FINAL INTERCHANGE MODIFICATION REPORT (IMR)

Project Development & Environment (PD&E) Study
I-95 at SR 5 (US 1) Interchange Modification Report

FPID: 419772-2-22-02

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated May 26, 2022, and executed by the Federal Highway Administration and FDOT.

Florida Department of Transportation
District Five, Deland, FL

Interchange Modification Report (IMR)

I-95 at US 1 PD&E Study

Interchange Modification Report

419772-2-22-02

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: Jesse Blouin E514AEEF19574EA... Jesse Blouin, AICP District Five	1/10/2023 | 8:42 AM EST Date
Interchange Review Coordinator	DocuSigned by: Melissa Mckinney 06F854BBA29945C... Melissa S. McKinney District Five	1/10/2023 | 9:57 AM EST Date
Systems Management Administrator	DocuSigned by: Jenna Bowman 4AD03E6A337F4C1... Jenna Bowman, PE Systems Implementation Office – Central Office	1/12/2023 | 4:29 PM EST Date
Chief Engineer	DocuSigned by: Dan Hurtado C42B6FE133D643A... Dan Hurtado, P.E. Central Office	1/12/2023 | 5:17 PM EST Date

TECHNICAL REPORT COVERSHEET

INTERCHANGE MODIFICATION REPORT

Florida Department of Transportation

District 5

I-95 and US 1 PD&E Interchange Modification Report

Limits of Project: US 1 (79030000)– from Broadway Ave. to Destination Daytona Ln., I-95 (790020000)– Milepost 35.280 to Milepost 45.712

Volusia County, Florida

Financial Management Number: 419772-2-22-02

ETDM Number: 1442

Date: 12-22-2022

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated May 26, 2022 and executed by the Federal Highway Administration and FDOT.

Scott A Zornek

Digitally signed by Scott A Zornek
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Reason: I attest to the accuracy and integrity of this document
Date: 2022.12.22 09:08:32-05'00'

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SYSTEMS IMPLEMENTATION OFFICE

QUALITY CONTROL CERTIFICATION FOR INTERCHANGE ACCESS REQUEST SUBMITTAL

Submittal Date: 12/15/2022

FM Number: 419772-2-22-02

Project Title: I-95 and US 1 PD&E

District: Five

Requestor: Jesse Blouin, AICP Phone: 386-943-5167

District IRC: Melissa S. McKinney Phone: 386-943-5077

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

Status of Document Complete copy of Draft IMR for review.

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: Jesse Blouin E514AEEF19574EA... Date: 1/10/2023 | 8:42 AM EST

Jesse Blouin, AICP

IRC DocuSigned by: Melissa McKinney 06F854BBA29945C... Date: 1/10/2023 | 9:57 AM EST

Melissa S. McKinney

Project Name: I-95 @ US 1 PD&E

FDOT Project Manager: Jesse Blouin, AICP

FPID No. 419772-2-22-02

DIRC: Melissa McKinney

No.	ITEM	READY FOR REVIEW	
		CHECKED BY	DATE
1	**Travel Demand Forecasting**		
	Has the latest version of approved model been used? *Have all adjustments been made per FDOT guidelines and MLOU and reviewed?*	SAZ	12/15/2022
	Have the traffic factors been reviewed and checked to make sure K, D and T factors are reasonable?	SAZ	12/15/2022
	Did the project traffic development follow FDOT Traffic Forecasting Handbook and MLOU?	SAZ	12/15/2022
	Have existing and future traffic volumes been checked for reasonableness?	SAZ	12/15/2022
2	**Operational Analysis**		
	Are the inputs into traffic software, correct?	SAZ	12/15/2022
	Has the validation/calibration of microsimulation been properly documented?	SAZ	12/15/2022
	Are operational analysis results reasonable?	SAZ	12/15/2022
3	**Safety Analysis**		
	Has appropriate safety analysis been performed to quantify impacts of the recommended improvements?	SAZ	12/15/2022
4	**Concept Design**		
	Does the proposed design meet minimum design standards?	SAZ	12/15/2022
	Have the exceptions and variations, if any, been justified?	SAZ	12/15/2022
5	**Conceptual Signing Plan**		
	Has a conceptual signing plan been reviewed, checked to make sure it can be signed and meets MUTCD?	SAZ	12/15/2022
6	**FHWA's Two Policy Points**		
	Does the proposal satisfy FHWA's policy points?	SAZ	12/15/2022
7	**Report Review**		
	Has the report been reviewed for grammatical and editorial errors?	SAZ	12/15/2022

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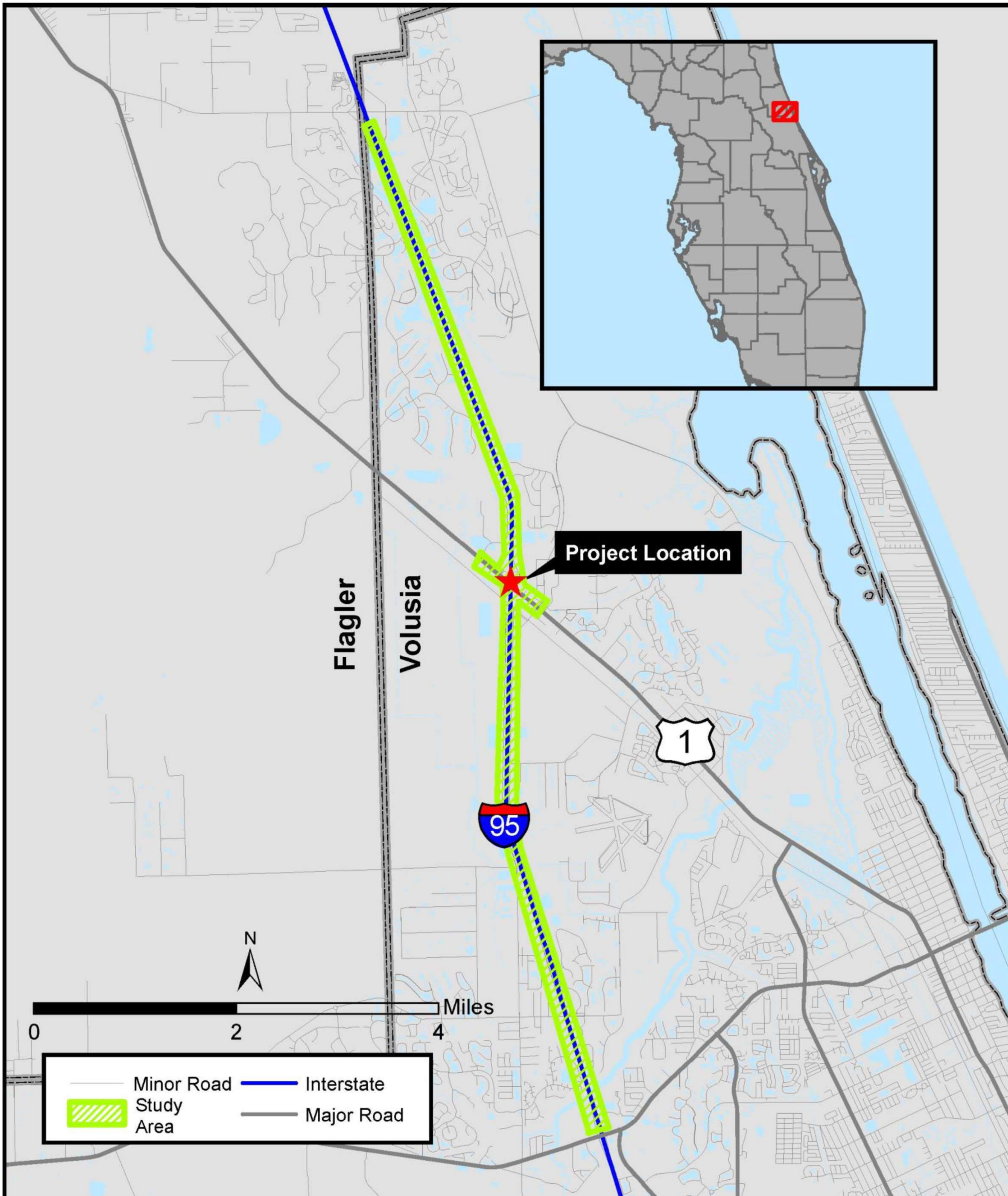
Executive Summary

The Florida Department of Transportation (FDOT) District Five has prepared an Interchange Modification Report (IMR) for the proposed interchange reconfiguration at I-95 and US 1 interchange from a partial cloverleaf interchange to a Diverging Diamond Interchange (DDI), and other arterial improvements.

The purpose of this IMR is to document the potential safety and operational impacts of the proposed interchange, typical section, and arterial modifications being proposed as part of the I-95 and US 1 interchange modification project. The findings of the operational and safety analysis and the FHWA Policy Point discussion are summarized within.

E.1 Background

I-95 and US-1 interchange is located in Volusia County and falls within the boundaries of the City of Ormond Beach. The study limits extend along I-95 from the south side of the Old Dixie Hwy. interchange to the north side of the SR 40 interchange. Along I-95, the adjacent interchanges of Old Dixie Hwy. and SR 40 are 4.9 miles to the north and 5.6 miles to the south, respectively. Along US 1 the limits extend from Broadway Ave., east of the interchange, to Destination Daytona Ln. west of the interchange. **Figure 1** shows displays the Area of Influence.



Project Development and Environment (PD&E) Studies
I-95 Interchange at SR 5 (US 1)

Interchange Modification Report

Area of Influence (AOI)

Figure 1

E. 2 Purpose and Need
The purpose and need of the Project Development & Environment (PD&E) study is provided below, from the March 23, 2020 ETDM Summary Report for this IMR, Project 1442.

Purpose

The purpose for improving the interchange on Interstate 95 at US 1 is to enhance operational and safety needs. Interchange improvements will reduce congestion and better serve regional trips.

Need

The need for the project is based on safety, transportation demand, and economic development.

Safety

Between 2012-2016, there were 797 crashes, with 20 fatalities at the interchange. Currently, the interchange is a partial cloverleaf with loop ramps in the northwest and northeast quadrants. The existing loop ramps have extremely tight and inconsistent radii, necessitating a low design speed. The low design speed causes issues northbound when diverging from the interstate to exit, and southbound when merging onto the interstate. The historic rollover and off-road crashes on the loop ramps are consistent with the design issues associated with the existing interchange configuration.

Transportation Demand
In the existing condition, the Annual Average Daily Traffic (AADT) on the southbound ramp is approximately 6,700 daily trips. The AADT on the northbound ramps is approximately 7,400 daily trips. Currently, the I-95 mainline, ramps, and northbound ramp intersection appear to operate at acceptable level of service (LOS); however, in the no-build condition the interchange the ramp terminal intersections will fail by the 2045 design year.

Economic Development
This interchange is located in a strategic area of Volusia County and provides access to a major regional tourist destination. Destination Daytona is one of the major destinations for year-round and special events related to Biketoberfest, Bike Week, Daytona International Speedway events and other outdoor entertainment activities. Additionally, there are planned mixed-use developments adjacent to the interchange which will place increased demands on the transportation network along the US 1 corridor and on the interchange. There is a total of 4,870,000 square feet of non-residential land uses and 2,950 residential dwelling units in the Ormond Crossings Master Development Plan.

E. 3 Methodology
The traffic methodology for this analysis is consistent with the approved Methodology Letter of Understanding (MLOU) included in **Appendix A.** The area of Influence (AOI) includes the two existing interchanges at SR 40/ Granada Blvd., Old Dixie Hwy., and includes the proposed US 1 interchange. The analysis years are Existing 2021, Opening Year 2030, and Design Year 2050. Synchro 11 and HCS 7 were used to conduct detailed operational analysis for the freeway, interchange, and intersections. HCM 2000 was used for all intersectrion analysis for consistency. Future year analysis required its use due to shared turn lane geometry.

E. 4 Alternatives

Following the approved MLOU, the following alternatives were considered in this IMR:

- No Build
- Build Alternative
    - Diverging Dimond Interchange

The Design Year 2050 operational analysis results show the Build Alternative provides improved traffic operations within the study area compared to the No-Build in the design year. The DDI Alternative not only improves traffic operations within the project limits through the Design Year, it also enhances safety by reducing the number of vehicle to vehicle and pedestrian to vehicle conflict points through the interchange. For these reasons the DDI Alternative is the preferred alternative.

E. 5 Compliance with FHWA General Requirements

The FHWA Policy on Access to the Interstate System provides the requirements for the justification and documentation necessary to substantiate any proposed changes in access to the Interstate System. The policy is published under the Federal Register Volume 74, Number 43743, dated May 22, 2017. The responses provided herein for each of the two policy statements demonstrate compliance with these requirements and justification for the proposed Interchange Modification Report (IMR) in support of the I-95 at US 1 PD&E Study in Volusia County, Florida. The following two FHWA Policy Criteria are addressed below.

Policy

It is in the national interest to preserve and enhance the Interstate System to meet the needs of the 21st Century by assuring that it provides the highest level of service in terms of safety and mobility. Full control of access along the Interstate mainline and ramps, along with control of access on the crossroad at interchanges, is critical to providing such service. Therefore, the Federal Highway Administration's (FHWA) decision to approve new or revised access points to the Interstate System under Title 23, United States Code (U.S.C.), Section 111, must be supported by substantiated information justifying and documenting that decision. The FHWA's decision to approve a request is dependent on the proposal satisfying and documenting the following requirements:

Point 1

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

Response

Operational Analysis

This IMR consists of a planned modification to the I-95 and US 1 interchange. A traffic operational analysis for the Existing 2021, Opening Year 2030, and Design Year 2050 conditions was performed to assess the impacts of the Build Alternative within the area of influence (AOI). Detailed analyses were performed for the mainline, ramps, intersections, and crossroad.

Some of the measures of effectiveness used to compare the operations of the Existing and Build Conditions were speed, level of service, intersection delays, and 95th queues. Based on the operational analysis conducted for the IMR, the following high-level operational analysis observations were made. Detailed results are provided in Future Traffic Operational Analysis section of this report.

- The 2050 No Build Alternative could not accommodate future traffic demand under existing geometry at the arterial level. LOS E or worse is expected at all intersections along US 1 during AM and PM peaks.

- Build Alternative intersections operates at LOS D or better during both opening and design year.

- The proposed Build Alternative provides operational benefits along US 1 as well as enhanced safety through the interchange.

Safety Analysis

A historic crash data and safety analysis was completed for this project and includes an existing conditions safety analysis to review the crash history, and a quantitative safety analysis using the Highway Safety Manual (HSM) predictive method to analyzed future conditions. The Enhanced Interchange Safety Analysis Tool (ISATe) and HSM Urban and Suburban Arterials Spreadsheet Tool were used for the predictive analysis to assess future conditions.

The predictive method analysis results show an overall decrease in freeway, ramp and crossroad ramp terminals in the Build Alternative compared to the No-Build Alternative.

DDIs have been proven to reduce crashes and crash severity. It is anticipated the I-95 and US 1 interchange modification to a DDI will reduce the total number of crashes, the number of fatalities, and potentially reduce wrong-way maneuver crashes through the I-95 and US 1 interchange area from a qualitative perspective.

Conceptual Singing Plan

Conceptual signing plans were developed and are included in **Appendix I**.

Point 2

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

Response

I-95 is a public facility and all interchanges within the area of influence provide full access. The interchange improvements will impact the I-95 and US 1 interchange. Improvements along US 1 are also being proposed to improve traffic flow and enhance safety. The proposed improvements at the interchange will continue to provide full access.

1.0 Introduction

The Florida Department of Transportation (FDOT) District 5 (D5) is conducting a Project Development and Environment (PD&E) study, State Financial Project Number 419772-22-02 to evaluate changes to the interchange of I-95 at US 1. The interchange is located in Ormond Beach, Florida under Volusia County.

The methods and assumptions discussed throughout this report are consistent with those presented in the Methodology Letter of Understanding (MLOU) prepared for the I-95 at US 1 Interchange Modification Report (IMR). Any deviations from or additions to the approved MLOU methodology are described and validated herein. Additionally, all methods and assumptions are in accordance with FDOT's established policies and procedures. This includes those detailed in the Project Traffic Forecasting Handbook (2019) and the Florida Standard Urban Transportation Modeling System (FSUTMS) User's Manual.

The purpose of improving the interchange of I-95 at US 1 is to enhance operational and safety needs. Interchange improvements will reduce congestion and better serve regional trips. The need for the project is based on safety, transportation demand, and economic development.

Between 2015-2019, there were 860 crashes, with ten fatalities at the interchange. Currently, the interchange at I-95 and US 1 is a partial cloverleaf with loop ramps in the northwest and northeast quadrants. This was designed in part due to the proximity of the Florida East Coast Railway (FEC) rail line, which parallels the US 1 corridor approximately 700 feet to the southwest. The existing loop ramps have tight and inconsistent radii, necessitating a low design speed. The low design speed causes issues northbound when diverging from the Interstate to exit, and southbound when merging onto the interstate. The historic rollover and off-road crashes on the loop ramps are consistent with the design issues associated with the existing interchange configuration.

Currently, the I-95 mainline, ramps, and northbound ramp intersection appear to operate at an acceptable level of service (LOS); however, in the no-build condition the ramp terminal intersections will fail by the 2050 design year.

This interchange is located in a strategic area of Volusia County and provides access to a major regional tourist destinations. Destination Daytona is one of the major destinations for year-round and special events related to Biketoberfest, Bike Week, Daytona International Speedway events and other outdoor entertainment activities. Additionally, there is a planned mixed-use development (Ormond Crossings) south of US 1, east and west of the interchange, which will place increased demands on the transportation network along the US 1 corridor and the interchange. There is a total of 4,870,000 square feet of non-residential land uses and 2,950 residential dwelling units in the Ormond Crossings Master Development Plan.

1.1 Background

I-95 and US-1 interchange is located in Volusia County and falls within the boundaries of the City of Ormond Beach. The study limits extend along I-95 from the south side of the Old Dixie Hwy. interchange to the north side of the SR 40 interchange. Along I-95, the adjacent interchanges of Old Dixie Hwy. and SR 40 are 4.9 miles to the north and 5.6 miles to the south, respectively. Along US 1 the limits extend from Broadway Ave., east of the interchange, to Destination Daytona Ln. west of the interchange.

1.2 Purpose and Need

The purpose and need of the PD&E study is provided below, from the March 23, 2020 ETDM Summary Report for Project 1442 which was developed to support this IMR.

Purpose

The purpose for improving the interchange on Interstate 95 at US 1 is to enhance operational and safety needs. Interchange improvements will reduce congestion and better serve regional trips.

Need

The need for the project is based on safety, transportation demand, and economic development.

<u>Safety</u>

Between 2012-2016, there were 797 crashes, with 20 fatalities at the interchange. Currently, the interchange is a partial cloverleaf with loop ramps in the northwest and northeast quadrants. The existing loop ramps have extremely tight and inconsistent radii, necessitating a low design speed. The low design speed causes issues northbound when diverging from the interstate to exit, and southbound when merging onto the interstate. The historic rollover and off-road crashes on the loop ramps are consistent with the design issues associated with the existing interchange configuration.

<u>Transportation Demand</u>

In the existing condition, the Annual Average Daily Traffic (AADT) on the southbound ramp is approximately 6,700 daily trips. The AADT on the northbound ramps is approximately 7,400 daily trips. Currently, the I-95 mainline, ramps, and northbound ramp intersection appear to operate at acceptable level of service (LOS); however, in the no-build condition the interchange the ramp terminal intersections will fail by the 2045 design year.

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This interchange is located in a strategic area of Volusia County and provides access to a major regional tourist destination. Destination Daytona is one of the major destinations for year-round and special events related to Biketoberfest, Bike Week, Daytona International Speedway events and other outdoor entertainment activities. Additionally, there are planned mixed-use developments adjacent to the interchange which will place increased demands on the transportation network along the US 1 corridor and on the interchange. There is a total of 4,870,000 square feet of non-residential land uses and 2,950 residential dwelling units in the Ormond Crossings Master Development Plan.

1.3 Planned and Programmed Transportation Projects

Programmed Projects

The FDOT Work Program (July 1, 2021) shows the following programmed projects:

1. I-95 Interchange at SR 5 (US 1) - PD&E/EMO Study
2. I-95 at Maytown Rd. – new interchange – PD&E/EMO Study
3. I-95/SR 9 From south of Bridge 790079 to Flagler County line - Resurfacing
4. I-95/SR 9 From South of Dunn Ave. to Airport Rd.- Resurfacing
5. I-95 -0.5 miles north of SR 44 to 1.6 miles north of US 92 – Add lanes and reconstruct
6. I-95 interchange at Pioneer Trl. – New Interchange
7. US 1 - Resurfacing from Woodland Ave. to Flagler Co Line

The R2CTPO Transportation Improvement Plan (June 23, 2021) identifies the following programmed projects:

1. I-95 Interchange at SR 5 (US 1) - PD&E/EMO Study
2. I-95 interchange at Pioneer Trl. – New Interchange
3. I-95 at Maytown Rd.– new interchange – PD&E/EMO Study
4. I-95 at LPGA Blvd. Interchange- PD&E/EMO Study

Planned Projects

The R2CTPO Long Range Transportation Plan (September 23, 2020) identifies the following planned projects:

1. US-1 from Nova Rd.(N) to I-95 – widen to six lanes. The exact limits and how the widening will terminate at I-95 are unknown.

2.0 Methodology

2.1 Analysis Years

The scope of this report includes a review of the existing roadway characteristics, collection of existing traffic data, and traffic operational evaluation for existing year, opening year, and design year.

- Travel Demand Model
  - Base year: 2015
  - Horizon year: 2045
- Traffic Operational Analysis
  - Existing year: 2021
  - Opening year: 2030
  - Design year: 2050

2.2 Area of Influence

The area of influence of the interchange is illustrated in **Figure 1**. The following intersections were evaluated for the study:

US 1: From the intersection of Destination Daytona Ln. west of the I-95 interchange to Broadway Ave. east of I-95 interchange and includes the following intersections:

- US 1 at Destination Daytona Ln. (Signalized)
- US 1 at I-95 Southbound Ramps (Signalized)
- US 1 at I-95 Northbound Ramps (Signalized)
- US 1 at Rosemary St. (Unsignalized)
- US 1 at Benton St. (Unsignalized)
- US 1 at Broadway Ave. (Signalized)

I-95: The interchange at US 1, as well as the Northbound Off-ramp and Southbound On-ramp at the north interchange of I-95 and Old Dixie Hwy. The Southbound Off-ramp and Northbound On-Ramp at the south interchange at I-95 and SR 40/Granada Blvd. are also included.

- I-95 mainline between SR 40 and US 1
- I-95 mainline between US 1 and Old Dixie Hwy.
- I-95 SB Off Ramp to SR 40
- I-95 NB On Ramp from SR 40
- I-95 NB Off ramp to Old Dixie Hwy.
- I-95 SB On Ramp from Old Dixie Hwy.

2.3 Analysis Period

Per the MLOU, the traffic operational analysis includes the AM and PM peak hours.

2.4 Analysis Tools

Synchro 11 software was used to conduct detailed operational analysis for the arterial and intersection operations. HCS7 was used for freeway operational analysis.

2.5 Considered Alternatives

Following the approved MLOU, the following alternatives were considered:

- No Build: No Build Alternative maintains the existing geometry with no changes to the interchange and along I-95 and US 1.
- Build Alternatives: Widening from 2-lanes to 3-lanes along US 1 through the project limits was done for both alternatives. Based on the project goals, objectives and in coordination with FDOT, two Build Alternatives were developed.
    - Diverging Diamond Interchange
    - Offset Alternative

Through the alternatives evaluation process the Diverging Diamond Interchange was determined to provide operational benefits compared to the offset and was carried forward as the Build Alternative.

2.6 Analysis Approach

2.6.1 Travel Demand Forecasting

A subarea of the Central Florida Regional Planning Model (CFRPM) version 7.0, with a base year of 2015 and horizon year of 2045, were evaluated for acceptability and validated to FSUTMS standards if needed using the standards from the "FSTUMS-Cube Framework Phase II – Model Calibration and Validations Standards" document. The CFRPM version 7.0 is FDOT's adopted regional planning model and reflects the improvements identified within the R2CTPO LRTP.

The validation of the base year model is performed by comparing base year counts to the model volumes. Before validation is conducted, 2015 base year model volumes were obtained within the project subarea and a Model Output Conversion Factor (MOCF) used to convert the volumes into model AADT volumes.

The sub-area validation process focuses on improving the forecasting accuracy within the impact limits of the study. This is achieved by running the model base year and checking how the model AADT volumes compare against actual traffic counts. Adjustments to Traffic Analysis Zone (TAZ) centroid connections based on confirming land uses seen from aerial maps are made, and where necessary, refining the TAZ centroid connection locations and splitting TAZ are considered. Other model enhancements are performed involving adjustments to facility and area types, speed-capacity tables, number of lanes and roadway coverage to represent the base year roadway condition.

The standards of Percent Error and Root Mean Square Error (RMSE) are outlined in the FDOT Traffic Forecasting Handbook and the FSUTMS Cube Framework Phase II: Model Calibration and Validation Standards. The validated CFRPM should meet the FSUTMS standards and is expected to provide a reasonable future traffic projection. Once validated, the 2045 model volumes were extrapolated to forecast the 2050 travel demand. The model results were compared with the trends based 2050 forecast to get 2050 travel demand. The Model Validation Memorandum can be found in **Appendix B** as part of the Project Traffic Forecasting Memo (PTFM).

2.6.2 Traffic Operational Analysis

Traffic software Synchro 11 was utilized for the operational analysis.

A. *Traffic Analysis Software Used*

Software		System Component					
		Freeway				Crossroad	
Name	Version	Basic Segment	Weaving	Ramp Merge	Ramp Diverge	Arterials	Intersections
HCS/HCM	7.9.6/6	☒	☒	☒	☒	☐	☐
Synchro 11.1.0.8/HCM 2000*	11.1.0.8	☐	☐	☐	☐	☐	☒
Corsim	☐	☐	☐	☐	☐	☐	☐
Vissim	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐

* HCM 2000 was used to for intersection analyses as the latest version of HCM is not capable of analyzing shared lane geometry.

B. *Selection of Measures of Effectiveness (MOE)*

- *The Level of Service criteria for each roadway classification, including mainline, ramps, ramp terminal intersections and the crossroad beyond the interchange ramp terminal intersections are identified below.* Level of Service (LOS) will be the primary MOE. **Table 1** details the LOS targets per State Highway System Policy No. 000-525-006c, effective April 19, 2017.

Table 1: Measures of Effectiveness

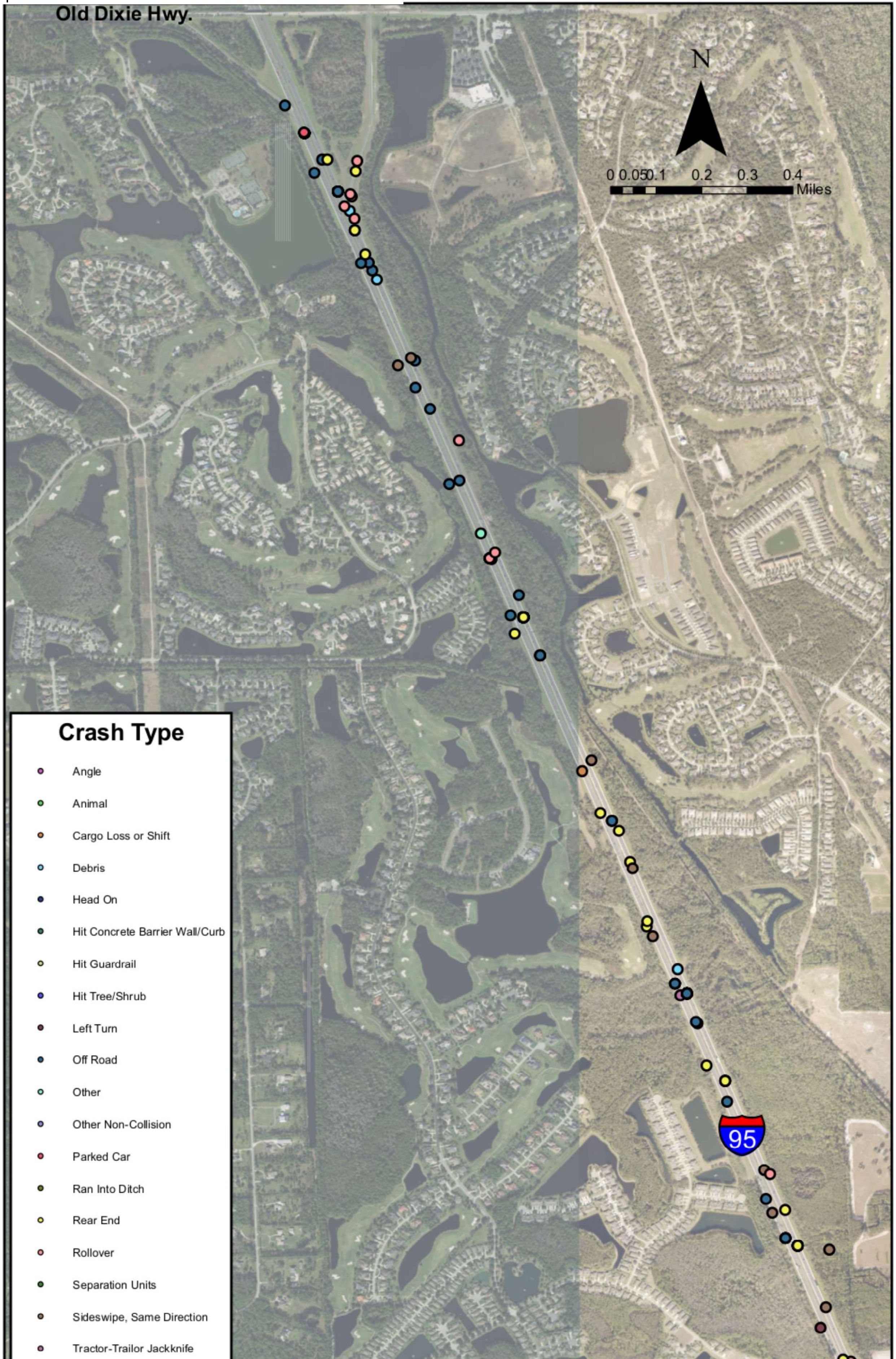
Roadway	Mainline/Segment	Ramps/Intersections
I-95	D	D
US 1	D	D

- *In addition to the Level of Service criteria, state other operational MOEs to be utilized for the evaluation of alternatives.*
  - Synchro
    LOS, volume/capacity ratio, movements/total intersection delay measured in seconds per vehicle per hour will be evaluated with the Synchro software based on HCM 2000 Edition for existing conditions and future alternatives. HCM 2000 was used for consistency as future year analysis required its ability to analyze shared turn lane geometry. In addition, u-turn movemnts cannot be analyzed due to limitations within the analysis tools. At each location where u-turns occur, the u-turn volume was added to the left turn movement. SimTraffic 95th Percentile queue will be used to inform the design of turn lanes for the proposed improvements.
  - HCS
    Basic mainline, merge/diverge, LOS and density.

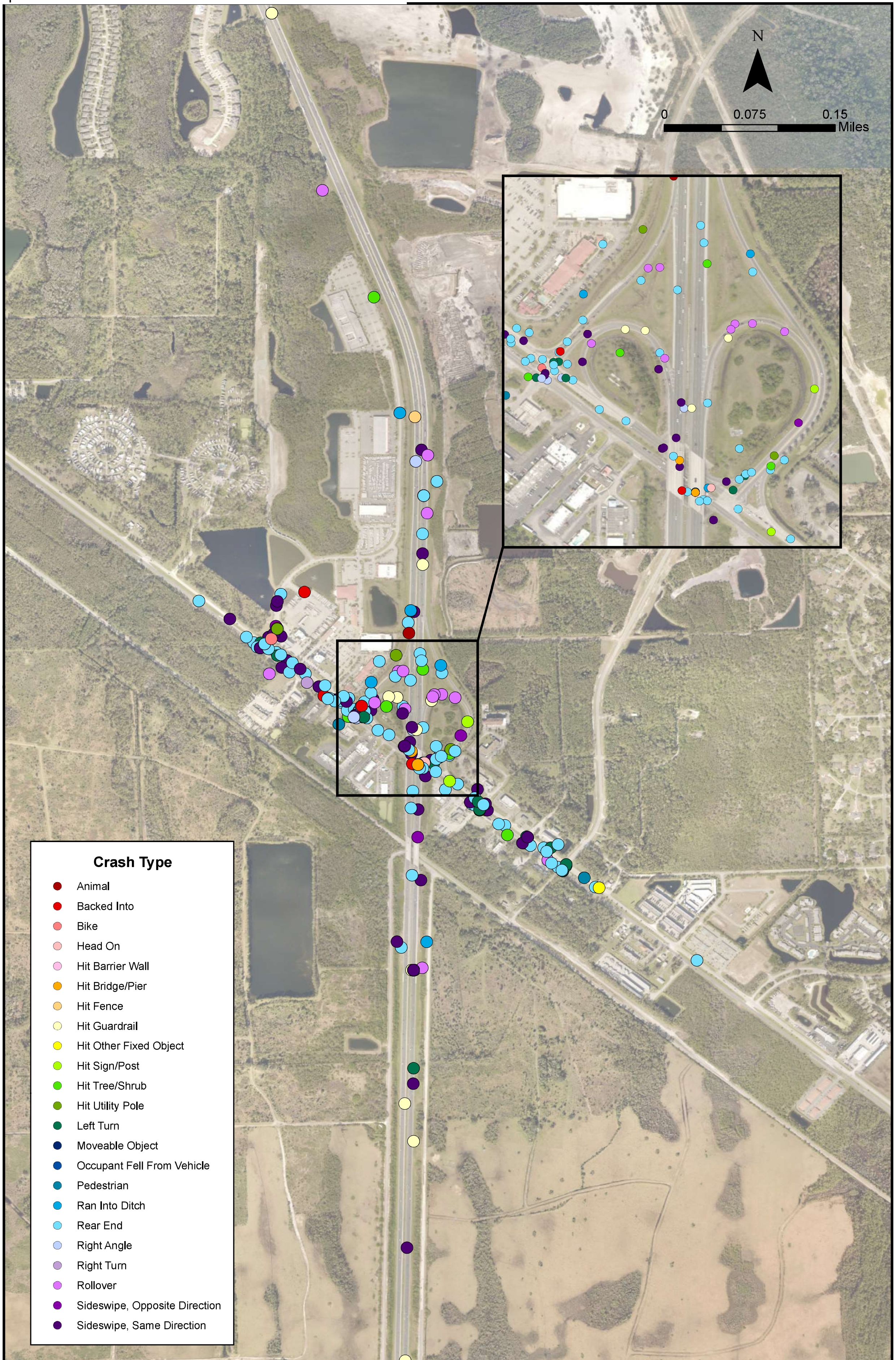
2.6.3 Safety Analysis

Safety data is an important part for the purpose and need of a PD&E study. As such, crash records were obtained from Crash Analysis Reporting System (CARS) Online for the most recent verified five years (2015 to 2019) as shown in **Figure 2**. The limits of the crash data for the area of influence are as follows:

- US 1 from 500’ west of Destination Daytona Ln. and 500’ east of Broadway Ave.,
- NB On Ramp to I-95,
- NB Off Ramp from I-95,
- SB On Ramp to I-95,
- SB Off Ramp from I-95,
- I-95 between Milepost 35.394 to Milepost 45.651



FDOT	Project Development and Environment (PD&E) Study I-95 at US-1 Interchange Modification Report	Crash Map (2015-2019)	Figure 2.1



FDOT	Project Development & Environment (PD&E) Studies I-95 at US 1 Interchange Modification Report	Crash Map (2015-2019)	Figure 2.2

FDOT	**Project Development and Environment (PD&E) Study** **I-95 at US-1** **Interchange Modification Report**	**Crash Map** **(2015-2019)**	**Figure 2.3**

2.6.3.1 Crash Statistics

Figures 2.1 through 2.3 shows a total of 860 crashes were reported from 2015 through 2019, 66 percent of which resulted in at least one injury and 1 percent resulted in a fatal crash. Below a detail summary of each fatal crash.

The first fatal crash occurred along I-95 northbound just north of SR 40. A motorcyclist failed to maintain their designated lane, traveled onto the median and struck the guardrail. This caused the motorcyclist to be thrown from the bike and impact the guardrail. Drugs were found in the motorcyclist system and was determined to be the cause of the crash.

The second crash occurred along I-95 northbound just south of Old Dixie Hwy. The driver was driving at a high rate of speed and abruptly changed lanes from the far left to the exit ramp for Old Dixie Hwy. where the car entered a ditch and overturned. The contributing cause was found to be careless driving.

The third crash occurred along I-95 northbound, south of Old Dixie Hwy. The driver attempted to change lanes when the front of the car collided with the rear of the second vehicle. The driver's car began to rotate and eventually overturn. The driver was found to have alcohol in their system and was considered to be the contributing cause of the crash.

The fourth fatal crash occurred along I-95 southbound, south of US 1. Driving in the center lane Vehicle 1 started to enter the right lane where the driver then overcorrected and struck Vehicle 2. Vehicle 1 overcorrected again and struck Vehicle 3. This crash was contributed to Driver 1 falling to yield the right of way.

The fifth crash occurred along I-95 northbound, north of mile marker 277. The driver did not notice an overturned vehicle ahead of them from an earlier crash. The driver could not avoid a collision and struck Vehicle 2.

The sixth crash occurred along I-95 southbound in the inside lane. The driver was traveling in the wrong direction (northbound) colliding with Vehicle 2. The collision caused Vehicle 1 to overturn.

The seventh crash occurred along I-95 southbound approaching mile marker 277. A motorcyclist traveling in the left lane traveled onto the shoulder causing it to impact the guardrail. The motorcyclist was thrown from the vehicle.

The eighth fatal crash occurred along I-95 northbound, south of Old Dixie Hwy. The tire of Vehicle 1 began to separate causing the driver to loss control. Driver 1 traveled towards the outside shoulder eventually causing the car to rotate and begin to overturn. The contributing cause of the crash was found to be failure to maintain equipment.

The ninth fatal crash occurred at the I-95 southbound off ramp intersection. The driver of a motorhome had a mechanical issue and failed to stop as they exited the interstate. The vehicle hit a light pole on the south side of the intersection and caught on fire. This crash was not attributed to any improper driving action.

The final fatal crash occurred at the I-95 NB On Ramp from US 1. A motorcyclist driving under the influence of alcohol/drugs and without a helmet lost control causing the motorcycle to strike the pavement on its left side throwing the driver onto the pavement. Driving under the influence was the cause of the crash.

As shown in **Figure 3**, the total number of crashes per year remained consistent through the study period with an average total crash of 171 crashes/year. There were 167 total crashes in 2015, 183 total crashes in 2016, 183 total crashes in 2017, 157 total crashes in 2018 and 170 total crashes in 2019, which shows that the crash frequency did not significantly increase due to any roadway or environment changes.

Figure 3: US 1 and I-95 Interchange Crash Frequency/Severity by Year

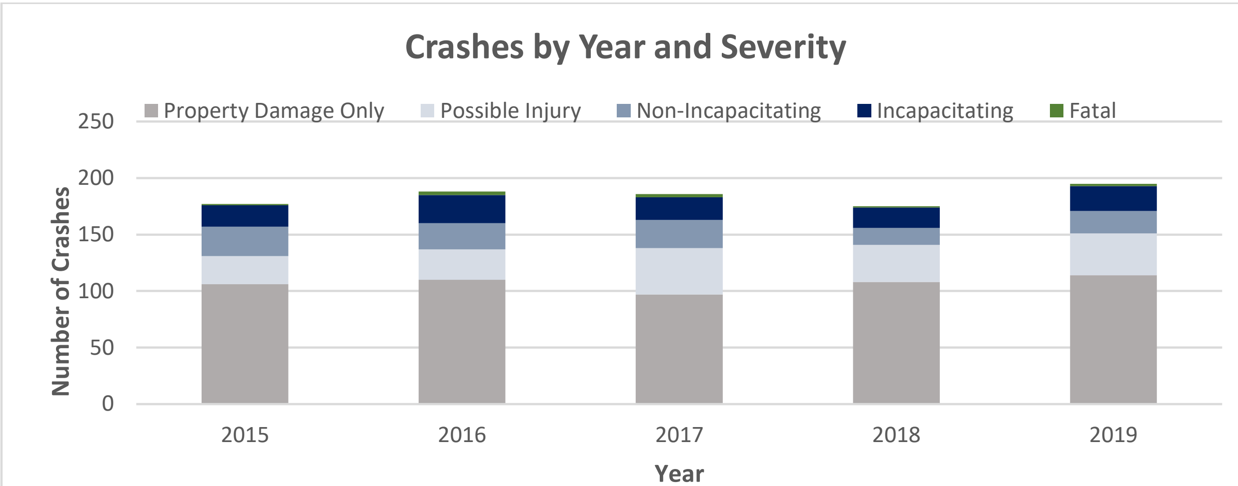
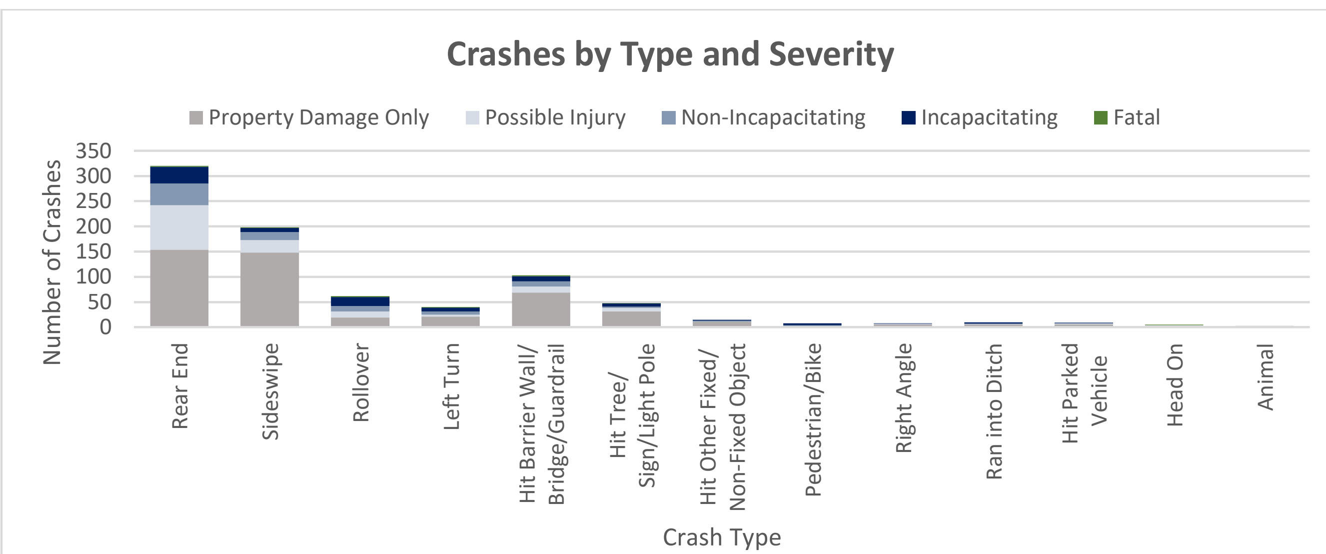


Figure 4 displays the crashes along the study corridor by type and severity for the five-year study period. The highest crash type was rear end, comprising 39 percent of the total crashes.

Figure 4: US 1 and I-95 Interchange Crashes by Type and Severity (Corridor Wide)



Other crash statistics include the following:

- The AM Peak (6:00 AM to 10:00 AM), the Midday Peak (12:00 PM to 2:00 PM), and the PM Peak (3:00 PM to 7:00 PM) accounted for 441 crashes (51 percent) during the study period.
- Crashes occurring during non-daylight conditions accounted for 27 percent of the crashes, indicating the majority of crashes occurred during daylight and/or lighted conditions.
- Crashes with wet roadway conditions accounted for 22 percent of the crashes, indicating a need for roadway resurfacing.
- Crashes on all I-95 exit and entrance ramps accounted for 168 crashes (18 percent) including one fatal crash.
- Crashes where alcohol and/or drugs were involved accounted for 3 percent.
- The highest crash type was rear end collisions that accounted for 299 (35 percent) crashes.

Appendix C provides a detailed summary of the 2015 to 2019 crash history along I-95 and US 1 within the area of influence.

2.6.3.2 Crash Rates

A crash rate analysis was performed for the US 1 and I-95 interchange study area for both segments and intersections. The crash rates were calculated by location and compared to the crash rate of similar facilities throughout FDOT District 5 and the State of Florida. Crash rates were calculated for the following intersections and segments:

- Intersection 1 – US 1 and Destination Daytona Ln.
- Intersection 2 – US 1 and I-95 SB ramps
- Intersection 3 – US 1 and I-95 NB ramps
- Intersection 4- US 1 and Broadway St.
- Intersection 5- US 1 and Benton St.
- Intersection 6 – US 1 and Broadway Ave.
- Segment 1 – I-95 from Milepost 40.471 to the bridge over US 1
- Segment 2 – I-95 from the bridge over US 1 to Milepost 41.639
- Segment 3 - US 1 West of I-95 SB Ramp to Destination Daytona Ln.
- Segment 4- US 1 between I-95 SB and NB Ramp
- Segment 5- US 1 East of I-95 NB Ramp to Rosemary St.
- Segment 6- US 1 between Rosemary St. to Benton St.
- Segment 7- US 1 between Benton St. to Broadway Ave.
- Segment 8- I-95 NB Off Ramp to US 1
- Segment 9- I-95 NB On Ramp from US 1
- Segment 10- I-95 SB Off Ramp to US 1
- Segment 11- I-95 SB On Ramp from US 1
- Segment 12- I-95 from Milepost 41.639 to Milepost 45.651
- Segment 13- I-95 from Milepost 35.394 to Milepost 40.471

The segment crash rate was calculated using the formula below, expressed as a number of crashes per million vehicle miles (MVM). The actual crash rate is calculated from the total number of crashes in a year, AADT, and the length of the segment based in the equation below:

$$Actual\ Crash\ Rate = \frac{Number\ of\ crashes\ per\ year * 1{,}000{,}000}{(AADT * 365\ days * segment\ length)}$$

Traffic data such as functional classification, AADTs, and average crash rates were collected from CAR System, and Florida Traffic Online and Volusia County Traffic Reports and provided in **Appendix C**.

Tables 2 and **3** summarize the statewide and district wide average crash rate for all segments and intersections.

Table 2: Average Intersection Crash Rate based on facility type

Intersection Facility Type	**Statewide**					**Districtwide**				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
US 1 & Destination Daytona Ln.: Urban 4-5 Lane 2-Way Divided Raised Median, 4-Leg	0.635	0.654	0.674	0.666	0.659	0.533	0.528	0.565	0.581	0.582
US 1 & I-95 SB ramps: Urban 4-5 Lane 2-Way Divided Raised Median, 4-Leg	0.635	0.654	0.674	0.666	0.659	0.533	0.528	0.565	0.581	0.582
US 1 & I-95 NB ramps: Urban 4-5 Lane 2-Way Divided Raised Median, 3-Leg	0.440	0.440	0.450	0.442	0.439	0.303	0.302	0.306	0.325	0.333
US 1 & Rosemary St: Urban 4-5 Lane 2-Way Divided Raised Median, 4-Leg	0.635	0.654	0.674	0.666	0.659	0.533	0.528	0.565	0.581	0.582
US 1 & Benton St: Urban 4-5 Lane 2-Way Divided Raised Median, 4-Leg	0.635	0.654	0.674	0.666	0.659	0.533	0.528	0.565	0.581	0.582
US 1 & Broadway Ave: Urban 4-5 Lane 2-Way Divided Raised Median, 4-Leg	0.635	0.654	0.674	0.666	0.659	0.533	0.528	0.565	0.581	0.582

Table 3: Average Segment Crash Rate based on facility type

Segment Facility Type	Statewide					Districtwide				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
I-95: Interstate Urban	0.992	1.041	1.038	0.980	0.956	0.906	0.881	0.951	0.930	0.876
US 1: Urban 4-5 Lane 2-Way Divided Raised Median	3.748	3.794	3.916	3.922	3.892	3.001	2.933	3.010	3.241	3.313
Urban Ramp	*	*	*	*	*	*	*	*	*	*

*Average Crash Rate data not provided in CAR System

Tables 4 and **5** compare actual crash rates vs. average districtwide and statewide average crash rates. Highlighted in red are the crash rates that exceed the average state and districtwide values.

Table 4: Actual Intersection Crash Rate

Intersection Facility Type	Statewide					Districtwide				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
US 1 & Destination Daytona Ln.: Urban 4-5 Lane 2-Way Divided Raised Median, 4-Leg	**1.011**	**1.494**	**1.045**	0.641	**1.592**	**1.011**	**1.494**	**1.045**	**0.641**	**1.592**
US 1 & I-95 SB ramps: Urban 4-5 Lane 2-Way Divided Raised Median, 4-Leg	0.556	0.430	0.515	0.520	0.204	**0.556**	0.430	0.515	0.520	0.204
US 1 & I-95 NB ramps: Urban 4-5 Lane 2-Way Divided Raised Median, 3-Leg	**1.141**	**0.935**	0.445	**0.551**	**0.460**	**1.141**	**0.935**	**0.445**	**0.551**	**0.460**
US 1 & Rosemary St: Urban 4-5 Lane 2-Way Divided Raised Median, 4-Leg	0.239	0.117	0.550	0.115	0.229	0.239	0.117	0.550	0.115	0.229
US 1 & Benton St: Urban 4-5 Lane 2-Way Divided Raised Median, 4-Leg	0.111	0.217	0.103	0.213	0.213	0.111	0.217	0.103	0.213	0.213
US 1 & Broadway Ave: Urban 4-5 Lane 2-Way Divided Raised Median, 4-Leg	0.220	0.108	0.611	0.317	0.211	0.220	0.108	**0.611**	0.317	0.211

Table 5: Actual Segment Crash Rate

Segment Facility Type	Statewide					Districtwide				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
I-95 from Mile point 40.471 to the bridge over US 1: Interstate Urban	0.000	0.354	0.471	0.267	0.087	0.000	0.354	0.471	0.267	0.087
I-95 from the bridge over US 1 to Mile point 41.639: Interstate Urban	3.571	0.622	0.165	0.389	0.371	**3.571**	0.622	0.165	0.389	0.371
US 1 west of I-95 Ramps to Destination Daytona Ln.: Urban 4-5 Lane 2-Way Divided Raised Median	3.374	**5.202**	**5.945**	**4.839**	**4.573**	**3.374**	**5.202**	**5.945**	**4.839**	**4.573**
US 1 from I-95 SB Ramp to NB Ramp: Urban 4-5 Lane 2-Way Divided Raised Median	2.914	0.950	0.892	0.000	3.719	2.914	0.950	0.892	0.000	**3.719**
US 1 south of I-95 NB Ramp to Rosemary St: Urban 4-5 Lane 2-Way Divided Raised Median	1.738	0.000	1.596	3.327	3.327	1.738	0.000	1.596	**3.327**	**3.327**
US 1 from Rosemary St. to Benton St.: Urban 4-5 Lane 2-Way Divided Raised Median	0.000	0.000	1.619	0.000	3.376	0.000	0.000	1.619	0.000	**3.376**
US 1 from Benton St. to Broadway Ave.: Urban 4-5 Lane 2-Way Divided Raised Median	2.963	2.898	**5.442**	**8.510**	2.837	2.963	2.898	**5.442**	**8.510**	2.837
I-95 NB Off to US 1: Urban Ramp*	1.699	8.043	1.724	6.522	0.000	1.699	8.043	1.724	6.522	0.000
US 1 to I-95 NB on: Urban Ramp*	1.228	0.000	0.000	3.806	1.209	1.228	0.000	0.000	3.806	1.209
I-95 SB Off to US 1: Urban Ramp*	6.773	3.223	3.445	6.551	3.122	6.773	3.223	3.445	6.551	3.122
US 1 to I-95 SB On: Urban Ramp*	15.825	0.000	8.917	8.385	0.000	15.825	0.000	8.917	8.385	0.000
I-95 from Milepost 41.639 to Milepost 45.651	0.396	0.497	0.551	0.396	0.489	0.396	0.497	0.551	0.396	0.489
I-95 from Milepost 35.394 to Milepost 40.471	0.425	0.502	0.602	0.502	0.529	0.425	0.502	0.602	0.502	0.529

*Actual Crashes were not compared to the average state and districtwide crash rates due to the missing average crash rates.

As shown in **Table 5 and 6** a couple of intersections and segments are greater than the statewide average. Higher speed traffic approaching along US 1 from the north toward Destination Daytona Lane compiled with and heavy truck traffic contribute to the higher crash rates along this segment. At the northbound ramps slower moving truck traffic, and a short weave distance between the ramps leads to increased crash rates at the interchange.

3.0 Existing Conditions

3.1 Sources of Information

Traffic information (AADT, trends, truck factors, and directional factors) were obtained from FDOT Florida Traffic Online (FTO) continuous Telemetered Traffic Monitoring Sites (TTMS) and short-term Portable Traffic Monitoring Sites (PTMS). Additional 48-hour bi-directional machine counts and peak period turning movement counts were also collected. Data sources and data to be used in the analysis are shown in **Table 6**.

Table 6: Traffic Data Sources

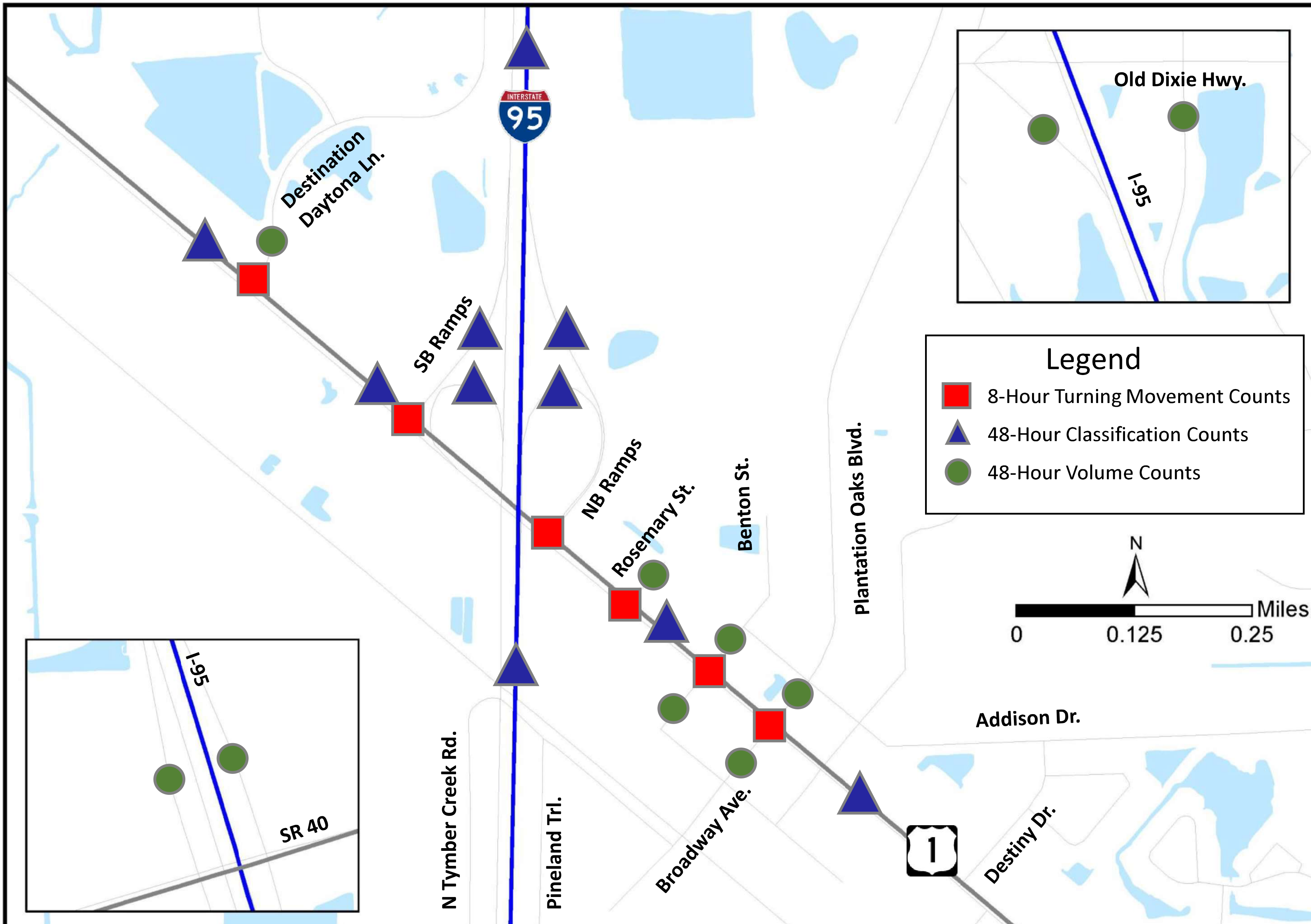
Data Source	Description of Data Used
FDOT Florida Traffic Online (TTMS and PTMS)	AADT (2019 and 2020)
Field Traffic Data	Machine counts, vehicle classification counts, turning movement counts
FDOT Straight Line Diagrams & Field Observations	Roadway Classification, mile markers, physical roadway features
Volusia County	AADT and existing and future land use data
City of Daytona Beach	Existing and future land use data
City of Ormond Beach	Existing and future land use data

3.1.1 Traffic Data Collection

The latest available (2019 and 2020) AADT, hourly volumes, vehicle classification, daily truck percentages, and directional split factors were obtained from PTMS and TTMS as available from FTO. At the time of the project traffic development 2021 FTO data was not available. Both the 2020 and 2021 counts are identified with the code “X” in FTO signifying the source for this data is unknown. This suggests it is not coming directly from traffic counts and may not be as reliable as the data collected for this study and was therefore not used as part of the traffic forecasting. The machine count, peak hour turning movement count (TMC), and vehicle classification data was collected on mid-weekdays in September, October, and early November 2021. All existing traffic data is provided as part **Appendix D**.

- Machine counts were conducted to collect roadway segment directional hourly volumes for a minimum of 48-hour durations at each location.
- Turning movement counts were collected from 6:30AM to 9:30AM, 11:00AM to 1:00PM and 3:30PM to 6:30PM
- Vehicle classification data was obtained from 48-hour classification counts.

Figure 5 shows the count type and location for the counts collected as part of this study.



FDOT	Project Development and Environment (PD&E) Studies I-95 Interchange at SR 5 (US 1) Interchange Modification Report	Data Collection Locations	Figure 5

3.1.2 Signal Timing Data

Signal timing data including time of day schedules, coordination splits, controller settings, and phasing sequences was requested from the Volusia County for each of the signalized intersections in the study area. The signal timing data is provided in **Appendix E.**

3.1.3 Existing Roadway Characteristics

Within the study limits, US 1 and I-95 have the basic geometric characteristics summarized in **Table 7**. Both US 1 and I-95 have uniform roadway characteristics throughout the project limits and therefore have one segment each.

- Segment 1 – US 1 (79030000)– from Broadway Ave. to Destination Daytona Ln.
- Segment 2 – I-95 (790020000)– Milepoint 35.280 to Milepoint 45.712

Turning movement counts and other intersection data were collected at six study locations to provide a comprehensive snapshot of existing conditions. The six study intersetions are:

- US 1 and Destination Daytona Ln.
- US 1 and I-95 SB Ramps
- US 1 and I-95 NB Ramps
- US 1 and Rosemary St.
- US 1 and Benton St.
- US 1 and Broadway Ave.

Intersection geometry was verified during the Novemember 4, 2021 field review. The existing lane configuration for each intersection is shown in **Figure 6**. RCI data can be found in **Appendix F**.

Table 7: Existing Roadway Characteristics Summary

	US 1	I- 95
Characteristic	Segment 1 - 500 feet South of Broadway Ave. to 500 feet North of Destination Daytona	Segment 2 - Milepost 35.280 to Milepost 45.712
Functional Classification	Urban Principal Arterial	Interstate
SIS Designation	Non-SIS	SIS Facility – Corridor Level 1
Maintaining Jurisdiction	Volusia County	Volusia County
Speed Limit	45 mph / 55 mph[1]	70 mph
Lane Width	12 feet	12 feet
Lane Geometry	From MP 10.696 to MP 11.579: 4 thru lanes	From MP 35.280 to MP 45.712: 6 thru lanes
Shoulder Width	4-foot paved shoulder on both sides	8-foot / 10-foot paved shoulder on both sides[2]
Median	42-foot Vegetation median[3]	40-foot Vegetation median and Guardrail[4]
Passing Zones	No Passing is allowed	No Passing is allowed
Curb & Gutter	None	Valley Gutter[5]
Sidewalks	Partial sidewalk on both sides	None
Bicycle lanes	Bike lanes on both sides	None
Transit Routes	VOTRAN, Route 3	None
Street Lighting	Lighting at Broadway Ave., I-95 Off and On Ramp intersections	Begins at FEC RR Bridge and continues north
Bridges	I-95 Overpass	Tymber Creek Rd./ FEC RR & US 1 / I-95

Notes

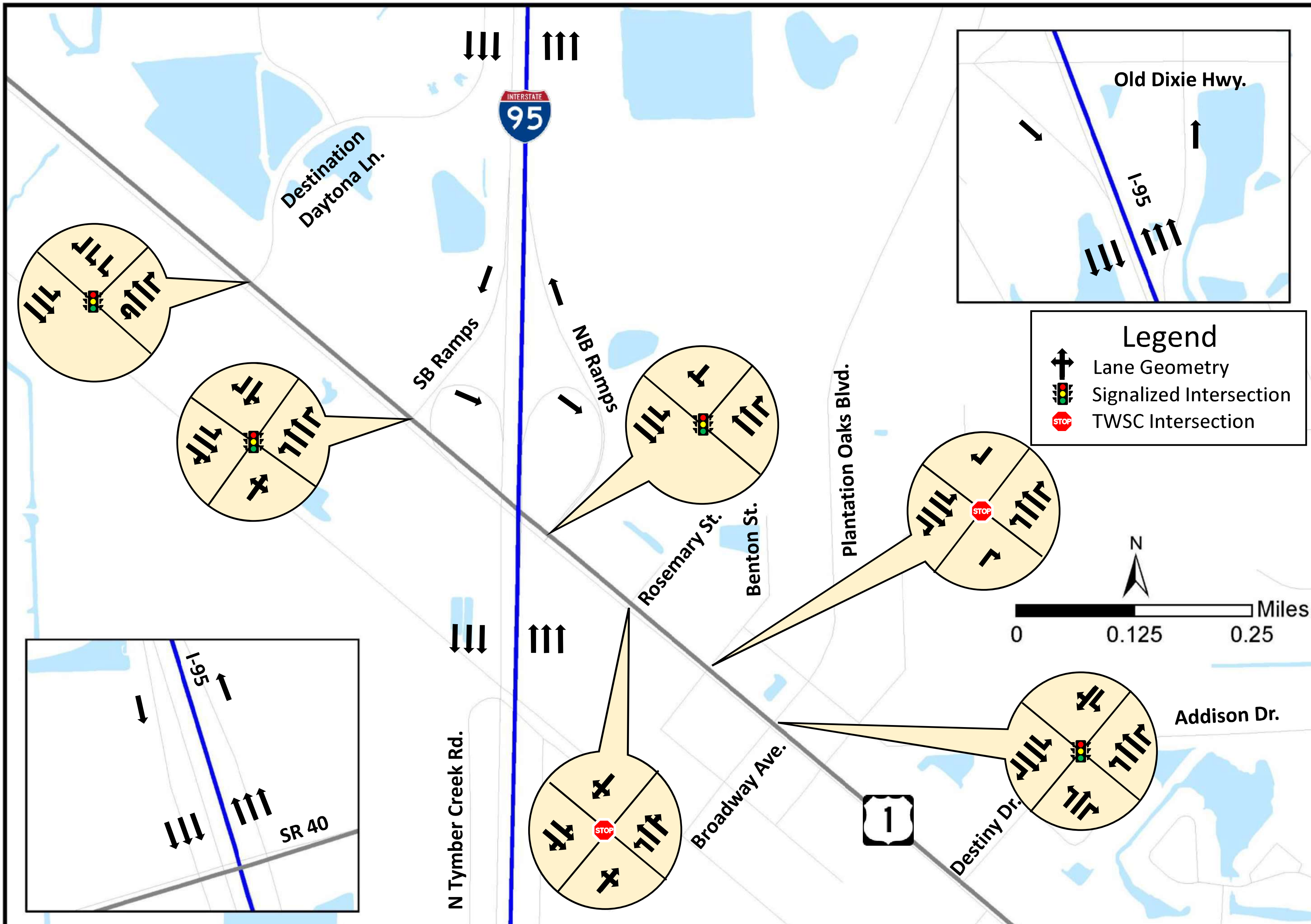
1 - 55 mph from 500 feet south of Broadway Ave. to 150 feet south of Broadway Ave. 45 mph from 150 feet south of Broadway Ave. to 350 feet north of Destination Daytona. 55 mph from 350 feet north of Destination Daytona to 500 feet north of Destination Daytona.

2 - I-95 has 8-foot paved shoulders with 10-foot paved shoulders through the bridge sections

3 - US 1 has a 42-foot vegetation median with a barrier wall through the overpass section

4 - I-95 has a 40-foot vegetation median with guardrail except through the bridge sections

5 - I-95 has a valley gutter on both sides except through the bridge sections



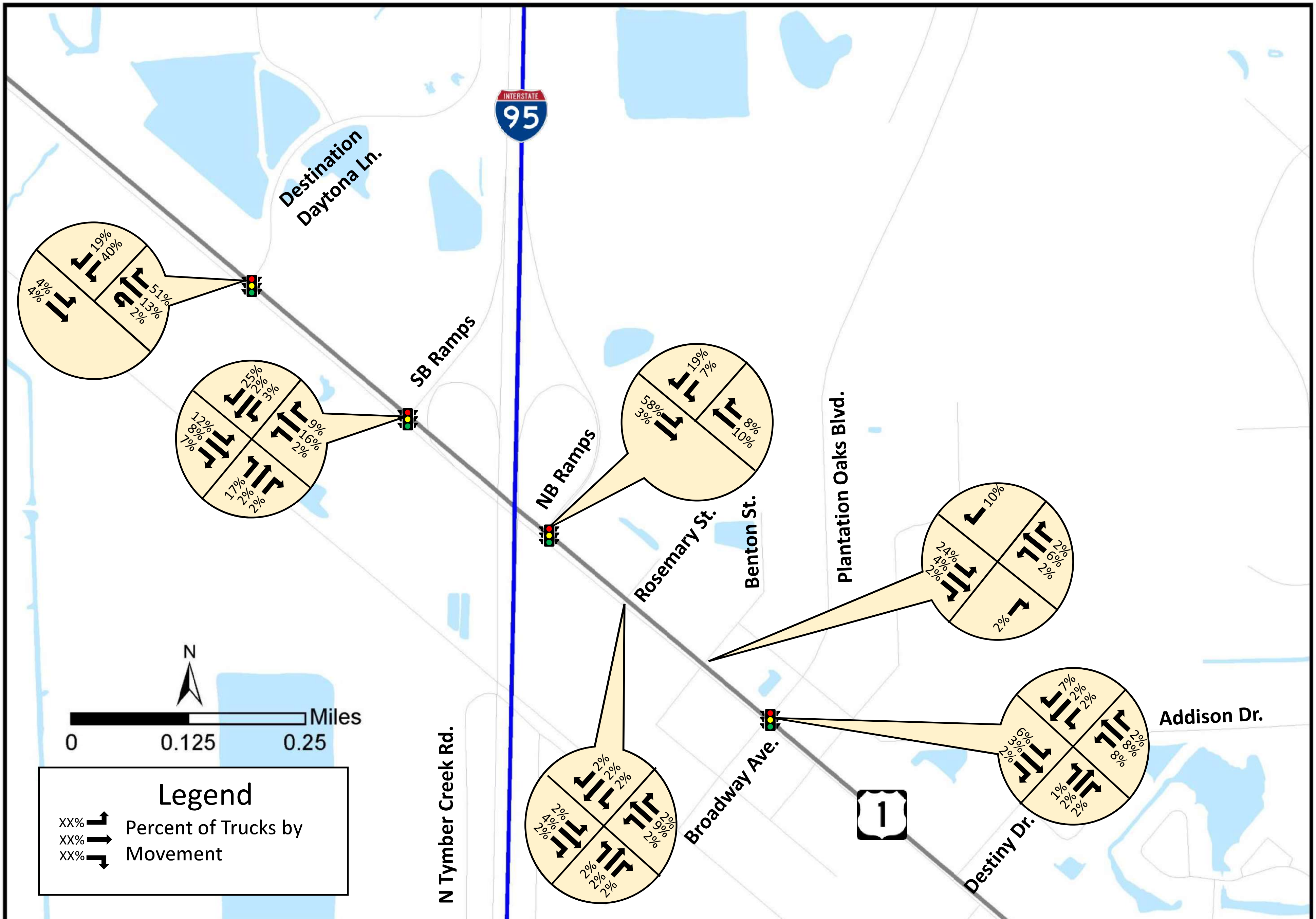
FDOT	Project Development and Environment (PD&E) Studies I-95 Interchange at SR 5 (US 1) Interchange Modification Report	Year 2021 Existing Geometry	Figure 6

3.1.4 Existing Traffic Characteristics

Table 8 provides a summary of existing traffic characteristics within the study area including peak to daily ratio, and directional split. This data was gathered from the seasonally corrected machine counts collected as part of this study. **Figures 7 and 8** provides the details of the heavy vehicles from the machine counts.

Table 8: Existing Traffic Characteristics - US 1 and I-95 Interchange

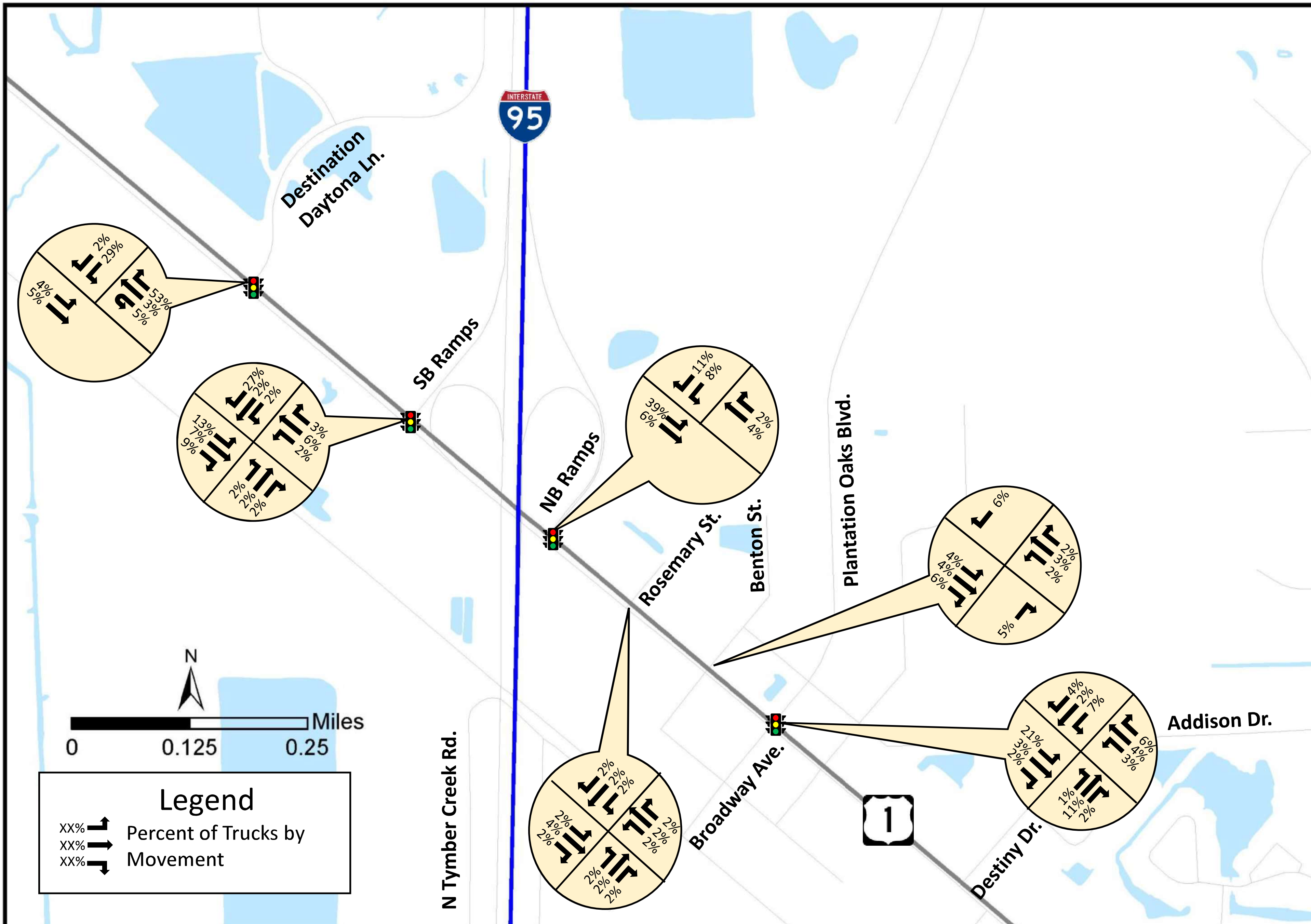
Roadway			Data Collection														Florida Traffic Online			
			Daily Volume	AM Peak Hour					PM Peak Hour					Average Peak to Daily Ratio	Average D	Florida Traffic Online K	Florida Traffic Online D	Florida Traffic Online T_{24}	Florida Traffic Online Site
	To	From		Peak Hour Volume	Northbound/ Eastbound	Southbound/ Westbound	Peak to Daily Ratio	D	Peak Hour Volume	Northbound/ Eastbound	Southbound/ Westbound	Peak to Daily Ratio	D						
US 1	West	Destination Daytona Ln.	14,139	1,232	914	318	8.7%	74%	1,135	594	541	8.0%	52%	8.4%	63.3%	9.0%	58.7%	7.8%	790536
	Destination Daytona Ln.	I-95 SB Ramps	23,172	1,665	1,054	611	7.2%	63%	1,835	797	1,038	7.9%	57%	7.6%	59.9%				
	I-95 SB Ramps	I-95 NB Ramps																	
	I-95 NB Ramps	Rosemary Dr.	23,740	1,934	846	1,088	8.1%	56%	2,228	1,349	879	9.4%	61%	8.8%	58.4%	9.0%	58.7%	8.2%	790351
	Rosemary Dr.	Benton St.																	
	Benton St.	Broadway Ave.																	
	Broadway Ave.	East	23,909	2,016	1,161	855	8.4%	58%	2,254	962	1,292	9.4%	57%	8.9%	57.5%				
US 1 Interchange	Southbound Off Ramp		5,308	430		430	8.1%	100%	397		397	7.5%	100%	7.8%	100%	9.0%	99.9%	7.8%	792037
	Southbound On Loop		6,150	541		541	8.8%	100%	523		523	8.5%	100%	8.7%	100%	9.0%	99.9%	7.8%	792038
	Northbound Off Loop		6,571	475	475		7.2%	100%	596	596		9.1%	100%	8.1%	100%	9.0%	99.9%	7.8%	792035
	Northbound On Ramp		5,715	404	404		7.1%	100%	549	549		9.6%	100%	8.3%	100%	9.0%	99.9%	7.8%	792036
Destination Daytona	US 1	North	8,384	403	179	224	4.8%	56%	496	223	273	5.9%	55%	5.4%	55.3%				
Rosemary	South	US 1																	
	US 1	North	606	21	8	13	3.5%	62%	48	16	32	7.9%	67%	5.7%	64.3%				
Benton	South	US 1	1,594	139	57	82	8.7%	59%	82	31	51	5.1%	62%	6.9%	60.6%				
	US 1	North	2,581	216	56	160	8.4%	74%	169	39	130	6.5%	77%	7.5%	75.5%				
Broadway	South	US 1	2,812	356	136	220	12.7%	62%	350	242	108	12.4%	69%	12.6%	65.5%				
	US 1	North	2,128	147	66	81	6.9%	55%	180	113	67	8.5%	63%	7.7%	58.9%				
I-95	South	US 1	77,809	4,792	2,641	2,151	6.2%	55%	5,202	2,580	2,622	6.7%	50%	6.4%	52.8%	9.0%	52.6%	17.7%	790496
	US 1	North	77,973	4,807	2,166	2,641	6.2%	55%	5,458	2,789	2,669	7.0%	51%	6.6%	53.0%	9.0%	52.6%	17.7%	790495



Project Development and Environment (PD&E) Studies
I-95 Interchange at SR 5 (US 1)
Interchange Modification Report

Existing (2021) Percentage of Trucks - AM Peak

Figure 7



FDOT	Project Development and Environment (PD&E) Studies I-95 Interchange at SR 5 (US 1) Interchange Modification Report	Existing (2021) Percentage of Trucks - PM Peak	Figure 8

3.1.5 Crash Data

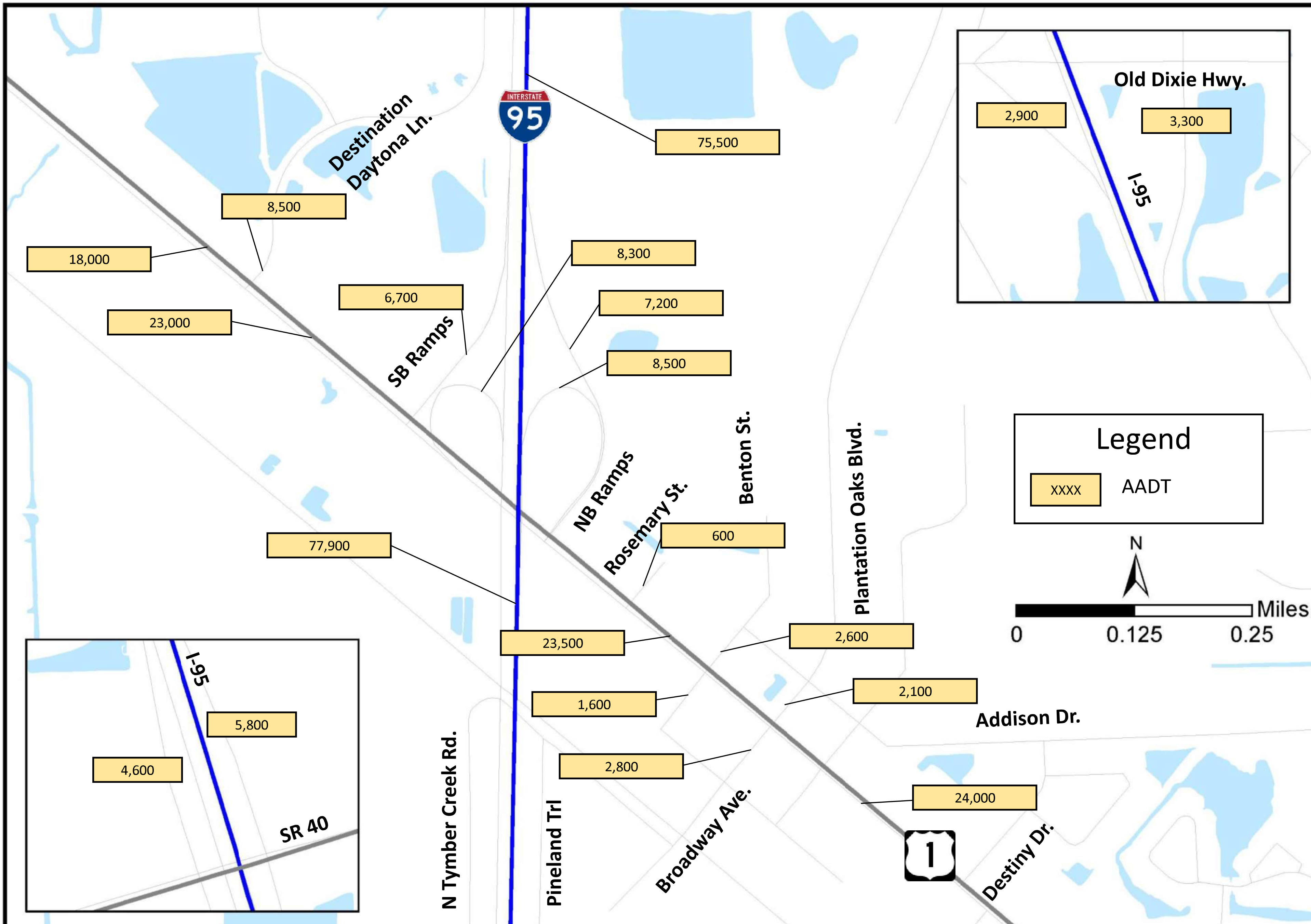
A safety analysis was completed for this project and is provided in **Appendix C**. The safety analysis includes historic crash data and a quantitative safety analysis using HSM predictive method. The crash data was extracted from the Crash Analysis Reporting (CAR) System.

3.2 Existing Year 2021 AADT

The Existing Year 2021 AADT volumes are derived from the machine count data collected throughout the AOI. These counts were seasonally adjusted based on the date and location of the count. In areas where the machine counts appeared low in comparison to historic counts, supplemental count data was used. These supplemental counts include 2019 FTO and Volusia County data. The following locations relied on these supplemental counts:

- *US 1 at I-95 Southbound Ramps – used 2019 FTO count data*
- *US 1 at I-95 Northbound Ramps – used 2019 FTO count data*

Figure 9 and **Table 9** provides the 2021 AADT information.



FDOT

Project Development and Environment (PD&E) Studies
I-95 Interchange at SR 5 (US 1)
Interchange Modification Report

Existing (2021) AADT

Figure 9

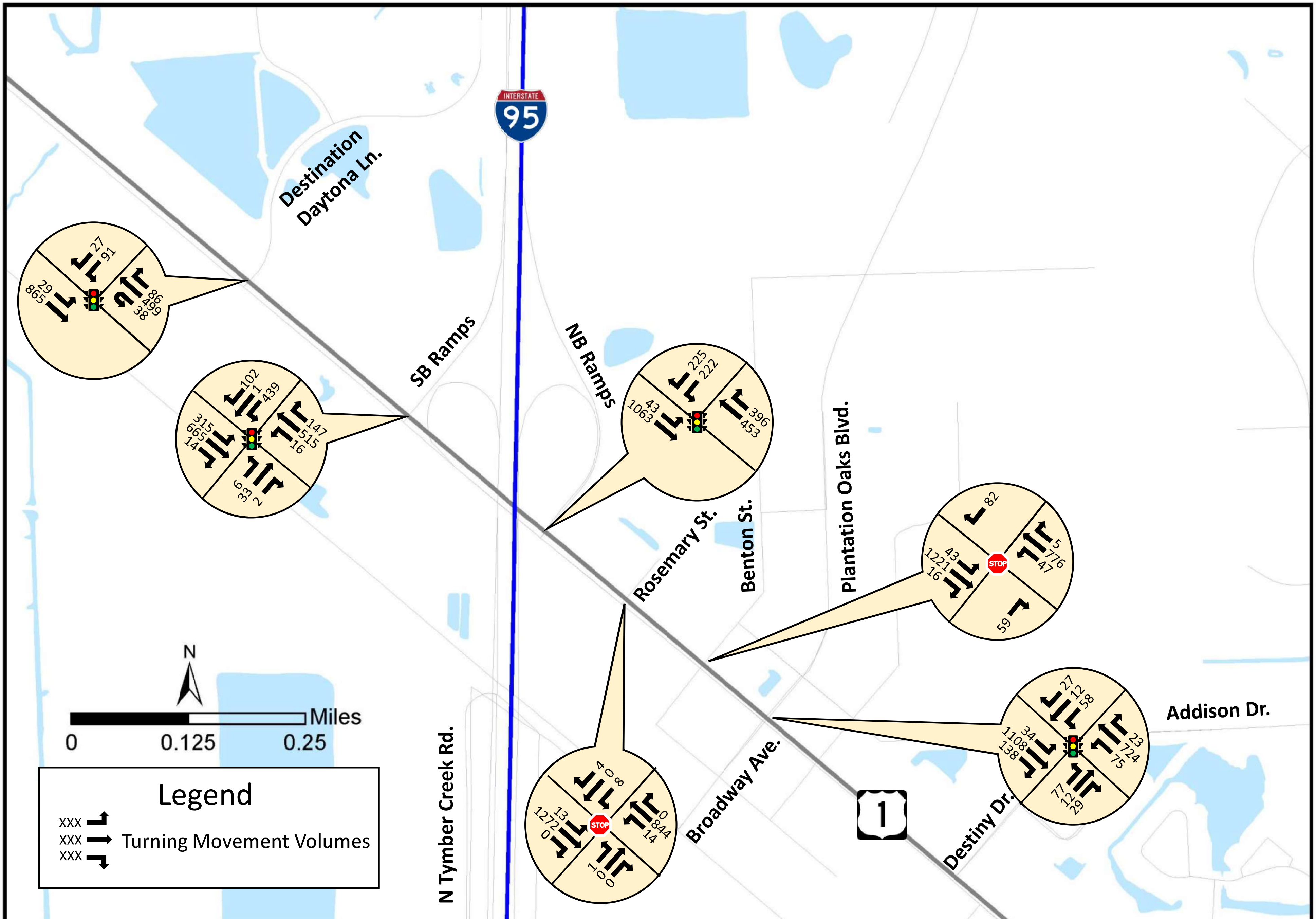
Table 9: Adjusted Counts

Count Location	Raw AADT	Seasonal Adjustment Factor	Final Existing AADT	Rounded AADT	Balanced AADT
I-95					
North of US 1	84754	0.92	77973	78000	75500
South of US 1	84575	0.92	77809	78000	78000
US 1					
West of Destination Daytona Ln.	18182	0.99	18000	18000	18000
West of I-95	23406	0.99	23172	23000	23000
East of I-95	23980	0.99	23740	23500	23500
East of Pine Tree Dr.	24151	0.99	23909	24000	24000
Side Street Characteristics					
I-95 Ramps					
Southbound Off Ramp	6771	0.99	6703	6700	6700
Southbound On Ramp	8337	0.99	8254	8300	8300
Northbound Off Ramp	8629	0.99	8543	8500	8500
Northbound On Ramp	7270	0.99	7197	7200	7200
Side Street Characteristics					
SB I-95 on Ramp from Old Dixie Hwy	2931	1	2931	2900	2900
NB I-95 off Ramp to Old Dixie Hwy	3301	1	3301	3300	3300
Destination Daytona Ln.	8595	0.98	8423	8500	8500
Ormond Gateway					
Rosemary Ave (N of US 1)	612	0.99	606	600	600
Rosemary Ave (S of US 1)					
Plantation Oaks Blvd- Trips derived from TIA					
Broadway Ave- Trips derived from TIA					
Pine Tree Dr					
US 1 -I-95 to Rosemary Dr					
US 1-Broadway Blvd to Pine Tree Dr					
Benton St. (N of US 1)	2607	0.99	2581	2600	2600
Benton St. (S of US 1)	1627	0.98	1594	1600	1600

3.2.1 Existing Year 2021 Peak Hour Volumes

Existing 2021 AM and PM peak hour volumes were derived from the peak hour turning movement counts collected as part of this study. At each intersection the AM and PM peak hour volumes were determined by identifying the highest hourly volume (highest volume for four consecutive 15-minute intervals) for each period. These counts were seasonally adjusted based the date and location of the count. The seasonally adjusted peak hour intersection volumes entering and exiting adjacent intersections along

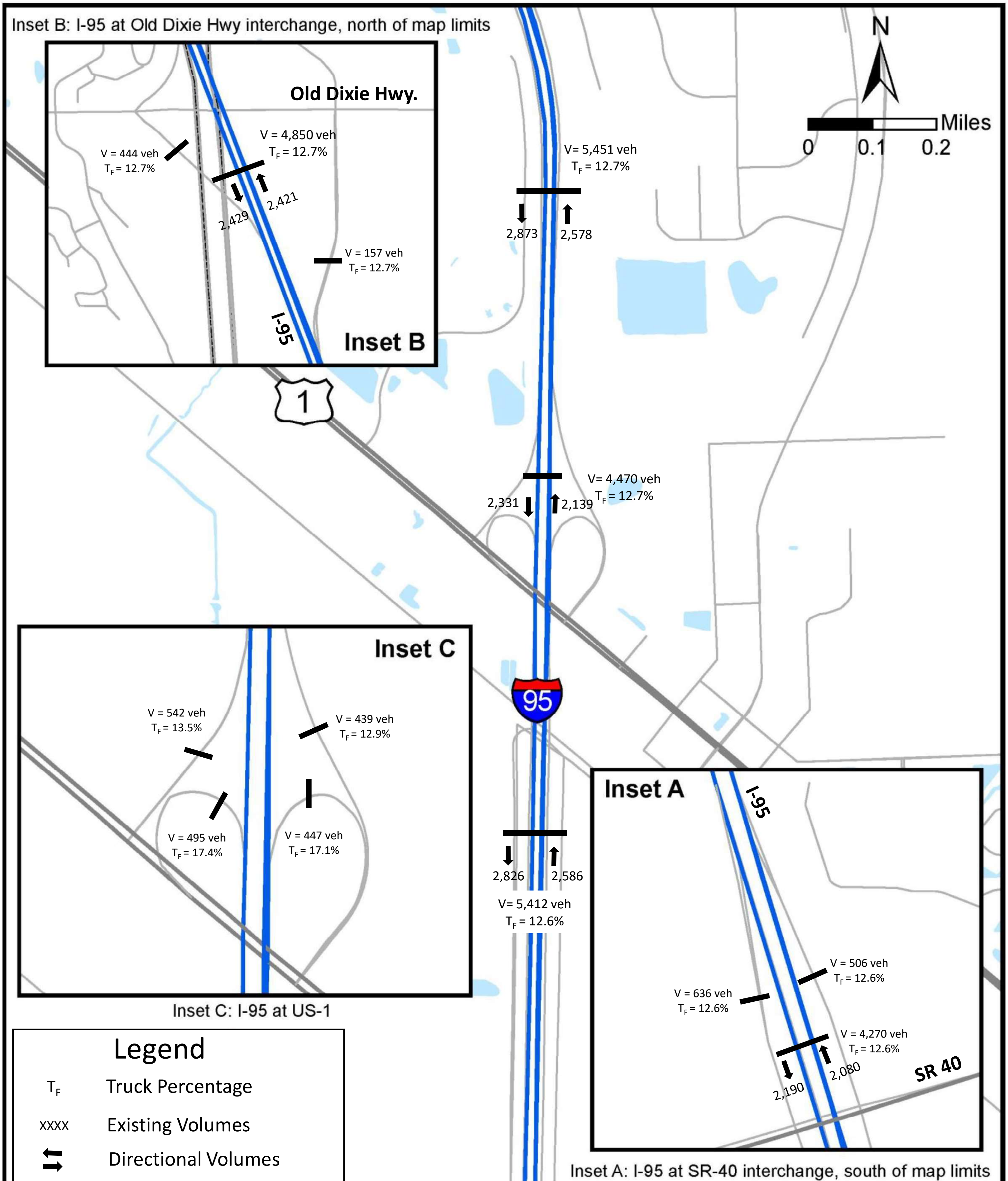
US 1 were compared and adjusted for the AM and PM peak hours to provide a balanced flow over the network. This process is necessary due to the differences in traffic volumes between intersections caused by the different peak hour timeframes and varying days of the data collection. Adjustments considered existing land use and any access points/intersections/driveways between intersections that could have an impact on network traffic. In general, the data collection effort included all major access points and therefore traffic was balanced networkwide. The final balanced Existing Year (2021) Turning Movement Counts along US 1 and Design Hour Volumes along I-95 for AM and PM peak hour volumes and are shown in **Figure 10** through **Figure 13.**



Project Development and Environment (PD&E) Studies
I-95 Interchange at SR 5 (US 1)
Interchange Modification Report

Existing (2021) Turning Movement Volumes - AM Peak

Figure 10



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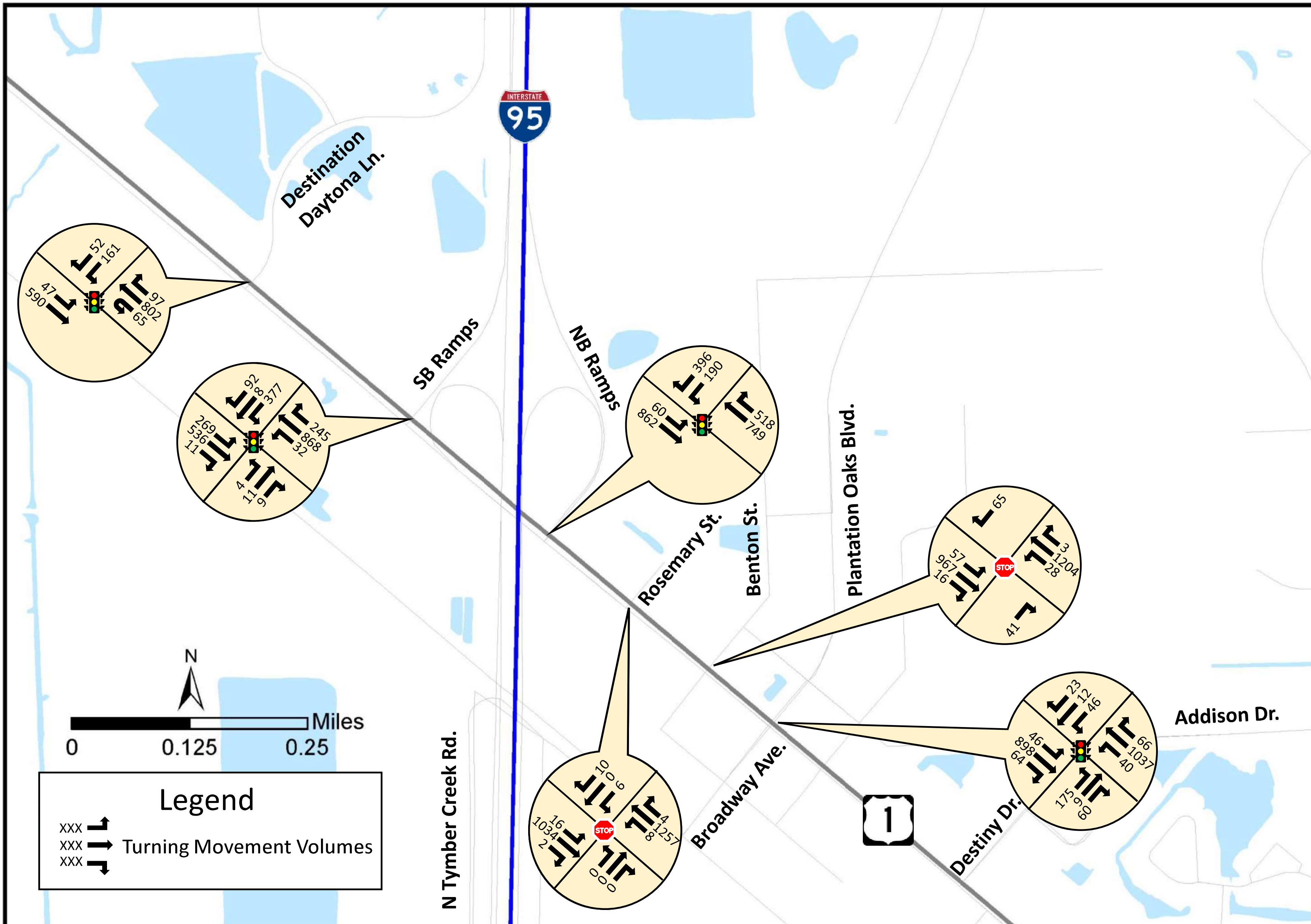
Interchange Modification Report

Existing AM Volumes

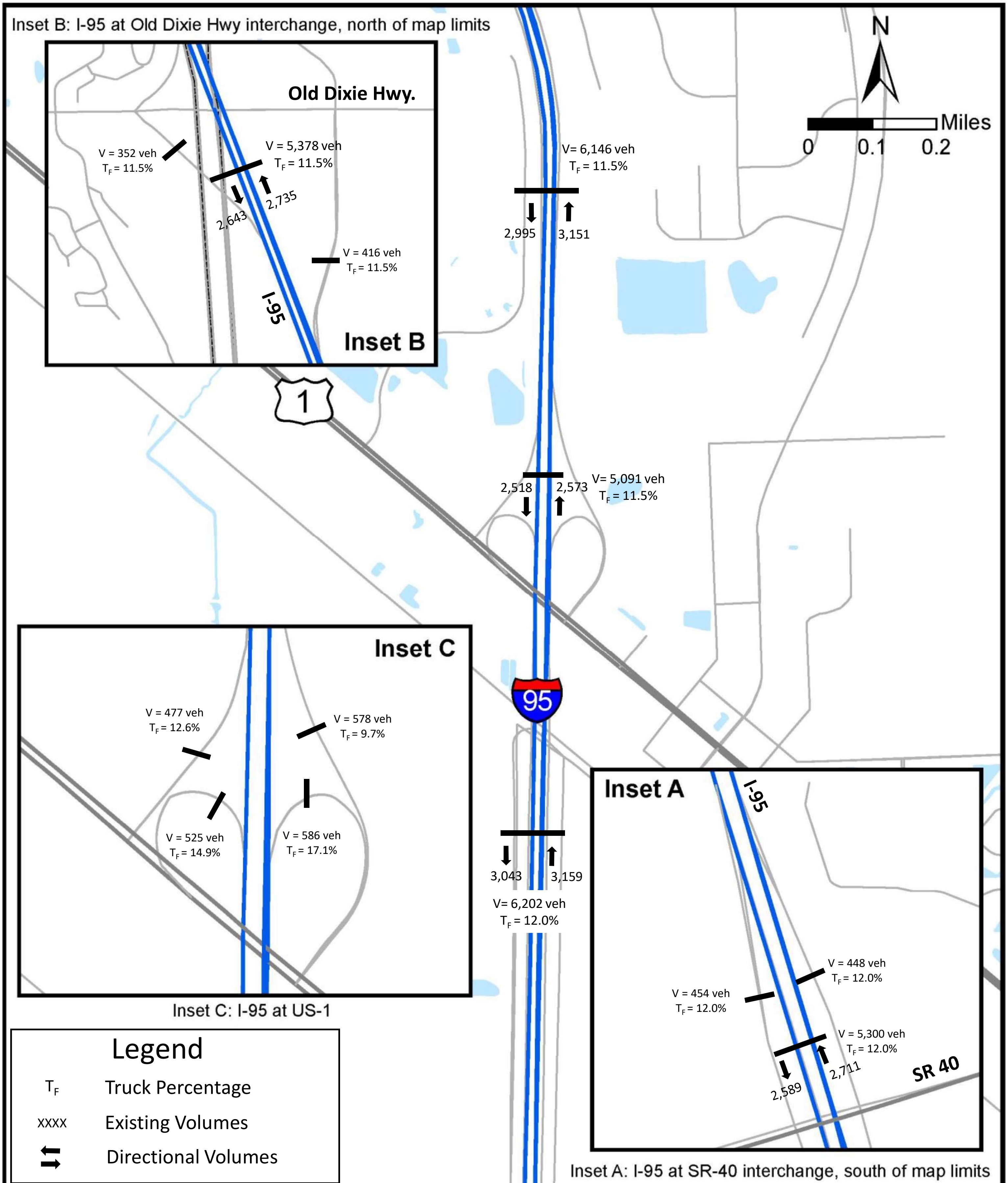
Figure 11



Project Development and Environment (PD&E) Studies
I-95 Interchange at SR 5 (US 1)
Interchange Modification Report

Existing (2021) Turning Movement Volumes - PM Peak

Figure 12



FDOT	Project Development and Environment (PD&E) Studies I-95 Interchange at SR 5 (US 1) Interchange Modification Report	Existing PM Volumes	Figure 13

3.3 Existing Traffic Operational Analysis

The existing roadway geometry and intersection volumes were used to prepare the existing condition operational analysis for the study area. Per the Methodology Letter of Understanding, LOS, vehicle delay, volume-to capacity (v/c) ratio, and queue length were used as measurements of effectiveness for intersection operations.

Existing roadway segment volumes were also used to analyze the segment operations along US 1. As established in the MLOU this PD&E Study will utilize a LOS D target for roadway segment operational performance. If LOS D cannot be reasonably achieved, FDOT will be consulted to determine an acceptable alternative performance criterion.

3.3.1 Existing Peak Hour Intersection Operations

The existing conditions (2021) were evaluated for the weekday AM and PM peak hour traffic volume conditions. A system peak was used for the AM and PM peak hours and traffic volumes were balanced between intersections. Current signal timings plans were obtained from Volusia County for use in the analysis.

Existing intersection LOS analysis were conducted using HCM 2000 methodologies as implemented by Synchro 11. Detailed Synchro 11 output reports and a summary of the measures of effectiveness for each intersection are located in **Appendix G**. HCM 2000 was used to be consistent with future year analysis which required its use due to shared turn lane geometry.

All signalized intersections operate at an overall intersection LOS of D or better in both of the peak hours. However, there are some movements which operate at LOS F and/or have v/c ratios greater than 1.0.

Destination Daytona Lane – The westbound right turn operates at LOS F due to the heavy truck traffic using this movement. The v/c for this movement is 0.09. The southbound movements at this intersection operate at LOS E. This movement is predominanlty heavy vehicles, with a v/c of 0.58. Signal timing at this intersection gives preferential treatment to US 1.

Southbound Ramp – The eastbound left turn operates at LOS E and F during the AM and PM peak hours, respectively. As with many of the movements at this interchange, heavy truck traffic is present. Maximum v/c for this movement is 0.91. In addition the southbound left movemtn operates at LOS E during both peak periods, but the v/c remains below 1.0.

Northbound Ramp – The westbound right turn operates at LOS F during the AM peak with a v/c of 0.42. This movement does not currently experience spillback onto US 1. The southbound movemtn at this intersection operates at LOS F during both peak periods with a maximum v/c of 1.16. The lack of available capacity is creating the poor operations.

Broadway Avenue – The northbound and southbound approaches at this intersection operate at LOS E in both peak periods. This reduced LOS can be attributed to the corrdinated timing plan favoring US 1 and limited capacity base on the sidestreet geometry.

Table 10 summarizes both LOS and overall delay.

Table 10: Existing Intersection Operations Analysis

Intersection	Movement							Approach					Intersection					
		Delay (seconds)		v/c		LOS			Delay (seconds)		LOS		Delay (seconds)		v/c		LOS	
		AM	PM	AM	PM	AM	PM		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Destination Daytona Ln.	EBL	4.2	5.5	0.05	0.1	A	A	EB	7.2	8.1	A	A	27.4	38.9	0.37	0.35	C	D
	EBT	7.3	8.3	0.37	0.25	A	A											
	WBL	17.7	17.6	0.09	0.11	B	B	WB	50.2	52.3	D	D						
	WBT	27.3	33.6	0.24	0.33	C	C											
	WBR	197.4	229.8	0.09	0.09	F	F											
	SBL	62.6	72.5	0.43	0.58	E	E	SB	61.5	70.5	E	E						
	SBR	57.9	64.3	0.02	0.03	E	E											
SB Ramp	EBL	76.6	91.6	0.93	0.91	E	F	EB	45.2	56.7	D	E	45.3	46.6	0.88	0.84	D	D
	EBTR	30.7	39.6	0.57	0.48	C	D											
	WBL	49.4	33.4	0.18	0.12	D	C	WB	34.0	27.8	C	C						
	WBT	33.6	27.6	0.74	0.73	C	C											
	WBR	0.0	0.0	0.09	0.15	-	-											
	NBLTR	25.7	34.8	0.06	0.03	C	C	NB	25.7	34.8	C	C						
	SBLT	65.3	72.7	0.94	0.91	E	E	SB	57.9	65.5	E	E						
	SBR	26.0	35.5	0.09	0.08	C	D											
NB Ramp	EBL	72.9	89.8	0.4	0.42	E	F	EB	22.1	37.3	C	D	54.9	51.6	0.75	0.77	D	D
	EBT	20.1	33.6	0.52	0.48	C	C											
	WBT	20.5	32.2	0.31	0.57	C	C	WB	49.3	35.1	D	D						
	WBR	82.4	39.2	0.29	0.46	F	D											
	SBLR	146.8	109.7	1.16	1.07	F	F	SB	146.8	109.7	F	F						

Intersection	Movement							Approach					Intersection					
		Delay (seconds)		v/c		LOS			Delay (seconds)		LOS		Delay (seconds)		v/c		LOS	
		AM	PM	AM	PM	AM	PM		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Rosemary St.[1]	EBT	0.0	0.0	0.57	0.33	A	A	EB	-	-	-		30.2	16.7	0.01	0.06	D	A
	WBL	12.3	10.2	0.03	0.01	B	B	WB	-	-	-	-						
	WBTR	0.0	0.0	0.29	0.54	-	-											
	NBLTR	30.2	0.0	0.01	0.00	D	A	NB	30.2	0	D	A						
	SBLTR	17.1	16.7	0.04	0.06	C	C	SB	17.1	16.7	C	C						
Benton St.[1]	EBL	9.9	11.5	0.06	0.10	A	B	EB	-	-	-		10.6	10.4	0.09	0.09	B	B
	EBT	0.0	0.0	0.38	0.30	-	-											
	EBR	0.0	0.0	0.01	0.01	-	-											
	WBL	11.6	9.9	0.08	0.04	B	A	WB	-	-	-							
	WBT	0.0	0.0	0.24	0.37	-	-											
	WBR	0.0	0.0	0.0	0.00	-	-											
	NBR	10.6	9.7	0.09	0.05	B	A	NB	10.6	9.7	B	A						
	SBR	9.9	10.4	0.11	0.09	A	B	SB	9.9	10.4	A	B						
Broadway Ave.	EBL	16.7	27.3	0.09	0.19	B	C	EB	29.4	30.6	C	C	26.2	28.9	0.54	0.54	C	C
	EBT	27.5	32.1	0.57	0.44	C	C											
	EBR	47.7	12.3	0.1	0.04	D	B											
	WBL	10.8	11.3	0.31	0.12	B	B	WB	12.5	17.9	B	B						
	WBT	12.8	18.5	0.38	0.51	B	B											
	WBR	9.4	12.5	0.02	0.05	A	B											
	NBL	54.1	58.7	0.41	0.61	D	E	NB	56.1	59.3	E	E						
	NBT	60.2	60.6	0.09	0.04	E	E											
	NBR	59.6	60.6	0.02	0.04	E	E											
	SBL	60.2	69.6	0.4	0.35	E	E	SB	62.3	72.3	E	E						
	SBTR	65.4	75.7	0.18	0.2	E	E											

[1] Two-Way Stop Control. LOS shown for TWSC intersection is for the worst movement.

3.3.2 Segment Operational Analysis

Analysis of the uninterrupted flow three-lane northbound and southbound segments was performed using the HCM 6th edition procedures as implemented in HCS 7 software for I-95. **Table 11** summarizes each segment with its corresponding analysis type.

Table 11: Type of Segment Operations Analysis

Segment	Analysis Type
I-95 NB On Ramp from US 1	Merge
I-95 SB On Ramp from US 1	Merge
I-95 SB Off Ramp to US 1	Diverge
I-95 NB Off Ramp to US 1	Diverge
I-95 SB Off Ramp to SR 40	Diverge
I-95 NB On Ramp from SR 40	Merge
I-95 NB Off ramp to Old Dixie Hwy.	Diverge
I-95 SB On Ramp from Old Dixie Hwy.	Merge
I-95 mainline between SR 40 and US 1	Basic
I-95 mainline between US 1 and Old Dixie Hwy.	Basic

Freeway facility capacity is governed by the position and severity of active bottlenecks as explained in Chapter 10 Freeway Facilities Core Methodology from HCM 6th edition. Based on this, the individual segment density is utilized as the accepted measure for level of service as shown in **Table 12**.

Table 12: Type of Segment Operations Analysis

LOS	Segments	Merge and Diverge
A	≤11	≤10
B	>11-18	>10-20
C	>18-26	>20-28
D	>26-35	>28-35
E	>35-45	>35
F	>45 or any component segment V_d/C ratio> 1.00	>39 or any component segment V_d/C ratio >1.00

3.3.2.1 Merge and Diverge Operations

As stated in the HCM 6, the level of service for basic, weaving, merge and diverge segments on a freeway are defined in terms of density. Therefore, values from **Table 11** for diverge and merge operations were used to establish LOS. **Table 13** summarizes the HCS 7 results for all 8 merge and diverge operations during existing year 2021.

Appendix G provides the HCS analysis for all segments.

Table 13: Existing Merge and Diverge Analysis Summary

Segment	**Analysis Type**	**AM Peak**		**PM Peak**	
		LOS	Density in Ramp AOI (pc/mi/ln)	LOS	Density in Ramp AOI (pc/mi/ln)
I-95 NB On Ramp from US 1	Merge	B	12.9	B	15.9
I-95 SB On Ramp from US 1	Merge	B	17.6	B	18.3
I-95 SB Off Ramp to US 1	Diverge	B	16.2	B	16.2
I-95 NB Off Ramp to US 1	Diverge	B	14.4	B	17.3
I-95 SB Off Ramp to SR 40	Diverge	B	13.4	B	13.2
I-95 NB On Ramp from SR 40	Merge	B	13.4	B	15.6
I-95 NB Off ramp to Old Dixie Hwy.	Diverge	B	14.5	B	17.9
I-95 SB On Ramp from Old Dixie Hwy.	Merge	B	15.2	B	15.1

As shown, all merge and diverge segments are working at a level of service B during the AM and PM of the existing conditions.

3.3.2.2 Basic Segment Operations

The same metrics were used to evaluate I-95 mainline segments. **Table 14** summarizes the results for these. As shown in the tables, all segments on I-95 between SR 40 and US 1 operate at a level of service B during the existing conditions.

Table 14: Existing Freeway Basic Segment Analysis

Segment	Analysis Type	AM Peak		PM Peak	
		LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
I-95 NB mainline between SR 40 and US 1	Freeway Basic Segment	B	14.8	B	17.2
I-95 SB mainline between SR 40 and US 1	Freeway Basic Segment	B	16.1	B	16.6
I-95 NB mainline between US 1 Ramps	Freeway Basic Segment	B	12.1	B	14.1
I-95 SB mainline between US 1 Ramps	Freeway Basic Segment	B	13.2	B	13.8
I-95 NB mainline between US 1 and Old Dixie Hwy	Freeway Basic Segment	B	14.6	B	17.2
I-95 SB mainline between US 1 and Old Dixie Hwy	Freeway Basic Segment	B	16.2	B	16.4

3.3.2.3 Arterial Segment Operations

The roadway arterial operational analysis was performed for the existing year traffic conditions for the AM and PM peak hours based on Synchro 11 and the HCM 6th methodology. The LOS reported in **Table 15** is based on Exhibit 18-1 of the HCM 6th Edition. Eastbound US 1 operates at an overall LOS E for the PM peak hour and LOS E westbound in the AM and PM peak hours. The presence of closely spaced active driveways and heavy vehicle traffic along US 1 contribute to slower operating conditions.

Table 15: Existing Conditions Arterial Analysis

Roadway Segments	**Free Flow Speed (MPH)**	**Existing Year AM Peak**		**Existing Year PM Peak**	
Eastbound Direction		Speed (MPH)	LOS	Speed (MPH)	LOS
Destination Daytona Ln.	45	18.7	D	17.5	D
I-95 SB Ramp	45	14.8	E	11.8	F
I-95 NB Ramp	45	16.6	E	12.4	F
Broadway Ave	45	19.1	D	17.5	D
Total		**17.1**	**D**	**14.3**	**E**
Westbound Direction					
Broadway Ave	45	14.1	E	11.0	F
I-95 NB Ramp	45	21.7	D	17.7	D
I-95 SB Ramp	45	12.5	F	14.0	E
Destination Daytona Ln.	45	15.7	E	13.7	E
Total		**16.3**	**E**	**14.6**	**E**

3.3.2.4 Multimodal Analysis

The existing condition provides bike lanes on both sides of US 1 from Broadway Avenue to Destination Daytona Lane. On northbound US 1, this recently constructed bike lane is forced to the outside, crossing the free flow I-95 northbound off ramp and the I-95 southbound on ramp. The bike lane in the southbound direction is not interrupted by the interchange operations. Although bike lanes are present, they are adjacent to a 45 MPH roadway and force cyclists to cross free flow traffic movements. Pedestrian facilities are limited through study area. New sidewalk was constructed adjacent to northbound US 1 beginning just south of the I-95 northbound ramp terminal intersection and continuing to Destination Daytona Lane. Pedestrians cross two unsignalized ramp movements. There is no existing sidewalk adjacent to southbound US 1. As reference, the Quality Level of Service analysis is provided in **Table 16**.

Multimodal LOS can be determined using generalized LOS tables from the Quality Level of Service Handbook. Bicycles operate within LOS D during both the AM and PM peak hours along US 1. The roadway bicycle LOS is within LOS D because of the presence of bike lanes on both sides of US 1. The pedestrian LOS is driven by the presence of sidewalk. US 1 has 48% sidewalk coverage within the study area and operates within LOS E. The transit level of service is at LOS F due to limited sidewalk coverage and just one bus serving the area in the peak period.

Table 16: Existing Multimodal Analysis

Bicycle Mode				
Paved Shoulder/Bicycle Lane Coverage	AADT	No. of Lanes	Vehicle/Lane	Existing LOS
100%	23,500	4	5,875	D
Pedestrian Mode				
Sidewalk Coverage	AADT	No. of Lanes	Vehicle/Lane	Existing LOS
48%	23,500	4	5,875	E
Bus Mode				
Sidewalk Coverage			Peak hour Buses	Existing LOS
48%			1	F

4.0 Travel Demand Model Development

4.1 2015 Base Year Model Calibration and Validation

CFRPM 7.0 went through a thorough review with the local planning agencies and the Metropolitan Planning Organizations (MPO)/Transportation Planning Organization (TPOs). This review was completed to ensure reasonableness between the model and 2015 field conditions. Population, population density, employment and employment density were inspected by using Google Earth imagery for each TAZ within the study area. Not only was the socioeconomic data reviewed but the network was reviewed for connectivity, area type, functional classification, number of lanes and turn prohibitors. Although changes were made for validation purposes which are discussed later, it was determined that no changes needed to be made to the 2015 Base Year network to incorporate 2015 field conditions. There were 46 counts used to validate the project area.

The project level accuracy assessments are shown in **Table 17** and **18**. Although there are no recommended standards, the project % RMSE by count group was compared to the count data and is provided in **Table 19.**

Table 17: Volume Count Ratio by Facility Type (Daily) after Validation

I-95 at US-1 and I-95 at LPGA Study Area							
Note: CFRPM 7.0 2015 Base Year Validation							
						Date:	2/24/2022
Facility Type	**No. of Links**	**Volume**	**Count**	**Volume/ Count Ratio***	**Difference ***	**Acceptable**	**Preferable**
Freeway	8	327,501	316,000	1.04	4%	±6%	±5%
Divided Arterial	16	215,094	210,600	1.02	2%	±10%	±7%
Undivided Arterial	8	34,350	34,300	1.00	0%	±10%	±7%
Collector	0	-	-	N/A	N/A	±15%	±10%
One-Way/Frontage	0	-	-	N/A	N/A	±20%	±15%
Ramps	19	79,305	103,900	0.76	-24%	N/A	
Region	51	656,250	664,800	0.99	-1%	N/A	

**Green = Preferable; Blue = Acceptable; Red = Out of Range*

Source: CFRPM 7, Department's 2019 Project Traffic Forecasting Handbook

Table 18: Volume Count ratio by Screenlines (Daily) after Validation

I-95 at US-1 and I-95 at LPGA Study Area							
Note: CFRPM 7.0 2015 Base Year Validation							
						Date:	2/24/2022
Count Range	**No. of Links**	**Volume**	**Count**	**Volume/Count Ratio***	**Difference***	**Acceptable**	**Preferable**
0-34,999	43	328,749	348,800	0.94	-6%	±15%	N/A
35,000-69,999	8	327,501	316,000	1.04	4%	±10%	N/A
>70,000	0	-	-	N/A	N/A	±5%	N/A
Region	51	656,250	664,800	0.99	-1%	N/A	

**Green* = Preferable; *Blue* = Acceptable; *Red* = Out of Range*
Source: CFRPM 7, Department's 2019 Project Traffic Forecasting Handbook

Table 19: %RMSE by Count Group (Daily) after Validation

I-95 at US-1 and I-95 at LPGA Study Area						
Note: CFRPM 7.0 2015 Base Year Validation						
					Date:	2/24/2022
Count Group	**No. of Links**	**Volume**	**Count**	**%RMSE***	**Acceptable**	**Preferable**
< 5,000	15	45,023	48,200	52%	N/A at Project Level	
5,000-9,999	14	81,234	94,100	48%	N/A at Project Level	
10,000-14,999	9	118,499	111,500	24%	N/A at Project Level	
15,000-19,999	3	38,658	51,000	30%	N/A at Project Level	
20,000-29,999	2	45,335	44,000	11%	N/A at Project Level	
30,000-49,999	8	327,501	316,000	9%	N/A at Project Level	
50,000-59,999	0	-	-	N/A	N/A at Project Level	
>=60,000	0	-	-	N/A	N/A at Project Level	
Region	51	656,250	664,800	22%	N/A at Project Level	

**Green* = Preferable; *Blue* = Acceptable; *Red* = Out of Range*
Source: CFRPM 7, Department's 2019 Project Traffic Forecasting Handbook

The CFRMP 7.0 validation performance measure comparisons meet the standards provided by the FDOT Project Traffic Forecasting Handbook within the study area. Based on this comparison, the model can be used for the future traffic forecasting at a project level for the I-95 at US-1.

4.2 2015 Model Results

This section provides an overview of the 2015 model results in the study area. For project purposes, the model volumes on the I-95 mainline and ramps were compared individually to the observed counts using the V/C ratio. The I-95 mainline has VC ratios close to 1.0 for all links, indicating that the estimated model PSWADT is close to the observed PSWADT. This indicates that the 2015 traffic generated by the model replicates the count PSWADT and can be used in the development of future year traffic. Further detail can be found within the Project Validation Memorandum. Further detail can be found within the Model Validation Memorandum provided in **Appendix B** as part of the PTFM.

4.3 2045 Model Development

In the 2045 horizon year network and ZDATA, the same validation process was replicated as for the base year 2015.

Population and employment data of 2045 were compared with the 2015 base year data to check for any discrepancies. A considerable amount of the zones shows substantial development in the study area.

The River to Sea Transportation Planning Organization Long Range Transportation Plan (LRTP) and Transportation Improvement Plan (TIP) was compared against the 2045 model to achieve a baseline. Once the 2045 model was found to include all necessary projects outlined in the LRTP and TIP. The projects in the Methodology Letter of Understanding (MLOU) for US 1 were then checked for concurrency with the CFRPM 7.0.

Only two of the projects were found to not be included in the 2045 cost feasible model, the additional lanes along I-95 from north of US 92 to SR 44 and the additional lanes for SR 483 from SR 400 to US 92. The 2045 model was updated to reflect these changes.

4.4 Future Analysis Scenarios

The project is anticipated to be advanced through a design-build procurement starting in 2022, with construction completion in 2030. Future traffic design volumes were developed for the following scenarios:

- Opening Year: 2030
- Design Year: 2050

Future forecasted volumes were developed to represent the expected travel demand. This means that there is a single set of volumes rather than separate Build and No Build volumes. These volumes will be used for both the Build and No-Build Alternative. These two alternatives will vary based on geometry and interchange configurations. This approach isolates the Build Alternative improvements so that the difference in the evolution of the Build and No Build scenarios is only due to the improvements.

4.5 Future Traffic Forecasting

Future year traffic volumes for this study were developed using the Central Florida Regional Planning Model (CFRPM), Version 7.0. The model, as provided, produces Peak Season Weekday Average Daily traffic (PSWADT) output for the 2015 Base Year, and 2045 forecast year. The baseline CFRPM model was modified to reflect 2015 conditions more closely within the AOIs. The modifications were carried forward in the future year 2045 model runs. The model outputs for each of these runs were then used as an input for the development of the future traffic volumes. Details related to the model validation can be found in the PTFM in **Appendix B**.

Future traffic volumes were developed by using the following steps:

1. Generate AADT for 2050 based on base year AADT and adjusted growth rates from CFRPM 7.0
2. Used recommended K and D factors to calculate future year AM and PM peak hour directional volumes
3. Balanced the resulting volumes throughout all corridors

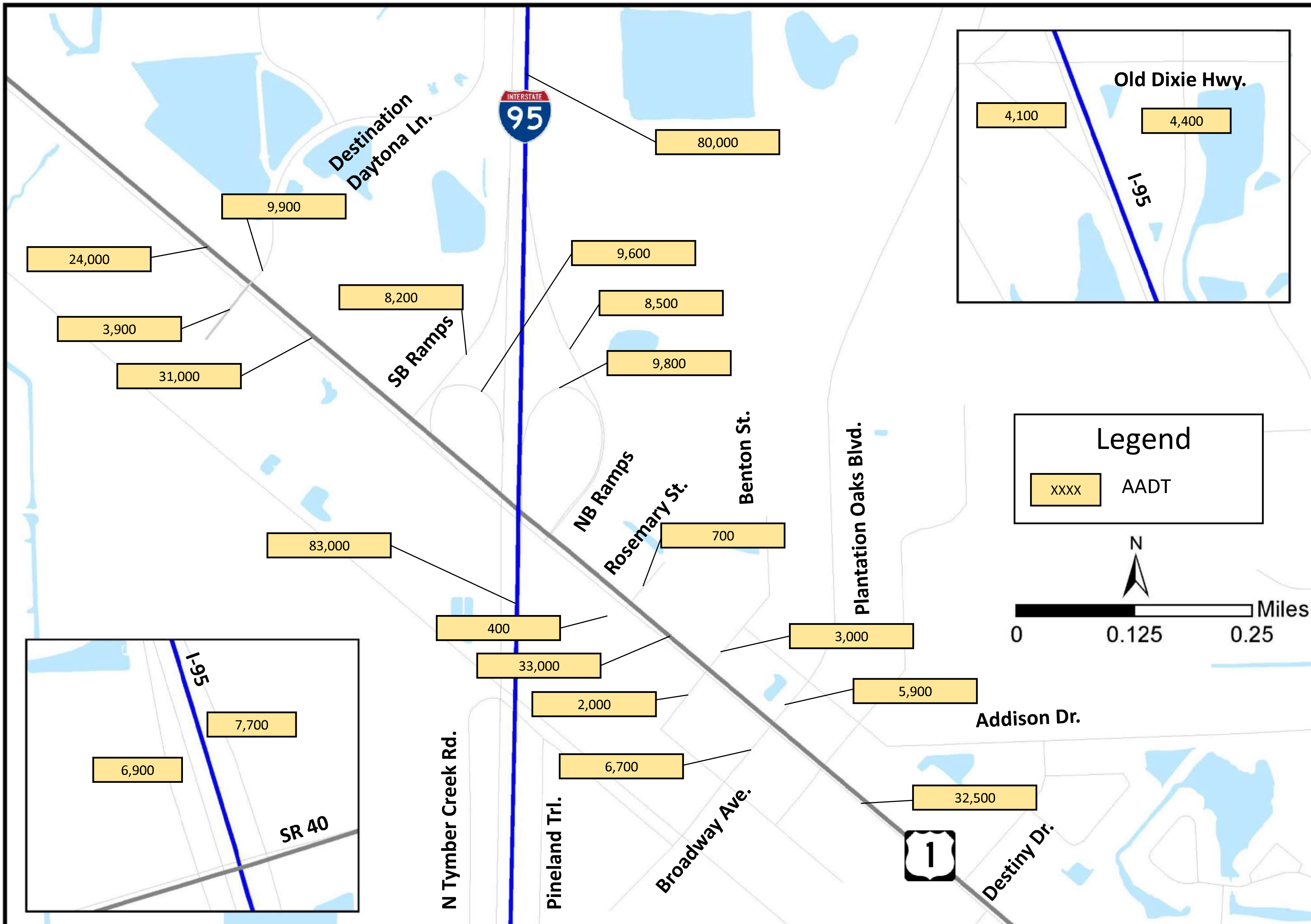
Two model runs were conducted using CFRPM 7.0 to help develop growth rates for future traffic. **Table 20** shows the model runs that were conducted and their use. The CUBE model outputs from CFRPM 7.0 are shown in **Appendix B**.

Table 20: CFRPM 7.0 Runs

CFRPM 7.0 Run Scenario	Analysis Year	Description	Notes
1	2015	Base Year	
2	2045	Model Year	Updated Land Uses per Agency direction.

4.5.1 Development of Future AADT Volumes

To develop future AADT volumes, the existing year counts were used and grown to 2050. This was done by deriving a growth rate from the CFRPM 7.0 model. The model output provided AADT values for each roadway segment for 2015 Base Year and 2045 Model Year. The 2021 and 2050 AADTs were interpolated to obtain the 2030 AADT for the project area. The 2030 and 2050 AADT volumes are shown in **Figure 14** and **Figure 15**. **Table 21** provides the growth rates and model data developed to forecast the 2050 AADT.



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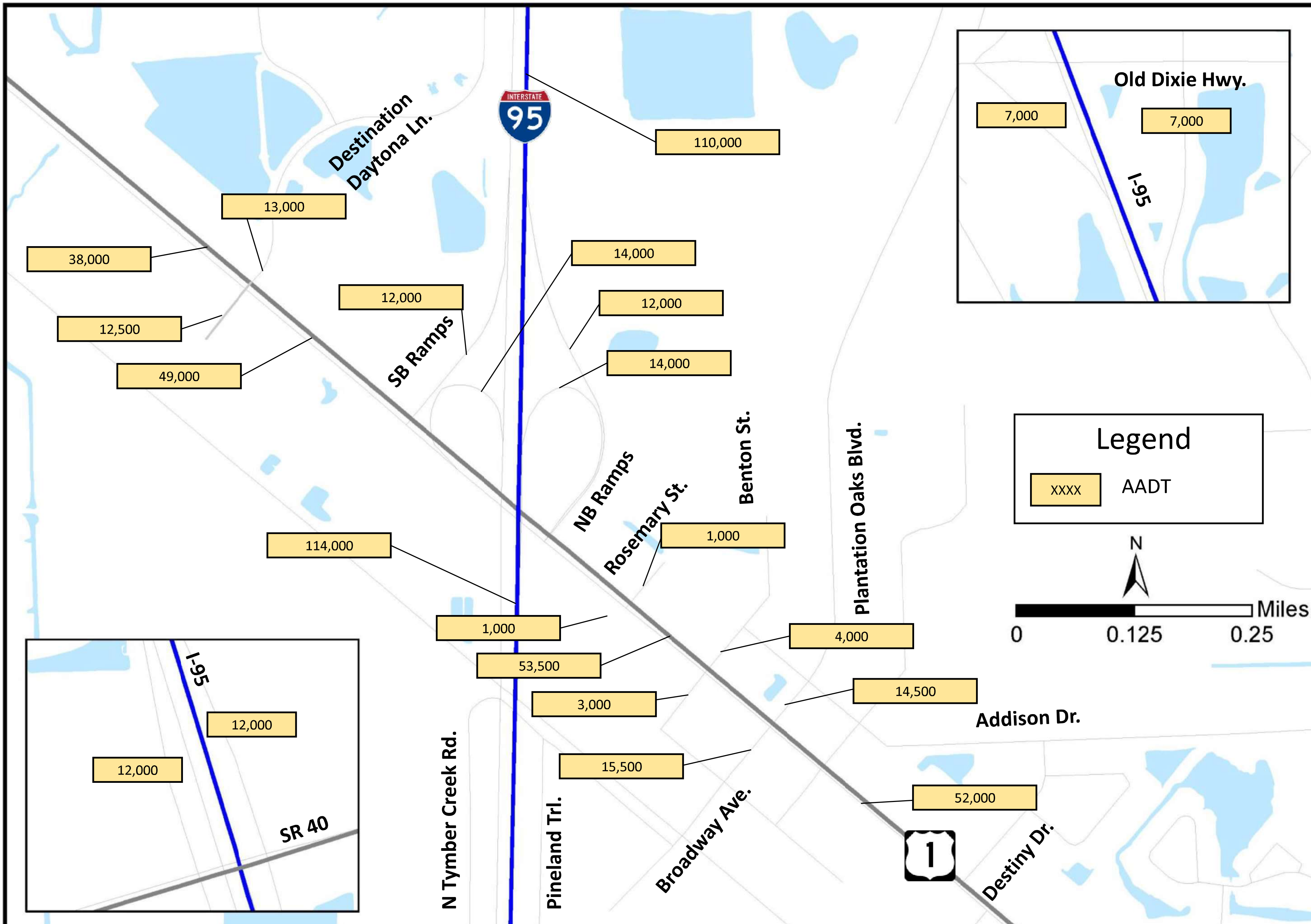
Opening Year (2030) AADT

Figure 14



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Design Year (2050) AADT

Figure 15

Table 21: 2050 AADT Calculation

Count Location	2015 Model/Count Volumes		2045 Volume	2021 Traffic Counts	Adjusted Link Growth to project 2015 to 2021 (G_1)	Projected 2021 Model Volume	Trends Analysis			BEBR Growth Rates		2021 to 2045 Recommended Growth Rate (G_2)	2045 to 2050 Recommended Growth Rate (G_3)	AADT (Using BEBR growth after the 2045 number)	Rounded AADT (Using BEBR growth after the 2045 number)
	AADT	AADT	AADT				Historic GR	Trend GR	R-squared	Medium	High				
	Model	Counts	Model												
I-95															
North of US 1	73,167	70,380	115,493	77,973	1.80%	81,061	1.28%	1.10%	32.49%	0.41%	0.84%	1.58%	0.41%	109,726	110,000
South of US 1	72,870	63,940	131,454	77,809	3.62%	88,676	-1.72%	-2.17%	34.80%	0.41%	0.84%	1.81%	0.41%	113,877	114,000
US 1															
West of Destination Daytona Ln.	15,250	14,010	49,654	18,000	7.12%	21,766	4.48%	3.52%	90.72%	0.41%	0.84%	3.52%	3.52%^	37,651	38,000
West of I-95	15,316	14,800	49,436	23,172	9.43%	23,980	1.44%	1.22%	30.71%	0.41%	0.84%	4.42%	0.41%	48,741	49,000
East of I-95	20,068	22,500	45,409	23,740	0.92%	21,174	1.05%	0.93%	32.66%	0.41%	0.84%	5.03%	0.41%	53,464	53,500
East of Pine Tree Dr	19,895	21,832	46,009	23,909	1.59%	21,788				0.41%	0.84%	4.73%	0.41%	52,088	52,000
Side Street Characteristics															
I-95 Ramps															
Southbound Off Ramp	4,767	5,959	6,605	6,703	3.12%	7,075	2.33%	1.88%	48.47%	0.41%	0.84%	2.48%*	0.41%	11,244	12,000
Southbound On Ramp	4,989	7,257	13,957	8,254	3.44%	8,753	0.65%	0.70%	14.29%	0.41%	0.84%	2.48%	0.41%	13,846	14,000
Northbound Off Ramp	2,910	7,272	13,914	8,543	4.37%	9,179	1.12%	1.00%	31.52%	0.41%	0.84%	2.15%	0.41%	13,588	14,000
Northbound On Ramp	3,430	6,449	5,131	7,197	2.90%	7,571	1.19%	1.00%	36.54%	0.41%	0.84%	2.15%*	0.41%	11,447	12,000
Side Streets															
SB I-95 on Ramp from Old Dixie Hwy.	2,024	2,725	3,194	2,931	1.89%	2,254	1.81%	1.43%	49.56%	0.41%	0.84%	5.15%	0.41%	6,687	7,000
NB I-95 off Ramp to Old Dixie Hwy.	4,578	2,587	5,985	3,301	6.90%	6,472	0.67%	0.74%	16.95%	0.41%	0.84%	4.14%	0.41%	6,715	7,000
Destination Daytona Ln.	701	0	867	8,423						0.76%	1.60%	1.60%	1.60%	12,603	13,000
Ormond Gateway														12,318	12,500
Rosemary Ave. (N of US 1)	585	0	6,907	606						0.76%	1.60%	0.76%	0.76%	744	1,000
Rosemary Ave. (S of US 1)												0.76%	0.76%	744	1,000
Plantation Oaks Blvd.- Trips derived from TIA													0.00%	14,328	14,500
Broadway Ave.- Trips derived from TIA										0.41%	0.84%		1.60%	15,421	15,500
Benton St. (N of US 1)	1,079	0	2,696	2,581						0.76%	1.60%	0.76%	0.76%	3,168	4,000
Benton St. (S of US 1)				1,594								3.39%	0.00%	2,891	3,000

*-Adjacent Growth Rates along the respective mainlines were used

^-The Growth rate was adjusted to accommodate additional predicted growth in this area

4.5.2 Development of Future DDHV Volumes

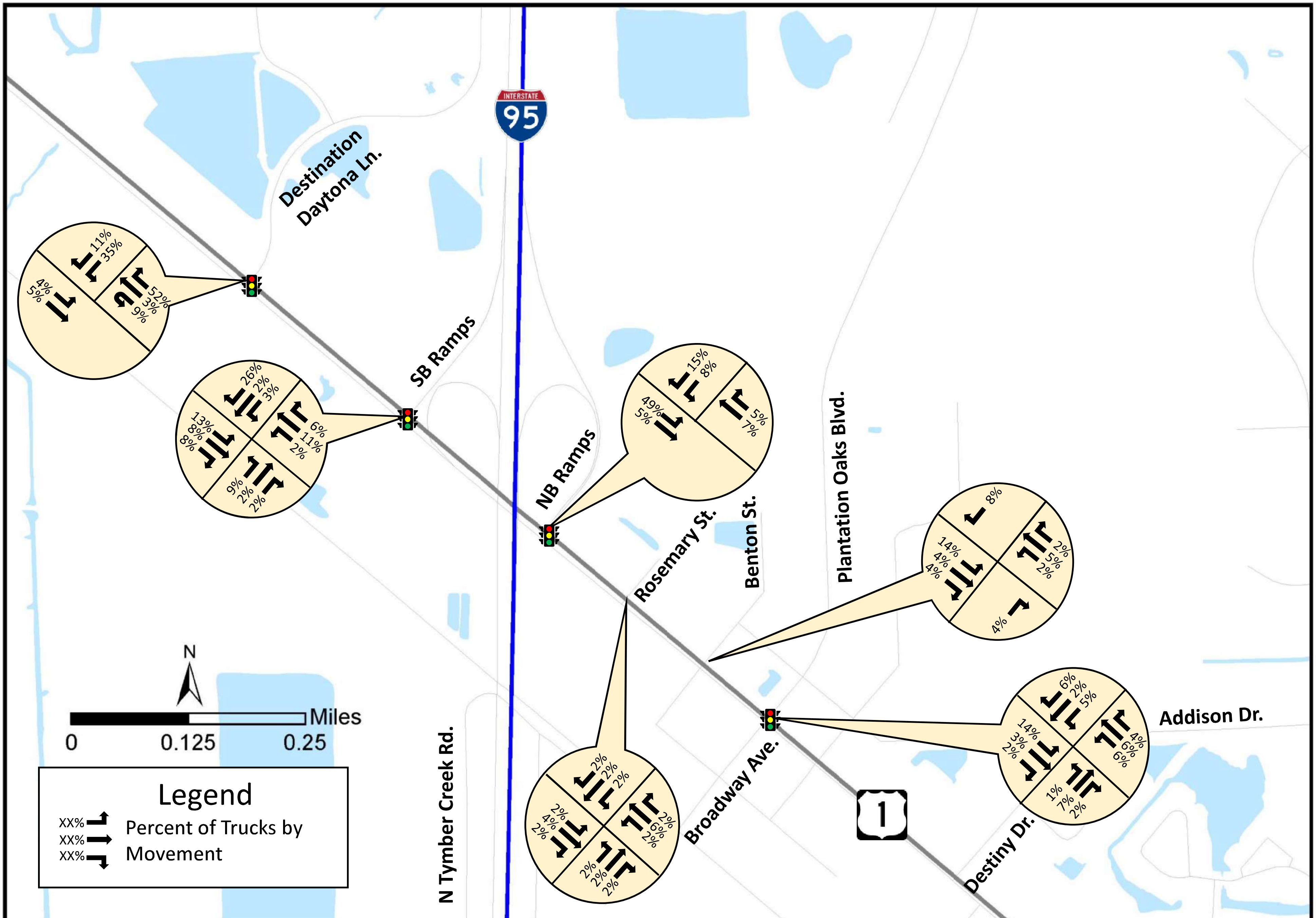
The development of future directional design hour traffic volumes was achieved by applying the recommended K and D factors to the adjusted AADT developed. These factors vary from the original MLOU due to the nature of the existing and expected future land use surrounding the interchange.

To calculate the measured K, 24-hour, 48-hour, 72-hour counts were used throughout the study area. Using the field counts, the peak hour was determined, and a K factor was calculated. The factor varied from the standard K due to the immediate land use surrounding the project. With the known expected changes in development within the project area, the K Factor was adjusted in coordination with the FDOT project team. The recommended K and D factors were developed by using the existing year counts and have been summarized in **Table 22**. With US 1 experiencing a unique level of truck traffic due to the surrounding land uses, a set of T factors were developed for use during the alternative analysis. These factors are provided in **Figure 16**. The use of a single T_f on US 1 would underestimate the heavy vehicles impacts on certain movements and skew the needs along the corridor resulting in geometry incapable of meeting the future demand.

Table 22: US 1 Recommended K, D, and T_F

Roadway	To	From	Recommended K	Recommended D	T_F
US 1	West	Destination Daytona Ln.	8.0%	60%	See Figure 16
	Destination Daytona Ln.	I-95 SB Ramps			
	I-95 SB Ramps	I-95 NB Ramps	9.0%	58.0%	See Figure 16: Future Percentage of Trucks
	I-95 NB Ramps	Rosemary Dr.			
	Rosemary Dr.	Benton St.			
	Benton St.	Broadway Ave.			
	Broadway Ave.	East			
US 1 Interchange*	Southbound Off Ramp		8.0%	53.0%	11.5%
	Southbound On Loop				
	Northbound Off Loop				
	Northbound On Ramp				
Destination Daytona Ln.	US 1	North	7.5%	55.0%	See Figure 16: Future Percentage of Trucks
Rosemary Dr.	South	US 1		63.0%	See Figure 16: Future Percentage of Trucks
	US 1	North			
Benton St.	South	US 1			
	US 1	North			
Broadway Ave.	South	US 1	9.0%	60.0%	
	US 1	North			
I-95	South	US 1	8.0%	53.0%	11.5%
	US 1	North			

*-D-factor is for NB On/SB Off Ramp and SB On/NB Off Ramp combined.



Project Development and Environment (PD&E) Studies
I-95 Interchange at SR 5 (US 1)
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Future Percentage of Trucks

Figure 16

4.5.3 Development of Future Intersection Turning Movement Volumes

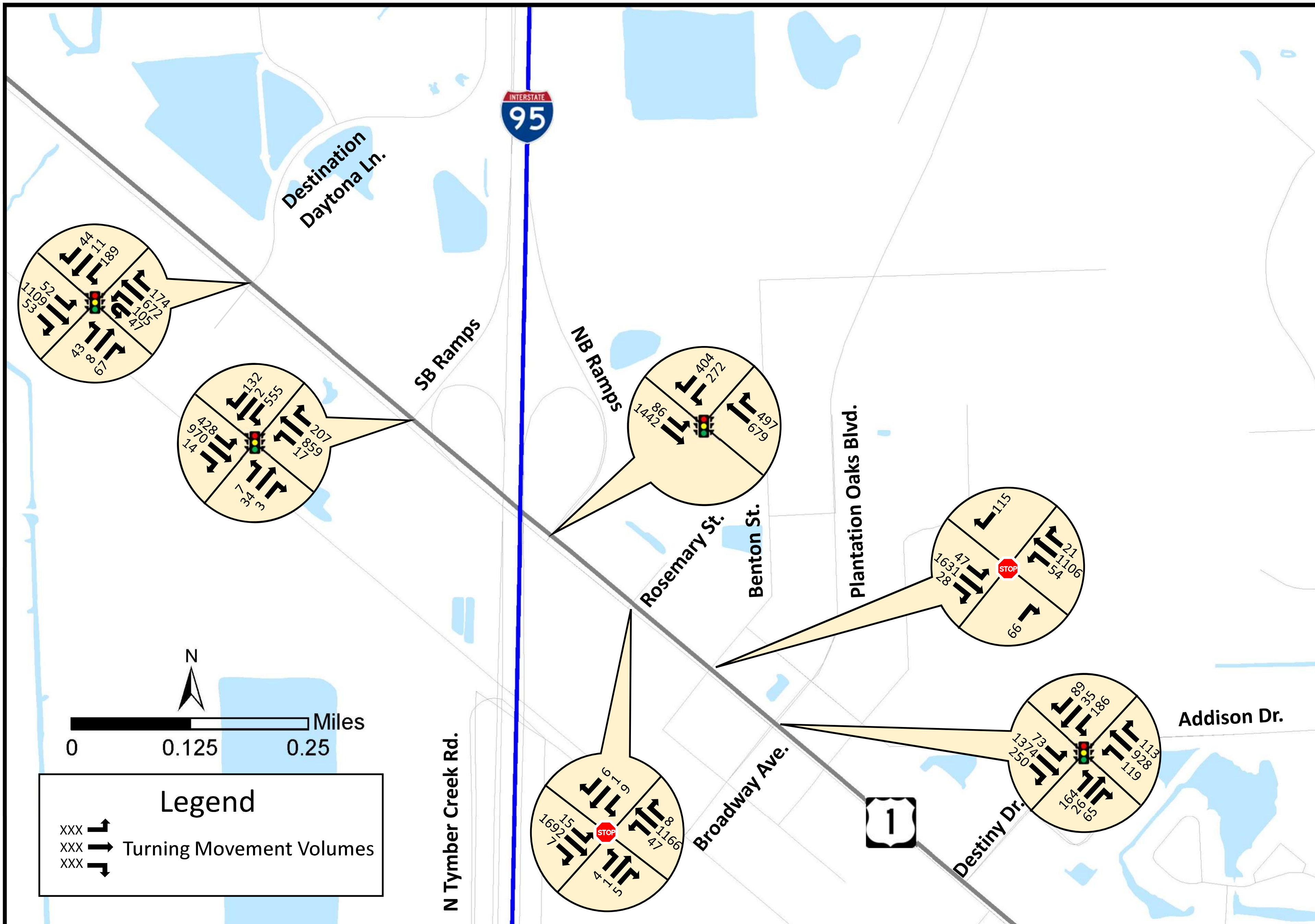
Initial turning movement estimates were developed using the Turns5 software provided by FDOT. The proposed 2050 AADTs presented in the previous section, along with the existing year turning movement counts (TMC) were used as inputs for this software. This data provided a first guess for the future TMCs which was then checked for reasonableness.

Consistent with the process used to develop existing peak hour volumes, adjustments were considered for the overall network and adjacent areas so that the predicted future volumes on each leg of each intersection are reasonably aligned with the proposed future AADTs. Where required, the main roadway was given precedence over minor side streets.

The analysis area for US 1 is slated to receive many new developments throughout the next 29 years (2021-2050) which can affect the use of the ramps from I-95 to US 1. While a majority of the trips are currently pass-through trips the future development will increase the number of trips originating and terminating in the project area.

At the interchange location, the entire interchange was represented as a single “intersection” junction based on where traffic enters and exits the interchange area. Once these “turns” were estimated, the traffic was assigned to individual ramps and or intersections within the interchange that accommodate that movement.

These resulting turning movements were then balanced along each corridor ensuring a consistent approach and output for the entire project area. The resulting design turning movement volumes for 2030 and 2050 can be found in **Figure 17** through **Figure 24**.

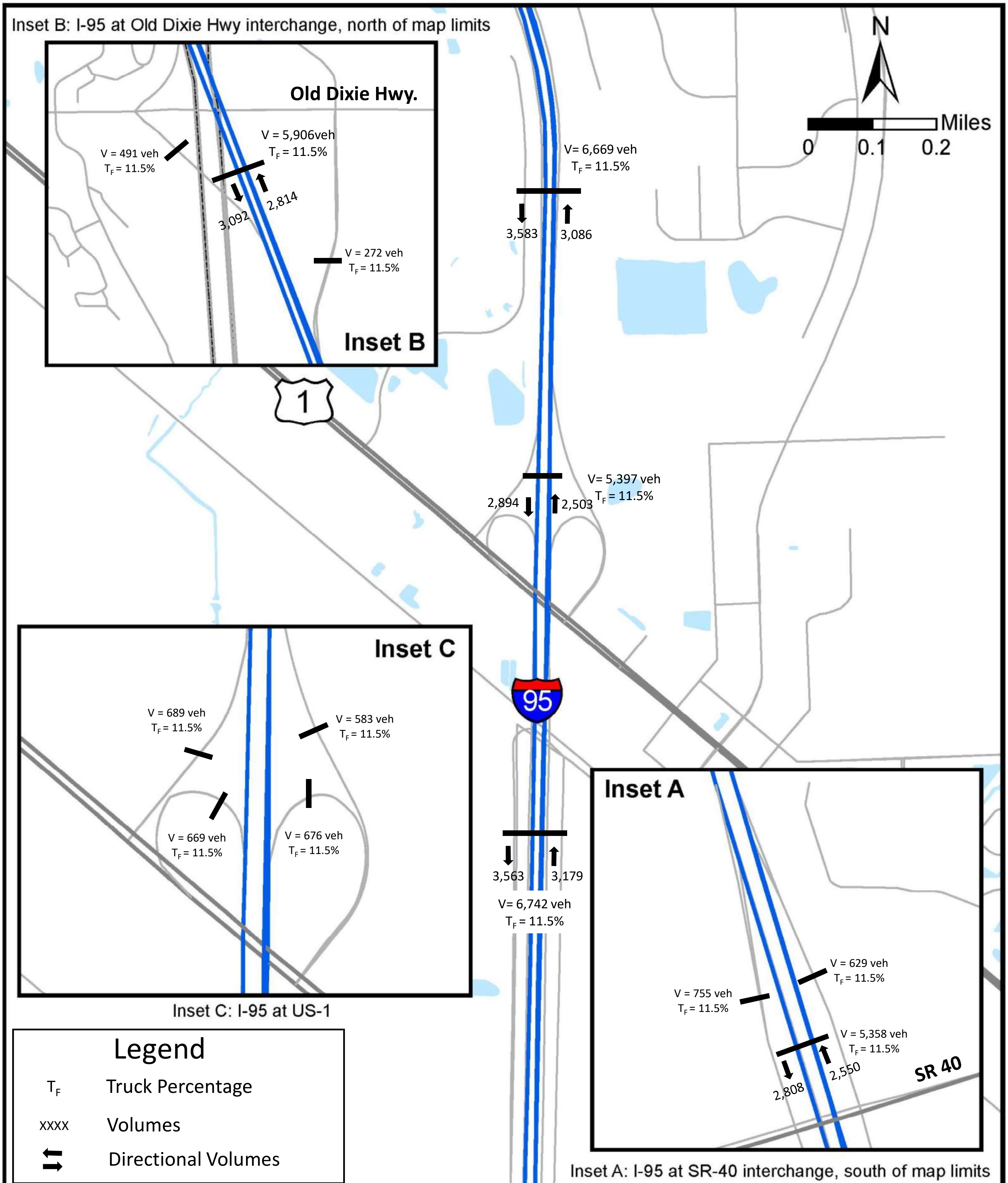


FDOT

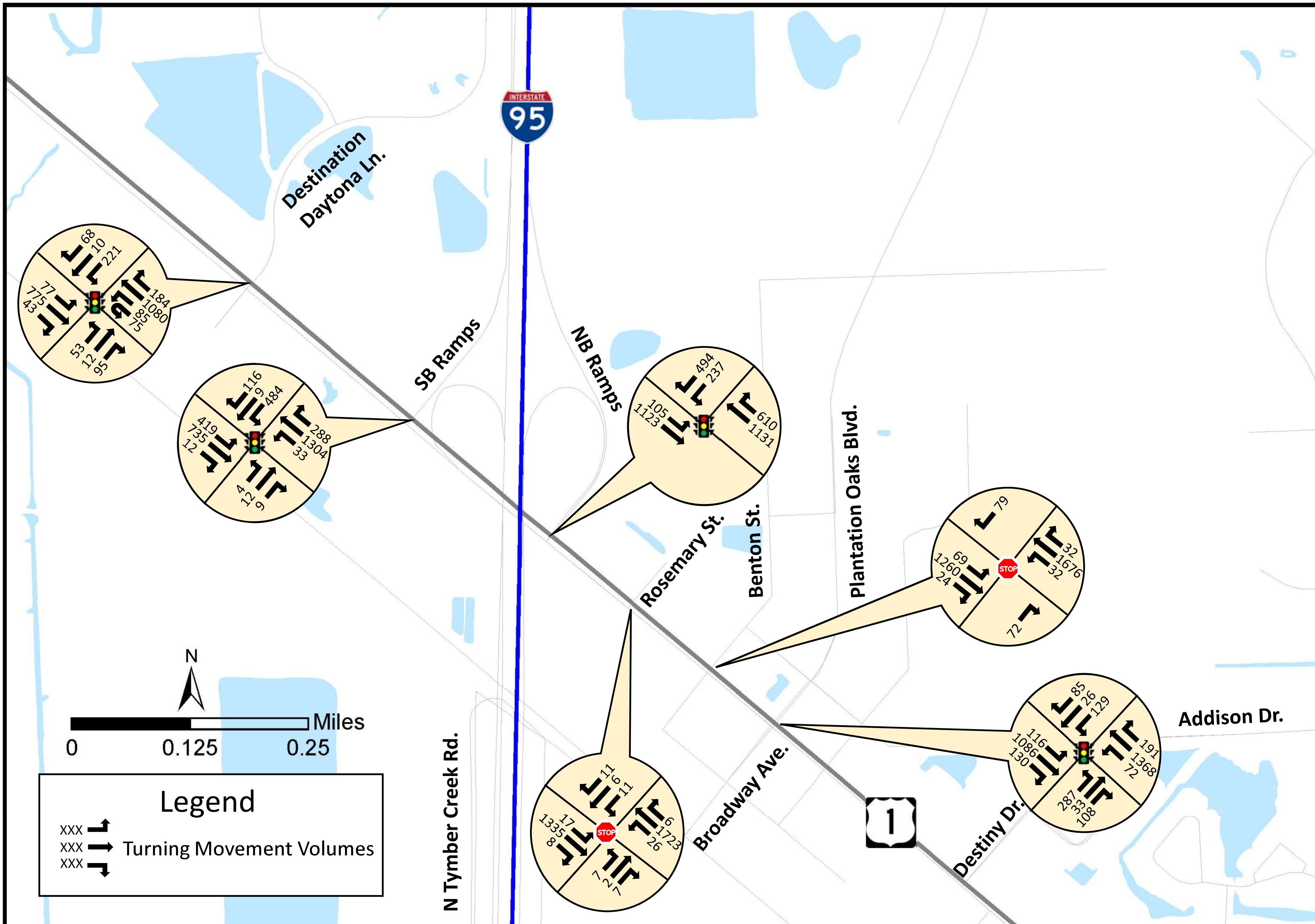
Project Development and Environment (PD&E) Studies
I-95 Interchange at SR 5 (US 1)
Project Traffic Analysis Report

Opening Year (2030) Turning Movement Volumes - AM Peak

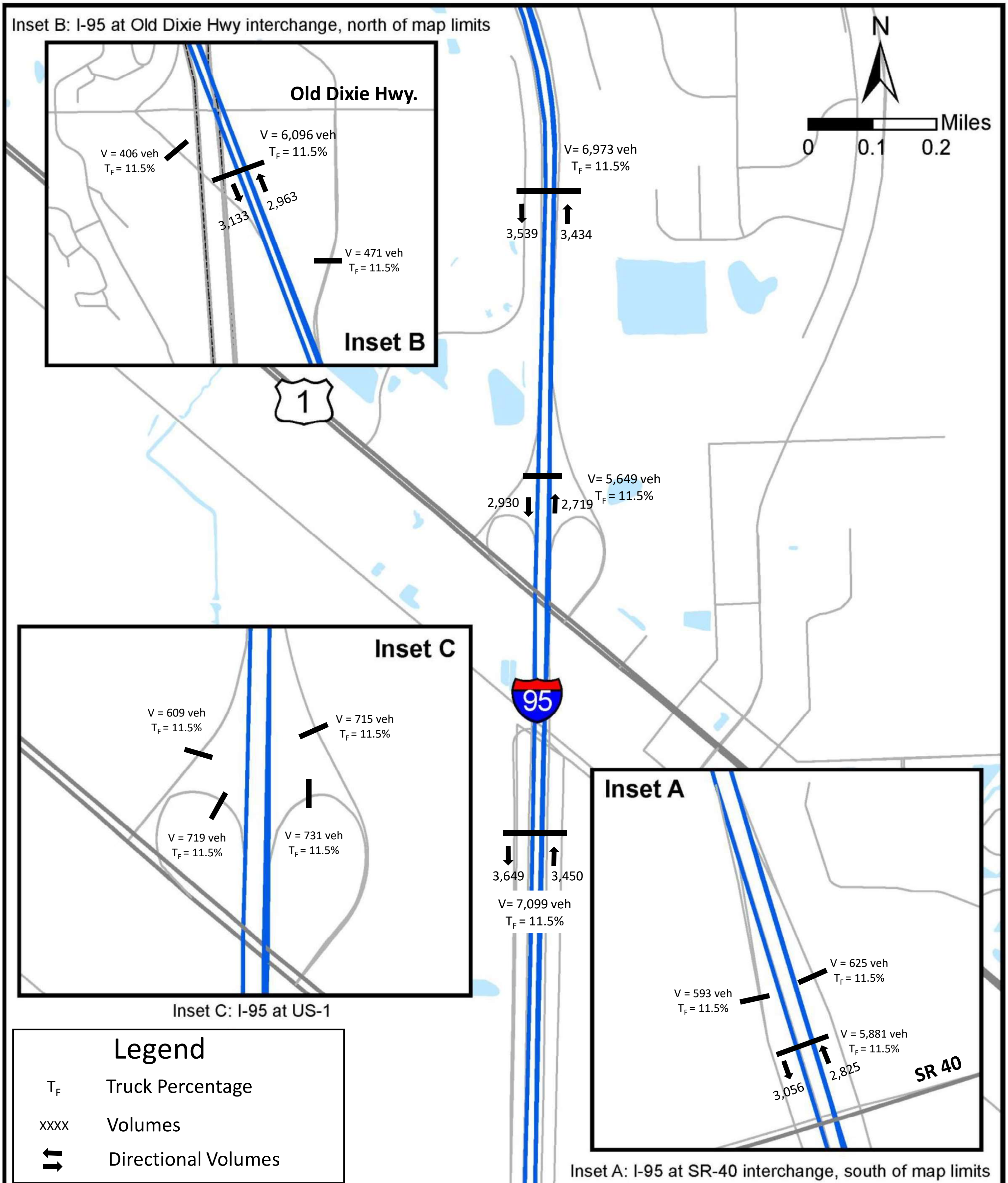
Figure 17



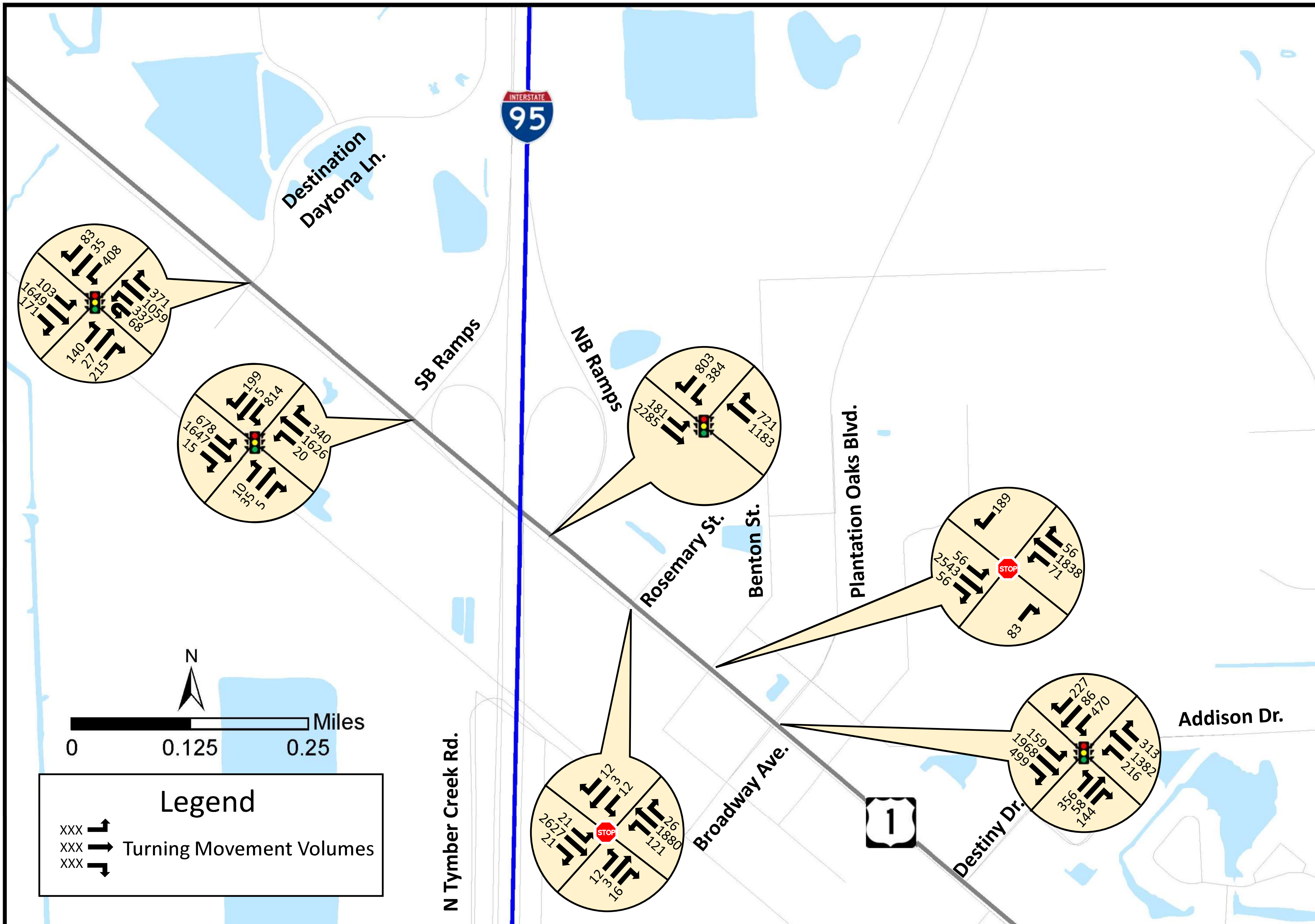
FDOT	Project Development and Environment (PD&E) Studies I-95 Interchange at SR 5 (US 1) Interchange Modification Report	Opening Year (2030) AM Volumes	Figure 18



FDOT	Project Development and Environment (PD&E) Studies I-95 Interchange at SR 5 (US 1) Project Traffic Analysis Report	Opening Year (2030) Turning Movement Volumes - PM Peak	Figure 19



FDOT	Project Development and Environment (PD&E) Studies I-95 Interchange at SR 5 (US 1) Interchange Modification Report	Opening Year (2030) PM Volumes	Figure 20



Project Development and Environment (PD&E) Studies
I-95 Interchange at SR 5 (US 1)
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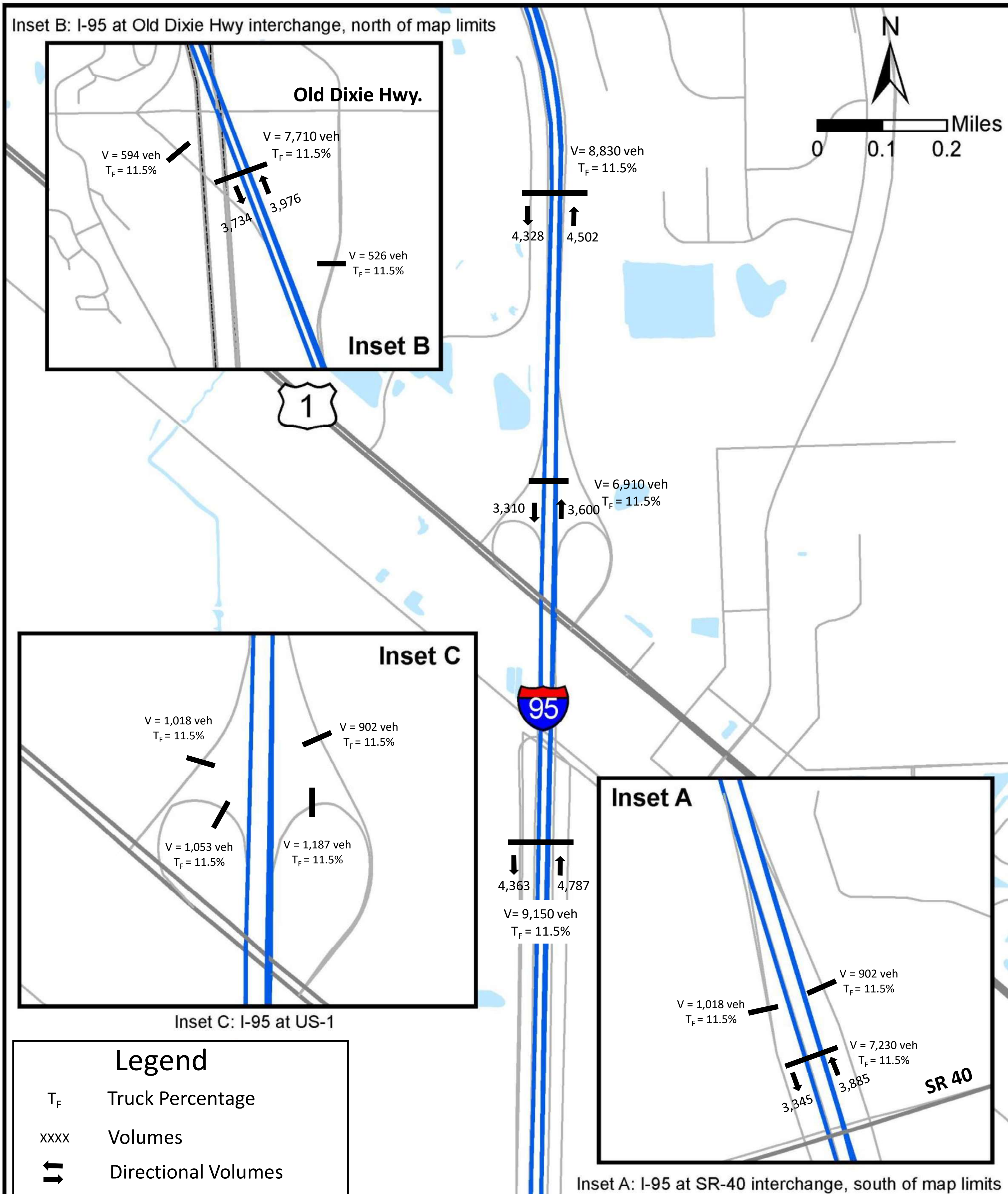
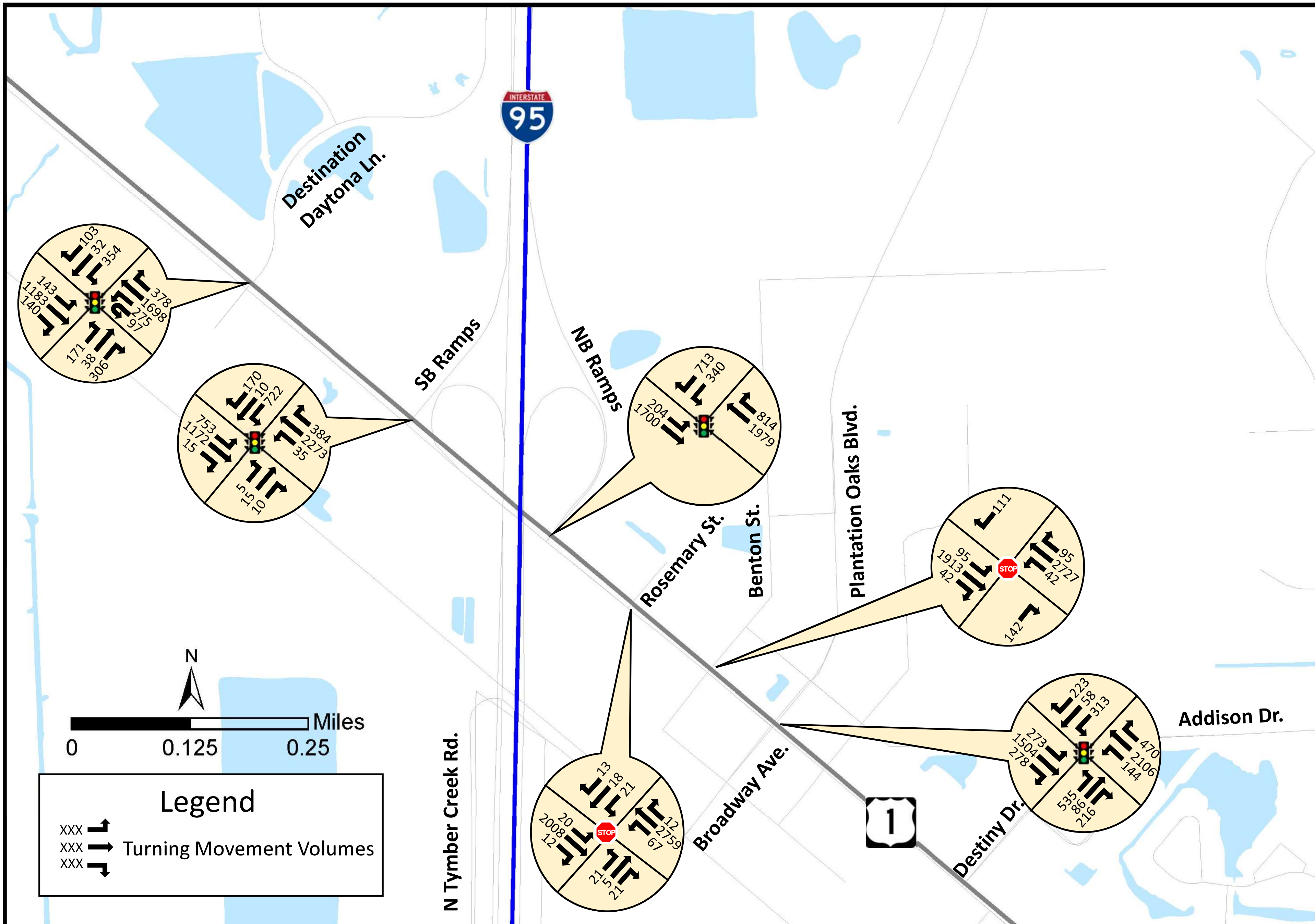
Design Year (2050) Turning Movement Volumes - AM Peak

Figure 21



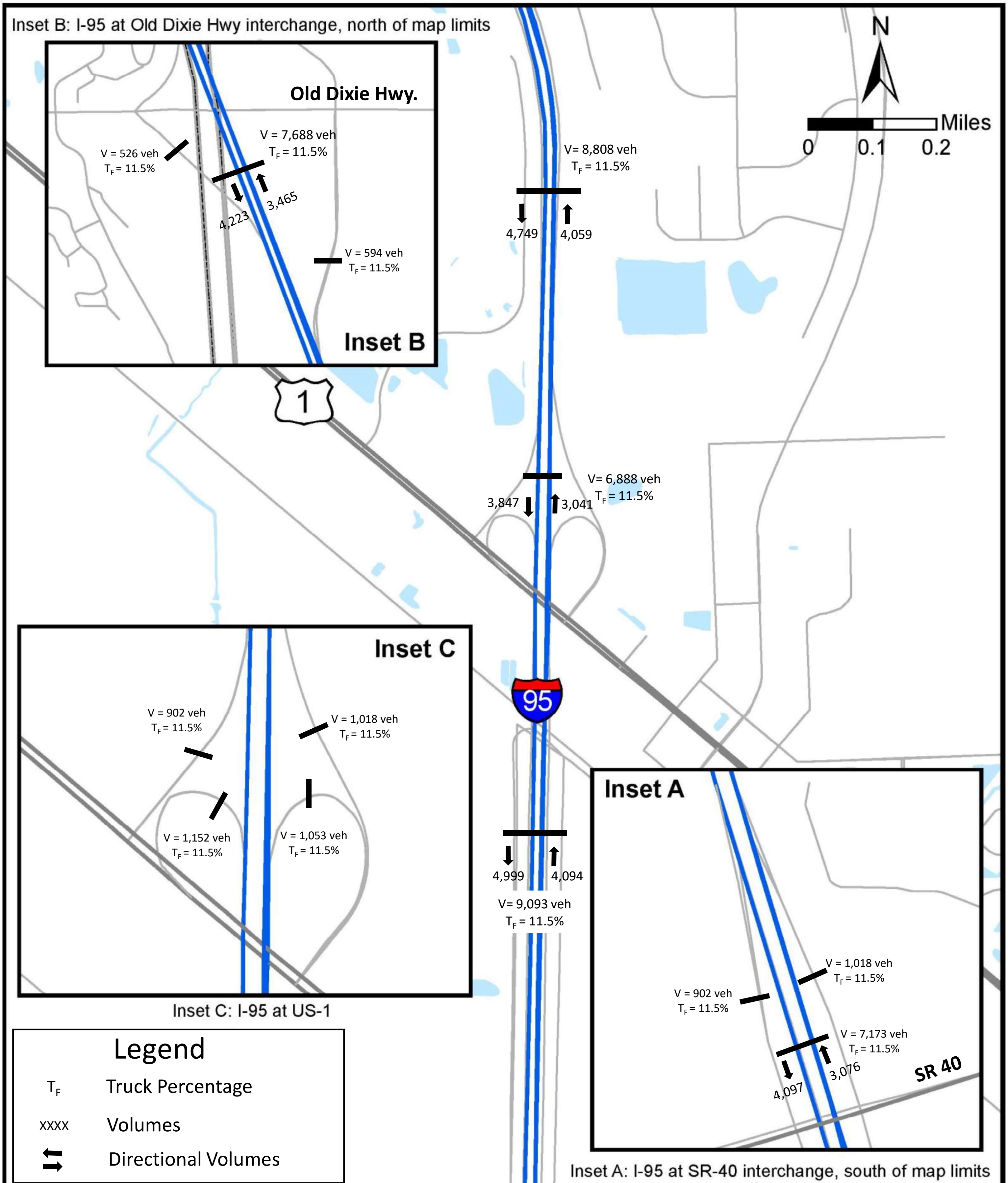
FDOT	Project Development and Environment (PD&E) Studies I-95 Interchange at SR 5 (US 1) Interchange Modification Report	Design Year (2050) AM Volumes	Figure 22



Project Development and Environment (PD&E) Studies
I-95 Interchange at SR 5 (US 1)
Project Traffic Analysis Report

Design Year (2050) Turning Movement Volumes - PM Peak

Figure 23



FDOT	**Project Development and Environment (PD&E) Studies** **I-95 Interchange at SR 5 (US 1)** **Interchange Modification Report**	**Design Year (2050)** **PM Volumes**	**Figure 24**

5.0 Considered Alternatives

As defined in the approved MLOU, the following alternatives were considered in this IMR:

- No Build Alternative
- Build Alternative

5.1 No-Build Alternative

The No-Build Alternative maintains the existing geometry at the I-95 and US 1 interchange and has no additional improvements to US 1. This alternative includes planned and programmed improvements as the south approach at Destination Daytona Lane. **Figure 6** shows the No Build geometry.

5.2 Selected Build Alternative

Two Build Alternatives were developed and analyzed with 2030 and 2050 volumes. Based on goals, objectives, and in coordination with FDOT, a recommended alternative was selected for the IMR. The Diverging Diamond Interchange eliminates conflict points making the intersections safer and improving signal timing operations along US 1. This alternative also includes widening of US 1 to three lanes in each direction throughout the project limits. **Table 23** summarizes all the intersection improvements, while **Figure 25** shows the new geometry for the DDI Alternative. **Appendix H** contains the operational analysis for the Build Alternative.

Table 23: Geometric Improvements

Intersection US 1 @	Improvement
Destination Daytona Ln.	WB Approach- Add an additional left turn lane, Add an additional through lane EB Approach- Add an additional shared through-right turn lane NB Approach- Entirely new approach with a left turn lane and a shared through-right lane SB Approach- Convert the right turn lane to a shared through-right lane
I-95 SB Ramp	Convert to DDI
I-95 NB Ramp	Convert to DDI
Rosemary St.	Convert Rosemary St. to right in/right out only. Eliminate the WB left turn WB Approach- Add an additional through lane EB Approach- Add an additional through lane
Dollar General	Provide a directional median allowing for WB and EB left turns and U-turns WB Approach- Add an additional through lane EB Approach- Add an additional through lane
Benton St.	Convert Benton St. to right in/right out only. Eliminate the WB and EB left turns WB Approach- Add an additional through lane EB Approach- Add an additional through lane
Broadway Ave./ Plantation Oaks Blvd.	EB Approach- Add a left turn lane, convert exclusive right turn lane to a shared through-right lane WB Approach- Add an additional through lane NB Approach- Add two left turn lanes SB Approach- Add a left turn and an exclusive right turn lane

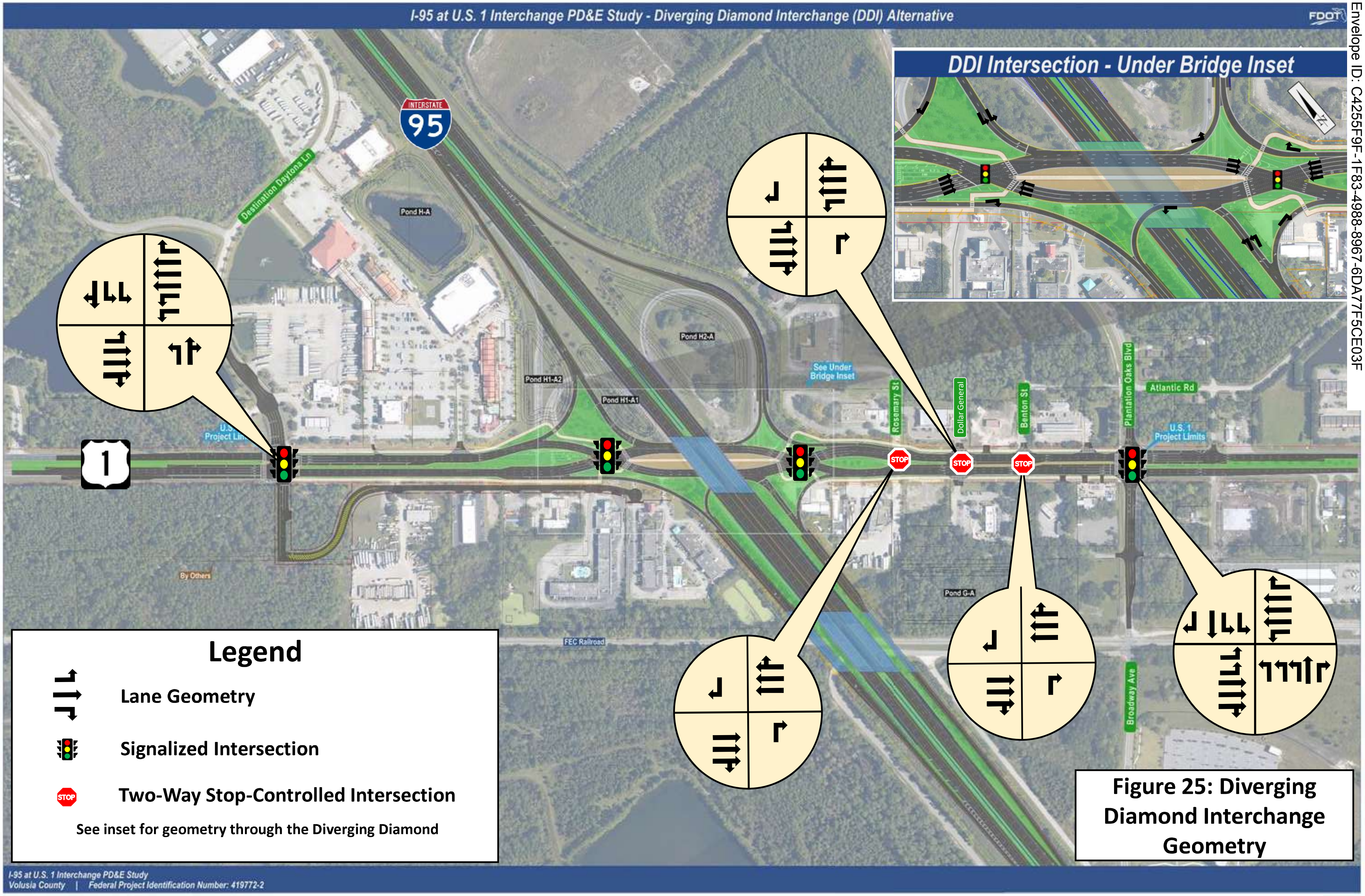


Figure 25: Diverging Diamond Interchange Geometry

6.0 Future Operational Analysis

This section summarizes the operational analysis for the No Build and Build Alternative. The Build Alternative presents a new design at the interchange as well as a six-lane widening along US 1 to better improve existing safety concerns and traffic operations. Intersection level of services analysis were conducted using HCM 2000 methodologies as implemented by Synchro version 11. The revision to the analysis was due to the limitation of HCM 6th Edition. The 6th Edition does not analyze shared turn lanes.

6.1 No Build Alternative

6.1.1 Intersection Operational Analysis

The No Build Alternative utilizes the same geometric characteristics as the existing conditions. It incorporates TSM&O solutions to improve traffic operations. Forecasted turning movement counts as shown in **Section 4.5.3** were used to analyze the No Build Alternative. **Table 24** through **26** and **Figure 26** through **29** summarizes the analysis for both years. **Appendix H** provides all the Synchro output.

As shown in **Table 24** and **25**, all study intersections operate at LOS F by the design year. This can be attributed to limited capacity along US 1 contributing to excessive side street delay and inadequate capacity for the turn lane movements.

Table 24: No Build Alternative Intersection Analysis- Opening Year 2030

Opening Year 2030																					
			Movement							Approach					Intersection					
Intersection	95th Percentile Queue (ft.)	Turn Bay Length (ft.)		Delay (seconds)		v/c		LOS			Delay (seconds)		LOS		Delay (seconds)		v/c		LOS	
				AM	PM	AM	PM	AM	PM		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Destination Daytona Ln.	294	350	EBL	14.0	15.6	0.13	0.29	B	B	EB	26.3	20.4	C	C	26.5	29.4	0.65	0.58	C	C
	-	-	EBTR	26.9	20.8	0.66	0.43	C	C											
	216	365	WBL	76.0	23.8	0.58	0.43	E	C	WB	13.1	21.0	B	C						
	-	-	WBT	2.2	20.5	0.35	0.56	A	C											
	121	1,040	WBR	0.3	21.8	0.17	0.21	A	C											
	-	-	NBLT	71.4	85	0.52	0.61	E	F	NB	67.6	77.6	E	E						
	-	-	NBR	64.8	72.5	0.04	0.06	E	E											
	594	160	SBL	68.4	77.7	0.63	0.69	E	E	SB	62.7	69.8	E	E						
	-		SBT	43.0	47.4	0.03	0.02	D	D											
	45	160	SBR	43.1	47.7	0.03	0.05	D	D											
SB Ramp	859	600	EBL	135.4	195.1	1.11	1.26	F	F	EB	73.1	96.6	E	F	92.8	85.5	1.12	1.18	F	F
	-	-	EBTR	46.1	41.4	0.69	0.57	D	D											
	69	200	WBL	67.0	13.6	0.12	0.09	E	B	WB	107.5	54.1	F	D						
	-	-	WBT	108.3	55.1	1.02	1.07	F	E											
	1054	585	WBR	0.0	0.0	0.13	0.18	-	-											
	-	-	NBLTR	28.4	38	0.07	0.04	C	D	NB	28.4	38.0	C	D						
	-	-	SBLT	139.6	157.6	1.17	1.18	F	F	SB	118.4	135	F	F						
	481	330	SBR	29.0	38.9	0.11	0.1	C	D											

Opening Year 2030																				
			Movement							Approach					Intersection					
Intersection	95th Percentile Queue (ft.)	Turn Bay Length (ft.)		Delay (seconds)		v/c		LOS			Delay (seconds)		LOS		Delay (seconds)		v/c		LOS	
				AM	PM	AM	PM	AM	PM		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
NB Ramp	177	370	EBL	53.0	99.2	0.41	0.81	D	F	EB	61.2	48.6	E	D	52.6	74.4	1.04	1.05	D	E
	-	-	EBT	61.6	43.9	0.99	0.74	E	D											
	-	-	WBT	42.2	88.6	0.73	1.05	D	F	WB	32.1	79.1	C	E						
	373	150	WBR	18.3	61.5	0.5	0.86	B	E											
	-	-	SBLR	69.1	106.7	0.98	1.08	E	F	SB	69.1	106.7	E	F						
Rosemary St.[1]	-	-	EBT	0.0	0.0	0.53	0.42	A	A	EB	0.4	0.8	-	-	23.1	36.6	0.07	0.21	C	E
	123	150	WBL	14.2	11.4	0.11	0.05	B	B	WB	0.5	0.2	-	-						
	-	-	WBTR	0.0	0.0	0.48	0.71	-	-											
	-	-	NBLTR	23.1	20.4	0.05	0.06	C	C	NB	23.1	20.4	C	C						
	-	-	SBLTR	23.1	36.6	0.07	0.21	C	E	SB	23.1	36.6	C	E						
Benton St.[1]	115	150	EBL	11.6	18.7	0.08	0.22	B	C	EB	0.3	1.0	-	-	13.9	18.7	0.12	0.22	B	C
	-	-	EBT	0.0	0.0	0.51	0.39	-	-											
	3	200	EBR	0.0	0.0	0.02	0.01	-	-											
	90	150	WBL	13.9	11	0.12	0.05	B	B	WB	0.6	0.2	-	-						
	-	-	WBT	0.0	0.0	0.34	0.52	-	-											
	244	230	WBR	0.0	0.0	0.01	0.02	-	-											
	-	-	NBR	11.5	10.1	0.11	0.1	B	B	NB	11.5	10.1	B	B						
	-	-	SBR	11.0	10.5	0.17	0.11	B	B	SB	11.0	10.5	B	B						

Opening Year 2030																				
			Movement							Approach					Intersection					
Intersection	95th Percentile Queue (ft.)	Turn Bay Length (ft.)		Delay (seconds)		v/c		LOS			Delay (seconds)		LOS		Delay (seconds)		v/c		LOS	
				AM	PM	AM	PM	AM	PM		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Broadway Ave.	172	220	EBL	13.7	63.4	0.23	0.51	B	E											
	-	-	EBT	19.8	5.1	0.71	0.52	B	A	EB	19.2	9.7	B	A						
	83	375	EBR	17.8	0.1	0.21	0.09	B	A											
	184	250	WBL	19.4	13.5	0.49	0.26	B	B											
	-	-	WBT	16.0	27.2	0.46	0.72	B	C	WB	15.9	25.4	B	C						
	313	200	WBR	11.6	16.4	0.08	0.17	B	B						28.9	39.4	0.74	0.84	C	D
	192	120	NBL	102.7	204.5	0.9	1.24	F	F											
	-	-	NBT	67.1	70.2	0.22	0.19	E	E	NB	89.6	159.8	F	F						
	90	120	NBR	65.3	68.9	0.04	0.07	E	E											
	244	200	SBL	89.2	88.7	0.88	0.76	F	F	SB	80.3	84.4	F	F						
	-	-	SBTR	66.9	79.4	0.38	0.34	E	E											

[1] Two-Way Stop Control. LOS shown for TWSC intersection is for the worst movement.

Table 25: No Build Alternative Intersection Analysis- Design Year 2050

Design Year 2050																		
	Movement							Approach					Intersection					
Intersection		Delay (seconds)		v/c		LOS			Delay (seconds)		LOS		Delay (seconds)		v/c		LOS	
		AM	PM	AM	PM	AM	PM		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Destination Daytona Ln.	EBL	22.1	147.4	0.43	1.06	C	F	EB	154.5	55.9	F	E	126.6	91.0	1.54	1.61	F	F
	EBTR	162.0	45.9	1.26	0.86	F	D											
	WBL	403.1	447.3	1.66	1.76	F	F	WB	94.2	97.9	F	F						
	WBT	2.8	39.8	0.63	1.01	A	D											
	WBR	18.4	14.7	0.42	0.56	B	B											
	NBLT	137	178.3	1.01	1.13	F	F	NB	94.8	130.4	F	F						
	NBR	62.1	97.7	0.44	0.86	E	F											
	SBL	196.7	150.1	1.24	1.09	F	F	SB	161.0	119.9	F	F						
	SBT	37.5	40.4	0.07	0.06	D	D											
	SBR	37.5	40.6	0.06	0.07	D	D											
SB Ramp	EBL	402.7	609.4	1.79	2.2	F	F	EB	179.5	263.1	F	F	254.8	365.3	1.86	2.01	F	F
	EBTR	88.5	43.5	1.06	0.79	F	D											
	WBL	77.2	11.3	0.14	0.22	E	B	WB	243.8	482.2	F	F						
	WBT	245.8	489.5	1.42	2.04	F	F											
	WBR	0.0	0.0	0.21	0.24	-	-											
	NBLTR	37.7	35.9	0.19	0.07	D	D	NB	37.7	35.9	D	D						
	SBLT	567.1	356.9	2.13	1.65	F	F	SB	456.5	296.8	F	F						
	SBR	0.3	38.2	0.16	0.21	A	D											

Design Year 2050																		
	Movement							Approach					Intersection					
Intersection		Delay (seconds)		v/c		LOS			Delay (seconds)		LOS		Delay (seconds)		v/c		LOS	
		AM	PM	AM	PM	AM	PM		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
NB Ramp	EBL	57.9	325.8	0.97	1.57	E	F	EB	107.2	95.1	F	F	241.9	271.5	1.75	1.68	F	F
	EBT	111.1	67.4	1.16	1.06	F	E											
	WBT	52.4	409.4	0.86	1.72	D	F	WB	58.5	357.3	E	F						
	WBR	68.6	230.8	0.77	1.28	E	F											
	SBLR	816.2	362.8	2.68	1.68	F	F	SB	816.2	362.8	F	F						
Rosemary St.[1]	EBT	0.0	0.0	0.83	0.63	A	E	EB	3.5	24.7	-	-	462.2	-	1.71	8.53	F	F
	WBL	462.2	23.0	1.71	0.26	F	C	WB	27.5	0.5	-	-						
	WBTR	0.0	0.0	0.78	1.14	-	-											
	NBLTR	-	-	-	-	F	F	NB	-	-	F	F						
	SBLTR	-	-	-	8.53	F	F	SB	-	-	F	F						
Benton St.[1]	EBL	21.2	518.0	0.21	1.75	C	F	EB	0.4	24.0	-	-	157.5	518.0	0.89	1.75	F	F
	EBT	0.0	0.0	0.79	0.59	-	-											
	EBR	0.0	0.0	0.03	0.03	-	-											
	WBL	157.5	18.9	0.89	0.15	F	C	WB	5.7	0.3	-	-						
	WBT	0.0	0.0	0.57	0.84	-	-											
	WBR	0.0	0.0	0.03	0.06	-	-											
	NBR	15.1	13.7	0.2	0.26	C	B	NB	15.1	13.7	C	B						
	SBR	13.6	19.9	0.32	0.33	B	C	SB	13.6	19.9	B	C						

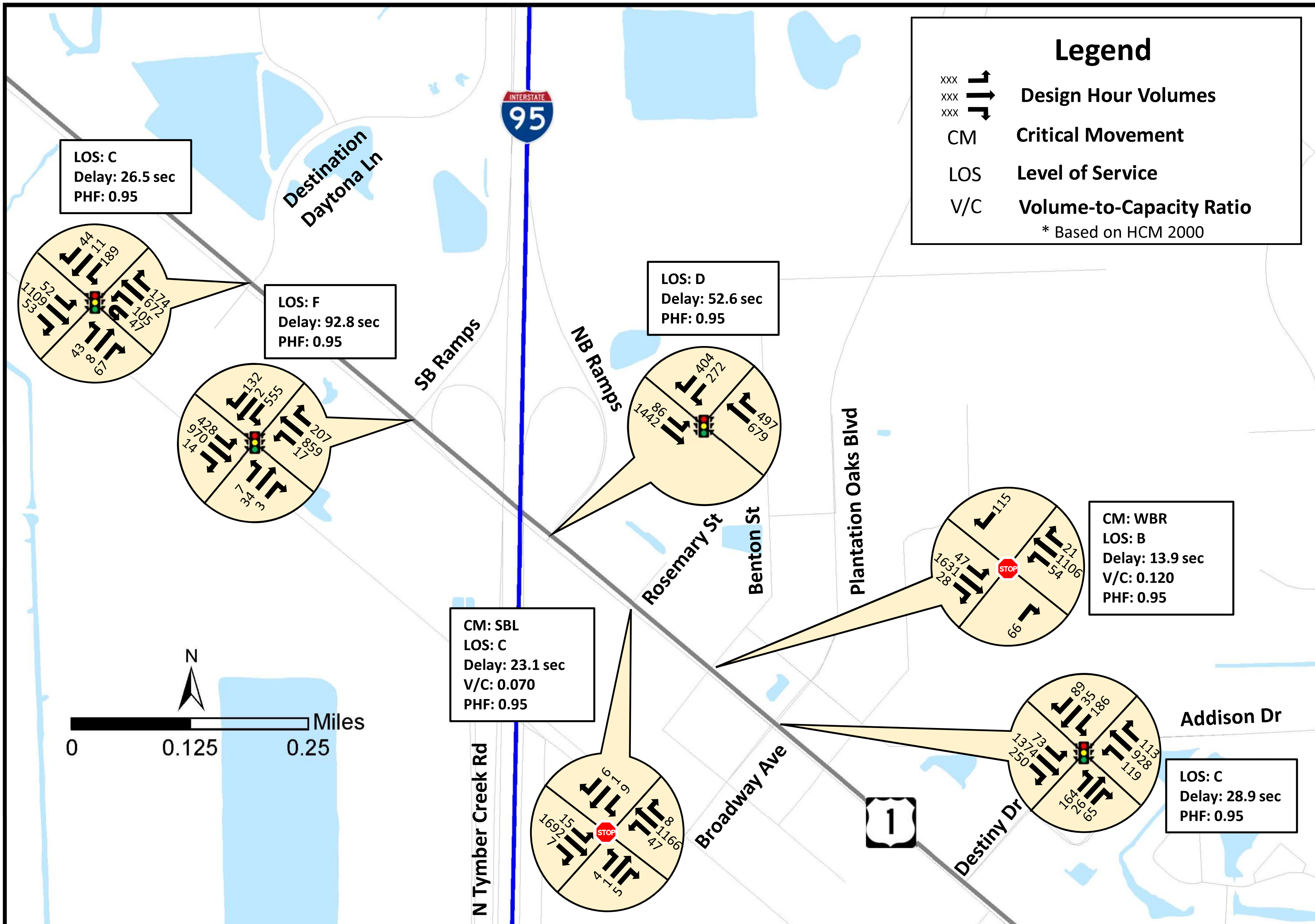
Design Year 2050																			
	Movement							Approach					Intersection						
Intersection		Delay (seconds)		v/c		LOS			Delay (seconds)		LOS		Delay (seconds)		v/c		LOS		
		AM	PM	AM	PM	AM	PM		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	
Broadway Ave.	EBL	56.9	101.4	0.66	0.98	E	F	EB	152.8	28.3	F	C	146.6	189.9	1.5	1.71	F	F	
	EBT	197.1	19.8	1.38	0.94	F	B												
	EBR	8.1	2.6	0.59	0.29	A	A												
	WBL	65	67.4	0.83	0.79	E	E	WB	59.7	262	E	F							
	WBT	65.5	323.6	1	1.6	E	F												
	WBR	30.4	46	0.36	0.66	C	D												
	NBL	544.6	639.7	2.05	2.27	F	F	NB	365.3	431.1	F	F							
	NBT	49.6	63.1	0.17	0.31	F	E												
	NBR	49.7	61.4	0.18	0.18	F	E												
	SBL	255.8	72.6	1.41	0.85	F	E	SB	182	78.3	F	E							
	SBTR	71.4	84.7	0.8	0.8	E	F												

[1] Two-Way Stop Control. LOS shown for TWSC intersection is for the worst movement.

Table 26: No Build Queue vs. Turn-Bay Length Comparison

Roadway	Approach	Movement	2030 Queue Length (ft)	2050 Queue Length (ft)	Turn Bay Length (ft)*
Destination Daytona Ln.	EB	L	525	575	350
	WB	L	450	375	365
		R	500	225	1,040
	SB	L	600	500	160
		R	225	475	160
SB Ramps	EB	L	1275	1150	600
	WB	L	175	175	200
		R	1075	1025	585
	SB	R	700	750	330
NB Ramps	EB	L	350	375	370
	WB	R	650	675	150
Rosemary St.	WB	L	675	650	150
Benton St.	EB	L	125	250	150
		R	100	225	200
	WB	L	550	525	150
		R	600	500	230
Plantation Oaks Blvd./Broadway Ave.	EB	L	400	500	220
		R	400	525	375
	WB	L	550	525	250
		R	525	500	200
	SB	L	225	275	120
		R	200	275	120
	NB	L	575	575	200

* Equals length of full lane width

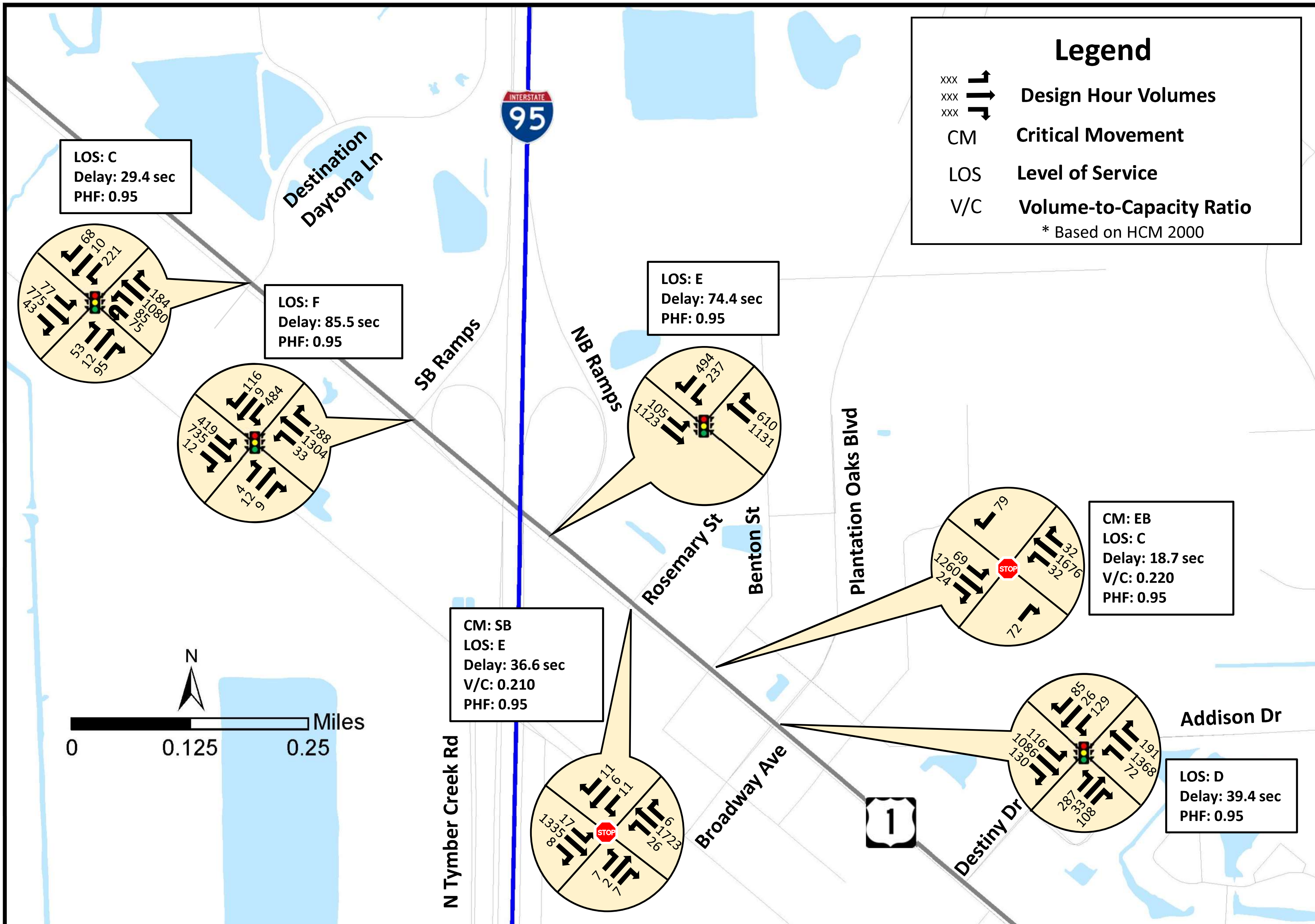


FDOT

Project Development and Environment (PD&E) Studies
I-95 Interchange at SR 5 (US 1)
Interchange Modification Report

2030 AM No Build
Operational Performance

Figure 26

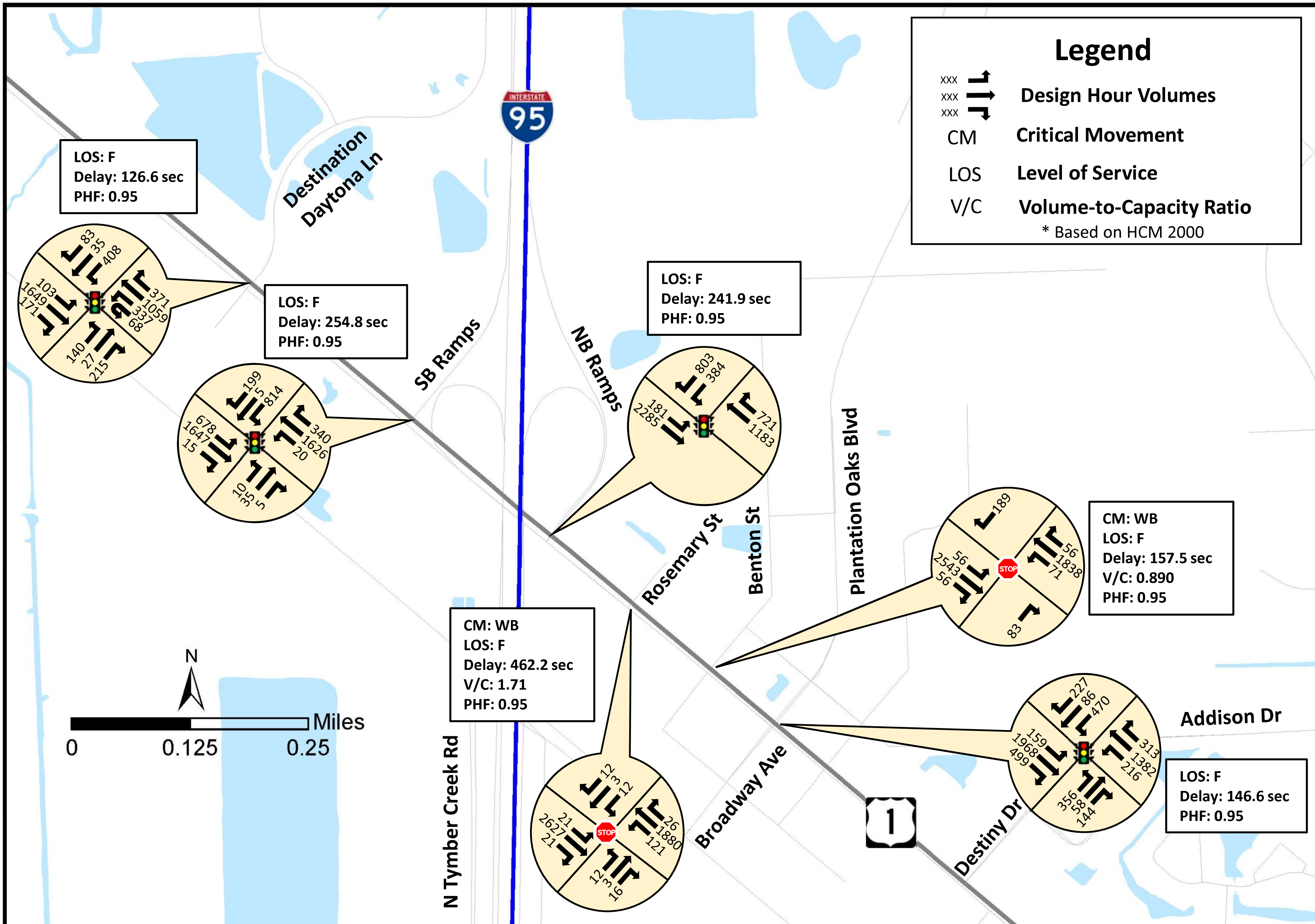


FDOT

Project Development and Environment (PD&E) Studies
I-95 Interchange at SR 5 (US 1)
Interchange Modification Report

2030 PM No Build Operational Performance

Figure 27

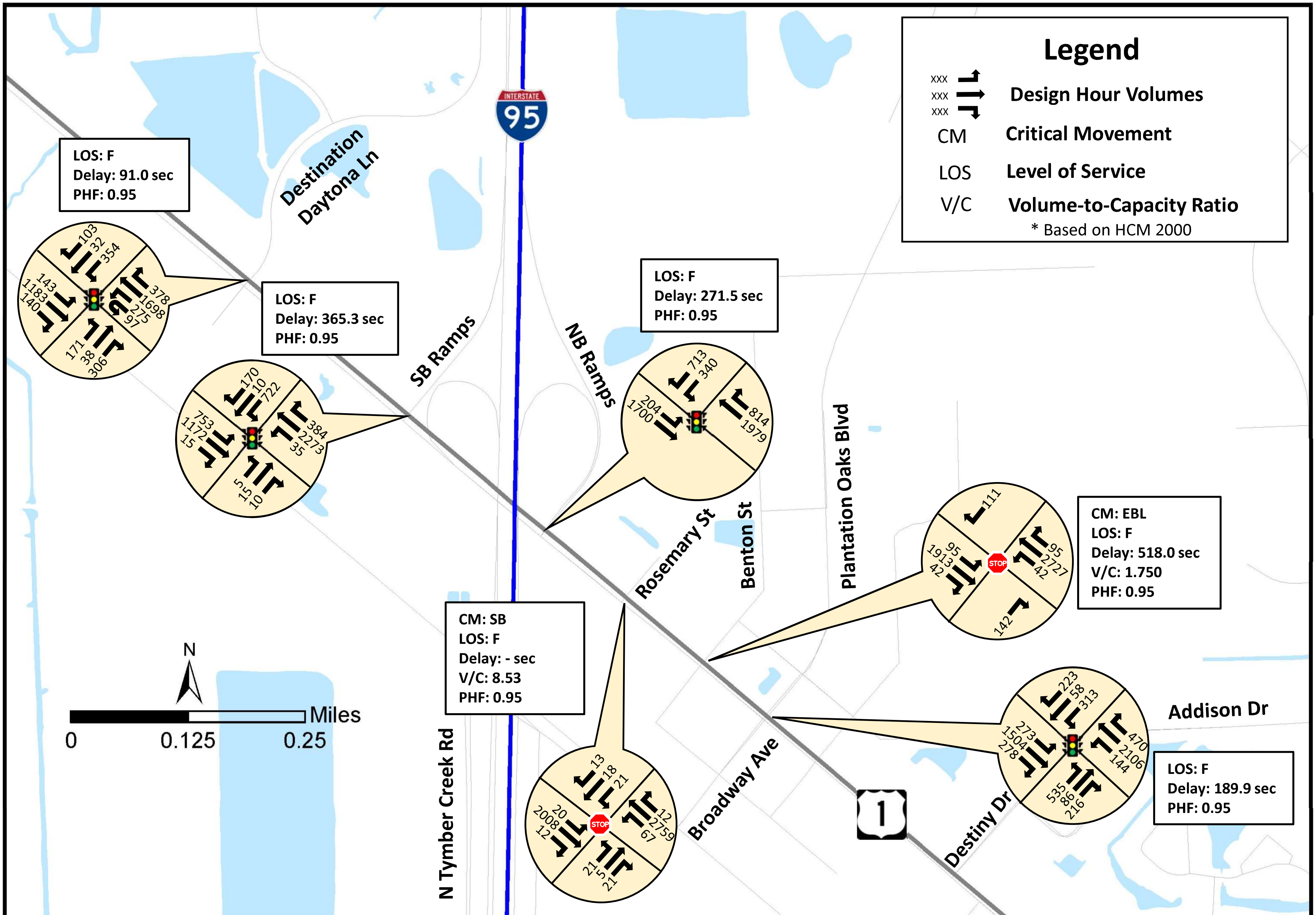


FDOT

Project Development and Environment (PD&E) Studies
I-95 Interchange at SR 5 (US 1)
Interchange Modification Report

2050 AM No Build Operational Performance

Figure 28



FDOT

Project Development and Environment (PD&E) Studies
I-95 Interchange at SR 5 (US 1)
Interchange Modification Report

2050 PM No Build
Operational Performance

Figure 29

6.1.2 Merge and Diverge Operations

As stated in the HCM 6, the level of service for basic, weaving, merge and diverge segments on a freeway are defined in terms of density. Therefore, values from **Table 11** for diverge and merge operations were used to establish LOS. **Table 27** and **28** summarize the HCS 7 results for all 8 merge and diverge operations during opening and design year. **Appendix H** provides the HCS analysis for all segments.

Table 27: 2030 Merge and Diverge Analysis Summary- No Build

Segment	Analysis Type	AM Peak		PM Peak	
		LOS	Density in Ramp AOI (pc/mi/ln)	LOS	Density in Ramp AOI (pc/mi/ln)
I-95 NB On Ramp from US 1	Merge	B	15.9	B	18.3
I-95 SB On Ramp from US 1	Merge	C	21.6	C	22.3
I-95 SB Off Ramp to US 1	Diverge	C	20.3	B	19.8
I-95 NB Off Ramp to US 1	Diverge	B	18.0	B	19.6
I-95 SB Off Ramp to SR 40	Diverge	B	17.1	B	17.2
I-95 NB On Ramp from SR 40	Merge	B	16.6	B	18.1
I-95 NB Off ramp to Old Dixie Hwy.	Diverge	B	17.5	B	19.9
I-95 SB On Ramp from Old Dixie Hwy.	Merge	B	19.0	B	18.5

Table 28: 2050 Merge and Diverge Analysis Summary- No Build

Segment	Analysis Type	AM Peak		PM Peak	
		LOS	Density in Ramp AOI (pc/mi/ln)	LOS	Density in Ramp AOI (pc/mi/ln)
I-95 NB On Ramp from US 1	Merge	C	24.9	C	22.7
I-95 SB On Ramp from US 1	Merge	C	27.2	D	31.1
I-95 SB Off Ramp to US 1	Diverge	C	24.8	C	26.6
I-95 NB Off Ramp to US 1	Diverge	C	27.4	C	23.8
I-95 SB Off Ramp to SR 40	Diverge	C	21.9	C	24.6
I-95 NB On Ramp from SR 40	Merge	C	26.5	C	22.9
I-95 NB Off ramp to Old Dixie Hwy.	Diverge	C	25.5	C	23.4
I-95 SB On Ramp from Old Dixie Hwy.	Merge	C	23.5	C	25.7

As shown in the above table all merge and diverge segments are working at a level of service C or better during the AM and PM of the opening and design year, except the SB On Ramp from US 1 which operates at LOS D during the PM peak of the design year.

6.1.3 Basic Segment Operations

The same metrics were used to evaluate I-95 mainline segments. **Table 29** and **30** summarize the results for these. As shown in the tables, the segment on I-95 between SR 40 and US 1 operates at a level of service C or better during opening year. HCS outputs can be found within **Appendix H**.

During design year the I-95 segment south of US 1 and north of US 1 operates at a LOS D.

Table 29: 2030 Freeway Basic Segment Analysis- No Build

Segment	Analysis Type	AM Peak		PM Peak	
		LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
I-95 NB mainline between SR 40 and US 1	Freeway Basic Segment	B	17.8	C	19.4
I-95 SB mainline between SR 40 and US 1	Freeway Basic Segment	C	20.0	C	20.6
I-95 NB between US 1 Ramps	Freeway Basic Segment	B	14.0	B	15.2
I-95 SB between US 1 Ramps	Freeway Basic Segment	B	16.2	B	16.4
I-95 NB mainline between US 1 and Old Dixie Hwy	Freeway Basic Segment	B	17.2	C	19.2
I-95 SB mainline between US 1 and Old Dixie Hwy	Freeway Basic Segment	C	20.2	C	19.9

Table 30: 2050 Freeway Basic Segment Analysis- No Build

Segment	Analysis Type	AM Peak		PM Peak	
		LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
I-95 NB mainline between SR 40 and US 1	Freeway Basic Segment	D	28.9	C	23.5
I-95 SB mainline between SR 40 and US 1	Freeway Basic Segment	C	25.5	D	30.8
I-95 NB between US 1 Ramps	Freeway Basic Segment	C	20.3	B	17.0
I-95 SB between US 1 Ramps	Freeway Basic Segment	C	18.5	C	21.8
I-95 NB mainline between US 1 and Old Dixie Hwy	Freeway Basic Segment	D	26.5	C	23.3
I-95 SB mainline between US 1 and Old Dixie Hwy	Freeway Basic Segment	C	25.2	D	28.6

6.1.4 Arterial Segment Operations

The roadway arterial operational analysis was performed for the opening and design year traffic conditions for the AM and PM peak hours based on Synchro 11 and the HCM 6th methodology. The LOS reported in **Table 31** and **32** is based on Exhibit 18-1 of the HCM 6th Edition.

As shown in both tables below, US 1 operates at an overall LOS F for the AM and PM peak hours during opening and design year.

Table 31: Year 2030 Arterial Analysis- No Build

Roadway Segments	Free Flow Speed (MPH)	Year 2030 AM Peak		Year 2030 PM Peak	
Northbound/Eastbound Direction		Speed (MPH)	LOS	Speed (MPH)	LOS
Destination Daytona Ln.	45	8.3	F	10.0	F
I-95 SB Ramp	45	11.8	F	11.7	F
I-95 NB Ramp	45	8.3	F	10.4	F
Broadway Ave	45	22.4	C	31.2	B
Total		**12.3**	**F**	**14.5**	**E**
Southbound/Westbound Direction					
Broadway Ave	45	12.8	F	8.6	F
I-95 NB Ramp	45	15.3	E	9.6	F
I-95 SB Ramp	45	5.4	F	8.8	F
Destination Daytona Ln.	45	30.2	B	17.4	D
Total		**11.7**	**F**	**10.6**	**F**

[1] Free flow speed along US 1 is assumed to be 45 mph

Table 32: Year 2050 Arterial Analysis- No Build

Roadway Segments	Free Flow Speed (MPH)	Year 2050 AM Peak		Year 2050 PM Peak	
Northbound/Eastbound Direction		Speed (MPH)	LOS	Speed (MPH)	LOS
Destination Daytona Ln.	45	1.9	F	5.8	F
I-95 SB Ramp	45	9.0	F	11.8	F
I-95 NB Ramp	45	5.2	F	7.8	F
Broadway Ave	45	4.9	F	21.2	D
Total		**4.8**	**F**	**11.1**	**F**
Southbound/Westbound Direction					
Broadway Ave	45	4.3	F	1.0	F
I-95 NB Ramp	45	13.4	E	2.8	F
I-95 SB Ramp	45	2.7	F	1.3	F
Destination Daytona Ln.	45	29.6	B	12.6	F
Total		**6.7**	**F**	**2.3**	**F**

[1] Free flow speed along US 1 is assumed to be 45 mph

6.1.5 Multimodal Analysis

Per the Quality Level of Service Handbook, bicycles operate within LOS D during both the AM and PM peak hours along US 1. The roadway bicycle LOS is within LOS D because of the presence of bike lanes on both sides of US 1. The pedestrian LOS is driven by the presence of sidewalk. Northbound US 1 has 62% sidewalk coverage operates within LOS D. Southbound US 1 does not have sidewalk and operates at LOS F. The transit level of service is at LOS F due to lack of sidewalks and just one bus in the peak period.

Table 33: Multimodal Analysis – No Build

Bicycle				
Paved Shoulder/Bicycle Lane Coverage	AADT	No. of Lanes	Vehicle/Lane	No Build LOS
100%	53,500	4	8,917	D
Pedestrian mode				
Sidewalk Coverage	AADT	No. of Lanes	Vehicle/Lane	No Build LOS
48%	53,500	4	8,917	E
Bus Mode				
Sidewalk Coverage			Peak hour Buses	No Build LOS
48%			1	F

6.2 Build Alternative

In the Build Alternative there is a new median opening at Dollar General which differs from the Existing and No Build scenarios. This section explains the ITE volume estimation used for the redistribution of traffic as a result of the new median opening. No additional trips were added or removed from the network as part of this estimation.

Using ITE Trip Generation 11th Edition Manual Land Use 814, and a calculated square footage of 9,092 sq ft. The following was derived:

Dollar General

$$Total\ AM\ Volume = 9.09 * 3.04 = 28\ vehicles$$

$$Total\ PM\ Volume = 9.09 * 6.70 = 61\ vehicles$$

With an AM peak distribution of 55% entering, and 45% exiting, the following numbers are deducted

$$AM\ Entering\ Volumes = .55 * 28 vehicles = 15 vehicles$$

$$AM\ Exiting\ Volumes = .45 * 28\ vehicles = 13\ vehicles$$

During the PM peak, the distribution change to 51% entering, and 49% exiting. Using these the volumes were calculated as shown below.

$$PM\ Entering\ Volumes = .51 * 61\ vehicles = 31\ vehicles$$

$$PM\ Exiting\ Volumes = .49 * 61\ vehicles = 30\ vehicles$$

Using ITE Trip Generation 11th Edition Manual Land Use 934, and a calculated square footage of 4,586 sq ft. The following was derived:

McDonald's

$$Total\ AM\ Volume = 4.58 * 44.61 = 204\ vehicles$$

$$Total\ PM\ Volume = 4.58 * 33.03 = 151\ vehicles$$

With an AM peak distribution of 51% entering, and 49% exiting, the following numbers are deducted:

$$AM\ Entering\ Volumes = .51 * 204 vehicles = 104\ vehicles$$

$$AM\ Exiting\ Volumes = .49 * 204\ vehicles = 100\ vehicles$$

During the PM peak, the distribution change to 52% entering, and 48% exiting. Using these the volumes were calculated as shown below.

$$PM\ Entering\ Volumes = .52 * 151\ vehicles = 79\ vehicles$$

$$PM\ Exiting\ Volumes = .48 * 151\ vehicles = 72\ vehicles$$

Due to the access provided at both Rosemary St. and Benton St. to the McDonald's and Dollar General parking lots a portion of the traffic discussed above was sent through this entry and exit points.

6.2.1 Build Alternative- Intersection Analysis

The Diverging Diamond Interchange eliminates conflict points making the intersection safer and improving signal timing operations along US 1. This alternative also includes widening of US 1 to three lanes on each direction throughout the project limits as shown in **Figure 25**.

Forecasted volumes from **Section 4.5.3** were redistributed per the DDI geometry and utilized to analyze the alternative during both 2030 and 2050 years. The analysis is summarized on **Table 34** and **35**. **Figures 30** through **33** summarize the basic operational performance. For the TWSC intersections, the critical movement is shown, which is the movement with the worst operational performance at the intersection. The v/c ratio and delay for the critical movement are also shown. For the signalized intersections, the delay and LOS shown are representative of the overall intersection. Synchro output can be found in **Appendix H**.

As shown above in **Table 34** and **35**, all signalized intersections operate at a level of service D or better in the opening and design years. The unsignalized intersections at Rosemary St. operates at LOS F on the side street approach in the design year. Based on proximity of this intersection to the adjacent signalized intersections, signals at this location would violate FDOT minimum spacing criteria. **Figure 34**, **Table 33,** and **Table 36** show the 95th percentile queues as established using SimTraffic.

Destination Daytona Lane – By the design year the eastbound left, northbound approach, and southbound approach operate at a LOS E or worse. The eastbound left along US 1 experiences delay due to the time necessary to facilitate the truck traffic at this intersection. The storage for this movement will be designed to accommodate the queues. Maximum v/c for this movement is 0.90. The northbound and southbound approaches operate at LOS F by the design year. The northbound movements operate with a maximum v/c of 0.87. This approach will be designed to accommodate future queues. The southbound left turn movement at this intersection will operate at LOS F with a maximum v/c of 1.01 in the design year. This movement is the primary egress from the truck travel center. The southbound through and right movement at this intersection operates at LOS E with a v/c of 0.53.

Broadway Avenue – By the design year the northbound approach and southbound approach operate at LOS E or worse. With US 1 as the primary movement, the side streets at this intersection experience increased delays. Storage lengths for each movement are being maximized to the extent possible to minimize spill over into adjacent lanes.

As shown in **Table 36**, some of the 95th percentile queues exceed the designed storage lengths. Throughout the study area the turn lane storge has been maximized to the extent possible given the location of driveways and side streets. Of note, the right turn movements on US 1 at the ramp terminal intersections are analyzed under signal control to protect the pedestrian movements crossing the ramp. The analysis assumes a pedestrian actuation each cycle. In reality, these movements will be under free-flow conditions based on the current pedestrian activity and prosed future land use. It will be unlikely the 95th percentile queue will be realized.

Table 34: DDI Intersection Analysis Summary- Opening Year 2030

Opening Year 2030																			
	Movement							Approach					Intersection						
Intersection		Delay (seconds)		v/c		LOS			Delay (seconds)		LOS		Delay (seconds)		v/c		LOS	
		AM	PM	AM	PM	AM	PM		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Destination Daytona Ln.	EBL	11.9	13.9	0.12	0.28	B	B	EB	20.6	19.6	C	B	20.0	20.0	0.48	0.46	B	B
	EBTR	21.0	20.1	0.5	0.36	C	C											
	WBL	15.6	5.0	0.43	0.35	B	A	WB	7.7	10.5	A	B						
	WBT	6.2	10.8	0.27	0.45	A	B											
	WBR	3.3	16.3	0.17	0.18	A	B											
	NBL	43.6	43.6	0.21	0.24	D	D	NB	47.9	48.1	D	D						
	NBTR	49.9	50	0.12	0.16	D	D											
	SBL	54.4	54.3	0.64	0.67	D	D	SB	52.1	51.2	D	D						
	SBTR	44.0	42.7	0.08	0.09	D	D											
US 1 & I-95 SBL	SBL	49.2	50.3	0.77	0.75	D	D		49.2	50.3	D	D	23.7	27.7	0.46	0.35	C	C
US 1 & I-95 SBR	SBR	52.0	55.3	0.33	0.57	D	E		52.0	55.3	D	E	6.7	4.9	0.29	0.44	A	A
West DDI Crossover	EBT	33.3	40.6	0.67	0.67	C	D	EB	33.3	40.6	C	D	25.9	20.3	0.44	0.52	C	C
	WBT	17.7	8.8	0.35	0.47	B	A	WB	17.7	8.8	B	A						
US 1 & I-95 NBL	NBL	50.8	49.4	0.73	0.77	D	D		50.8	49.4	D	D	18.2	15.4	0.29	0.4	B	B
US 1 & I-95 NBR	NBR	55.2	12.6	0.79	0.25	E	B		55.2	12.6	E	B	8.9	54.9	0.54	0.43	A	D
East DDI Crossover	EBT	28.7	24.2	0.73	0.76	C	C	EB	28.7	24.2	C	C	25.6	22.5	0.48	0.49	C	C
	WBT	19.1	20.7	0.26	0.34	B	C	WB	19.1	20.7	B	C						

Opening Year 2030																			
	Movement							Approach					Intersection						
Intersection		Delay (seconds)		v/c		LOS			Delay (seconds)		LOS		Delay (seconds)		v/c		LOS	
		AM	PM	AM	PM	AM	PM		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Rosemary St.	EBTR	-	-	-	-	-	-	EB	-				21.4	17.3	0.05	0.06	C	C
	WBTR	-	-	-	-	-	-	WB	-									
	NBR	21.4	17.3	0.05	0.06	C	C	NB	21.4	17.3	C	C						
	SBR	-	-	-	-	-	-	SB	-									
Dollar General	EBL	10.6	12.8	0.03	0.06	B	B	EB	0.1	0.2	-	-	14.5	12.8	0.13	0.06	B	B
	EBTR	0.0	0	0.41	0.33	-	-											
	WBL	14.5	9.9	0.13	0.04	B	A	WB	0.6	0.2	-	-						
	WBTR	0.0	0	0.3	0.43	-	-											
	NBR	9.1	9.4	0.06	0.04	A	A	NB	9.1	9.4	A	A						
	SBR	8.7	9.3	0.01	0.02	A	A	SB	8.7	9.3	A	A						
Benton St.	EBTR	0.0	0.0	0.42	0.33	-	-	EB	0.0	0.0	-		9.5	10.0	0.13	0.1	A	A
	WBTR	0.0	0.0	0.29	0.42	-	-	WB	0.0	0.0	-							
	NBR	9.2	9.6	0.08	0.09	A	A	NB	9.2	9.6	A	A						
	SBR	9.5	10.0	0.13	0.1	A	A	SB	9.8	10	A	A						

Opening Year 2030																			
	Movement							Approach					Intersection					
Intersection		Delay (seconds)		v/c		LOS			Delay (seconds)		LOS		Delay (seconds)		v/c		LOS	
		AM	PM	AM	PM	AM	PM		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Broadway Ave.	EBL	14.5	25.3	0.19	0.4	B	C	EB	35.0	14.6	D	B	30.6	21.8	0.58	0.5	C	C
	EBTR	36.6	13	0.66	0.46	D	B											
	WBL	18.3	10.9	0.56	0.27	B	B	WB	17.0	18.1	B	B						
	WBT	17.2	19.0	0.38	0.55	B	B											
	WBR	14.2	14.1	0.08	0.13	B	B											
	NBL	45	43.6	0.25	0.38	D	D	NB	47.8	46	D	D						
	NBT	54.1	51.7	0.23	0.23	D	D											
	NBR	52.6	50.5	0.04	0.07	D	D											
	SBL	38.3	43.0	0.34	0.27	D	D	SB	42.5	46.6	D	D						
	SBT	49.4	51.4	0.19	0.17	D	D											
	SBR	48.4	50.6	0.06	0.06	D	D											

Table 35: DDI Intersection Analysis Summary- Design Year 2050

Design Year 2050																		
	Movement							Approach					Intersection					
Intersection		Delay (seconds)		v/c		LOS			Delay (seconds)		LOS		Delay (seconds)		v/c		LOS	
		AM	PM	AM	PM	AM	PM		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Destination Daytona Ln.	EBL	70.4	103.7	0.55	0.9	E	F	EB	56.9	46.6	E	D	50.9	52.2	0.93	0.86	D	D
	EBTR	56.1	40.4	0.95	0.75	E	D											
	WBL	74.7	61.2	0.94	0.9	E	E	WB	26.2	39.4	C	D						
	WBT	6.1	31.8	0.44	0.75	A	C											
	WBR	9	43.2	0.37	0.45	A	D											
	NBL	65	86.3	0.57	0.85	E	F	NB	94.2	90.9	F	F						
	NBTR	109.7	93.1	0.8	0.87	F	F											
	SBL	90.8	108.8	0.93	1.01	F	F	SB	87.1	94.1	F	F						
	SBTR	74.3	55.3	0.53	0.29	E	E											
US 1 & I-95 SBL	SBL	62.4	54.5	0.87	0.82	E	D		62.4	54.5	E	D	28.5	34.4	0.77	0.6	C	C
US 1 & I-95 SBR	SBR	76.3	71.5	0.8	0.79	E	E		76.3	71.5	E	E	9.6	13.4	0.64	0.79	A	B
West DDI Crossover	EBT	26.1	64.5	0.72	0.85	C	E	EB	26.1	64.5	C	E	25.9	36.3	0.79	0.88	C	D
	WBT	25.7	21.3	0.85	0.89	C	C	WB	25.7	21.3	C	C						
US 1 & I-95 NBL	NBL	54.0	53.5	0.81	0.84	D	D		54.0	53.5	D	D	20.5	13.9	0.53	0.65	C	B
US 1 & I-95 NBR	NBR	77.6	27.5	0.91	0.5	E	C		77.6	27.5	E	C	13.3	17.8	0.82	0.66	B	B
East DDI Crossover	EBT	28.8	39.6	0.79	0.84	C	D	EB	28.8	39.6	C	D	37.4	27.1	0.78	0.79	D	C
	WBT	53.4	16.3	0.77	0.75	D	B	WB	53.4	16.3	D	B						
Rosemary St.	EBTR	-	-	-	-	-	-	EB	-	-	-	-	58.3	34.6	0.33	0.29	F	D
	WBTR	-	-	-	-	-	-	WB	-	-	-	-						
	NBR	58.3	34.6	0.33	0.29	F	D	NB	58.3	34.6	F	D						
	SBR	-	-	-	-	-	-	SB	-	-	-	-						

Design Year 2050																		
	Movement							Approach					Intersection					
Intersection		Delay (seconds)		v/c		LOS			Delay (seconds)		LOS		Delay (seconds)		v/c		LOS	
		AM	PM	AM	PM	AM	PM		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Dollar General	EBL	17.3	30.7	0.12	0.26	C	D	EB	0.2	0.7	-	-	30.7	30.7	0.35	0.26	D	D
	EBTR	0.0	0	0.64	0.5	-	-											
	WBL	30.7	13.9	0.35	0.1	D	B	WB	1.0	0.2	-	-						
	WBTR	0.0	0	0.5	0.7	-	-											
	NBR	10.7	10.1	0.08	0.05	B	B	NB	10.7	10.1	B	B						
	SBR	9.1	11	0.01	0.03	A	B	SB	9.1	11.0	A	B						
Benton St.	EBTR	0.0	0	0.64	0.52	-	-	EB	0.0	0	-	-	11.7	12.5	0.22	0.20	B	B
	WBTR	0.0	0	0.47	0.69	-	-	WB	0.0	0	-	-						
	NBR	11.7	11.1	0.22	0.2	B	B	NB	11.7	11.1	B	B						
	SBR	10.4	12.5	0.23	0.2	B	B	SB	10.4	12.5	B	B						
Broadway Ave.	EBL	100.5	99.1	0.81	0.95	F	F	EB	44.5	29.8	D	C	51.9	44.9	0.99	0.91	D	D
	EBTR	39.6	15.5	1.0	0.77	D	B											
	WBL	206.4	79.2	1.21	0.79	F	E	WB	42.4	43.3	D	D						
	WBT	24.6	47.4	0.55	0.96	C	D											
	WBR	8.3	13.6	0.25	0.4	A	B											
	NBL	97.9	73.2	0.92	0.88	F	E	NB	87.6	64.8	F	E						
	NBT	95.8	59.0	0.69	0.44	F	E											
	NBR	58.8	46.2	0.21	0.4	E	D											
	SBL	82	90.5	0.89	0.92	F	F	SB	75.2	78.7	E	E						
	SBT	63.8	60.1	0.36	0.34	E	E											
	SBR	65.6	67.0	0.47	0.6	E	E											

Table 36: DDI Queue vs. Turn-Bay Length Comparison

Roadway	Approach	Movement	2030 Queue Length (ft)	2050 Queue Length (ft)	Turn Bay Length (ft)*
Destination Daytona Ln.	EB	L	225	450	360
	WB	L	250	350	485
		R	150	450	625
	SB	L	225	375	290
	NB	L	125	225	270
SB Ramps	EB	R	475	725	455
	SB	L	275	450	740 (1850**)
		R	225	350	595
NB Ramps	WB	R	175	375	335
	NB	L	325	375	665 (2600**)
		R	200	200	585
Dollar General	EB	L	100	100	280
	WB	L	100	100	280
Plantation Oaks Blvd./Broadway Ave.	EB	L	400	325	260
	WB	L	300	925	255
		R	425	925	175
	SB	L	175	350	245
		R	100	275	245
	NB	L	200	400	200
		R	100	225	215

* Equals length of full lane width
** Total Ramp Length

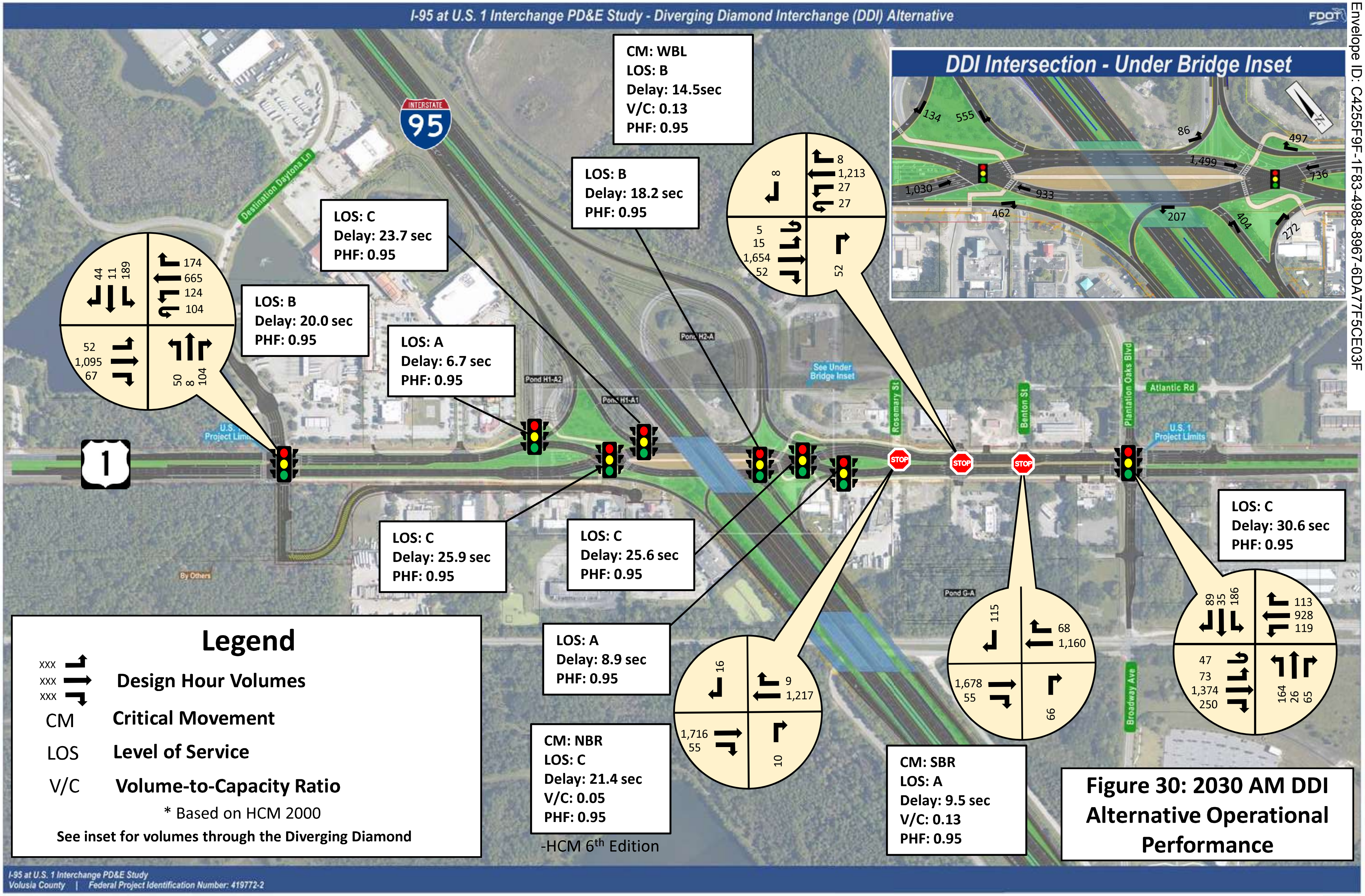


Figure 30: 2030 AM DDI Alternative Operational Performance

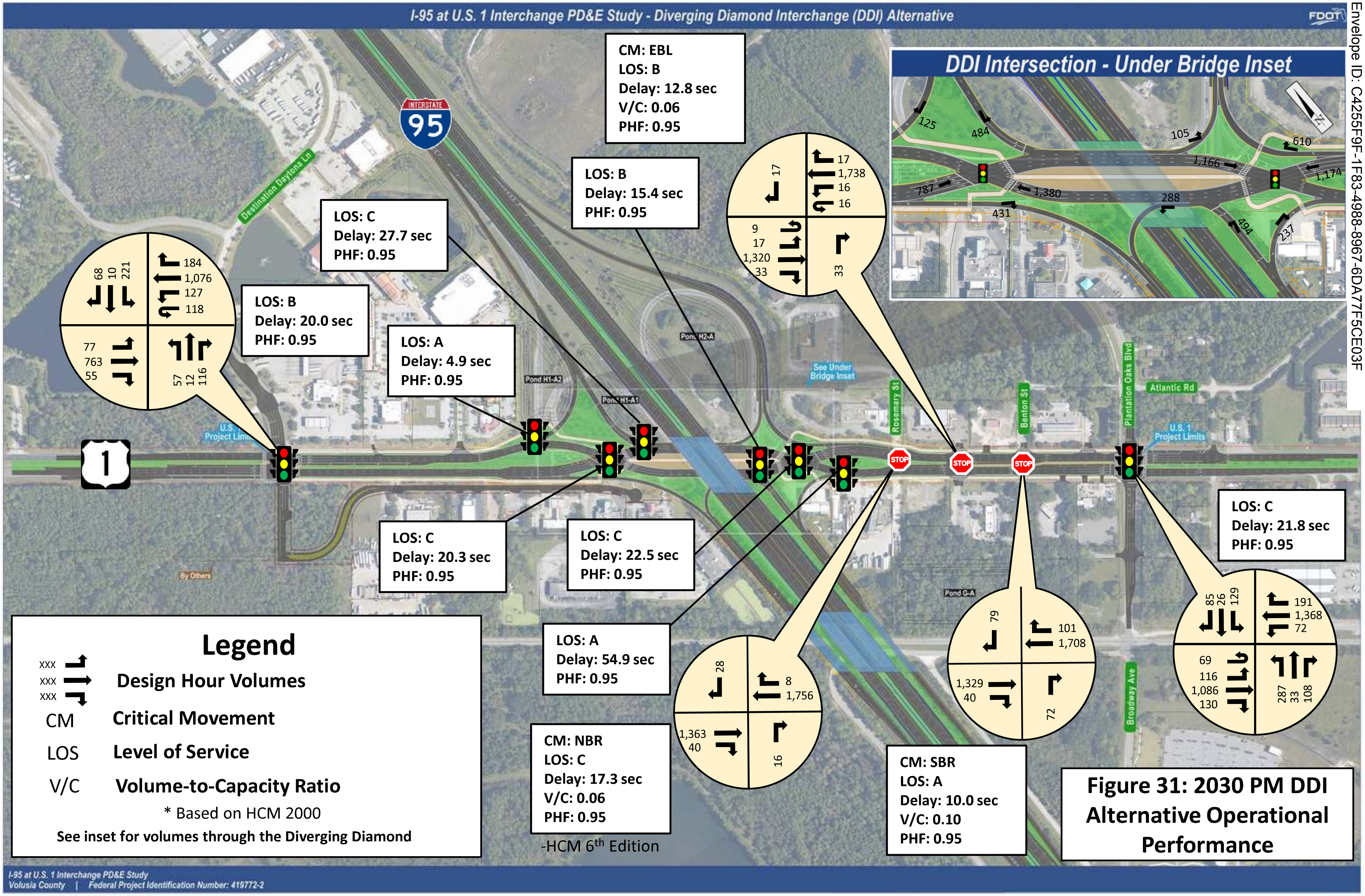


Figure 31: 2030 PM DDI Alternative Operational Performance

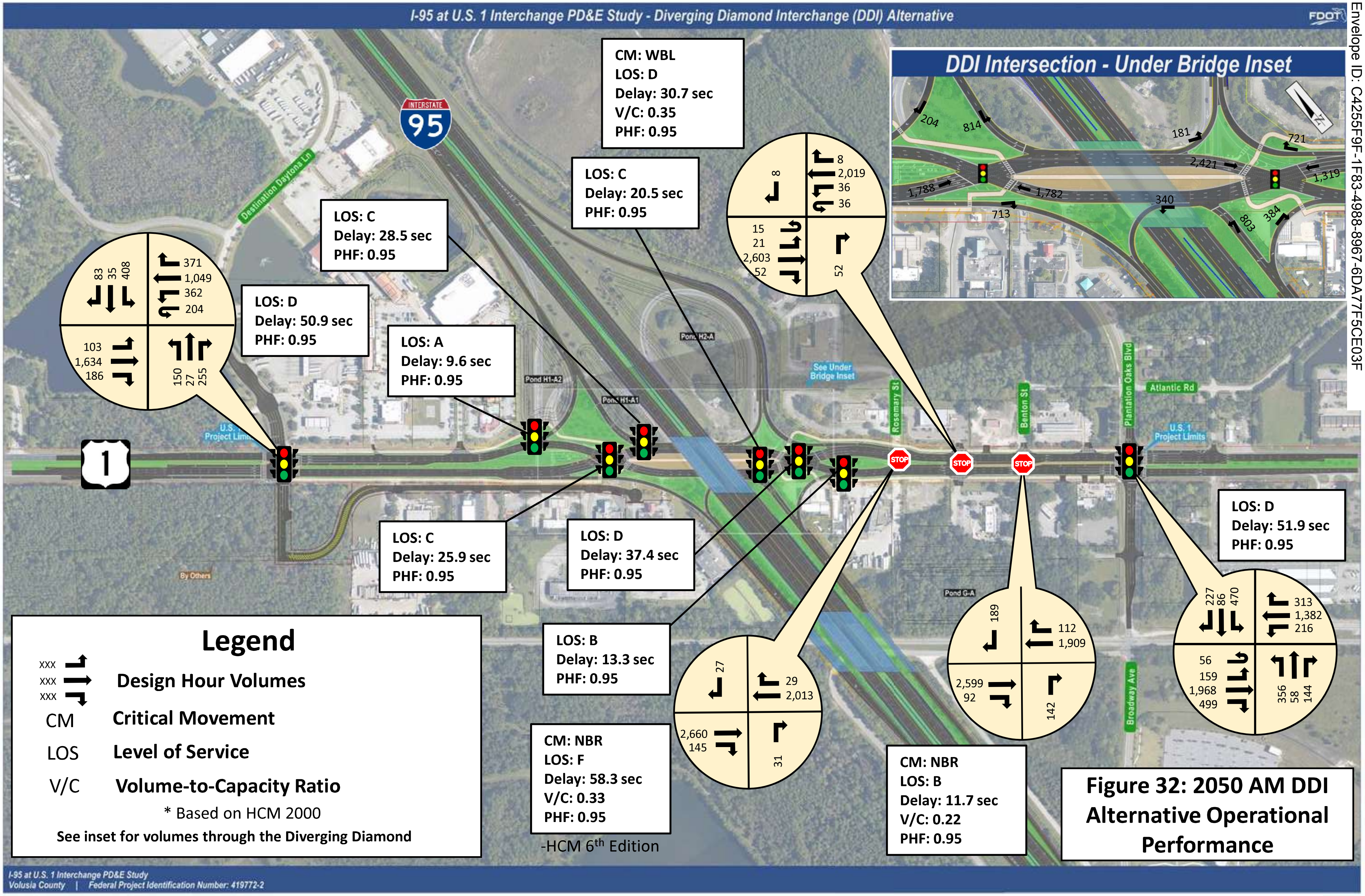


Figure 32: 2050 AM DDI Alternative Operational Performance

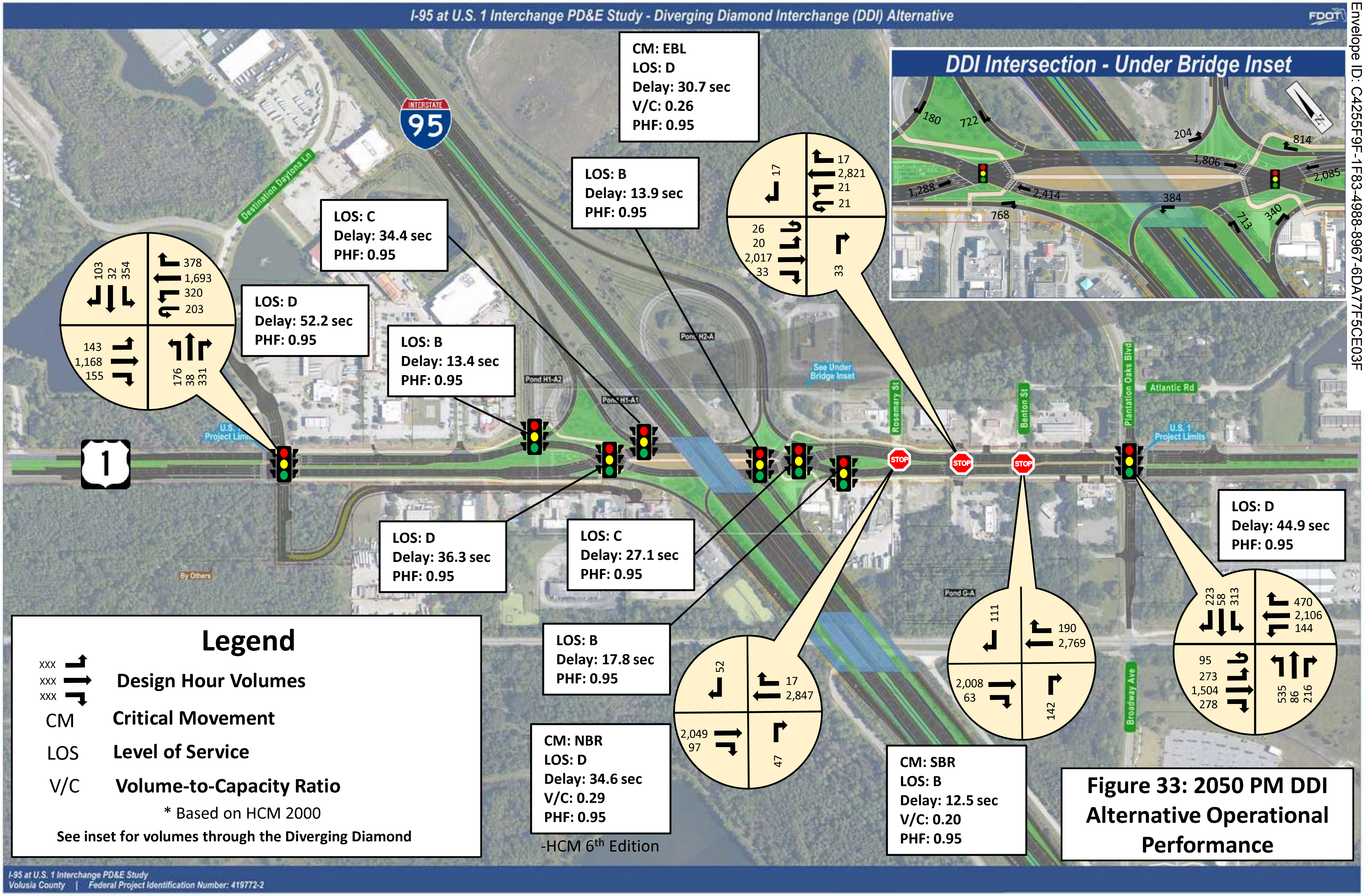


Figure 33: 2050 PM DDI Alternative Operational Performance

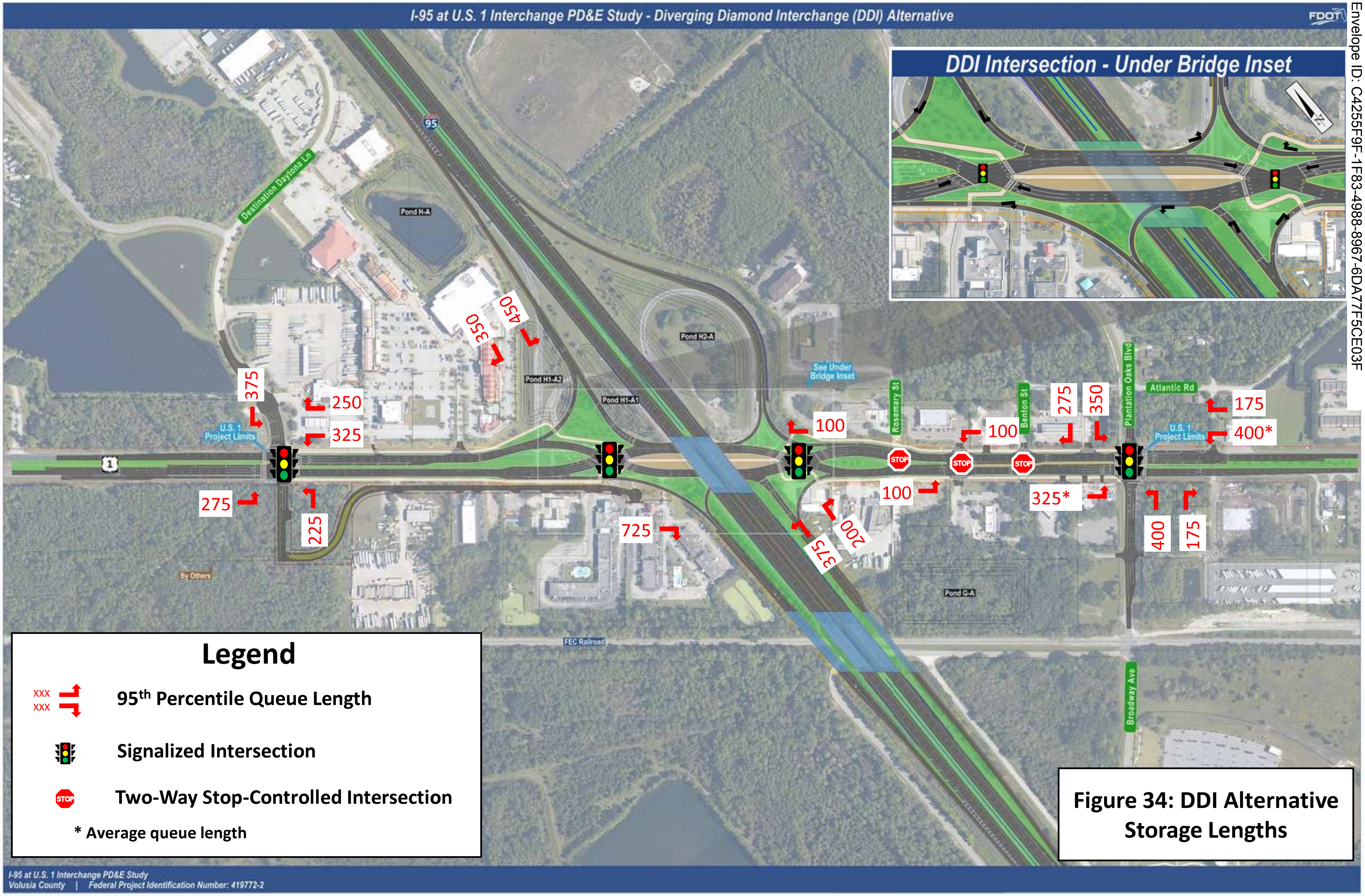


Figure 34: DDI Alternative Storage Lengths

6.2.2 Merge and Diverge Operations- DDI Alternative

As stated in HCM 6, the level of service for basic, weaving, merge and diverge segments on a freeway are defined in terms of density. Therefore, the values in **Table 11** are used to evaluate the diverge and merge operations. **Table 37 and 38** summarizes the HCS 7 results for all 8 merge and diverge operations during opening and design year. **Appendix H** provides the HCS analysis for all segments.

Table 37: 2030 Merge and Diverge Analysis Summary- DDI Alternative

Segment	Analysis Type	AM Peak		PM Peak	
		LOS	Density in Ramp AOI (pc/mi/ln)	LOS	Density in Ramp AOI (pc/mi/ln)
I-95 NB On Ramp from US 1	Merge	B	19.6	B	18.3
I-95 SB On Ramp from US 1	Merge	C	21.6	C	22.3
I-95 SB Off Ramp to US 1	Diverge	B	16.7	B	16.2
I-95 NB Off Ramp to US 1	Diverge	B	13.5	B	15.1
I-95 SB Off Ramp to SR 40	Diverge	B	17.1	B	17.2
I-95 NB On Ramp from SR 40	Merge	B	16.6	B	18.1
I-95 NB Off ramp to Old Dixie Hwy.	Diverge	B	17.5	B	19.9
I-95 SB On Ramp from Old Dixie Hwy.	Merge	B	19.0	B	18.5

Table 38: 2050 Merge and Diverge Analysis Summary- DDI Alternative

Segment	Analysis Type	AM Peak		PM Peak	
		LOS	Density in Ramp AOI (pc/mi/ln)	LOS	Density in Ramp AOI (pc/mi/ln)
I-95 NB On Ramp from US 1	Merge	C	24.9	C	26.3
I-95 SB On Ramp from US 1	Merge	C	27.2	D	31.1
I-95 SB Off Ramp to US 1	Diverge	C	21.2	C	23.0
I-95 NB Off Ramp to US 1	Diverge	C	22.9	B	19.3
I-95 SB Off Ramp to SR 40	Diverge	C	21.9	C	24.6
I-95 NB On Ramp from SR 40	Merge	C	26.5	C	22.9
I-95 NB Off ramp to Old Dixie Hwy.	Diverge	C	25.5	C	23.4
I-95 SB On Ramp from Old Dixie Hwy.	Merge	C	23.5	C	25.7

As shown in the above table all merge and diverge segments are working at a level of service C or better in the opening and design years during the AM and PM, expect the SB On Ramp at US 1 during the PM peak which operate at LOS D in the design year.

6.2.3 Basic Segment Operations- DDI Alterantive

The same metrics were used to evaluate I-95 mainline segments. **Table 39** and **40** summarize the results for these. Both the north and south segments along I-95 operate at a LOS C or better in the opening year.

Table 39: 2030 Freeway Basic Segment Analysis- DDI Alternative

Segment	Analysis Type	AM Peak		PM Peak	
		LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
I-95 NB mainline between SR 40 and US 1	Freeway Basic Segment	B	17.8	C	19.4
I-95 SB mainline between SR 40 and US 1	Freeway Basic Segment	C	20.0	C	20.6
I-95 NB between US 1 Ramps	Freeway Basic Segment	B	14.0	B	15.2
I-95 SB between US 1 Ramps	Freeway Basic Segment	B	16.2	B	16.4
I-95 NB mainline between US 1 and Old Dixie Hwy	Freeway Basic Segment	B	17.2	C	19.2
I-95 SB mainline between US 1 and Old Dixie Hwy	Freeway Basic Segment	C	20.2	C	19.9

Table 40: 2050 Freeway Basic Segment Analysis- DDI Alternative

Segment	Analysis Type	AM Peak		PM Peak	
		LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
I-95NB mainline between SR 40 and US 1	Freeway Basic Segment	D	28.9	C	23.5
I-95 SB mainline between SR 40 and US 1	Freeway Basic Segment	C	25.5	D	30.8
I-95 NB between US 1 Ramps	Freeway Basic Segment	C	20.3	B	17.0
I-95 SB between US 1 Ramps	Freeway Basic Segment	C	18.5	C	21.8
I-95 NB mainline between US 1 and Old Dixie Hwy	Freeway Basic Segment	D	26.5	C	23.3
I-95 SB mainline between US 1 and Old Dixie Hwy	Freeway Basic Segment	C	25.2	D	28.6

During the design year the NB direction of the I-95 segment south of US 1 operates at LOS D during the AM peak, while during the PM peak the SB direction operates at an LOS D. The NB I-95 segment from SR 40 to US 1 also operates at LOS D during the AM peak as-well-as the SB direction during the PM peak.

6.2.4 Arterial Segment Operations

The roadway arterial operational analysis was performed for the existing year traffic conditions for the AM and PM peak hours based on Synchro 11 and the HCM 6th methodology. The LOS reported in **Table 41** and **42** is based on Exhibit 18-1 of the HCM 6th Edition.

As shown in **Table 41**, during the opening year the new six-lane segment of US 1 operates at an overall LOS C during the AM and PM peak hours in the westbound direction, and an overall LOS E in the eastbound direction during PM peak. This is similar to the No Build, however, in the westbound direction the No Build operates at LOS F.

Table 41: Year 2030 Arterial Analysis- DDI Alternative

Roadway Segments	Free Flow Speed (MPH)	Year 2030 AM Peak		Year 2030 PM Peak	
Eastbound Direction		Speed (MPH)	LOS	Speed (MPH)	LOS
Destination Daytona Ln.	45	30.3	B	30.7	B
I-95 SB Ramp	30	25.3	C	25.5	C
East Crossover	30	3.6	F	3.1	F
I-95 NB Ramp	30	20.7	D	1.5	F
Broadway Ave	45	15.2	D	23.4	C
Total		**18.9**	**D**	**15.1**	**E**
Westbound Direction					
Broadway Ave	45	32.5	B	31.2	B
I-95 NB Ramp	30	22.4	C	20.2	D
West Crossover	30	11.8	F	16.2	E
Destination Daytona Ln.	45	27.5	B	23.9	C
Total		**25.4**	**C**	**25.6**	**C**

Table 42: Year 2050 Arterial Analysis- DDI Alternative

Roadway Segments	Free Flow Speed (MPH)	Year 2050 AM Peak		Year 2050 PM Peak	
Eastbound Direction		Speed (MPH)	LOS	Speed (MPH)	LOS
Destination Daytona Ln.	45	19.6	D	23.0	C
I-95 SB Ramp	30	25.3	C	25.3	C
East Crossover	30	4.5	F	2.1	F
I-95 NB Ramp	30	13.4	E	4.9	F
Broadway Ave	45	15.1	E	22.2	C
Total		**16.3**	**E**	**15.1**	**E**
Westbound Direction					
Broadway Ave	45	28.9	B	21.6	D
I-95 NB Ramp	30	22.6	C	22.1	C
West Crossover	30	9.6	F	10.8	F
Destination Daytona Ln.	45	27.5	C	15.4	E
Total		**22.8**	**C**	**17.7**	**D**

During the design year, US 1 operates at an overall LOS E eastbound in the AM and PM peak. The westbound direction operates at LOS D or better. When comparing the Build and No Build arterial operations, a No Build operates at LOS F in both directions during the AM and PM peaks. Constraints surrounding the modeling software create slow link speeds. This anomaly occurs on links with short lengths, where due to the models acceleration and deceleration parameters, full speed (30 mph) operations cannot be achieved. For this reason, **Table 41 and 42** evaluates speed arterial wide speed rather than the individual segments.

6.2.5 Multimodal Analysis-Build Atlernative

Bicycles operate within LOS C during both the AM and PM peak hours along US 1. The roadway bicycle LOS is satisfied because of the presence of a mixed-use path along both sides of US 1. The pedestrian LOS is driven by the presence of sidewalk. This same mixed use path provides 100% sidewalk coverage allowing the pedestrian to operate at LOS C. The transit level of service is at LOS E due to presence of the mixed-use path and just one bus in the peak period.

Table 43: Multimodal Analysis – DDI Alternative

Bicycle				
Paved Shoulder/Bicycle Lane Coverage	AADT	No. of Lanes	Vehicle Lanes	Build LOS
100%	53,500	6	8,917	C
Pedestrian mode				
Sidewalk Coverage	AADT	No. of Lanes	Vehicle Lanes	Build LOS
100%	53,500	6	8,917	C
Bus Mode				
Sidewalk Coverage			Peak hour Buses	Build LOS
100%			1	E

7.0 Safety Analysis

7.1 I-95 Predictive Crashes

The Highway Safety Manual Predictive methodology provides procedures to estimate crashes for a given facility, test the effectiveness of proposed alternatives on estimated crashes and evaluate the economic impact of crashes. The first step in this evaluation is to establish a prediction of annual crashes, based on existing traffic volumes, facility types, geometric characteristics and observed crashes. This is followed by an estimate of futures crashes with projected traffic volumes for the future alternatives.

The safety analysis was performed utilizing AADT projections from the Project Traffic Forecasting Memorandum which can be found within **Appendix B**.

7.1.1 I-95 No Build Alternative Crashes

The No Build Alternative uses the same network geometry and historic crash data as the existing conditions but utilizes future volumes. The ISATe was used to predict the total number of crashes between 2030 and 2050.

Table 44 summarizes the total Fatal, Injury, and Property Damage Only crashes for the existing geometry with opening year (2030) volumes and design year (2050) volumes and interpolated volumes between the opening and design year. Summary tables for existing conditions and No Build Alternative are included in **Appendix C.**

Table 44: No Build Alternative Crash Severity

	Fatal and Injury	PDO	Total
Freeway Segments	335.6	767.2	**1102.8**
Ramp Segments	225.5	320.4	**545.8**
Totals	**561.1**	**1087.6**	**1648.6**

7.1.2 Diverging Diamond Interchange Alternative

This Build Alternative utilizes the DDI configuration with opening year (2030) and design year (2050) traffic volumes interpolated to derive interim year traffic volumes. The Highway Safety manual predictive model is used without the EB methodology due to geometric changes, increase number of lanes, and ramp configurations. The existing crash history is not applicable at the crossroad terminals. These will be addressed through a qualitative analysis. DDI alternative output sheets can be found in **Appendix C**.

Tables 45 summarizes the total Fatal Injury and Property Damage Only crashes for the DDI configuration.

Table 45: DDI Crash Severity

	Fatal and Injury	PDO	Total
Freeway Segments	152.4	351.3	**503.7**
Ramp Segments	24.4	29.1	**53.5**
Totals	**176.8**	**380.4**	**557.2**

7.2 Arterial Roadway Predictive Crashes

An intersection safety analysis (predictive crashes) was performed for all intersections with a different geometry than the No Build condition. The *HSM Urban and Suburban Arterials Spreadsheet* Tool was used to analyzed intersections and segments along US 1. **Table 46** and **47** summarizes predictive crashes by severity for both the opening and design year. Arterial output sheets can be found in **Appendix C.** Although the Build Alternative shows an increase in fatal and injury crashes, it is expected that the lower operating speeds (35 mph in Build condition against 45 mph in No Build condition) will reduce the fatalities and the severity of the injury crashes thereby resulting in safer operations. The analysis summary shows an increase in the total number of fatal and injury crashes, combined, in the Build condition. The distribution of the severity changes with the Build condition showing an overall decrease in fatal crashes but an increase in injury crashes. This trend is expected for the intersection and segments, alike.

Table 46: Year 2030- Intersection Crash Severity

Year 2030	**No Build**			**Build**		
	Fatal and Injury	PDO	Total	Fatal and Injury	PDO	Total
Broadway Ave.	1.8	3.2	5.0	3.2	2.8	6.0
Benton St.	2.3	3.0	5.2	0.2	0.8	1.0
Rosemary St.	1.5	2.1	3.7	0.1	0.5	0.6
Destination Daytona Ln.	1.4	2.6	4.0	2.5	2.3	4.8

Table 47: Year 2050- Intersection Crash Severity

Year 2050	**No Build**			**Build**		
	Fatal and Injury	PDO	Total	Fatal and Injury	PDO	Total
Broadway Ave.	3.7	6.3	10.0	4.7	4.0	8.7
Benton St.	3.7	4.5	8.2	0.3	1.8	2.1
Rosemary St.	2.6	3.3	5.9	0.2	1.1	1.3
Destination Daytona Ln.	2.5	4.4	6.9	3.2	2.7	5.9

Lane geometry along US 1 is consistent throughout the entire segment, therefore only one segment was considered. **Table 48** summarizes the predictive crashes for this segment.

Table 48: US 1 Segment- Crash Severity

Severity	**Year 2030**		**Year 2050**	
	No Build	Build	No Build	Build
Fatal and Injury	1.8	4.3	3.3	7.5
PDO	4.7	6.4	8.6	10.4
Total	6.5	10.7	11.8	17.9

7.3 Crash Discussion

The Build alternative crash predictions were compared to the No Build predicted crashes. In the Diverging Diamond Interchange (DDI) alternative the crashes decrease on from 1648.6 (No Build) to 557.2 (DDI) for freeways and ramp segments. This reduction is most likely a result of eliminating substandard loops and increasing the spacing between merge and diverge points.

Table 49 shows the comparison of the Build against the No Build predicted crashes.

The Enhanced Interchange Safety Analysis Tool (ISATe) does not include an interchange option specifically for diverging diamond interchanges and does not include Crash Modification Factor (CMF) values to predict crashes.

The DDI research presented in National Cooperative Highway Research Program (NCHRP) Report 959 Diverging Diamond Interchange Information Guide Second Edition (2021) was utilized for this qualitative assessment. The following bullets outline the qualitative safety assessment of a DDI vs a partial cloverleaf interchange:

- Conflict Points –
  - The existing partial cloverleaf configuration has 15 total conflict points: 5 merging, 5 diverging, and 5 crossing.
  - The proposed DDI configuration has 14 total conflict points: 6 merging, 6 diverging, and 2 crossing.
  - While the DDI only has one less total conflict point, it has 3 less crossing conflict points. Crossing conflict points are typically locations where higher severity crashes are more likely to happen (like angle crashes). Thus, it would be expected the DDI would have less severe crashes than the diamond configuration of the partial cloverleaf interchange.
- Wrong-way maneuver concerns are more common at a diamond interchange, but the design of the DDI, mainly the channelization of movements, may decrease the likelihood of wrong-way maneuvers at freeway exit ramps.
- Lower speeds should reduce the total number of crashes and also reduce the number of severe injury crashes through the interchange area.

DDIs have been proven to reduce crashes and crash severity. It is anticipated the I-95 and US 1 interchange modification to a DDI will reduce the total number of crashes, the number of fatalities, and potentially reduce wrong-way maneuver crashes through the I-95 and US 1 interchange area from a qualitative perspective.

Table 49: No-Build vs. DDI Alternative Total Predicted Crashes

Facility	No Build	DDI
Freeway Segments	1102.8	503.7
Ramp Segments	545.8	53.5
Total	1648.6	557.2

Table 50 provides a breakdown of crashes by facility for the No Build and Build condition in 2050. Using Table 122.6.4 of the FDM Section 122 Design Exceptions and Design Variations, the crash distribution rate based on each injury type was applied to the total number of crashes to determine the breakdown by crash type.

Table 50: 2050 Crash Total by Facility

Facility	No Build	DDI
Broadway Ave.	10.0	8.7
Benton St.	8.2	2.1
Rosemary St.	5.9	1.3
Destination Daytona Ln.	6.9	5.9
US 1 Segment	11.8	17.9
Freeway Segments	62.0	27.8
Ramp Segments	30.7	3.0
Total	**130.2**	**66.7**

The cost provided in Table 122.6.2 was used to calculate the total cost per crash injury type. Based on these calculations, the cost of crashes in 2050 are shown in **Table 51**. The Build Alternative is expected to be 49% less than the No Build.

Table 51: 2050 Crash Cost by Facility

All Type Facilities	HSM Crash Distribution for Florida	FDOT KABCO Crash Costs	No Build		Build	
			Crashes	Cost	Crashes	Cost
Fatal	0.007	$10,890,000	0.91	$9,925,146	0.47	$5,084,541
Incapacitating Injury	0.041	$888,030	5.34	$4,740,482	2.73	2,428,496
Non-Incapacitating Injury	0.124	$180,180	16.14	$2,908,970	8.27	$1,490,233
Possible	0.217	$103,950	28.25	$2,936,941	14.47	$1,504,562
Property Damage Only	0.611	$7,700	79.55	$616,552	40.75	$313,803
Total			**130.2**	**$21,124,091**	**66.7**	**$10,821,635**

8.0 Recommended Alternative

Based on the operational and safety analysis for the study area, the Diverging Diamond Interchange is the recommended alternative.

Traffic operational analysis, as described in Section 6, shows the Build Alternative improves operations and delays through the design year 2050 in all intersections within the study area except at Rosemary St. where the design year 2050 AM peak LOS for this unsignalized intersection is F. However, Rosemary St. will be converted to a right in/right out configuration rather than a full median opening. This reconfiguration will enhance the safety at this location. Freeway, merge, and diverge segments all continue to operate at LOS D or better through the Design Year for the Build Alternative.

The safety analysis shows an overall decrease in total predicted crashes in the Build Alternative compared to the No-Build Alternative; freeway segments crashes decrease, ramp segment crashes decrease, and crossroad ramp terminals crashes increased but due to the operational characteristics of a DDI the severity is expected to be reduce. Although it cannot currently be modeled, a diverging diamond interchange should result in safety improvements at crossroad ramp terminals and along the crossroad serviced by the ramps.

9.0 Other Considerations

9.1 Consistency with other Plans/Projects

The FHWA Policy Points (adopted May 22, 2017) for IARs focuses on the SO&E aspects of the project. It is intended that planning and land use consistency be evaluated as part of the socio-cultural effect evaluation during the NEPA process. This IMR document serves to provide determination of SO&E acceptability per FHWA to advance the project and for inclusion in subsequent NEPA documentation with the PD&E study.

9.2 Environmental Considerations

This IMR is being developed concurrently with a PD&E study. Details regarding the potential for the proposed project to impact the social, cultural, natural, and physical environmental will be evaluated as part of the PD&E process. This concurrent effort will provide the necessary National Environmental Policy Act documentation to support advancing the project to the next phase of the project development. Environmental impacts were minimized. FDOT will implement the U.S. Fish and Wildlife Service Standard Protection Measures to avoid adverse impacts. Therefore, potential environmental impacts of the project are not fatal impacts. Environmental impacts will be documented in a Type II Categorical Exclusion and supporting technical documents.

9.3 Funding Plan

The project is listed in the River to Sea Transportation Planning Organization (R2CTPO) 2045 Long Range Transportation Plan (LRTP) Strategic Intermodal System (SIS) Cost Feasible Project List with funding for a PD&E Study and Preliminary Engineering in 2021 / 2022 with funding at $2.8 million and $3.3 million, respectively. The project is also listed in the R2CTPO Transportation Improvement Program (TIP) for the fiscal years 2022 / 2023 to 2026 / 2027 with funding for right-of-way in 2026 / 2027 and more than $6 million in funding for previous fiscal years which covered PD&E and Preliminary Engineering. The project is listed in the FDOT's State Transportation Improvement Program (STIP) with funding for PD&E prior to 2023, Preliminary Engineering prior to 2023 / 2023, and right-of-way after the year 2026.

9.4 Conceptional Signing and Marking Plan

The conceptual signing plan for the Preferred Alternative was developed in compliance with FDOT Design Standards and can be found within **Appendix I**. The signing plans provided in the IMR are conceptual only and will be subject to final design. The purpose of these plans is to demonstrate that adequate distance/spacing is available for advanced signing and directions for drivers within the study area.

9.5 Access Management

I-95 is a limited access facility designated at Access Class 1 and currently designated Area Type 4 throughout the study area. No changes are proposed to the Access Management Classes for I-95 or US 1. Along the I-95 mainline, no new interchanges are being proposed in the vicinity of this project.

On US 1, the following access modifications are proposed as a part of this project:

- The full median opening at Rosemary Street is being closed.
- The directional median opening at Benton Street is being shifted 280 ft to the northwest.
- Thirteen properties along US Highway 1 will have an access change and an additional property will be displaced. This will result in 11 connections removed along US Highway 1.

An Access Management Plan is currently being developed in conjunction with FDOT District 5 and will be completed by Spring 2023.

10.0 Conclusion and Recommendations

This Interchange Modification Report (IMR) documents the proposed improvements for the I-95 at US 1 interchange. This report reviews the traffic forecasting, safety, and operational analysis for the Opening (2030) and Design Year (2050).

Based on the traffic operational analysis and safety analysis it was found that the Diverging Diamond Interchange (DDI) is the preferred alternative. The traffic analysis shows that the No-Build Alternative will not be able to accommodate the future traffic demand.

Purpose and Need

- The purpose for improving the interchange on Interstate 95 at US 1 is to enhance operational and safety needs. Interchange improvements will reduce congestion and better serve regional trips.
- The need for the project is based on safety, transportation demand, and economic development.

Future Traffic Operations

This IMR consist of a planned modification to the I-95 and US 1 interchange. A traffic operational analysis for the Existing 2021, Opening Year 2030, and Design Year 2050 conditions was performed to assess the impacts of the Build Alternative within the area of influence (AOI). Detailed analyses were performed for the mainline, ramps, intersections, and crossroad.

Some of the measures of effectiveness used to compare the operations of the Existing and Build Conditions are speed, level of service, intersection delays, and 95th queues. Based on the operational analysis conducted for the IMR, the following high-level operational analysis observations were made, and detailed results are provided in Future Traffic Operational Analysis section of this report.

- The 2050 No Build Alternative could not accommodate future traffic demand under existing geometry at the arterial level. LOS E or worse is expected at all intersections along US 1 during AM and PM peaks in the No Build condition.

- Build Alternative intersections operate at LOS D or better during both opening and design year.

- The proposed Build Alternative provides operational benefits along US 1 as well as enhances safety through the interchange.

Future Safety Performance

A historic crash data and safety analysis was completed for this project and includes an existing conditions safety analysis to review the crash history, and a quantitative safety analysis using the Highway Safety Manual (HSM) predictive method to analyzed future conditions. The Enhanced Interchange Safety Analysis Tool (ISATe) and HSM Urban and Suburban Arterials Spreadsheet Tool were used for the predictive analysis to assess future conditions.

The predictive method analysis results show an overall decrease in freeway, and ramp in the future Build Alternative compared to the No-Build Alternative.

Despite the ISATe not addressing the DDI, two recent, four—star, additions to the Crash Modification Factor (CMF) Clearinghouse indicate a significant safety increase when converting to a DDI. CMF 9658 applies to the conversion of at grade intersections to a DDI. This specific CMF has a value of 0.420 (58.0 %

decrease in crashes). In addition, CMF 10761 evaluates the conversion of a diamond interchange to a DDI. CMF 10761 has a value of 0.858 (14.2 % decrease in crashes). Although the current configuration of the I-95 at US 1 interchange is not a diamond, this CMF highlights the safety improvements expected from a DDI conversion.

FHWA Policy

The FHWA Policy on Access to the Interstate System provides the requirements for the justification and documentation necessary to substantiate any proposed changes in access to the Interstate System. The policy is published under the Federal Register Volume 74, Number 43743, dated May 22, 2017. The responses provided herein for each of the two policy statements demonstrate compliance with these requirements and justification for the proposed Interchange Modification Report (IMR) in support of the I-95 at US 1 PD&E Study in Volusia County, Florida. The following two FHWA Policy Criteria are addressed below.

Policy

It is in the national interest to preserve and enhance the Interstate System to meet the needs of the 21st Century by assuring that it provides the highest level of service in terms of safety and mobility. Full control of access along the Interstate mainline and ramps, along with control of access on the crossroad at interchanges, is critical to providing such service. Therefore, the Federal Highway Administration's (FHWA) decision to approve new or revised access points to the Interstate System under Title 23, United States Code (U.S.C.), Section 111, must be supported by substantiated information justifying and documenting that decision. The FHWA's decision to approve a request is dependent on the proposal satisfying and documenting the following requirements:

Point 1

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

Response

Operational Analysis

This IMR consists of a planned modification to the I-95 and US 1 interchange. A traffic operational analysis for the Existing 2021, Opening Year 2030, and Design Year 2050 conditions was performed to assess the impacts of the Build Alternative within the area of influence (AOI). Detailed analyses were performed for the mainline, ramps, intersections, and crossroad.

Some of the measures of effectiveness used to compare the operations of the Existing and Build Conditions were speed, level of service, intersection delays, and 95th queues. Based on the operational analysis conducted for the IMR, the following high-level operational analysis observations were made. Detailed results are provided in Future Traffic Operational Analysis section of this report.

- The 2050 No Build Alternative could not accommodate future traffic demand under existing geometry at the arterial level. LOS E or worse is expected at all intersections along US 1 during AM and PM peaks.

- Build Alternative intersections operates at LOS D or better during both opening and design year.

- The proposed Build Alternative provides operational benefits along US 1 as well as enhanced safety through the interchange.

Safety Analysis

A historic crash data and safety analysis was completed for this project and includes an existing conditions safety analysis to review the crash history, and a quantitative safety analysis using the Highway Safety Manual (HSM) predictive method to analyzed future conditions. The Enhanced Interchange Safety Analysis Tool (ISATe) and HSM Urban and Suburban Arterials Spreadsheet Tool were used for the predictive analysis to assess future conditions.

The predictive method analysis results show an overall decrease in freeway, ramp and crossroad ramp terminals in the Build Alternative compared to the No-Build Alternative.

DDIs have been proven to reduce crashes and crash severity. It is anticipated the I-95 and US 1 interchange modification to a DDI will reduce the total number of crashes, the number of fatalities, and potentially reduce wrong-way maneuver crashes through the I-95 and US 1 interchange area from a qualitative perspective.

Conceptual Singing Plan

Conceptual signing plans were developed and are included in **Appendix I**.

Point 2

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

Response

I-95 is a public facility and all interchanges within the area of influence provide full access. The interchange improvements will impact the I-95 and US 1 interchange. Improvements along US 1 are also being proposed to improve traffic flow and enhance safety. The proposed improvements at the interchange will continue to provide full access.