	#929	m176	#198	#1,245	-	#628	#472	-	179	236	-
	Available Storage (feet)	***300***	***2,250***	***600***	***300***	***900***		***475***	***>1,000***		***180***	***>1,000***	

95th percentile volume exceeds capacity, queue may be longer.
m: Volume for 95th percentile queue is metered by upstream signal.
Storage length noted above is turn pocket length for left/right turn movements or link distance per lane to adjacent signalized intersection for through movements.
Storage length for arterial left turns at ramp terminals is distance between ramp terminals plus extended defacto left turn pocket length.

7. ALTERNATIVES

As part of this IMR, the following alternatives have been analyzed:

- No-Build Alternative
- Build Alternative 1 – Tight Diamond Interchange (TDI)
- Build Alternative 2 – Diverging Diamond Interchange (DDI)
- Build Alternative 3 – Single Point Urban Interchange (SPUI)

For the future Build Alternative, the number of lanes and volumes on I-95 and I-95 ramps at the junction areas will be the same as the No-Build Alternative. Therefore, the ramps merge/diverge/weaving analysis will also be the same as the No-Build Alternative.

7.1 No-Build Alternative

The No-Build alternative provides a baseline for comparison to all study alternatives. This alternative represents the existing physical and operational conditions within the area of influence including all planned and programmed roadway improvements over the course of the analysis years. The basis for any interchange proposal is based on a comparison of the No-Build and Build Alternatives, identification of the network that is considered in the No-Build Alternative in each analysis year is required.

At this time, the No-Build alternative considers the existing configuration plus any programmed improvement with future traffic. The No-Build Alternative does not satisfy the objectives of this project. The operational analysis results for the No-Build Alternative are provided in **Section 6**.

7.2 Build Alternatives

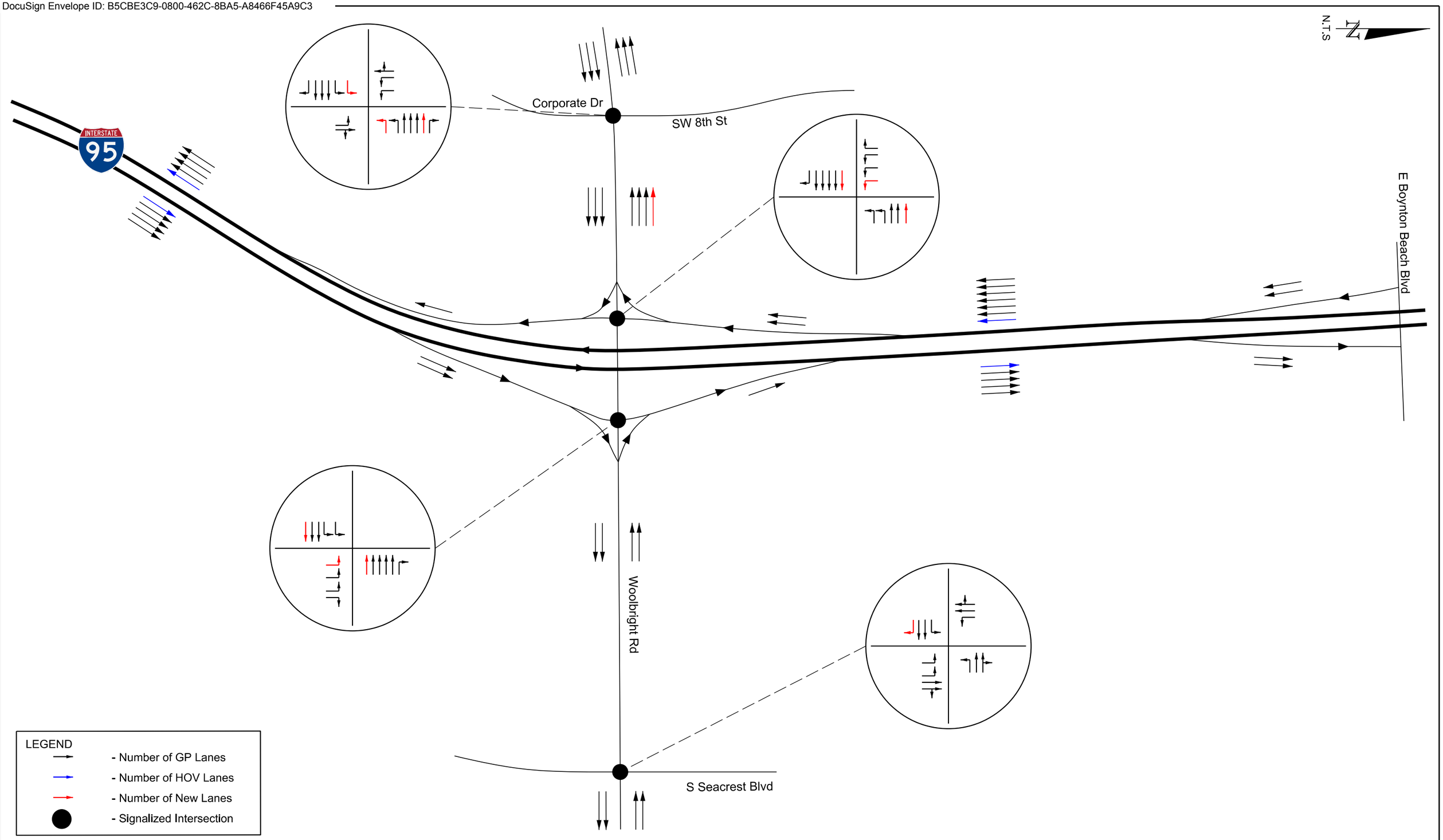
Build Alternative 1

Build Alternative 1 maintains the existing TDI configuration. Within the study area, no improvements are proposed along the I-95 and ramps at the gore area. The following improvements are proposed under Build Alternative 1:

- Add third left-turn lane on the I-95 NB off-ramp.
- Add a fifth through lane on the WB approach at the I-95 NB ramp terminal.
- Add a third through lane on the EB approach at the I-95 NB ramp terminal.
- Add third left-turn lane on the I-95 SB off-ramp.

- Add a fifth through lane on the WB approach at the I-95 SB ramp terminal.
- Add a third through lane on the EB approach at the I-95 SB ramp terminal.
- Add a fourth lane along Woolbright Road segment on the WB direction between the I-95 SB ramp terminal and SW 8th Street.
- Add a second left-turn lane on WB and EB approach at SW 8th Street intersection.
- Add a fourth through lane at the WB approach at Woolbright Road and SW 8th Street intersection.
- Add a right-turn lane on the EB approach Seacreast Boulevard intersection.

The improvements are illustrated in **Figure 7-1**.



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Title: Build Alternative - TDI Lane Configuration

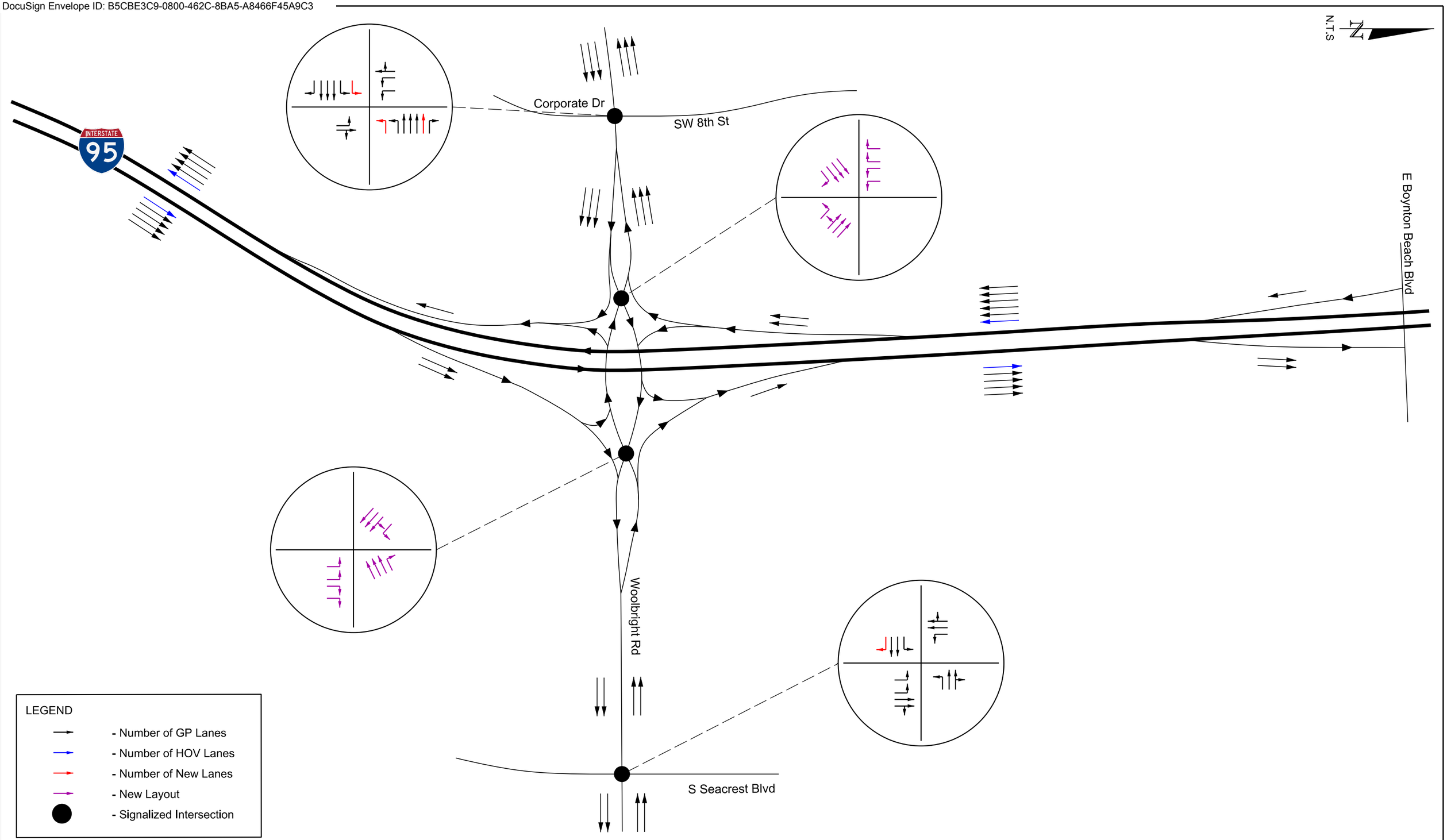
Figure: 7-1

Build Alternative 2

Build Alternative 2 reconfigures the existing Diamond Interchange into a Diverging Diamond Interchange (DDI) configuration (See **Figure 7-2**). The DDI concept requires drivers to briefly cross to the left, or opposite side of the road at carefully designed crossover intersections. Drivers travel for a short distance, then cross back to the traditional or right side of the road. This unconventional design allows movements for the left and right-turns to and from the I-95 ramps onto Woolbright Road without crossing the path of opposing traffic. The crossover is made at the signal where the opposing traffic flows split the signal green time. The major advantage of this type of interchange is that the left-turning vehicles do not require a signal phase which makes this a two-phased signal system with more green time for the opposing traffic. In addition, the DDI has fewer conflict points (i.e. 14 for DDI, 26 for TDI) resulting in significant safety and operational improvement at the interchange. The following improvements are proposed to accommodate the design year traffic demand under Build Alternative 2:

- Widen Woolbright Road to provide 3 lanes in each direction between SW 8th Street and I-95 NB ramp terminal.
- Provide dual right-turn lanes and dual left-turn lanes for the SR 9/I-95 NB and SB off-ramps.
- Provide dual EB and WB left-turn lanes onto I-95 SB and NB on-ramps, respectively.
- Add a fourth lane along Woolbright Road segment on the WB direction between the I-95 SB ramp terminal and SW 8th Street.
- Add a second left-turn lane on WB and EB approach at SW 8th Street intersection.
- Add a fourth through lane at the WB approach at Woolbright Road and SW 8th Street intersection.
- Add a right-turn lane on the EB approach Seacreast Boulevard intersection.

These improvements are necessary to enhance the operations of the intersections within the interchange influence area. This alternative will demolish the existing bridges over I-95 and the SFRC and two new bridges (one EB and one WB) will be built over I-95 and the SFRC. The proposed improvements will also require right of way impacts to 5 properties along Woolbright Road including 3 relocations (1 business and 2 residents). A typical section for Build Alternative 2 is provided in **Appendix G**.



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Title:

Build Alternative 2 - DDI Lane Configuration

Figure:

7-2

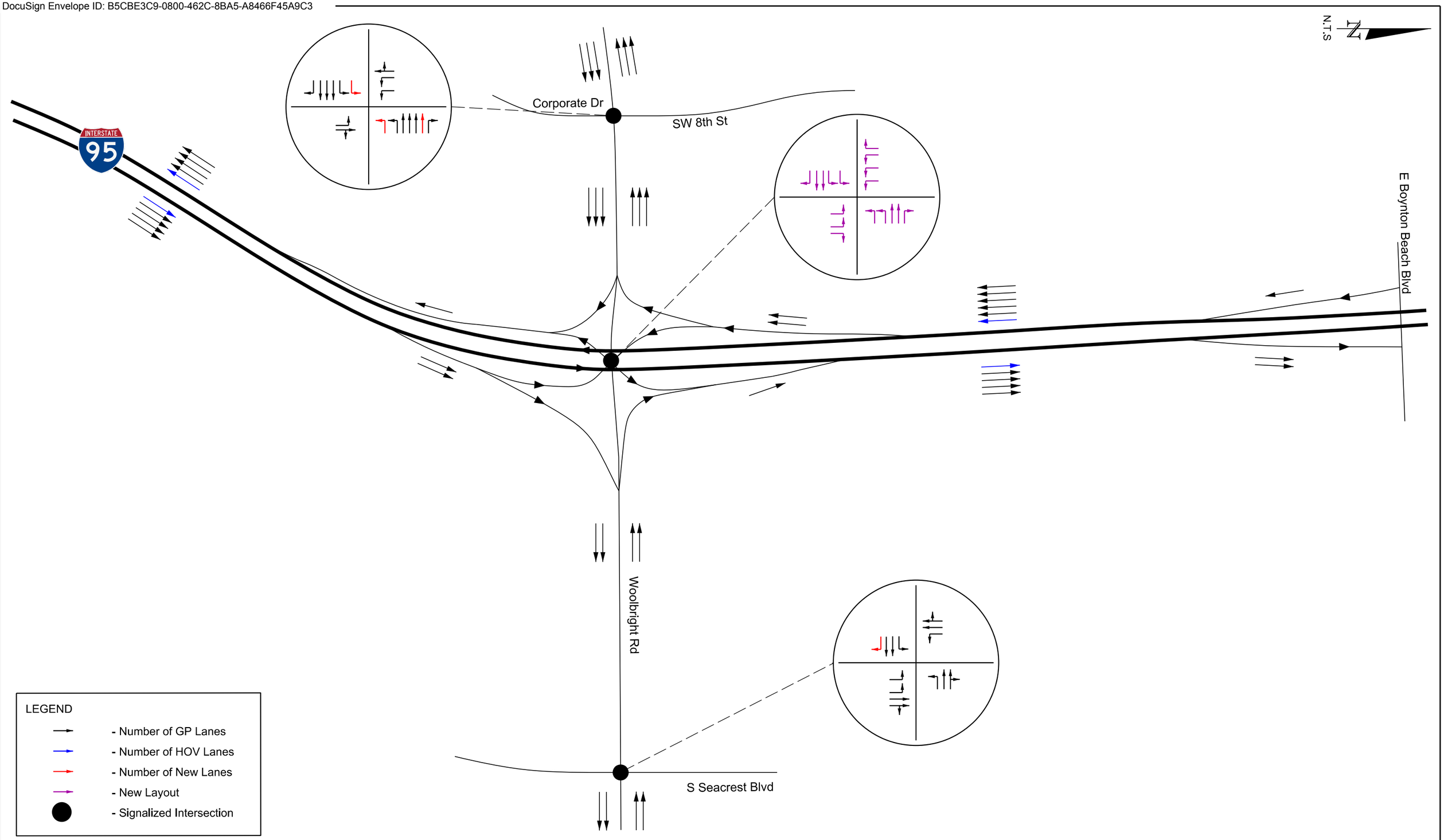
Build Alternative 3

Build Alternative 3 reconfigures the existing Diamond Interchange into SPUI configuration (See **Figure 7-3**). The SPUI concept consolidates the two intersections of a Diamond Interchange into one single intersection. This allows left-turning traffic from both directions of the intersecting roadways to turn simultaneously without crossing the path of the opposing left-turns. Since traffic passing through the SPUI is controlled by a single signal, vehicles can clear the intersection much more quickly compared to a Diamond Interchange. The major advantages of SPUI are improved operational efficiency and safety. This can be attributed to the single, three-phase traffic signal and less conflict points compared to the Diamond Interchange. In addition, the SPUI also allows for wider turns, easing movement for heavy trucks. The following improvements are proposed to accommodate the design year traffic demand under Build Alternative 3:

- Widen Woolbright Road to provide 3 lanes in each direction from SW 8th Street to I-95 ramp terminal.
- Provide triple left-turn lanes for the I-95 SB off-ramp and dual left-turn lanes for the I-95 NB off-ramp.
- Provide dual EB and WB left-turn lanes from Lantana Road to the I-95 SB and NB on-ramps, respectively.
- Add a fourth lane along Woolbright Road segment on the WB direction between the I-95 SB ramp terminal and SW 8th Street.
- Add a second left-turn lane on WB and EB approach at SW 8th Street intersection.
- Add a fourth through lane at the WB approach at Woolbright Road and SW 8th Street intersection.
- Add a right-turn lane on the EB approach Seacreast Boulevard intersection.

These improvements are necessary to enhance the operations of the intersections within the interchange influence area. This alternative will demolish the existing bridge over I-95 and a new bridge will be constructed.

Documentation for the Build Alternative analysis is provided in **Appendix G**.



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Title:

Build Alternative 3 - SPUI Lane Configuration

Figure:

7-3

7.3 Build Design Traffic

The Build Alternative design traffic for Opening Year 2025 and Design Year 2045 was developed by keeping the same volumes for the freeway, ramps and turning volumes at the intersections as the No-Build traffic. The AADT in the Build Alternative will be the same as the AADT under No-Build Alternative. The Opening Year 2025 and Design Year 2045 intersection turning movement volumes and DDHV during the AM and PM peak hours for the Build Alternative are similar to the No-Build Alternative that are presented in **Figures 5-2 and 5-3** (see page 53 and 54).

8. EVALUATION OF ALTERNATIVES

This section discusses the analysis of alternatives based on safety, operational and engineering factors. The No-Build Alternative was evaluated in **Section 6.** A comparison of the No-Build and the Build Alternatives are provided in this section. The evaluation criteria are described as follows:

- Conformance with Regional and State Transportation Plans
- Compliance with FHWA Requirements
- Traffic Operational Performance
- Safety
- Achievement of Objectives

8.1 Conformance with Local, Regional, and State Transportation Plans

The improvements proposed in the IMR for the Build Alternative are consistent with improvement plans incorporated in Florida's SIS, 2040 Long Range Cost Feasible Plan and the Statewide Transportation Improvement Program (STIP). The proposed improvements are consistent with the current 2040 Cost Feasible LRTP, adopted by Palm Beach County and the TPA. The improvements are also incorporated in the TPA's TIP.

8.2 Compliance with Policies and Engineering Standards

The design criteria for this project are based on design parameters outlined in the FDOT Design Manual (FDM), the FDOT Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways and AASHTO's A Policy on Geometric Design of Highway and Streets published in 2011.

8.3 HCM Based Individual Element Build Operational Analysis

An individual element operational analysis was conducted for the Build Alternative using the HCM 6th Edition methodologies. The LOS for individual freeway elements was determined using HCS 7.7. Ramp analysis was performed by calculating the v/c ratio at the study ramps. Synchro 10.3 was used to analyze the study intersections. The results of this detailed analysis are presented in the following sections. Documentation for the Build Alternative analysis is provided in **Appendix G**.

8.4 Build Alternatives Operational Analysis

The Build Alternative being considered for the Woolbright Road interchange along I-95 and is described in detail in **Section 7**.

The No-Build Alternative Operational analyses presented in Section 6 of this IMR, demonstrated that failing conditions are expected within the study area by Design Year 2045 if no infrastructure improvements are considered. To address these operational deficiencies, three Build Alternatives were developed and evaluated for the Woolbright Road interchange. The operational analysis for the Build Alternatives was performed using HCM procedures and discussed in the sections below.

It should be noted that the proposed improvements will not include any design modification to I-95 mainline and merge/diverge areas. Therefore, the Opening Year 2025 and Design Year 2045 Build Alternative freeway, weaving and ramp analysis is the same as the No-Build in **Section 6.1**. Microsimulation analysis using VISSIM was not performed considering the type of recommended improvements in this IMR. The recommended improvements such as addition of turn lanes at the intersections were analyzed using Synchro.

8.4.1 Build Alternative 1 - TDI

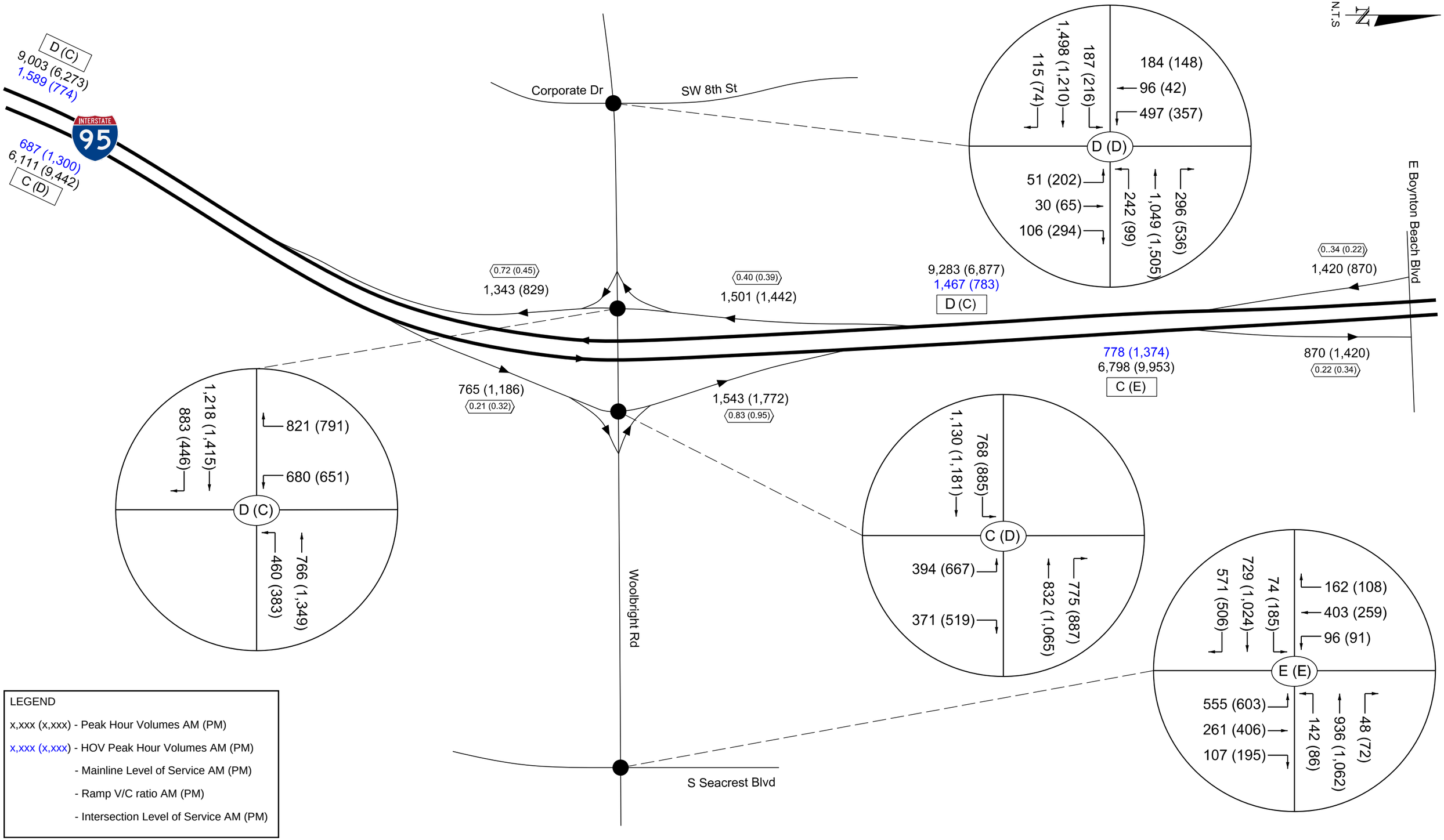
Opening Year 2025 Build Alternative 1 – TDI Analysis

Intersection Analysis

The Opening Year 2025 Build intersection analysis results are summarized in **Table 8-1**. In Opening Year 2025 the Build Alternative 1 operates at acceptable LOS at all study intersections except Woolbright Road at Seacrest Boulevard intersection which will operate at LOS E or worse in the AM and PM peak hours. There is only one movement that is failing in the Opening Year 2025 at Woolbright Road and Seacrest Boulevard intersection as listed below:

- NB left-turn (AM and PM peak hours)

Figure 8-1 illustrates the peak hour volumes and LOS results for all the 2025 Build Alternative 1 - TDI intersections analysis.



LEGEND

x,xxx (x,xxx) - Peak Hour Volumes AM (PM)

x,xxx (x,xxx) - HOV Peak Hour Volumes AM (PM)

- Mainline Level of Service AM (PM)

- Ramp V/C ratio AM (PM)

- Intersection Level of Service AM (PM)

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Title: Opening Year 2025 Build Alternative - TDI Peak Hour Volumes and LOS/VC Ratios

Figure: 8-1

Table 8-1: Opening Year 2025 Build Alternative 1 – TDI Intersection Analysis Summary

Intersection	Intersection Approach					Overall Intersection	
	Approach	Movement	Peak Hour Volumes	Delay (sec)	LOS	Delay (sec)	LOS
				AM (PM)	AM (PM)	AM (PM)	AM (PM)
Woolbright Road at Corporate Drive/SW 8th Street	Eastbound	Left	187 (216)	70.7 (79.3)	E (E)	47.4 (39.5)	D (D)
		Through	1,498 (1,210)	40.5 (32.6)	D (C)		
		Right	115 (74)	27.2 (24.3)	C (C)		
	Westbound	Left	242 (99)	74.0 (57.9)	E (E)		
		Through	1,049 (1,505)	41.0 (24.3)	D (C)		
		Right	296 (536)	23.5 (15.1)	C (B)		
	Northbound	Left	51 (202)	59.1 (70.4)	E (E)		
		Through/Right	136 (359)	65.1 (79.1)	E (E)		
	Southbound	Left	497 (357)	67.8 (73.1)	E (E)		
		Through/Right	280 (190)	56.2 (52.0)	E (D)		
Woolbright Road at I-95 Southbound Ramps	Eastbound	Through	1,218 (1,415)	51.9 (35.9)	D (D)	37.6 (28.0)	D (C)
		Right	883 (446)	43.5 (27.8)	D (C)		
	Westbound	Left	460 (383)	51.5 (26.2)	D (C)		
		Through	766 (1,349)	23.3 (17.8)	C (B)		
	Southbound	Left	680 (651)	54.9 (65.9)	D (E)		
		Right	821 (791)	1.4 (1.3)	A (A)		
Woolbright Road at I-95 Northbound Ramps	Eastbound	Left	768 (885)	40.2 (68.0)	D (E)	25.4 (36.2)	C (D)
		Through	1,130 (1,181)	4.7 (13.4)	A (B)		
	Westbound	Through	832 (1,065)	34.5 (43.2)	C (D)		
		Right	775 (887)	0.6 (0.9)	A (A)		
	Northbound	Left	394 (667)	65.8 (64.2)	E (E)		
		Right	371 (519)	45.8 (43.7)	D (D)		
Woolbright Road at Seacrest Boulevard	Eastbound	Left	74 (185)	40.9 (76.7)	D (E)	57.9 (56.9)	E (E)
		Through	729 (1,024)	26.8 (36.1)	C (D)		
		Right	571 (506)	41.8 (42.0)	D (D)		
	Westbound	Left	142 (86)	35.8 (50.7)	D (D)		
		Through/Right	984 (1,134)	33.6 (46.7)	C (D)		
	Northbound	Left	555 (603)	156.6 (106.5)	F (F)		
		Through/Right	368 (601)	47.2 (62.9)	D (E)		
	Southbound	Left	96 (91)	74.6 (64.5)	E (E)		
		Through/Right	565 (367)	71.3 (65.7)	E (E)		

In the Opening Year, the 95th Percentile queue length exceeds the storage at the following intersection approaches:

- EB right-turn at Woolbright Road and I-95 SB ramp terminal (AM peak hour) – however, it should be noted that the EB through has three through lanes with 95th percentile queues as 276 and 331 feet in AM and PM peak hours, which will allow the right most lane to serve the EBR movement similar to existing conditions.
- NB left-turn at Woolbright Road and Seacrest Boulevard intersection (AM peak hour).

Table 8-2 summarizes the queue analysis for Opening Year 2025 Build Alternative.

Table 8-2: 95th Intersection Percentile Queue Length Summary – Opening Year 2025 Build Alternative 1 – TDI

Intersection	Time Period	95th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Woolbright Road at Corporate Drive /SW 8th Street	AM Peak	138	609	0	152	322	16	67	96	-	#381	309	-
	PM Peak	#163	457	0	m82	308	103	258	335	-	243	136	-
	Proposed Storage (feet)	***250***	***1,300***	***225***	***300***	***1,250***	***375***	***400***	***>1,000***		***>1,000***	***>1,000***	
Woolbright Road at I-95 Southbound Ramps	AM Peak	-	276	1,052	166	86	-	-	-	-	276	-	0
	PM Peak	-	331	105	m130	90	-	-	-	-	280	-	0
	Proposed Storage (feet)	***-***	***1,250***	***600***	***900***	***500***	***-***	***-***	***-***	***-***	***>1,700***	***-***	***400***
Woolbright Road at I-95 Northbound Ramps	AM Peak	220	50	-	-	m181	m219	179	-	341	-	-	-
	PM Peak	#615	69	-	-	m234	m55	285	-	285	-	-	-
	Proposed Storage (feet)	***900***	***500***	***-***	***-***	***2,250***	***675***	***>1,300***	***-***	***400***	***-***	***-***	***-***
Woolbright Road at Seacrest Boulevard	AM Peak	m54	242	97	112	481	-	#523	216	-	158	347	-
	PM Peak	m#259	578	231	#95	#776	-	#471	340	-	152	216	-
	Proposed Storage (feet)	***300***	***2,250***	***600***	***300***	***900***		***475***	***>1,000***		***180***	***>1,000***	

95th percentile volume exceeds capacity, queue may be longer.
m: Volume for 95th percentile queue is metered by upstream signal.
Storage length noted above is turn pocket length for left/right turn movements or link distance per lane to adjacent signalized intersection for through movements.

Design Year 2045 Build Alternative 1 – TDI Analysis

Intersection Analysis

The Design Year 2045 Build Alternative 1 – TDI intersection analysis results are summarized in **Table 8-3**. In Design Year 2045, the Build Alternative 1 will operate at acceptable LOS at both ramp terminal intersections. Woolbright Road at Corporate Drive/SW 8th Street intersection will operate at LOS E in 2045 AM peak hour and Woolbright Road at Seacrest Boulevard intersection will operate at LOS F in both AM and PM peak hours. In addition, several movements at these two intersections are failing (LOS F) in Design Year 2045 as listed below:

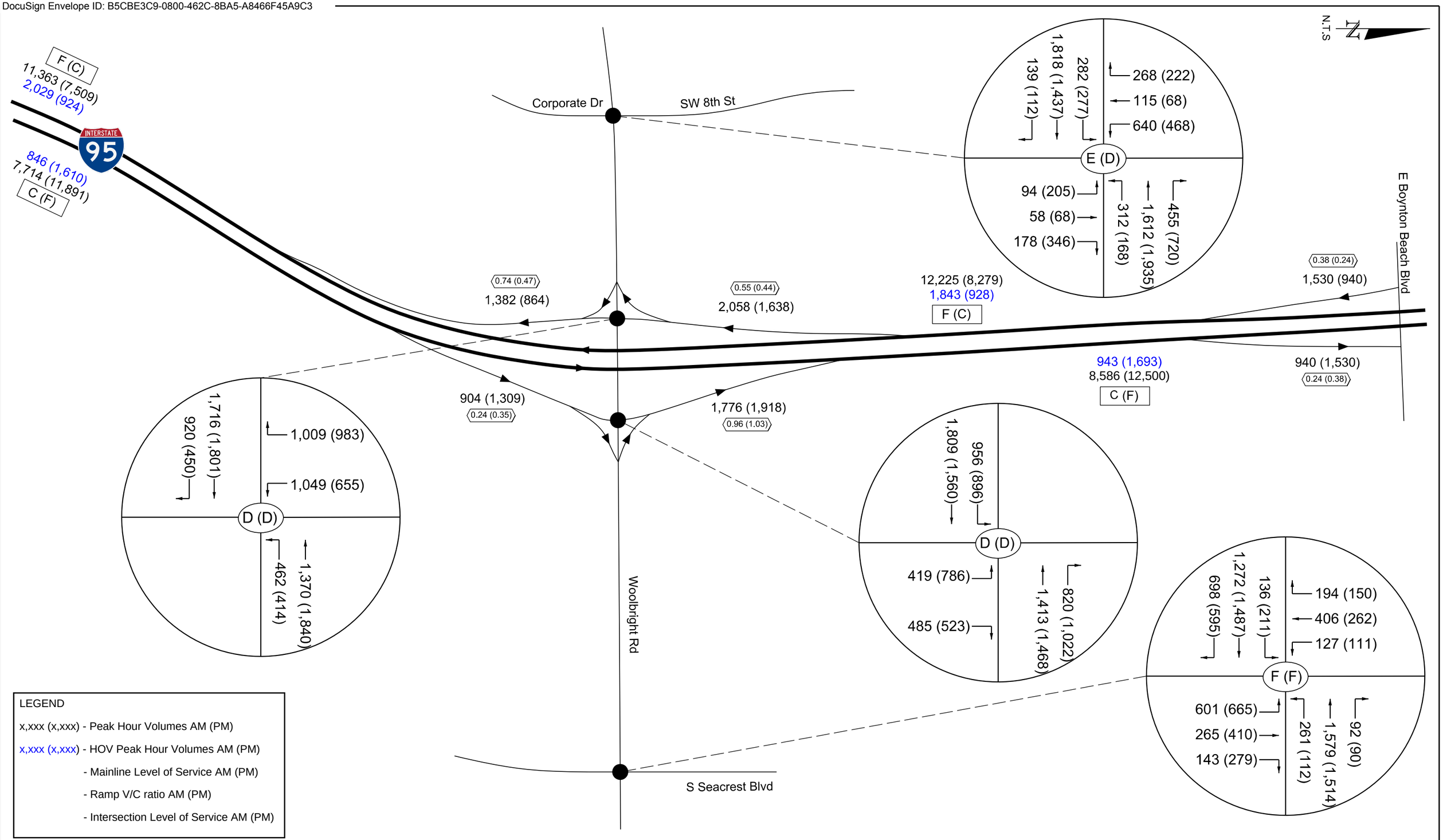
Woolbright Road at Corporate Drive/SW 8th Street

- EB left-turn (PM peak hour)
- WB left-turn and right-turn (AM peak hour)
- NB through/right-turn (PM peak hour)
- SB left-turn (AM and PM peak hours)

Woolbright Road at Seacrest Boulevard

- EB left-turn (AM and PM peak hours)
- WB left-turn (AM peak hour)
- WB through/right-turn (AM and PM peak hours)
- NB left-turn (AM and PM peak hours)
- SB left-turn (AM and PM peak hours)

Figure 8-2 illustrates the peak hour volumes and LOS results for the Design Year 2045 Build Alternative 1 – TDI intersections analysis.



LEGEND

x,xxx (x,xxx) - Peak Hour Volumes AM (PM)

x,xxx (x,xxx) - HOV Peak Hour Volumes AM (PM)

- Mainline Level of Service AM (PM)

- Ramp V/C ratio AM (PM)

- Intersection Level of Service AM (PM)

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Title: Design Year 2045 Build Alternative - TDI Peak Hour Volumes and LOS/VC Ratios

Figure: 8-2

Table 8-3: Design Year 2045 Build Alternative 1 – TDI Intersection Analysis Summary

Intersection	Intersection Approach					Overall Intersection	
	Approach	Movement	Peak Hour Volumes	Delay (sec)	LOS	Delay (sec)	LOS
				AM (PM)	AM (PM)	AM (PM)	AM (PM)
Woolbright Road at Corporate Drive/SW 8th Street	Eastbound	Left	282 (277)	76.6 (100.9)	E (F)	75.9 (48.3)	E (D)
		Through	1,818 (1,437)	49.6 (45.0)	D (D)		
		Right	139 (112)	27.4 (30.3)	C (C)		
	Westbound	Left	312 (168)	86.7 (71.3)	F (E)		
		Through	1,612 (1,935)	58.8 (33.6)	E (C)		
		Right	455 (720)	122.7 (17.9)	F (B)		
	Northbound	Left	94 (205)	59.4 (79.6)	E (E)		
		Through/Right	236 (414)	74.7 (87.6)	E (F)		
	Southbound	Left	640 (468)	174.2 (82.6)	F (F)		
		Through/Right	383 (290)	66.2 (48.2)	E (D)		
Woolbright Road at I-95 Southbound Ramps	Eastbound	Through	1,716 (1,801)	52.3 (41.2)	D (D)	42.2 (36.6)	D (D)
		Right	920 (450)	42.2 (20.2)	D (C)		
	Westbound	Left	462 (414)	64.9 (39.6)	E (D)		
		Through	1,370 (1,840)	26.1 (43.2)	C (D)		
	Southbound	Left	1,049 (655)	75.2 (66.2)	E (E)		
		Right	1,009 (983)	2.3 (2.1)	A (A)		
Woolbright Road at I-95 Northbound Ramps	Eastbound	Left	956 (896)	77.5 (78.5)	E (E)	39.2 (37.9)	D (D)
		Through	1,809 (1,560)	10.7 (22.5)	B (C)		
	Westbound	Through	1,413 (1,468)	53.2 (35.0)	D (D)		
		Right	820 (1,022)	0.1 (0.2)	A (A)		
	Northbound	Left	419 (786)	73.6 (72.2)	E (E)		
		Right	485 (523)	65.0 (44.2)	E (D)		
Woolbright Road at Seacrest Boulevard	Eastbound	Left	136 (211)	165.5 (96.8)	F (F)	98.9 (105.8)	F (F)
		Through	1,272 (1,487)	34.1 (42.1)	C (D)		
		Right	698 (595)	25.7 (28.6)	C (C)		
	Westbound	Left	261 (112)	343.3 (59.2)	F (E)		
		Through/Right	1,671 (1,604)	98.5 (134.5)	F (F)		
	Northbound	Left	601 (665)	261.1 (332.2)	F (F)		
		Through/Right	408 (689)	50.6 (66.6)	D (E)		
	Southbound	Left	127 (111)	83.7 (82.7)	F (F)		
		Through/Right	600 (412)	74.2 (58.3)	E (E)		

Table 8-4 summarizes the queue analysis for Design Year 2045 Build Alternative 1. In the Design Year 2045, the 95th Percentile queue length exceeds the storage at the following intersection approaches:

- EB right-turn at Woolbright Road and I-95 SB ramp terminal (AM peak hour) – however, it should be noted that the EB through with three through lanes will have queues as 400 and 510 feet in AM and PM peak hours, which will allow the right most lane to serve the EBR movement similar to existing conditions. Therefore, it will not impact the EBT capacity at Woolbright Road/SW 8th Street intersection.
- NB right-turn at Woolbright Road and I-95 NB ramp terminal (AM peak hour)
- EB left-turn at Woolbright Road and Seacrest Boulevard intersection (PM peak hour); however, it should be noted that there is a two-way left turn lane (TWLTL) available beyond the marked left turn storage of 300’ which can serve this spill over during the PM peak hour.
- WB left-turn at Woolbright Road and Seacrest Boulevard intersection (AM peak hour)
- WB through at Woolbright Road and Seacrest Boulevard intersection (AM and PM peak hours)
- NB left-turn at Woolbright Road and Seacrest Boulevard intersection (AM and PM peak hours)

Table 8-4: 95th Intersection Percentile Queue Length Summary – Design Year 2045 Build Alternative 1 – TDI

Intersection	Time Period	95th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Woolbright Road at Corporate Drive /SW 8th Street	AM Peak	200	#888	25	m205	527	356	101	227	-	#556	399	-
	PM Peak	#240	554	0	m111	505	m260	#279	#488	-	#369	273	-
	Proposed Storage (feet)	***250***	***1,300***	***225***	***300***	***1,250***	***375***	***400***	***>1,000***		***>1,000***	***>1,000***	
Woolbright Road at I-95 Southbound Ramps	AM Peak	-	m400	m971	m170	m116	-	-	-	-	#475	-	0
	PM Peak	-	#510	m115	m144	m263	-	-	-	-	282	-	0
	Proposed Storage (feet)	***-***	***1,250***	***600***	***900***	***500***	***-***	***-***	***-***	***-***	***>1,700***	***-***	***400***
Woolbright Road at I-95 Northbound Ramps	AM Peak	m#608	m113	-	-	m286	m7	#193	-	524	-	-	-
	PM Peak	m#556	m138	-	-	m239	m39	#356	-	289	-	-	-
	Proposed Storage (feet)	***900***	***500***	***-***	***-***	***2,250***	***675***	***>1,300***	***-***	***400***	***-***	***-***	***-***
Woolbright Road at Seacrest Boulevard	AM Peak	m#243	497	140	#527	#1,168	-	#576	231	-	203	#373	-
	PM Peak	m#371	#934	132	#223	#1,182	-	#626	388	-	#200	231	-
	Proposed Storage (feet)	***300***	***2,250***	***600***	***300***	***900***		***475***	***>1,000***		***180***	***>1,000***	

95th percentile volume exceeds capacity, queue may be longer.
m: Volume for 95th percentile queue is metered by upstream signal.
Storage length noted above is turn pocket length for left/right turn movements or link distance per lane to adjacent signalized intersection for through movements.
Storage length for arterial left turns at ramp terminals is distance between ramp terminals plus extended defacto left turn pocket length.

8.4.2 Build Alternative 2 - DDI

Opening Year 2025 Build Alternative 2 – DDI Analysis

Intersection Analysis

The Opening Year 2025 Build Alternative 2 – DDI intersection analysis results are summarized in **Table 8-5**. In Opening Year 2025, all study intersections will operate at an acceptable LOS D or better except the Woolbright Road at Corporate Drive/SW 8th Street intersection which will operate at LOS E in AM and PM peak hours. In addition, several movements at these two intersections are failing (LOS F) in Opening Year 2025 as listed below:

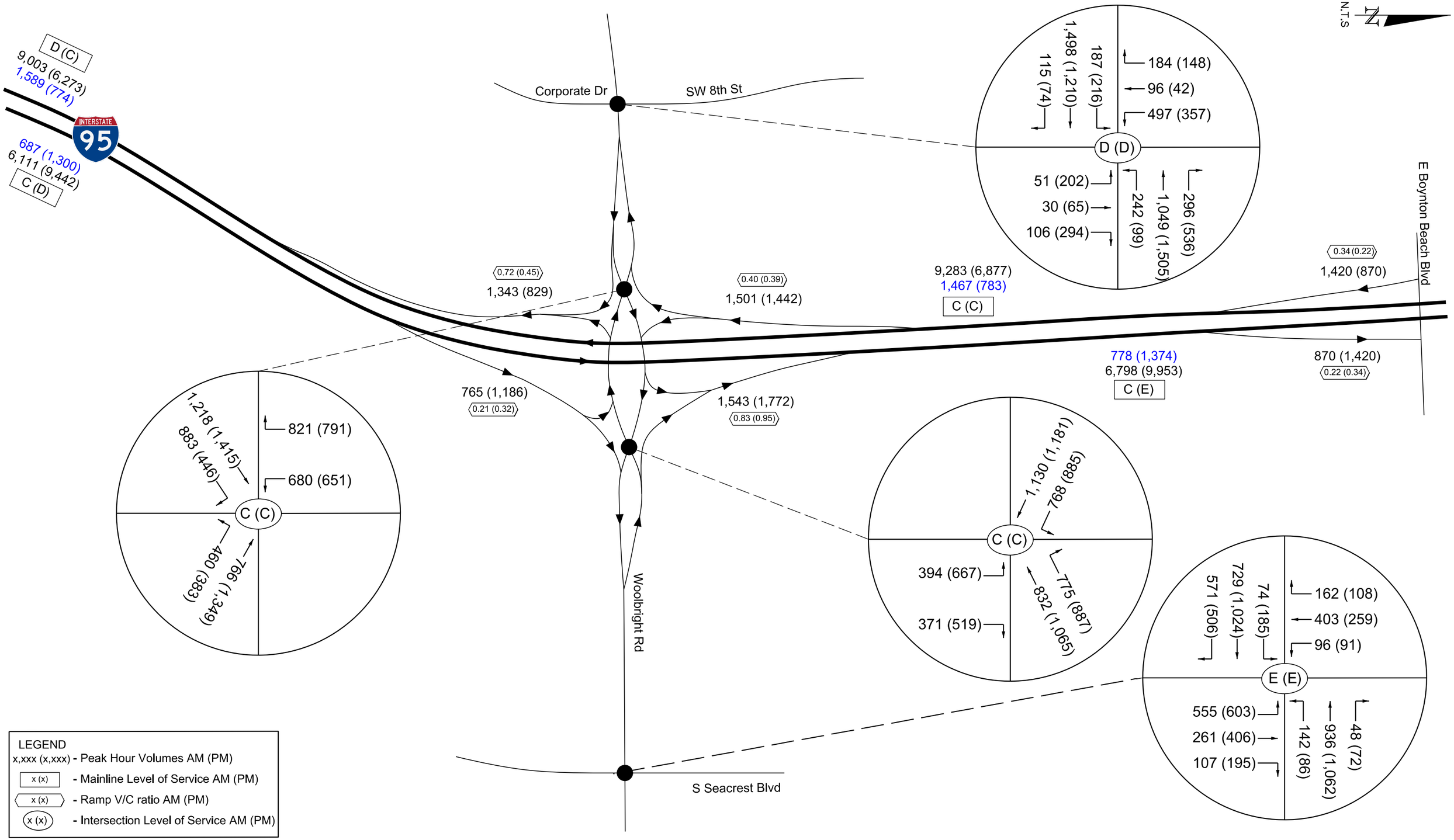
Woolbright Road at Corporate Drive/SW 8th Street

- SB left-turn (PM peak hour)

Woolbright Road at Seacrest Boulevard

- EB left-turn (PM peak hour)
- NB left-turn (AM and PM peak hours)
- NB through/right-turn (PM peak hour)

Figure 8-3 illustrates the peak hour volumes and LOS results for the Design Year 2045 intersections analysis.



LEGEND

x,xxx (x,xxx) - Peak Hour Volumes AM (PM)

x (x) - Mainline Level of Service AM (PM)

x (x) - Ramp V/C ratio AM (PM)

x (x) - Intersection Level of Service AM (PM)

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Table 8-5: Opening Year 2025 Build Alternative 2 – DDI Intersection Analysis Summary

Intersection	Intersection Approach					Overall Intersection	
	Approach	Movement	Peak Hour Volumes	Delay (sec) AM (PM)	LOS AM (PM)	Delay (sec) AM (PM)	LOS AM (PM)
Woolbright Road at Corporate Drive/SW 8th Street	Eastbound	Left	187 (216)	62.9 (77.5)	E (E)	48.1 (40.0)	D (D)
		Through	1,498 (1,210)	33.6 (36.9)	C (D)		
		Right	115 (74)	23.1 (27.3)	C (C)		
	Westbound	Left	242 (99)	62.0 (62.3)	E (E)		
		Through	1,049 (1,505)	36.8 (26.1)	D (C)		
		Right	296 (536)	76.7 (9.2)	E (A)		
	Northbound	Left	51 (202)	58.7 (44.6)	E (D)		
		Through/Right	136 (359)	65.2 (77.3)	E (E)		
	Southbound	Left	497 (357)	79.3 (83.8)	E (F)		
		Through/Right	280 (190)	60.7 (51.5)	E (D)		
Woolbright Road at I-95 Southbound Ramps	Eastbound	Through	1,218 (1,415)	31.3 (29.8)	C (C)	26.3 (26.3)	C (C)
		Right	883 (446)	0 (0)	A (A)		
	Westbound	Left	460 (383)	0 (0)	A (A)		
		Through	766 (1,349)	18.3 (22.6)	B (C)		
	Southbound	Left	680 (651)	32.3 (30.4)	C (C)		
		Right	821 (791)	30.1 (31.1)	C (C)		
Woolbright Road at I-95 Northbound Ramps	Eastbound	Left	768 (885)	0 (0)	A (A)	32.4 (33.2)	C (C)
		Through	1,130 (1,181)	36.6 (34.3)	D (C)		
	Westbound	Through	832 (1,065)	26.7 (32.0)	C (C)		
		Right	775 (887)	0 (0)	A (A)		
	Northbound	Left	394 (667)	22.2 (26.3)	C (C)		
		Right	371 (519)	29.4 (30.4)	C (C)		
Woolbright Road at Seacrest Boulevard	Eastbound	Left	74 (185)	37.7 (200.6)	D (F)	56.8 (55.9)	E (E)
		Through	729 (1,024)	19.9 (25.9)	B (C)		
		Right	571 (506)	23.6 (23.2)	C (C)		
	Westbound	Left	142 (86)	33.8 (42.2)	C (D)		
		Through/Right	984 (1,134)	32.3 (35.5)	C (D)		
	Northbound	Left	555 (603)	179.8 (92.8)	F (F)		
		Through/Right	368 (601)	49.7 (85.0)	D (F)		
	Southbound	Left	96 (91)	73.7 (59.7)	E (E)		
		Through/Right	565 (367)	69.6 (68.7)	E (E)		

Table 8-6 summarizes the queue analysis for Opening Year 2025 Build Alternative 2 – DDI and shows all study intersections will have queues contained within available storage except the intersection of Woolbright Road/Seacrest Boulevard where following movements will have 95th percentile queues longer than available storage:

- EB left-turn at Woolbright Road and Seacrest Boulevard intersection (PM peak hour); however, it should be noted that there is a two-way left turn lane (TWLTL) available beyond the marked left turn storage of 300' which can serve this spill over during the PM peak hour.
- NB left turn (AM and PM peak hours).

Table 8-6: 95th Intersection Percentile Queue Length Summary - Opening Year 2025 DDI

Intersection	Time Period	95th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Woolbright Road at Corporate Drive /SW 8th Street	AM Peak	135	562	4	166	325	97	67	97	-	#365	305	-
	PM Peak	#163	467	2	84	431	8	197	337	-	#273	138	-
	Proposed Storage (feet)	***250***	***1,300***	***225***	***300***	***1,250***	***375***	***400***	***>1,000***		***>1,000***	***>1,000***	
Woolbright Road at I-95 Southbound Ramps	AM Peak	-	471	0	0	116	-	-	-	-	318	-	425
	PM Peak	-	493	0	0	230	-	-	-	-	294	-	415
	Proposed Storage (feet)	***-***	***1,250***	***600***	***700***	***700***	***-***	***-***	***-***	***-***	***>1,700***	***-***	***>1,700***
Woolbright Road at I-95 Northbound Ramps	AM Peak	0	362	-	-	m261	0	153	-	189	-	-	-
	PM Peak	0	361	-	-	m386	0	279	-	267	-	-	-
	Proposed Storage (feet)	***700***	***700***	***-***	***-***	***2,250***	***800***	***>1,300***	***-***	***>1,300***	***-***	***-***	***-***
Woolbright Road at Seacrest Boulevard	AM Peak	45	244	115	109	472	-	#517	216	-	158	349	-
	PM Peak	#335	494	47	70	576	-	#518	#427	-	148	226	-
	Proposed Storage (feet)	***300***	***2,250***	***600***	***300***	***900***		***475***	***>1,000***		***180***	***>1,000***	

#: 95th percentile volume exceeds capacity, queue maybe longer.
m: Volume for 95th percentile queue is metered by upstream signal.
Storage length noted above is turn pocket length for left/right turn movements or link distance per lane to adjacent signalized intersection for through movements.
Storage length for arterial left turns at ramp terminals is distance between ramp terminals plus extended defacto left turn pocket length.

Design Year 2045 Build Alternative 2 – DDI Analysis

Intersection Analysis

The Design Year 2045 Build Alternative 2 – DDI intersection analysis results are summarized in **Table 8-7**. In Design Year 2045, all study intersections will operate at an acceptable LOS D or better except Woolbright Road/Corporate Drive (LOS E in AM peak hour) and Woolbright Road/Seacrest Boulevard (LOS F in AM and PM peak hours). In addition, several movements at these two intersections are failing (LOS F) in Design Year 2045 as listed below:

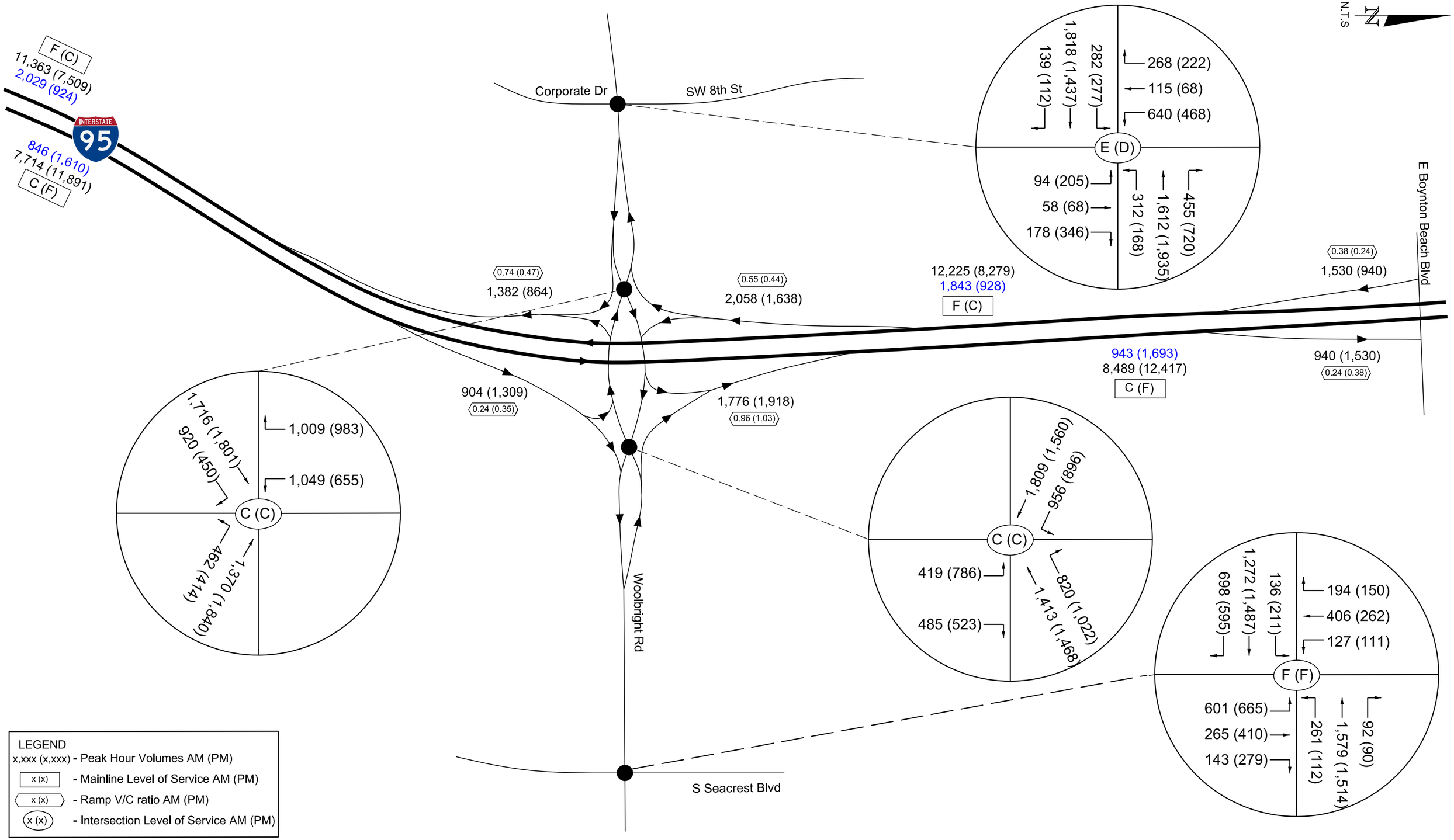
Woolbright Road at Corporate Drive/SW 8th Street

- WB right-turn (AM peak hour)
- SB left-turn (AM and PM peak hours)

Woolbright Road at Seacrest Boulevard

- EB left-turn (AM and PM peak hours)
- EB through (PM peak hour)
- WB left-turn (AM peak hour)
- NB left-turn (AM and PM peak hours)
- NB through/right-turn (PM peak hour)

Figure 8-4 illustrates the peak hour volumes and LOS results for the Design Year 2045 Build Alternative 2 – DDI intersections analysis.



LEGEND

x,xxx (x,xxx) - Peak Hour Volumes AM (PM)

x (x) - Mainline Level of Service AM (PM)

x (x) - Ramp V/C ratio AM (PM)

x (x) - Intersection Level of Service AM (PM)

Florida Department of Transportation
District Four
3400 West Commercial Boulevard
Fort Lauderdate, FL 33309

I-95/SR 9 Interchange at Woolbright Road
Project Development & Environment Study
FPID No.: 437279-1-22-02
ETDM No.: 14341

Title: Design Year 2045 Build Alternative - 2 DDI Peak Hour Volumes and LOS/VC Ratios

Figure: 3-4

Table 8-7: Design Year 2045 Build Alt 2 – DDI Intersection Analysis Summary

Intersection	Intersection Approach					Overall Intersection	
	Approach	Movement	Peak Hour Volumes	Delay (sec) AM (PM)	LOS AM (PM)	Delay (sec) AM (PM)	LOS AM (PM)
Woolbright Road at Corporate Drive/SW 8th Street	Eastbound	Left	282 (277)	65.7 (72.8)	E (E)	71.9 (49.1)	E (D)
		Through	1,818 (1,437)	61.9 (45.4)	E (D)		
		Right	139 (112)	29.8 (30.5)	C (C)		
	Westbound	Left	312 (168)	73.1 (56.8)	E (E)		
		Through	1,612 (1,935)	39.9 (39.2)	D (D)		
		Right	455 (720)	95.5 (13.4)	F (B)		
	Northbound	Left	94 (205)	50.0 (43.1)	D (D)		
		Through/Right	236 (414)	64.2 (78.5)	E (E)		
	Southbound	Left	640 (468)	183.7 (118.9)	F (F)		
		Through/Right	383 (290)	67.1 (53.1)	E (D)		
Woolbright Road at I-95 Southbound Ramps	Eastbound	Through	1,716 (1,801)	18.2 (23.4)	B (C)	20.3 (33.2)	C (C)
		Right	920 (450)	0 (0)	A (A)		
	Westbound	Left	462 (414)	0 (0)	A (A)		
		Through	1,370 (1,840)	22.9 (42.7)	C (D)		
	Southbound	Left	1,049 (655)	40.0 (35.9)	D (D)		
		Right	1,009 (983)	35.4 (29.6)	D (C)		
Woolbright Road at I-95 Northbound Ramps	Eastbound	Left	956 (896)	0 (0)	A (A)	30.4 (26.4)	C (C)
		Through	1,809 (1,560)	34.0 (27.1)	C (C)		
	Westbound	Through	1,413 (1,468)	25.7 (25.7)	C (C)		
		Right	820 (1,022)	0 (0)	A (A)		
	Northbound	Left	419 (786)	22.5 (23.0)	C (C)		
		Right	485 (523)	31.3 (36.1)	C (D)		
Woolbright Road at Seacrest Boulevard	Eastbound	Left	136 (211)	238.2 (409.7)	F (F)	99.7 (103.2)	F (F)
		Through	1,272 (1,487)	48.2 (127.3)	D (F)		
		Right	698 (595)	38.0 (34.0)	C (C)		
	Westbound	Left	261 (112)	254.6 (55.9)	F (E)		
		Through/Right	1,671 (1,604)	102.2 (73.6)	F (E)		
	Northbound	Left	601 (665)	251.5 (143.8)	F (F)		
		Through/Right	408 (689)	50.6 (81.3)	D (F)		
	Southbound	Left	127 (111)	73.8 (65.3)	E (E)		
		Through/Right	600 (412)	61.6 (67.9)	E (E)		

Table 8-8 summarizes the queue analysis for Design Year 2045 Build Alternative 2 – DDI and shows all study intersections will have queues contained within available storage except the intersections of Woolbright Road at Corporate Drive/SW 8th Street and Woolbright Road at Seacrest Boulevard where following movements will have 95th percentile queues longer than available storage:

- EB left-turn at Woolbright Road and Seacrest Boulevard intersection (PM peak hour); however, it should be noted that there is a two-way left turn lane (TWLTL) available beyond the marked left turn storage of 300’ which can serve this spill over during the PM peak hour.
- WB through at Woolbright Road/Seacrest Boulevard intersection (AM and PM peak hours)

- NB left turn at Woolbright Road/Seacrest Boulevard intersection (AM and PM peak hours)
- SB left turn at Woolbright Road/Seacrest Boulevard intersection (AM and PM peak hours)
- WB through at Woolbright Road/I-95 SB ramp terminal intersection (PM peak hour)

Queues for the WB through at SB ramp terminal in the PM peak hour are higher and extend beyond the distance between the ramp terminals; however, it will not affect operation due to the available storage that extends to the upstream intersection (Woolbright Road at Seacrest Boulevard).

Table 8-8: 95th Intersection Percentile Queue Length Summary – Design Year 2045 DDI

Intersection	Time Period	95th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Woolbright Road at Corporate Drive /SW 8th Street	AM Peak	195	#955	26	#221	#530	184	95	216	-	#556	403	-
	PM Peak	195	#635	38	m138	#720	106	192	391	-	#405	275	-
	Available Storage (feet)	***250***	***1,300***	***225***	***300***	***1,250***	***375***	***400***	***>1,000***		***>1,000***	***>1,000***	
Woolbright Road at I-95 Southbound Ramps	AM Peak	-	m202	0	0	195	-	-	-	-	552	-	576
	PM Peak	-	m591	0	0	#772	-	-	-	-	323	-	513
	Available Storage (feet)	***-***	***1,250***	***600***	***700***	***700***	***-***	***-***	***-***	***-***	***>1,700***	***-***	***>1,700***
Woolbright Road at I-95 Northbound Ramps	AM Peak	0	600	-	-	m343	0	163	-	253	-	-	-
	PM Peak	0	425	-	-	m382	0	306	-	293	-	-	-
	Available Storage (feet)	***700***	***700***	***-***	***-***	***2,250***	***800***	***>1,300***	***-***	***>1,300***	***-***	***-***	***-***
Woolbright Road at Seacrest Boulevard	AM Peak	#273	#806	249	#495	#1,174	-	#546	234	-	194	364	-
	PM Peak	#446	#1,118	357	121	#1,074	-	#616	#454	-	180	236	-
	Available Storage (feet)	***300***	***2,250***	***600***	***300***	***900***		***475***	***>1,000***		***180***	***>1,000***	

#: 95th percentile volume exceeds capacity, queue maybe longer.
m: Volume for 95th percentile queue is metered by upstream signal.
Storage length noted above is turn pocket length for left/right turn movements or link distance per lane to adjacent signalized intersection for through movements.
Storage length for arterial left turns at ramp terminals is distance between ramp terminals plus extended defacto left turn pocket length.

8.4.3 Build Alternative 3 - SPUI

Opening Year 2025 Build Alternative 1 – SPUI Analysis

Intersection Analysis

The Opening Year 2025 Build Alternative 3 – SPUI intersection analysis results are summarized in **Table 8-9**. In Opening Year 2025, all study intersections will operate at an acceptable LOS D or better except the Woolbright at Corporate Drive/SW 8th Street intersection which will operate at LOS E in AM and PM peak hours. In addition, several movements at these two intersections are failing (LOS F) in Opening Year 2025 as listed below:

Woolbright Road at Corporate Drive/SW 8th Street

- SB left-turn (PM peak hour)

Woolbright Road at Seacrest Boulevard

- NB left-turn (AM and PM peak hours)

Figure 8-5 illustrates the peak hour volumes and LOS results for the Opening Year 2025 Build Alternative 3 – SPUI intersections analysis.

N.T.S

Corporate Dr

SW 8th St

Woolbright Rd

S Seacrest Blvd

E Boynton Beach Blvd

D (C)

9,003 (6,273)

1,589 (774)

687 (1,300)

6,111 (9,442)

C (D)

1,343 (829)

1,501 (1,442)

765 (1,186)

1,543 (1,772)

9,283 (6,877)

1,467 (783)

C (C)

778 (1,374)

6,798 (9,953)

C (E)

0.34 (0.22)

1,420 (870)

870 (1,420)

0.22 (0.34)

D (D)

115 (74)

1,498 (1,210)

187 (216)

184 (148)

96 (42)

497 (357)

51 (202)

30 (65)

106 (294)

242 (99)

1,049 (1,505)

296 (536)

C (C)

883 (446)

450 (530)

768 (885)

821 (791)

680 (651)

394 (667)

371 (519)

460 (383)

372 (682)

775 (887)

E (E)

571 (506)

729 (1,024)

74 (185)

162 (108)

403 (259)

96 (91)

555 (603)

261 (406)

107 (195)

142 (86)

936 (1,062)

48 (72)

LEGEND

x,xxx (x,xxx) - Peak Hour Volumes AM (PM)

x (x) - Mainline Level of Service AM (PM)

x (x) - Ramp V/C ratio AM (PM)

x (x) - Intersection Level of Service AM (PM)

Florida Department of Transportation
District Four
3400 West Commercial Boulevard
Fort Lauderdate, FL 33309

I-95/SR 9 Interchange at Woolbright Road
Project Development & Environment Study
FPID No.: 437279-1-22-02
ETDM No.: 14341

Title: Opening Year 2025 Build Alternative - 2 SPUI Peak Hour Volumes and LOS/VC Ratios

Figure: 8-5

Table 8-9: Opening Year 2025 Build Alt Alternative 3 – SPUI Intersection Analysis Summary

Intersection	Intersection Approach					Overall Intersection	
	Approach	Movement	Peak Hour Volumes	Delay (sec)	LOS	Delay (sec)	LOS
				AM (PM)	AM (PM)	AM (PM)	AM (PM)
Woolbright Road at Corporate Drive/SW 8th Street	Eastbound	Left	187 (216)	63.8 (69.3)	E (E)	46.8 (42.8)	D (D)
		Through	1,498 (1,210)	32.0 (37.6)	C (D)		
		Right	115 (74)	22.1 (27.8)	C (C)		
	Westbound	Left	242 (99)	55.5 (68.8)	E (E)		
		Through	1,049 (1,505)	30.9 (37.8)	C (D)		
		Right	296 (536)	46.4 (12.6)	D (B)		
	Northbound	Left	51 (202)	60.8 (48.6)	E (D)		
		Through/Right	136 (359)	64.8 (74.9)	E (E)		
	Southbound	Left	497 (357)	106.2 (70.2)	F (E)		
		Through/Right	280 (190)	60.0 (45.1)	E (D)		
Woolbright Road at I-95 Southbound/ Northbound Ramps	Eastbound	Left	768 (885)	70.4 (59.9)	E (E)	26.7 (29.4)	C (C)
		Through	450 (530)	29.2 (35.7)	C (D)		
		Right	883 (446)	1.1 (0.4)	A (A)		
	Westbound	Left	460 (383)	49.4 (51.6)	D (D)		
		Through	372 (682)	26.1 (35.5)	C (D)		
		Right	775 (887)	0.6 (0.9)	A (A)		
	Southbound	Left	680 (651)	53.9 (49.1)	D (D)		
		Right	821 (791)	1.4 (1.3)	A (A)		
	Northbound	Left	394 (667)	52.5 (58.6)	D (E)		
		Right	371 (519)	0.4 (0.6)	A (A)		
Woolbright Road at Seacrest Boulevard	Eastbound	Left	74 (185)	21.7 (56.9)	C (E)	55.8 (59.2)	E (E)
		Through	729 (1,024)	16.8 (36.9)	B (D)		
		Right	571 (506)	12.1 (58.1)	B (E)		
	Westbound	Left	142 (86)	35.1 (54.9)	D (D)		
		Through/Right	984 (1,134)	32.7 (51.9)	C (D)		
	Northbound	Left	555 (603)	192.0 (111.5)	F (F)		
		Through/Right	368 (601)	48.8 (55.3)	D (E)		
	Southbound	Left	96 (91)	72.2 (74.0)	E (E)		
		Through/Right	565 (367)	68.0 (63.8)	E (E)		

Table 8-10 summarizes the queue analysis for Opening Year 2025 Build Alternative 3 – SPUI and shows all study intersections will have queues contained within available storage except the intersection of Woolbright Road at Seacrest Boulevard where following movements will have 95th percentile queues longer than available storage:

- EB left turn (PM peak hour)
- NB left turn (AM and PM peak hours)

Table 8-10: 95th Intersection Percentile Queue Length Summary – Opening Year 2025 SPUI

Intersection	Time Period	95th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Woolbright Road at Corporate Drive /SW 8th Street	AM Peak	135	535	4	155	221	84	71	97	-	#425	302	-
	PM Peak	153	498	0	m74	450	32	185	325	-	244	106	-
	Available Storage (feet)	***250***	***1,300***	***225***	***300***	***1,250***	***375***	***400***	***>1,000***		***>1,000***	***>1,000***	
Woolbright Road at I-95 Southbound /Northbound Ramps	AM Peak	m474	m233	m228	m235	m132	m75	239	-	0	270	-	0
	PM Peak	507	285	0	m209	m319	m94	407	-	0	248	-	0
	Available Storage (feet)	***600***	***1,400***	***700***	***750***	***2,600***	***800***	***>1,400***	***-***	***800***	***>1,600***	***-***	***500***
Woolbright Road at Seacrest Boulevard	AM Peak	m25	159	79	117	495	-	#487	213	-	157	347	-
	PM Peak	196	624	124	77	#802	-	#519	350	-	154	216	-
	Available Storage (feet)	***300***	***2,250***	***600***	***300***	***900***		***475***	***>1,000***		***180***	***>1,000***	

#: 95th percentile volume exceeds capacity, queue maybe longer.
m: Volume for 95th percentile queue is metered by upstream signal.
Storage length noted above is turn pocket length for left/right turn movements or link distance per lane to adjacent signalized intersection for through movements.

Design Year 2045 Build Alternative 3 – SPUI Analysis

Intersection Analysis

The Design Year 2045 Build Alternative 3 – SPUI intersection analysis results are summarized in **Table 8-11**. In Design Year 2045, all study intersections will operate at an acceptable LOS D or better except Woolbright Road/Corporate Drive (LOS E in AM peak hour) and Woolbright Road/Seacrest Boulevard (LOS F in AM and PM peak hours). In addition, several movements at these two intersections are failing (LOS F) in Design Year 2045 as listed below:

Woolbright Road at Corporate Drive/SW 8th Street

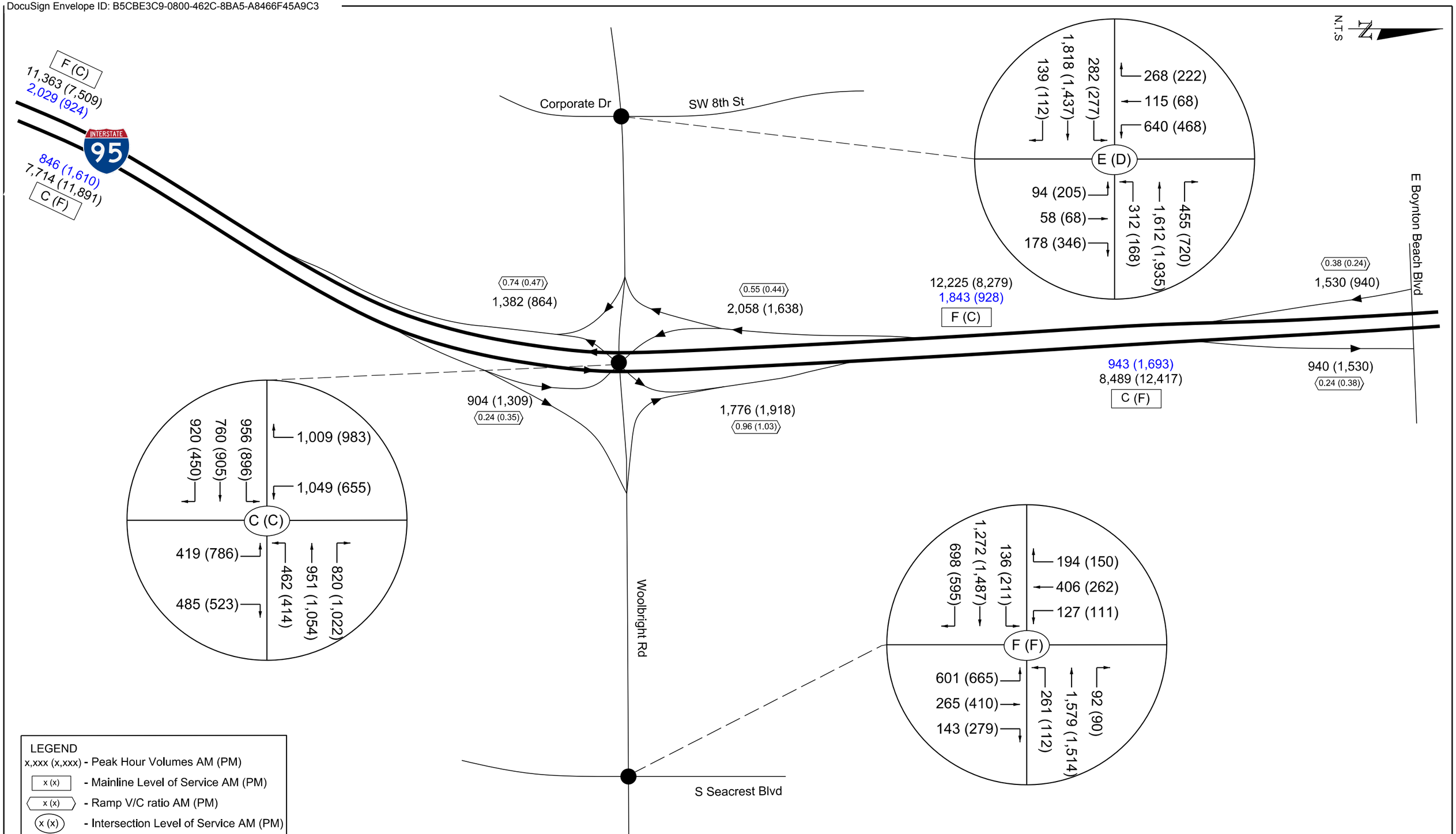
- NB left-turn (AM peak hour)
- SB left-turn (AM and PM peak hours)

Woolbright Road at Seacrest Boulevard

- EB left-turn (AM and PM peak hours)
- WB left-turn (AM peak hour)
- WB through/right-turn (AM and PM peak hours)

- NB left-turn (AM and PM peak hours)
- SB left-turn (PM peak hour)

Figure 8-6 illustrates the peak hour volumes and LOS results for the Design Year 2025 Build Alternative 3 – SPUI intersections analysis.



LEGEND

x,xxx (x,xxx) - Peak Hour Volumes AM (PM)

x (x) - Mainline Level of Service AM (PM)

x (x) - Ramp V/C ratio AM (PM)

x (x) - Intersection Level of Service AM (PM)

Florida Department of Transportation
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3400 West Commercial Boulevard
Fort Lauderdate, FL 33309

I-95/SR 9 Interchange at Woolbright Road
Project Development & Environment Study
FPID No.: 437279-1-22-02
ETDM No.: 14341

Title: Design Year 2045 Build Alternative - 2 SPUI Peak Hour Volumes and LOS/VC Ratios

Figure: 8-6

Table 8-11: Design Year 2045 Build Alternative 3 – SPUI Intersection Analysis Summary

Intersection	Intersection Approach					Overall Intersection	
	Approach	Movement	Peak Hour Volumes	Delay (sec) AM (PM)	LOS AM (PM)	Delay (sec) AM (PM)	LOS AM (PM)
Woolbright Road at Corporate Drive/SW 8th Street	Eastbound	Left	282 (277)	69.1 (70.3)	E (E)	70.4 (53.6)	E (D)
		Through	1,818 (1,437)	49.0 (50.0)	D (D)		
		Right	139 (112)	27.2 (32.6)	C (C)		
	Westbound	Left	312 (168)	79.9 (48.1)	E (D)		
		Through	1,612 (1,935)	28.9 (44.4)	C (D)		
		Right	455 (720)	0.6 (45.4)	A (D)		
	Northbound	Left	94 (205)	82.7 (49.4)	F (D)		
		Through/Right	236 (414)	70.1 (76.7)	E (E)		
	Southbound	Left	640 (468)	290.3 (99.7)	F (F)		
		Through/Right	383 (290)	68.3 (44.3)	E (D)		
Woolbright Road at I-95 Southbound/ Northbound Ramps	Eastbound	Left	956 (896)	35.9 (46.7)	E (D)	27.6 (31.1)	C (C)
		Through	760 (905)	23.9 (32.0)	C (C)		
		Right	920 (450)	0.2 (0.2)	A (A)		
	Westbound	Left	462 (414)	50.6 (55.9)	D (E)		
		Through	951 (1,054)	40.1 (51.7)	D (D)		
		Right	820 (1,022)	0.1 (0.2)	A (A)		
	Southbound	Left	1,049 (655)	73.2 (49.2)	E (D)		
		Right	1,009 (983)	2.3 (2.1)	A (A)		
	Northbound	Left	419 (786)	53.3 (71.0)	D (E)		
		Right	485 (523)	0.5 (0.6)	A (A)		
Woolbright Road at Seacrest Boulevard	Eastbound	Left	136 (211)	206.6 (109.4)	F (F)	94.9 (103.7)	F (F)
		Through	1,272 (1,487)	35.9 (68.7)	D (E)		
		Right	698 (595)	16.7 (33.1)	B (C)		
	Westbound	Left	261 (112)	319.0 (75.8)	F (E)		
		Through/Right	1,671 (1,604)	117.7 (137.9)	F (F)		
	Northbound	Left	601 (665)	184.1 (238.8)	F (F)		
		Through/Right	408 (689)	49.4 (61.8)	D (E)		
	Southbound	Left	127 (111)	73.8 (84.9)	E (F)		
		Through/Right	600 (412)	70.6 (60.5)	E (E)		

Table 8-12 summarizes the queue analysis for Design Year 2045 Build Alternative 3 – SPUI and shows all study intersections will have queues contained within available storage except the intersection of Woolbright Road at Seacrest Boulevard where following movements will have 95th percentile queues longer than available storage:

- EB left-turn at Woolbright Road and Seacrest Boulevard intersection (PM peak hour); however, it should be noted that there is a two-way left turn lane (TWLTL) available beyond the marked left turn storage of 300' which can serve this spill over during the PM peak hour.
- WB through (AM and PM peak hours)
- NB left turn (AM and PM peak hours)
- SB left turn (AM and PM peak hours)

Table 8-12: 95th Intersection Percentile Queue Length Summary – Design Year 2045 SPUI

Intersection	Time Period	95th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Woolbright Road at Corporate Drive /SW 8th Street	AM Peak	192	#951	26	m212	446	m0	102	223	-	#591	395	-
	PM Peak	192	#685	2	m97	m#739	m310	189	386	-	#405	227	-
	Available Storage (feet)	***300***	***1,300***	***275***	***300***	***1,250***	***375***	***400***	***>1,000***		***>1,000***	***>1,000***	
Woolbright Road at I-95 Southbound /Northbound Ramps	AM Peak	m512	m310	m463	m183	m332	m0	255	-	0	#469	-	0
	PM Peak	m562	m560	m0	m161	m388	m16	#529	-	0	250	-	0
	Available Storage (feet)	***600***	***1,400***	***700***	***750***	***2,600***	***800***	***>1,400***	***-***	***800***	***>1,600***	***-***	***500***
Woolbright Road at Seacrest Boulevard	AM Peak	m#208	m#778	m425	#538	#1,218	-	#517	231	-	195	#373	-
	PM Peak	#331	#1,060	314	#160	#1,258	-	#590	376	-	#200	230	-
	Available Storage (feet)	***300***	***2,250***	***600***	***300***	***900***		***475***	***>1,000***		***180***	***>1,000***	

#: 95th percentile volume exceeds capacity, queue maybe longer.

m: Volume for 95th percentile queue is metered by upstream signal.

Storage length noted above is turn pocket length or link distance per lane to adjacent signalized intersection.

8.5 Safety

A predictive safety analysis was performed in the study area. The predictive safety analysis was performed per the guidelines in the American Association of State Highway and Transportation Officials (AASHTO) HSM and the IARUG Safety Analysis Guidance.

Predictive safety analysis was performed using a quantitative and qualitative approach. Quantitative safety analysis, using the Enhanced Interchange Safety Analysis Tool (ISATe), was performed where applicable in the study area. The quantitative safety analysis was performed for a 20-year design period from 2025 to 2045 for the No-Build and Build Alternative. For sections where the HSM Part C and CMF methodologies could not be applied, a qualitative safety analysis was performed. The following improvements were analyzed either quantitatively or qualitatively:

- Quantitative
    - Conversion of a diamond interchange to a TDI
    - Conversion of a diamond interchange to a DDI
- Qualitative
    - The conversion of a diamond interchange to a SPUI
    - Intersection improvements at the Woolbright Road at SW 8th Street

8.5.1 Quantitative Safety Analysis

A quantitative safety analysis was performed as part of this IMR, where applicable. To perform the analysis, the ISATe tool was used. The ISATe tool is intended to apply the HSM Part C methodology to freeway facilities, including freeway segments and interchanges in urban and rural areas. ISATe was developed as part of the National Cooperative Highway Research Program (NCHRP) Project 17-45. To perform the safety analysis in ISATe, the study area, where improvements are being recommended, was segmented into homogenous sections. Once the study area was segmented, the applicable inputs were provided to produce a predicted number of crashes for the 2025 to 2045 study period. The total number of crashes were then distributed using the KABCO injury classification scale. The KABCO distribution provided in the FDM Chapter 122 was used.

For the safety analysis, the No-Build alternative uses the existing roadway with the proposed improvements described in **Section 7.1**. The Build alternative uses the proposed improvements described in **Section 7.2**. The No-Build and Build Alternative predictive crash results were compared to determine

the safety benefits of the proposed improvements. Since the Build alternative does require significant changes in the geometric configuration, the predictive safety analysis did not utilize the Empirical-Bayes Method for the No-Build or Build Alternative, as recommended in the Safety Guidance. The following quantitative safety analysis compares the No-Build and Build Alternative for Woolbright Road interchange improvements. I-95 mainline was not included in this analysis since no improvements are proposed on the I-95 mainline. **Appendix H** presents the input data used to perform the analysis and output summary for the No-Build and Build Alternative.

Woolbright Road Interchange – Alternative 1 (TDI)

Predictive safety analysis was performed for Build Alternative 1. The improvements to the I-95 Northbound and Southbound ramp terminals were coded in the Build alternative. **Table 8-13**, presented below, shows the expected crash frequencies for the No-Build and Build Alternative.

Table 8-13: Predicted Crash Frequency at the I-95 and Woolbright Road Interchange (Crashes/Year)

Ramp Terminal	Alternative	K	A	B	C	PDO	Total
Northbound Ramp Terminal	No-Build	0.2	1.0	3.0	5.2	14.7	24.0
	Build	0.2	1.0	3.0	5.2	14.7	24.0
	Change	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Southbound Ramp Terminal	No-Build	0.2	1.2	3.7	6.5	18.4	30.1
	Build	0.2	1.2	3.7	6.4	18.1	29.6
	Change	*0.0*	*0.0*	*0.1*	*0.1*	*0.3*	*0.5*
Total	No-Build	0.4	2.2	6.7	11.8	33.1	54.2
	Build	0.4	2.2	6.7	11.6	32.8	53.7
	Change	*0.0*	*0.0*	*0.1*	*0.1*	*0.3*	*0.5*

The analysis shows the improvements provided at the Southbound ramp terminal should reduce the number of crashes by 0.5 crashes/year. The analysis also shows the improvements provided at the Northbound ramp terminal show no reduction in crashes and the number of crashes/year remain the same as the No-Build. Overall, the improvements at the I-95 and Woolbright Road interchange should reduce the number of crashes by 0.5 crashes/year.

Woolbright Road Interchange – Alternative 2 (DDI)

Predictive safety analysis was performed for Build Alternative 1. For Build Alternative 2, a CMF of 0.592 for converting a diamond interchange to a diverging diamond interchange (CMF ID: 9104) was applied to

observed crashes. **Table 8-14** also shows the average predicted crashes per year at Woolbright Road interchange.

Table 8-14: Predicted Number of Crashes for DDI

Ramp Terminal	Observed Crash Frequency		CMF	Build Expected Crash Frequency		Reduction in Crashes	
	FI	PDO		FI	PDO	FI	PDO
Northbound Ramp Terminal	7.6	7.2	0.592	4.5	4.3	3.1	2.9
Southbound Ramp Terminal	7.8	12.8	0.592	4.6	7.6	3.2	5.2
Total	**15.4**	**20**		**9.1**	**11.9**	**6.3**	**8.1**

Table 8-14 results show the Build Alternative 2 (DDI) will have a crash reduction of 40.8% compared to the existing crashes at I-95 and Woolbright Road Interchange.

8.5.2 Qualitative Safety Analysis

The HSM Part C methodology and CMF methodology cannot always account for unique configurations and as a result, quantitative predictive safety analysis cannot be performed. However, to still account for the proposed improvements that cannot be analyzed using HSM Part C or with CMFs, a qualitative safety analysis has been performed for these applicable improvements.

Woolbright Road Interchange – Alternative 3 (SPUI)

It is proposed that the existing diamond interchange be converted to a SPUI at the study interchange for Alternative 3. This improvement cannot be accounted for using the HSM Part C methodology or CMF methodology. Since there are no other ways to quantify this improvement, a qualitative discussion has been provided. The qualitative safety benefits of a SPUI interchange include:

- Reduction of overall interchange delay due to the main intersection operates with three traffic signal phases rather than four phases in a diamond interchange.
- Improve the safety of the overall intersection due to having one signalized intersection and vehicles only cross paths at one location.
- The SPUI design allows left-turns to be made at higher speeds, increasing the main intersection's capacity.
- Improve travel times on the arterial due to having one signalized intersection.

Woolbright Road at SW 8th Street Intersection

It is recommended to provide dual left-turn lanes on the eastbound and westbound approaches of the intersection. The proposed design modifications at this study intersection will provide additional storage and improve intersection delay and queues. The additional storage and operational improvements should result in a reduction of crashes as a result of reduced congestion.

Segment between I-95 SB ramp terminal intersection to SW 8th Street intersection

It is recommended to provide one additional through lane along Woolbright Road for the westbound movement. The proposed modification will provide additional capacity and improve travel times and queues at this segment. The additional capacity and operational improvement should result in a reduction of crashes as a result of reduced congestion.

8.6 Alternatives Comparison

The No-Build Alternative and the Build Alternatives were compared, and a summary is provided in the sections below.

8.6.1 Operational Comparison

This section compares the intersections traffic operational performance of the No-Build and Build Alternatives.

In the No-Build Alternative, all the study intersections operate at failing LOS F in the AM and PM peak hours by the Design Year 2045. The traffic operations at these intersections improve with the implementation of the Build Alternatives except the Woolbright Road and Seacrest Boulevard intersection. Since no improvements were considered for Woolbright Road and Seacrest Boulevard intersection in the Build Alternative except a committed exclusive EBR turn lane which is considered in both No-Build and Build Alternatives, therefore the delay and LOS for this intersection are similar to the No-Build Alternative. All the three Build Alternatives (TDI, DDI and SPUI) will provide acceptable LOS D or better for terminal intersections by the Design Year 2045. The proposed improvements at the Woolbright Road/Corporate Drive intersection will provide acceptable LOS D in Opening Year 2025 in both AM and PM peak hours; however, in the Design Year 2045 LOS at this intersection will be “E” in the AM peak hour and “D” in the PM peak hour. The Woolbright Road at Seacrest Boulevard intersection will operate at LOS E and F in the 2025 and 2045 AM (PM) peak hours respectively.

8.6.2 Cost Estimate

The estimated construction cost was developed for the Woolbright Road interchange alternatives using the FDOT Long Range Estimates (LRE) program. Design Engineering Costs were estimated at 12% of the construction cost and Construction Engineering Inspection (CEI) were estimated at 15%. Right of way costs were provided by FDOT and include right of way acquisition and business damages. **Table 8-15** reflects the estimated project costs for the Woolbright Road Interchange Alternatives. The FDOT Long Range Estimating (LRE) and engineer's estimates are provided in **Appendix I**.

Table 8-15: Estimated Project Costs for Woolbright Road Interchange Alternatives

Cost Element	BUILD ALTERNATIVES		
	TDI	DDI	SPUI
Roadway Construction (LRE Cost)	$10,956,542	$19,000,000	$20,000,000
Engineering Design & CEI	$2,958,266	$5,130,000	$5,400,000
Right of Way Acquisition	$1,500,500	$5,200,000	$1,500,000
Total Project Cost	**$15,415,308**	**$29,330,000**	**$26,900,000**

8.6.3 Benefit/Cost Analysis

In general terms, a benefit-cost ratio is an indicator of the overall value of a proposed project. The ratio is expressed as the benefits, in monetary units, relative to the costs, in monetary units. A ratio greater than 1 indicates the project is worth considering, while a ratio of less than 1 indicates the project is monetarily unjustifiable. A quantitative benefit-cost analysis was performed to assess the proposed improvements based on safety and operations.

The total cost for the Build Alternative 1 is estimated at $15,415,308 which includes the construction cost of $2,958,266 and the Right-of-Way cost of $1,500,500. The annualized cost is expected to be $1,900,568.

The benefits include traffic operation along I-95, I-95 ramps reconstruction, and interchange termini intersections improvements.

The values of the AM and PM peak hour delay change for the I-95 at Woolbright Road Interchange termini intersections under the 2045 No-Build and Build Alternatives were subsequently compared. The overall delay and travel time for the Build Alternative 1 condition will decrease during the AM and PM peak hour compared to the No-Build Alternative. The Value-of-Time used for the analysis was $28.83, which is based on the current FHWA Road User Cost Calculator. The traffic operation benefit analysis shows that the annual benefit will be $1,563,513.61.

A 4%-time value for money was utilized to discount and annualize the future costs and benefits over the design periods for the various cost components. The benefit/cost analysis results are presented in **Table 8-16**. The detailed benefit cost analysis is provided in **Appendix I**.

Table 8-16: Benefit Cost Analysis for Woolbright Road Interchange Alternative

Benefit Cost		Build Alternative 1	Build Alternative 2	Build Alternative 3
		TDI	DDI	SPUI
Total Cost		$ 15,415,308.00	$29,330,000.00	$26,900,000.00
Annual Cost		$ 1,900,567.88	$3,616,123.40	$3,316,526.40
Annual Benefit	Operation	$ 1,563,513.61	$ 1,765,892.99	$ 1,356,939.87
Benefit/Cost Ratio		**0.82**	**0.49**	**0.41**

Based on the results of the benefit-cost analysis, Build Alternative 1 has the best benefit-cost ratio of 0.82. Build Alternative 2 is next with a benefit-cost ratio of 0.49 and finally Build Alternative 3 with a benefit-cost ratio of 0.41.

8.7 Evaluation Matrix

Based on the analysis and evaluation of several key evaluation parameters, including traffic operations, safety benefits, right of way impacts, and construction costs, Build Alternative 1 with the TDI configuration is the preferred alternative due to the significant safety and traffic operational benefits with the lower construction cost. The No-Build Alternative shows the least benefits from the evaluation matrix. **Table 8-17** shows the evaluation matrix for the Woolbright Road Interchange Alternatives.

Table 8-17: Alternatives Evaluation Summary

Evaluation Factors		No-Build	Build Alternative TDI	Build Alternative DDI	Build Alternative SPUII
ENGINEERING	Meets Purpose and Need	No	Yes		
	Improves Safety	No	Yes	Yes	Yes
	Meets 2045 LOS Target	No	Yes	Yes	Yes
	Improves SIS Connectivity	No	Yes		
	R/W & Property Impacts	No	No	Yes (5 properties)	No
	Meets Geometric Design Criteria	Yes	Yes	Yes	Yes
Total Project Cost		$0	$15.4M	29.3M	29.4M

8.8 Recommended Alternative

The No-Build Alternative will not accommodate the travel demand at the I-95 and Woolbright Road Interchange. In the Design Year 2045, significant operational deficiencies exist. All of the study area intersections operate at unacceptable LOS F in the No-Build Alternative. These operational deficiencies are associated with high arterial through and left-turn volume at the ramp terminal intersections and insufficient capacity at the ramp terminals, the SW 8th Street and the Seacrest Boulevard intersections. Congestion from the insufficient capacity at these intersections extend to the I-95 SB off ramp and spills back onto SB mainline affecting freeway operations. These also affected the operations at the NB off ramp intersection.

Based on the comprehensive evaluation presented in this IMR, Build Alternative 1 with TDI configuration was selected as the Preferred Alternative due to the significantly traffic operational and safety benefits it provides compared to the other Alternatives. Build Alternative 1 also satisfies the purpose and need of this project and provides the highest benefit-cost ratio making it the most cost-effective alternative.

The Build Alternative 1 for this study performs substantially better than the No-Build Alternative for all future years. The proposed interchange improvements provide additional capacity for the heavy off ramp left turn volumes as well as for the EB and WB through volumes. By implementing these improvements, three out of the four study intersections will operate at an acceptable LOS D or better in the Design Year 2045. Woolbright Road will benefit from the increase in number of through lanes and improved ramp terminal intersection configuration resulting in lower intersection delay. The additional turn lanes at the SW 8th Street intersection will also result in lower intersection delay. These improvements help process traffic travelling to and from the interchange.

A predicted quantitative safety analysis was also performed to determine if the Build Alternatives addressed the existing safety concerns. To analyze the future safety analysis, expected crash frequencies for I-95, Woolbright Road and ramp segments were analyzed. Based on the proposed improvements for the Preferred Alternative (TDI), crashes are expected to reduce by approximately 1% compared to the No-Build Alternative.

8.9 Access Modifications

The preferred alternative does not propose any modifications to the existing access management classification or access locations as no roadway modifications are proposed along Woolbright Road and I-95.

8.10 Conceptual Signing Plan

A conceptual signing plan was prepared for the preferred alternative. **Appendix J** presents the conceptual signing plan for proposed modifications within the area of influence.

8.11 Design Exceptions and Variations

Implementation of the proposed improvements will not require any design exceptions or variations.

9. JUSTIFICATION

The proposed improvements at the Woolbright Road interchange with I-95 are consistent with the requirements set by the FHWA Access to the Interstate System Policy dated August 27, 2009 and by FDOT Procedure No. 525-030-160. The roadway enhancements in this IMR will provide traffic relief, thereby enhance safety within the area of influence. The I-95 at Woolbright Road interchange will operate at an acceptable LOS through the Design Year 2045.

9.1 Compliance with FHWA General Requirements

The following requirements serve as the primary decision criteria used in the approval of interchange modification projects. Responses to each of the FHWA 2 policy points are provided to show that the proposed modification for the I-95 at Woolbright Road interchange is viable based on the conceptual analysis performed to date.

9.1.1 FHWA 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)).

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 No-Build 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 with the TDI 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 signalized intersections indicated that the all the study intersections will operate at an overall LOS F during the peak hours by Design Year 2045 if no improvements are done. Under Build Alternative, the study indicated that TDI Interchange performs substantially better than the No-Build Alternative for all future year scenarios, particularly for the I-95 ramp terminal intersections, which are the primary focus for this study. The SB ramp terminal intersection will experience 66.6% and 69.7% reduction in delay for the AM and PM peak hours, respectively, whereas the NB ramp terminal will experience 58.2% and 75.5% reduction in delay during the AM and PM peak hours, respectively compared to the No-Build Alternative. Significant queuing will also be observed at the ramp terminals and adjacent intersections.

From a safety perspective, a total of 734 crashes occurred along I-95 and the ramps at Woolbright Road within the study area from 2013 to 2017. And a total of 341 crashes occurred along Woolbright 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 the preferred Build Alternative 1 is anticipated to result in an overall crash reduction of approximately 1% compared to the No-Build Alternative due to the significant reduction in delays resulting from the TDI configuration. This will enhance safety within the interchange area.

Overall, the preferred Build Alternative 1 provides significantly better traffic operations and enhanced safety when compared to the No-Build Alternative.

9.1.2 FHWA 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.

The proposed improvements to the I-95 at Woolbright Road interchange and adjacent intersections will provide full access and cater to all traffic movements from Woolbright Road to and from I-95. The proposed modifications are designed to meet current standards for federal-aid projects on the interstate system and conform to the American Association of State Highway and Transportation Officials (AASHTO) and the FDOT Design Manual.

10. CONCEPTUAL FUNDING PLAN/CONSTRUCTION SCHEDULE

The improvements proposed as part of the Build Alternative at the I-95 at Woolbright Road interchange are performed under the Programmatic Agreement with FHWA. Therefore, FDOT Central Office will conduct necessary review and assessment of the justification for the proposed improvements. This project is funded for design in Fiscal Year (FY) 2022 - 2026 in FDOT Citizen's Report Draft Tentative Work Program. Construction is funded in the 10-year SIS plan (FY 2027). The funding for project phases in FDOT Work Program for FY 2022 – FY 2026 is shown in **Table 10-1**.

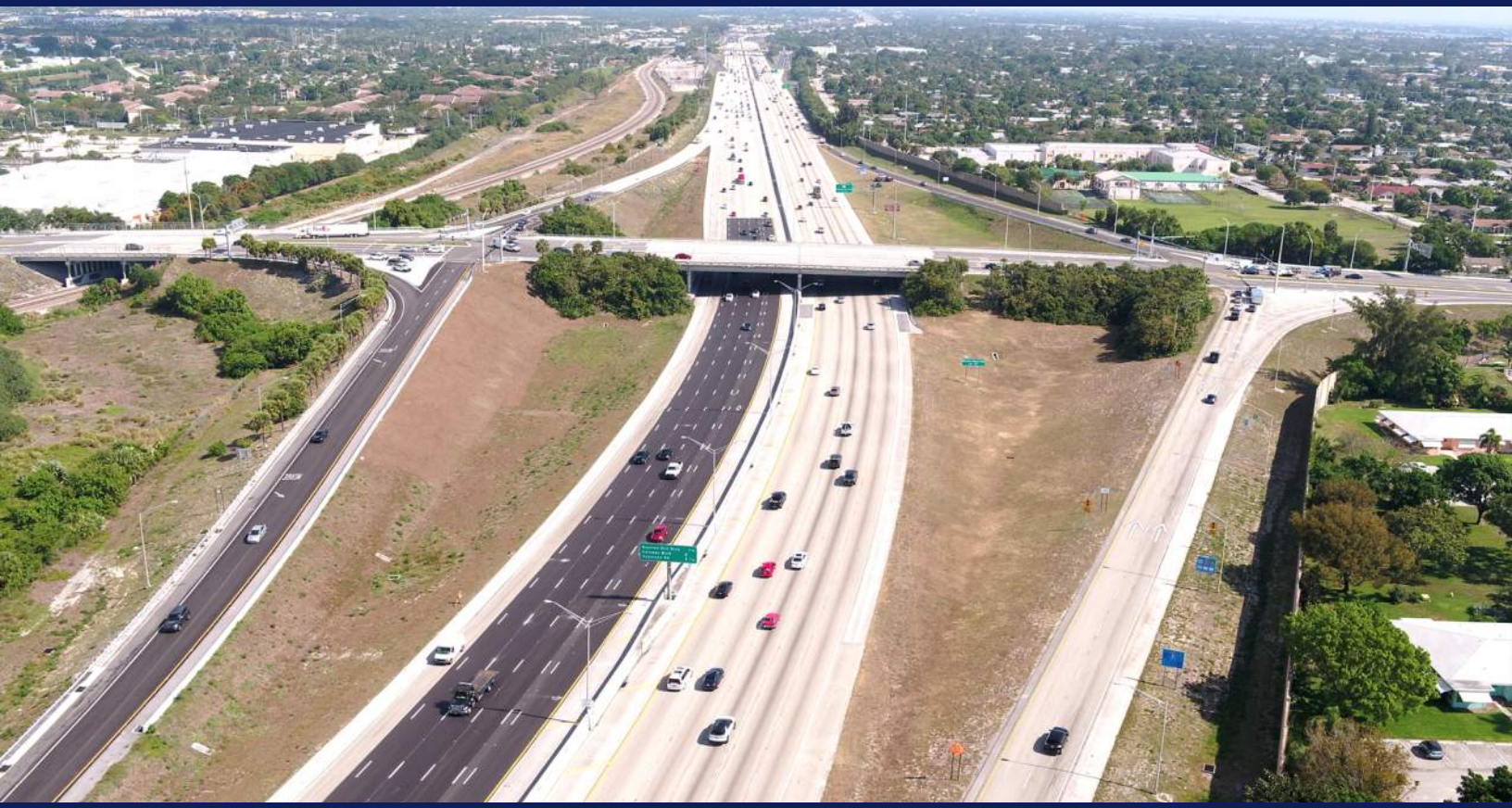
Table 10-1: Funding for FPID 437279-1 - I-95 at Woolbright Road Improvements

Phase	Fund Code	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	5 Year Total
Right-of-Way Support	ACNP	$280,000	$54,335				$334,335
	BNIR	$3,888,421	$998,144				$4,886,565
Right-of-Way Land	ACNP		$58,216				$58,216
	BNIR	$15,529,466	$3,999,032				$19,528,498
Construction	ACNP				$200,000		$200,000
Total		**$19,697,887**	**$5,109,727**		**$200,000**		**$25,007,614**

LIST OF APPENDICES

SR 9/I-95 Project Development and Environment (PD&E) Study from S. of Woolbright Road to N. of Woolbright Road Palm Beach County, Florida

FPID No.: 437279-1-22-02 | ETDM No.: 14341



INTERCHANGE MODIFICATION REPORT APPENDICES

June 2021