INTERCHANGE OPERATIONAL ANALYSIS REPORT (IOAR)

State Road (SR) 79 at Interstate 10 (I-10)

Financial Project Identification Numbers: 433590-1-22-01

Holmes County, Florida

Prepared for

Florida Department of Transportation
District Three

FINAL REPORT

August 2019

PROFESSIONAL ENGINEER CERTIFICATE

I hereby certify that I am a registered professional engineer in the State of Florida practicing with RS&H, Inc., a Florida corporation authorized to operate as an engineering business, (EB No. EB0005620) by the State of Florida Department of Professional Regulation, Board of Engineers and that I have prepared or approved the evaluation, findings, opinions, conclusions or technical advice hereby reported for:

PROJECT: State Road (SR) 79 at I-10
Interchange Operational Analysis Report (IOAR)

LOCATION: Holmes County, FL

FPID NUMBERS: 433590-1-22-01

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

Amanda J Schram
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STATE OF
FLORIDA
PROFESSIONAL ENGINEER

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Interchange Operational Analysis Report (IOAR)

Interstate 10 at SR 79
FPID: 433590-1-22-01

Determination of Safety, Operational, and Engineering Acceptability

Acceptance of this document indicates successful completion of the review and the Interchange Access Request (IAR) is considered acceptable for safety, operations, and engineering. Approval is contingent upon compliance with applicable Federal requirements, specifically the National Environmental Policy Act (NEPA) or Department Project Development and Environment (PD&E) Procedures. Completion of the NEPA/PD&E process is considered acceptance of the general project location and concepts described in the environmental document.

Requestor

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SYSTEMS IMPLEMENTATION OFFICE

QUALITY CONTROL CERTIFICATION FOR INTERCHANGE ACCESS REQUEST SUBMITTAL

Submittal Date: 8/27/2019

FM Number: 433590-1-22-01

Project Title: State Road (SR) 79 at Interstate 10 (I-10) IOAR

District: Three

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

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

Ready for Final Submittal

Quality Control (QC) Statement

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

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Executive Summary

The purpose of this Interchange Operational Analysis Report (IOAR) is to provide the required technical documentation for obtaining the Federal Highway Administration (FHWA) determination of safety, operational and engineering acceptability for the implementation of traffic signals at the stop controlled State Road 79 (SR 79) at Interstate 10 (I-10) interchange. The project limits extend from one mile east and west of the interchange on I-10 and half a mile north and south of the interchange on SR 79.

SR 79, a four lane north/south facility within the study area, is an Emerging Strategic Intermodal System (SIS) corridor as well as a designated hurricane evacuation route. The ramp terminal intersections will not be able to accommodate future traffic if operational improvements are not implemented at the interchange. Traffic conditions are expected to operate below the level of service (LOS) target C in the opening and design years of the No-Build Alternative. Implementation of traffic signals at the SR 79/I-10 interchange is anticipated to provide an acceptable level of service at both intersections and reduce intersection delay.

The primary basis for traffic projections in this IOAR is Version 1.4 of the adopted Northwest Florida Regional Planning Model (NWFRPM) which has a base year of 2006 and a cost feasible year of 2035. The analysis years for the study include Existing Year 2015, Opening Year 2025, and Design Year 2045. The operational analysis for this study is performed primarily using capacity analysis software (Synchro and HCS).

Two primary alternatives will be evaluated in this IOAR for future conditions: a No-Build Alternative and a Build Alternative. The Build Alternative proposes signalizing the two ramp terminals.

The Design Year 2045 operational analysis results show that the Build Alternative is expected to provide significantly better traffic operations within the SR 79/I-10 study area compared to the No-Build. During the 2045 AM and PM peak, the No-Build Alternative exhibits operational failure (LOS F) at the eastbound ramp terminal. The current stop controlled ramp movement cannot accommodate the future Design Year demand. During both peak hours, the implementation of a signal at the stop controlled ramp junctions provided by the Build Alternative is expected to alleviate the operational issues at the SR 79/I-10 interchange and provide an overall intersection LOS of B or better at both ramp terminals.

In terms of safety, the proposed Build Alternative treatment will improve operations at the intersections and assist in reducing right angle crashes, which are the predominate type of crash along the SR 79 facility in the ramp terminal intersection influence area (a radius of 250 feet). Moreover, the Highway Safety Manual (HSM) analysis of the ramp terminals resulted in an annual reduction in crashes of 73% (0.58 crashes) for the Build Alternative.

In conclusion, the Build Alternative showed significant operational improvements over the No-Build in the Design Year 2045. Based on the safety and traffic operations benefits of the Build Alternative, it is considered the preferred alternative for the SR 79 at I-10 IOAR.

This IOAR has been developed in accordance with FDOT Policy No. 000-525-015: Approval of New or Modified Access to Limited Access Highways on the Strategic Highway System (SHS), FDOT Procedure No. 525-030-160: New or Modified Interchanges, Interchange Access Request User's Guide and the FDOT Project Traffic Forecasting Handbook (Procedure No. 525-030-120).

E.1 Compliance with FHWA General Requirements

The following requirements serve as the primary decision criteria used in approval of interchange access requests. Responses to the FHWA policy points are provided to show that the proposed project is viable based on the analysis performed to date.

E.1.1 The request does not have a significant adverse impact on the safety and operation of the freeway system

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

The Build Alternative is expected to reduce the observed crashes at the intersection influence area by 73% with the installation of a traffic signal at the ramp terminals of the SR 79 at I-10 interchange. The intersection influence area is considered to be a 250 foot radius around each ramp terminal intersection. This signal implementation will reduce both right angle and left turn crashes since both are attributed to failure to stop at an intersection in the event of an opposing vehicle. From 2011-2015, four crashes were located within the intersection areas of influence with right angle crashes being the most common type of crash accounting for 75% of total crashes. The intersection areas of influence also had 1 left turn crash accounting for 25% of total crashes. The Build Alternative is expected to provide safety enhancements over the No-Build, which is upheld by the results of the HSM-based safety analysis.

The Design Year 2045 operational analysis results show that the Build Alternative provides significantly better traffic operations within the SR 79/I-10 study area compared to the No-Build. During the 2045 AM and PM peak, the No-Build Alternative exhibits operational failure (LOS F) at the eastbound ramp terminal. The current stop controlled ramp movement cannot accommodate the future Design Year demand. During both peak hours, the implementation of a signal at the stop controlled ramp junctions provided by the Build Alternative is expected to alleviate the operational issues at the SR 79/I-10 interchange and provide overall intersection LOS of B or better at both ramp terminals.

The Build Alternative is expected to improve the safety and operations of the SR 79 at I-10 interchange in both the Opening Year 2025 and Design Year 2045.

E.1.2 The proposed access connects to a public road only and will provide for all traffic movements

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

The proposed operational improvements will maintain current access for all traffic movements for the project interchange. The current diamond interchange configuration will be maintained while the control for the ramp terminal intersections will be changed from stop control to signalized control.

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1.0 INTRODUCTION

1.1 Background

The Applicant, Florida Department of Transportation (FDOT) District 3, requests the FHWA approval of an Interchange Operational Analysis Report (IOAR) for the implementation of traffic signals at the State Road 79 (SR 79)/Interstate 10 (I-10) interchange in Holmes County. This IOAR has been developed in accordance with FDOT Policy No. 000-525-015: Approval of New or Modified Access to Limited Access Highways on the Strategic Highway System (SHS), FDOT Procedure No. 525-030-160: New or Modified Interchanges, Interchange Access Request User's Guide and the FDOT Project Traffic Forecasting Handbook (Procedure No. 525-030-120).

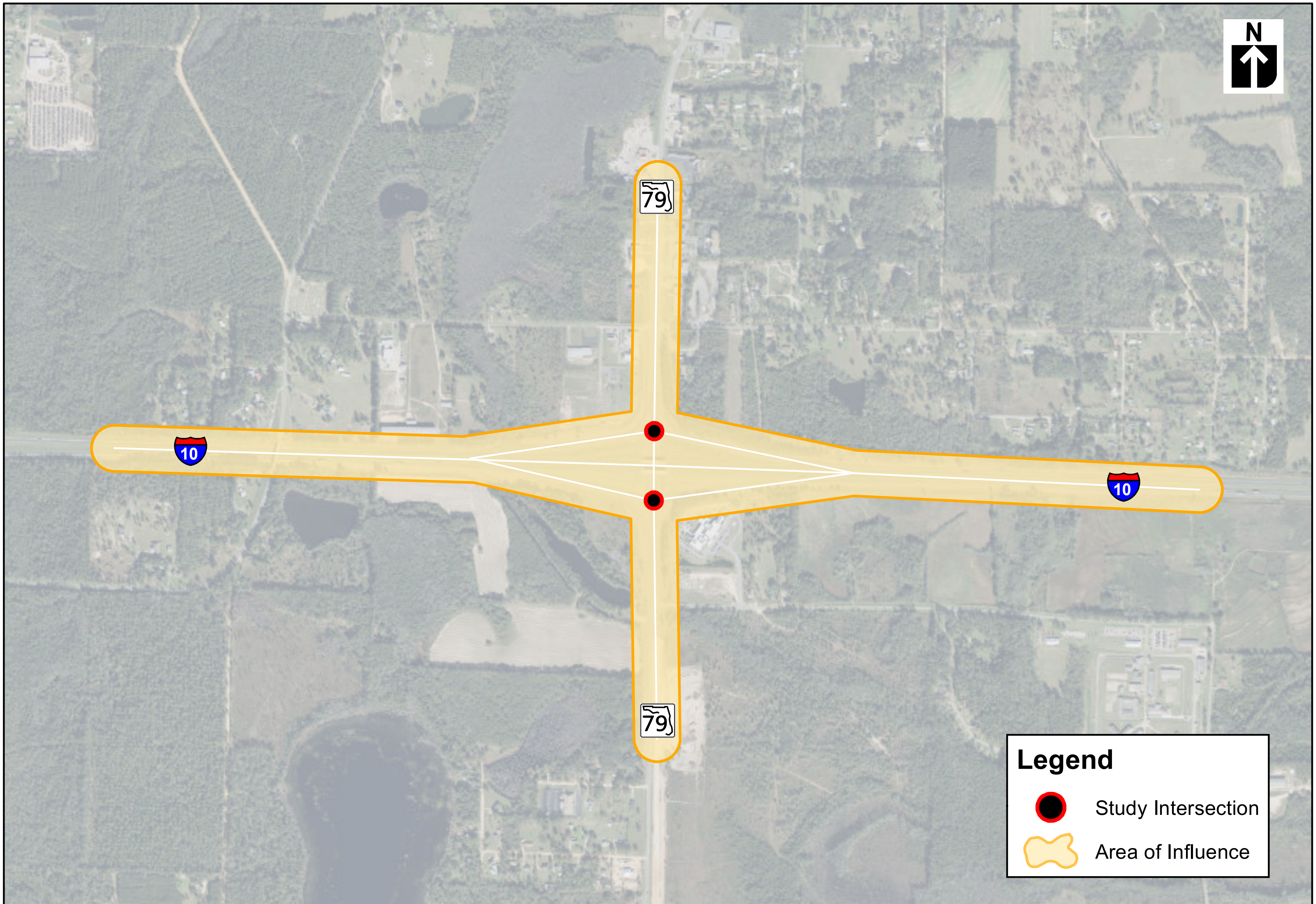
FDOT is conducting an IOAR to decide on the installation of a traffic signal at the stop-controlled ramp terminal intersections of the SR 79/I-10 interchange. A Project Development and Environment (PD&E) study has been completed on SR 79 from I-10 to the Alabama State Line and a Design Traffic Technical Memorandum (DTTM) was completed to supplement the operational analysis of the PD&E study. As part of the SR 79 DTTM, it was determined that the unsignalized intersections of the SR 79 ramp terminals would operate below the adopted Level of Service (LOS) target C by the Design Year 2045. The SR 79 DTTM is provided in **Appendix A**. An Efficient Transportation Decision Making (ETDM) process has been completed for the PD&E.

1.2 Purpose and Need

I-10, an east/west facility, is an integral part of the Strategic Intermodal System (SIS) providing for high-speed and high-volume traffic movements within the state of Florida. I-10 is a four lane facility within the area of influence. SR 79 serves as a north/south corridor connecting I-10 to Alabama and is an Emerging Strategic Intermodal System (SIS) corridor as well as a designated hurricane evacuation route. The purpose of this project is to investigate a signalization alternative for the SR 79/I-10 interchange that will improve safety and operations. The need for this study is based on the traffic analysis results from the DTTM, which reported operations below the level of service (LOS) target C. The I-10 EB off ramp reported LOS F during Design Year 2045 under unsignalized intersection control.

1.3 Project Location

The proposed I-10 modifications are located in Holmes County, Florida at the SR 79/I-10 ramp terminal intersections; the location of the project is shown in **Figure 1-1**. The project limits extend from one mile east and west of the interchange on I-10 and a half mile north and south of the interchange on SR 79.



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SR 79 at I-10 Interchange
Operational Analysis Report (IOAR)

Project Location and Area of Influence

Figure 1-1

2.0 METHODOLOGY

2.1 Overview

The following section will summarize the methodology used in the IOAR including data collection, traffic forecasting, design hour traffic development, LOS criteria, and operational analysis. Relevant information and data from the SR 79 DTTM was used where applicable.

2.2 Analysis Years

The following study years are established for this IOAR:

Traffic Forecasting

- Base Year: 2006
- Horizon Year: 2035

Traffic Operational Analysis

- Existing Year: 2015
- Opening Year: 2025
- Design Year: 2045

2.3 Area of Influence

The SR 79 at I-10 interchange is located in Holmes County. The area of influence for this study is on SR 79 approximately half a mile north and south of the SR 79/I-10 interchange and on I-10 approximately one mile east and west of the SR 79/I-10 interchange. The area of influence is depicted in **Figure 1-1**.

2.4 Data Collection

Several types of traffic data were collected for this study. The majority of the data collection effort occurred during the SR 79 DTTM. The data sources within the project study area included:

- Field Traffic Counts (Collected in October 2015)
- FDOT Transportation System Data
- Existing Traffic Data from FDOT Florida Traffic Information 2015 (FTI) DVD
- Existing Plans, Programs and Project Lists from FDOT and Holmes County
- Crash Data (Years 2011-2015)

2.5 Base Traffic Data and Traffic Factors

The primary sources of existing traffic for this IOAR are field traffic counts and the 2015 FTI DVD. A comparison of the I-10 interchange ramp volumes indicated that minimal growth occurred between 2015 and 2017, the latest available FTI data. A traffic data collection effort was performed for the SR 79 DTTM during the third week of October 2015 (Tuesday and Wednesday). The traffic data collected for the DTTM, which lies within the IOAR study area, includes peak period turning movement counts at the ramp terminal intersections and machine counts on all of the intersection legs.

The following summarizes the location and type of field traffic counts collected.

12-Hour Peak Period Turning Movement Counts (6:00 AM to 6:00 PM):

- SR 79 at I-10 Eastbound Off-/On-Ramps
- SR 79 at I-10 Westbound Off/On-Ramps

24-Hour Machine Counts:

- I-10 Eastbound Ramp to SR 79
- I-10 Eastbound Ramp from SR 79
- I-10 Westbound Ramp to SR 79
- I-10 Westbound Ramp from SR 79
- SR 79 North of I-10
- SR 79 South of I-10

Information from the 2015 FDOT Traffic Information DVD was used to obtain the necessary traffic data along I-10 as well as to check the reasonableness of the 2015 traffic counts.

The peak hour turning movement volumes and peak hour ramp volumes are based on the turning movement counts collected in the field. The AADTs for the mainline segments, ramps, and intersection approaches are based on daily volumes (ADT) collected by tube counts. The ADTs were converted into AADTs by applying a seasonal factor.

The factors used for design traffic analysis include the D, K, and T_f factors. The T_f factor is the percentage of truck traffic during the peak hour and can be estimated as half of the T_{24} factor. The traffic factors recommended for use in this IOAR are presented in **Table 2-1**. The T_{24} factor was determined through traffic counts for SR 79 and the FTI DVD was used for I-10. The K factor is the Standard K for rural arterials and highways. The D factor used for SR 79 was calculated from the peak hour directional volumes at three count stations located north of the interchange, within the interchange, and south of the interchange. The peak hour directional volumes were averaged to get a D factor of 53%. The D factor used for I-10 was determined through the FTI DVD.

Table 2-1 Summary of Traffic Factors

Facility	K	D	T_f
SR 79	9.5%	53%	3%
I-10	9.5%	53%	17%

The peak hour factors (PHF) used in the Existing Year analysis were calculated from project traffic counts. A PHF of 0.94 was used for the SR 79/I-10 eastbound ramp terminal and 0.95 was used for the SR 79/I-10 westbound ramp terminal for the AM peak hour. The PM peak hour used a PHF of 0.87 and 0.91 for the eastbound and westbound ramps, respectively. A consistent PHF of 0.92 was used for all future year analyses.

2.6 Travel Demand Forecasting

The travel demand forecasting effort occurred during the development of the SR 79 DTTM. The DTTM utilized the adopted Northwest Florida Regional Planning Model (NWFRPM) V1.4. The NWFRPM is a regional travel demand model developed and maintained by the Florida Department of Transportation, District 3. The NWFRPM is the primary travel demand forecasting tool used to support the Long Range Transportation Plan updates of the Transportation Planning Organizations (TPO) located within the West Florida Regional Planning Council (WFRPC) district. The NWFRPM boundaries coincide with the WFRPC jurisdictional boundaries and includes a 2006 Base Year and a 2035 Forecast Year. While the adopted NWFRPM contains a 2035 forecast year model, a 2040 SE Dataset was provided by FDOT District 3 for use in this analysis. Forecast model runs were conducted using the 2035 Cost Feasible highway network with the updated 2040 SE Data provided by FDOT.

2.6.1 Forecast Model Review

A review of the 2035 Cost Feasible Network model run was conducted to assess the reasonableness of future traffic projections in the study corridor. The study area model review checked for illogical speed and capacity calculations, illogical trip pathing, reasonableness of trip distribution and assignment, and the reasonableness of population and employment growth. Upon completion of the review, it was confirmed that there were no significant performance issues associated with the forecast year model.

The NWFRPM 2035 Cost Feasible Network serves as the base network for the design year alternatives. The Cost Feasible Network was reviewed to ensure that the appropriate planned transportation improvements were included in the forecast year model network. Results of this review confirmed that the following FDOT Five Year Work Program improvements were not coded into the 2035 Cost Feasible Network:

- SR 79 from Ebro to 0.5 miles south of I-10: Improve from two to four lanes
- SR 77 within Washington County: Improve from two to four lanes

The improvements listed above were coded into a revised 2035 Cost Feasible highway network.

2.6.2 Review of Base Model Assignments

A review of the NWFRPM 2006 Base Year Model was conducted to assess whether the model is replicating travel patterns in the SR 79 study corridor at a reasonable and acceptable level. The results of this evaluation served as the basis for determining the necessity and scale of a study corridor validation. The primary measure used for this evaluation was model volume/count ratios. Counts coded into the NWFRPM were verified by the 2006 FDOT FTI and were the primary inputs used to evaluate the base year model.

Initial review of the 2006 NWFRPM confirmed that a majority of the corridors in Holmes County were characterized by volume over-assignments. The SR 79 corridor from I-10 to the Florida/Alabama state line had a volume/count ratio of 1.18. The Florida Project Traffic Forecasting Handbook recommends a model AADT threshold within 15% of the associated count for major arterials. In order to produce more reasonable model forecasts for the project corridor, it was determined that a corridor level validation was necessary.

2.6.3 Subarea Model Validation

The FDOT standard measures of travel demand assignment validation were used to compare the assigned daily model volumes to observed 24-hour traffic counts along the SR 79 corridor.

Based on the results of the NWFRPM review, it was confirmed that a corridor validation was necessary to further refine the traffic forecasting capabilities of the model in the study corridor. Based on potential deficiencies identified in the model review, the following refinements were conducted:

- CR 177 from SR 79 to SR 2: Revise coding from Facility Type (FT) 43 to FT 35 to better reflect speed and capacity characteristics on this parallel corridor
- SR 77 from I-10 to US 90: Revise coding from FT 31 to FT 23 to better reflect speed and capacity characteristics on this parallel corridor
- Coding adjustments to the connectors of the following centroids to better reflect travel distribution characteristics: 1045, 1048 1051, 1062, 1063, 1064

The implementation of the revisions listed above resulted in a change in the volume/count ratio of the SR 79 study corridor from 1.18 to 1.08. This value falls within the acceptable threshold for major arterials as outlined in the FDOT Project Traffic Forecasting Handbook.

2.7 Development of Design Traffic

The development of design traffic for this IOAR followed procedures consistent with the process defined in the 2014 FDOT Project Traffic Forecasting Handbook. The development of future year traffic volumes was based on Existing Year 2015 AADTs and the growth rates selected in the SR 79 DTTM which is located in Section 5 of **Appendix A**. As discussed in the DTTM, historical traffic data, population projections, and travel demand model projections were reviewed to determine the growth rates for the project. The historical growth within the study area indicates fluctuations in traffic over the last 15 years and proves to not be feasible for consideration of a future growth rate. The linear population growth rate for Holmes County from 2015 to 2040 is 0.30%. The socioeconomic data produced approximately 0.5% growth for single family dwelling units, multi-family dwelling units and school enrollment. The travel demand model produced average growth rates ranging from 0.5% to 2.5%. Based on the review of the available data, the growth rates derived from the NWFRPM were preferred for the study area. The selected growth rate for the project study area for both the No-Build and Build Alternatives was 1.0% annually. The selected growth rate was applied to the Existing Year 2015 AADTs to achieve the Design Year 2045 AADTs. The Opening Year 2025 forecasts were developed by interpolating between the 2015 and 2045 AADT volumes.

The future year Directional Design Hour Volumes (DDHVs) were developed by applying the selected K- and D-factors to the project AADTs. The peak-hour intersection volumes for Design Year 2045 were calculated by multiplying the approach DDHVs by the existing turning movement proportions. The Opening Year 2025 peak-hour intersection volumes were developed by interpolating between the 2015 and 2045 volumes. The final future year volumes were checked for reasonableness.

2.8 Level of Service Criteria

FDOT maintains level of service targets for the State Highway System in accordance with FDOT LOS Policy 000-525-006. Level of service (LOS) is used to identify roadway facility performance by assigning a letter ranging from "A" (best) to "F" (worst).

FDOT's defined LOS target for the State Highway System is LOS D within urbanized areas and LOS C outside urbanized areas. Since the project area is defined as a rural area, the FDOT LOS target is "C".

2.9 Analysis Procedures

The operational analysis for this study included AM and PM peak-hour intersection analysis using Synchro 10 and segment analysis using Highway Capacity Software (HCS) 7. The analysis was conducted to determine the traffic operations of the existing conditions and to improve the LOS at the ramp junctions in the future year analysis.

2.9.1 Capacity Analysis Procedure

The capacity analysis using Synchro software was conducted to evaluate the operational performance of the ramp terminal intersections. Overall intersection delay and LOS was reported for the intersections under signalized control. For the unsignalized intersections, the movement with the highest delay was reported.

The capacity analysis using HCS 7 analyzed five segments in each direction along I-10 using the freeway facility module. The segments analyzed were basic freeway segments, diverge segments, and merge segments.

The capacity analysis was developed for the AM and PM peak hours for the following analysis years and alternatives:

- Existing Year 2015
- No-Build Alternative
  - Opening Year 2025
  - Design Year 2045
- Build Alternative
  - Opening Year 2025
  - Design Year 2045

2.9.1.1 Measures of Effectiveness

The following measures of effectiveness (MOEs) from the capacity analysis results were used to evaluate the operational performance of the study elements:

- Freeway Segments – total density, LOS by segment
- Ramp Terminal Intersections – overall intersection delay or movement with highest delay and LOS

The traffic operation conditions of the No-Build and Build Alternatives were compared using the above MOEs.

3.0 EXISTING CONDITIONS

The following sections provide a discussion and evaluation of the existing conditions within the area of influence for this IOAR. This discussion includes transportation systems data, existing traffic data, and existing operating conditions.

3.1 Existing Transportation Network

3.1.1 Existing Roadway Network

The existing transportation network within the area of influence consists of one rural principal arterial interstate, one rural principal arterial, and one rural minor arterial. **Table 3-1** summarizes the functional classification and number of lanes for the major roadways within the project area of influence.

I-10 – I-10 within the study area is an east-west, four-lane facility with a 60 foot grassy median. There is one interchange with I-10 within the area of influence at SR 79. The segment of I-10 within the project limits is designated as a Strategic Intermodal System (SIS) Corridor.

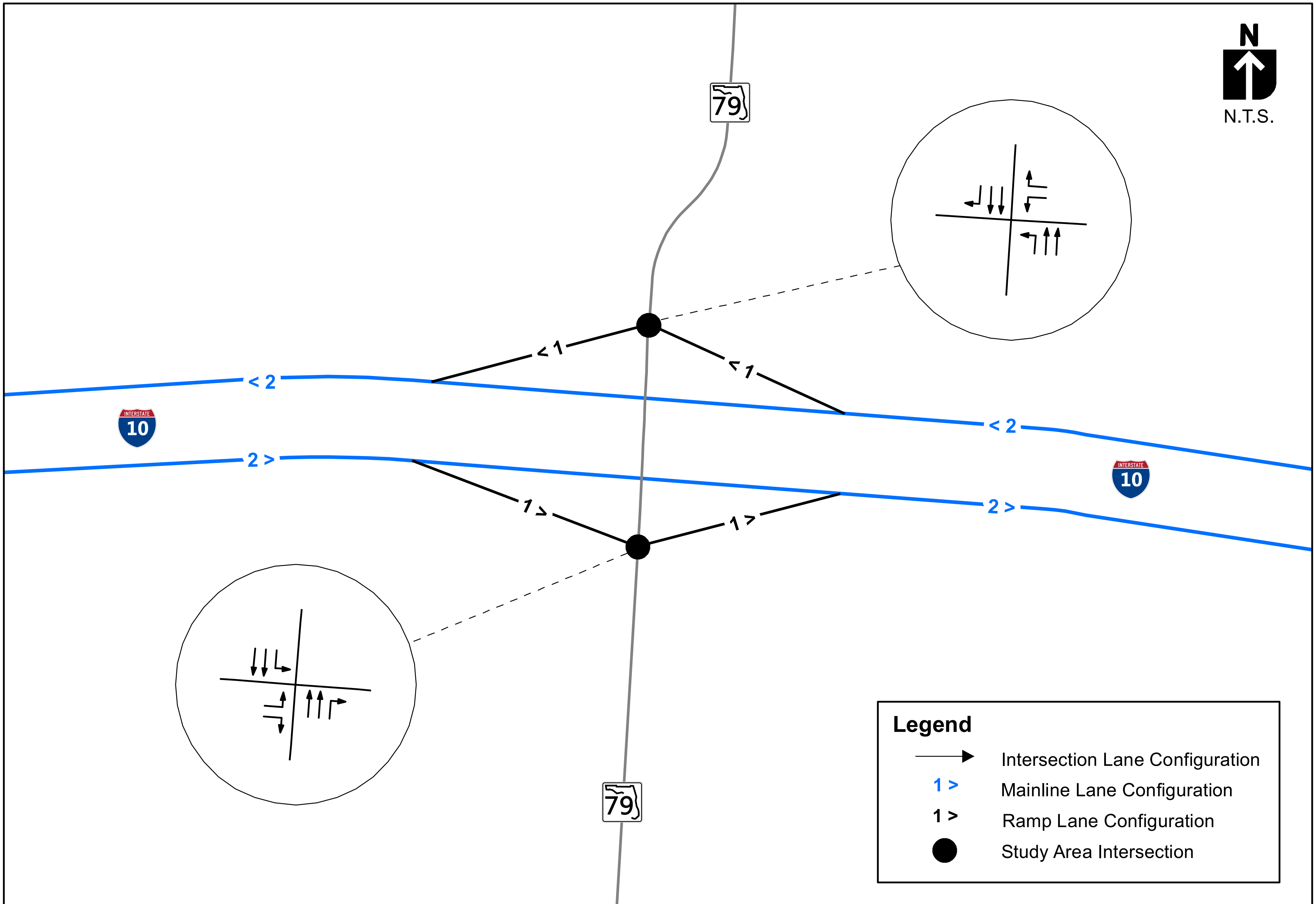
SR 79 – SR 79 within the study area is a four-lane, divided, north-south facility with a raised median. The segment of SR 79 north of I-10 is designated as an Emerging SIS Corridor and the segment of SR 79 south of I-10 is designated as a SIS connector.

Table 3-1 Functional Classification of Area Roadways

Roadway	Functional Classification	Number of Lanes
SR 79 North of I-10	Rural Minor Arterial	4
SR 79 South of I-10	Rural Principal Arterial	4
I-10	Rural Principal Arterial-Interstate	4

There is one existing interchange within the study area at SR 79/I-10 and it is a diamond interchange. The SR 79/I-10 interchange is unsignalized with channelized right turns for the on- and off-ramps that operate under yield and free-flow conditions.

Figure 3-1 shows the existing lane configuration for the study area interchange.



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SR 79 at I-10 Interchange
Operational Analysis Report (IOAR)

Existing Year 2015
Lane Configuration

Figure
3-1

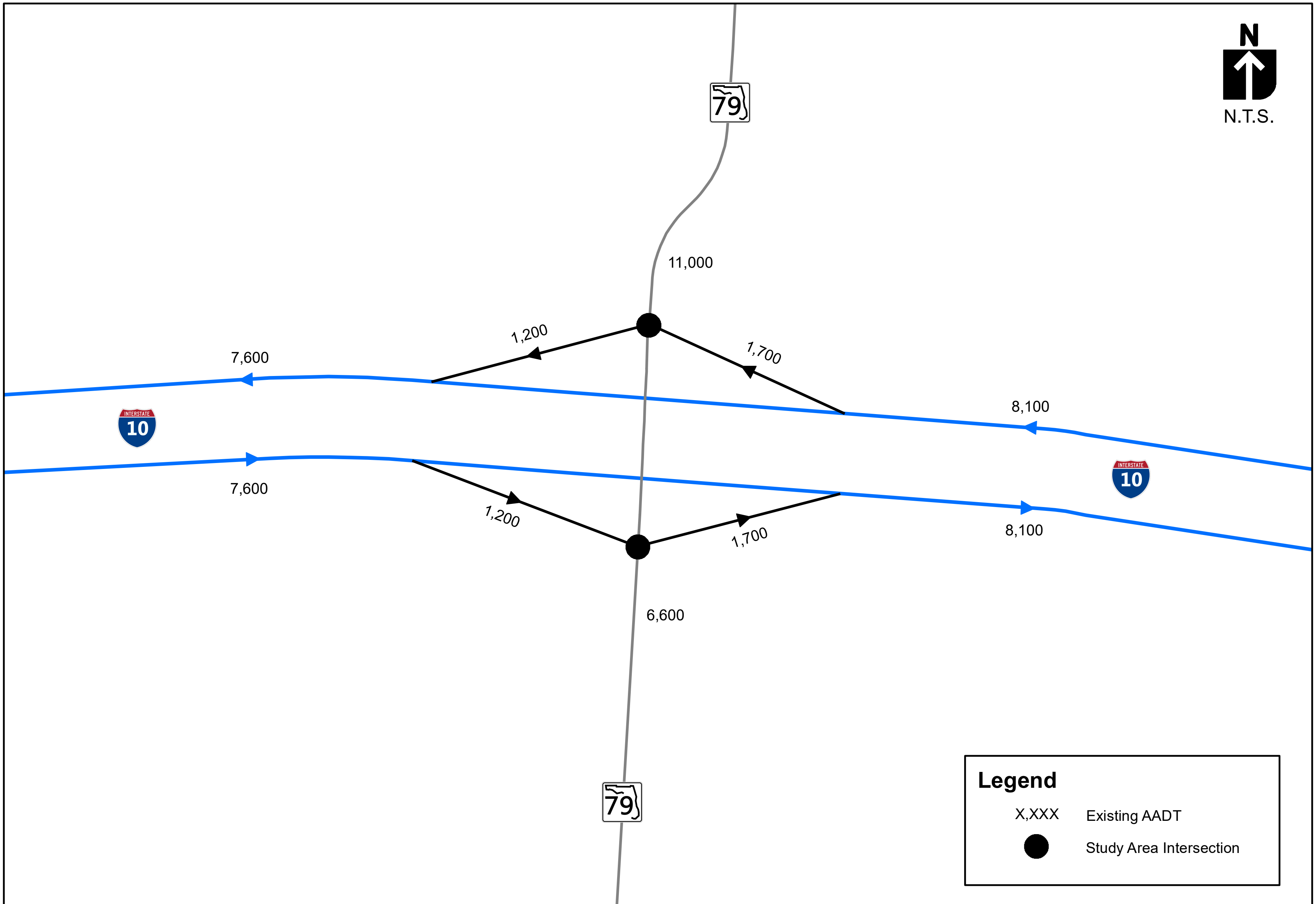
3.2 Existing Operational Performance

This section summarizes the operational analysis performed within the area of influence to assess the existing year 2015 traffic conditions.

3.2.1 Existing Traffic Data

An extensive traffic count effort was performed to obtain existing traffic data for the SR 79 DTTM. Since this count data coincides with the study area for this IOAR, it was used to develop the existing traffic. Peak period turning movement counts were taken at the SR 79/I-10 interchange as well as tube counts on SR 79 north and south of the interchange. Count data was collected the third week of October 2015. The peak hour turning movement counts were used to determine the ramp peak hour volumes. One I-10 mainline count east of the SR 79 interchange was available using the Florida Traffic Information (FTI) DVD 2015. The I-10 mainline count and SR 79 counts north and south of the interchange were converted to Annual Average Daily Traffic (AADT) by applying the appropriate seasonal correction factor in accordance with FDOT standards. **Figure 3-2** shows the Existing Year 2015 AADT. The existing traffic data was used to develop the existing year 2015 balanced mainline, ramp and intersection peak hour volumes shown in **Figure 3-3**.

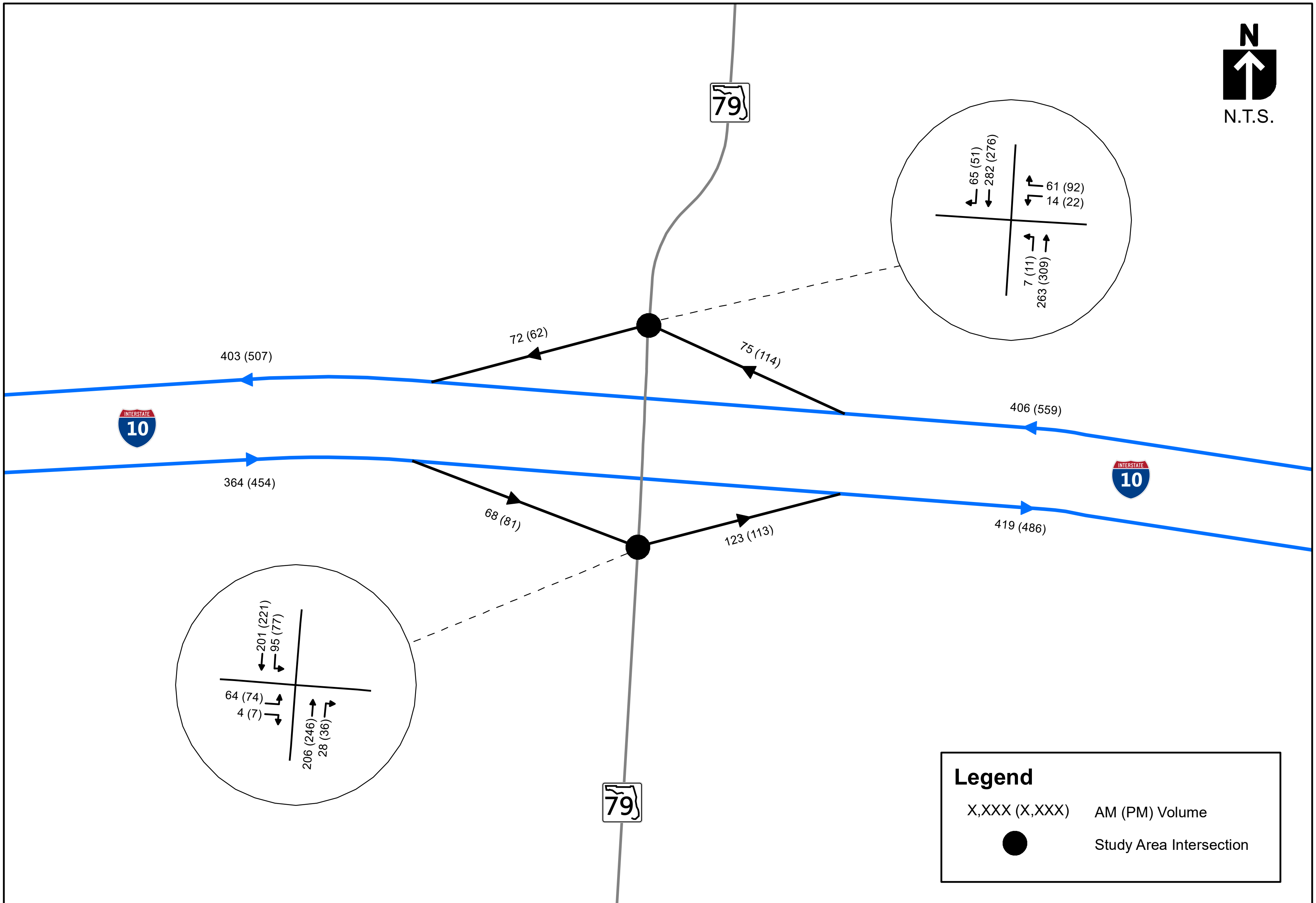
The field-collected traffic data was provided in the SR 79 DTTM, which is located in **Appendix A**. The I-10 FTI synopsis report and seasonal factor report are located in **Appendix B**.



SR 79 at I-10 Interchange
Operational Analysis Report (IOAR)

Existing Year 2015
Annual Average Daily Traffic (AADT) Volumes

Figure 3-2



SR 79 at I-10 Interchange
Operational Analysis Report (IOAR)

Existing Year 2015
AM (PM) Peak Hour Volumes

Figure
3-3

3.2.2 Existing Crash Information

Historical crash data for the project study area was obtained from FDOT's Crash Analysis Reporting System (CARS) database. Crash data collected along I-10 and SR 79 from 2011 to 2015 included the number of crashes by milepost for each year, number of vehicles involved, type of crashes, number of injuries and/or fatalities, cause, economic loss and average daily traffic.

The Average Crash Rate Method of crash analysis, based on segment length, average daily traffic and number of crashes occurred, was used for calculating the actual crash rate for the roadway segments. The study area was divided into two roadway segments; SR 79 (Section 52030000 MP 0.74 to 1.74) and I-10 (Section 52002000 MP 16.22 to 18.22). The actual crash rate for the facilities from year 2011 to year 2015 was compared with the statewide average crash rate for the same type of facility, in this case rural interstate facilities for I-10 and rural 4-5 Lane 2 Way Divided Raised facilities for SR 79. The crash analysis results, as shown in **Table 3-2**, indicated that there are high crash locations within the project area of influence during this five-year period. High crash locations are considered to be locations where the segment actual average crash rate exceeds the statewide average crash rate. The segment of SR 79 within the study area is a high crash location for the years 2013-2015. The segment of I-10 within the study area is considered a high crash location for the year 2012. No fatal crashes occurred within the project area over the five-year period (2011-2015). A summary of the crash analysis results is provided in **Appendix C**.

Table 3-2 Historical Crash Rate Analysis

SR 79				
Segment No.	**Year**	**Statewide Actual Crash Rate**	**Segment Actual Crash Rate**	**High Crash Location**
52030000	2011	0.539	0.000	No
	2012	0.603	0.000	No
	2013	0.684	1.453	Yes
	2014	0.643	0.865	Yes
	2015	0.717	1.941	Yes
I-10				
Segment No.	**Year**	**Statewide Actual Crash Rate**	**Segment Actual Crash Rate**	**High Crash Location**
52002000	2011	0.340	0.170	No
	2012	0.367	0.445	Yes
	2013	0.438	0.423	No
	2014	0.415	0.384	No
	2015	0.499	0.410	No

SR 79 Segment Crashes

The crash analysis results revealed that there were a total of 15 crashes on SR 79 within a half mile north and south of the study interchange for this five-year period (2011 to 2015). Of these 15 crashes, right-angle crashes were the most common type of crash accounting for 46.7% of total crashes followed by “other” crashes accounting for 26.7% of total crashes.

No fatal crashes occurred within this segment. Six (6) crashes were considered property damage only crashes, while nine (9) of the crashes were considered injury crashes. Of the injury crashes, five (5) crashes were contributed to failure to yield right-of-way, three (3) were coded as “other contributing action” and one (1) was associated with failure to keep in proper lane. The actual average crash rate for the SR 79 segment for years 2013-2015 is greater than the statewide average crash rate making this a high crash location for three years. There were no reported crashes for the years 2011 and 2012.

I-10 Segment Crashes

The crash analysis results revealed that there were a total of 23 crashes on I-10 within one mile east and west of the study interchange for this five-year period (2011 to 2015). Of these 23 crashes, crashes coded as “other” were the most common type of crash accounting for 30.4% of total crashes followed by fixed object crashes accounting for 21.7% of total crashes.

No fatal crashes occurred within this segment. Sixteen (16) crashes were considered property damage only crashes, while seven (7) of the crashes were considered injury crashes. Of the injury crashes, three (3) crashes were contributed to careless or negligent manner, one (1) was contributed to driving too fast for conditions, one (1) was associated with failure to keep in proper lane, and two (2) were coded as “no contributing action.” The actual average crash rate for the I-10 mainline segment for the year 2012 is greater than the statewide average crash rate making this a high crash location for the year 2012.

Figure 3-4 illustrates the historical crash data with crashes plotted by mile post location.

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SR 79 at I-10 Interchange Operational Analysis Report (IOAR)

Historical Crash Data Map (2011-2015)

Figure 3-4

3.2.3 Existing Operational Analysis

A detailed capacity analysis using Synchro 10 (Revision 10.1.2.20) was conducted to evaluate the operational performance of the SR 79/I-10 ramp terminal intersections. Synchro models were prepared for the Existing Year 2015 AM and PM peak hours. The primary objective of the existing conditions analysis was to establish the current operational conditions at the study interchange.

Capacity analysis was also conducted for the I-10 mainline and freeway/ramp junctions in order to evaluate operational performance of the freeway elements. The Highway Capacity Software (HCS) 7 (Revision 7.6) was used to determine the LOS for the freeway and ramp locations.

The existing conditions Synchro and HCS reports are in **Appendix D**.

3.2.3.1 Existing Synchro Analysis

The existing conditions intersection operational analysis results for the 2015 AM and PM peak hours are located in **Table 3-3**. Since the interchange is unsignalized, the movement with the highest delay using HCM 2000 methodology is represented in the table. The movement with the highest delay is the left-turn movement from both I-10 off-ramps.

Table 3-3 Existing Year (2015) Intersection Delay and LOS[1]

Location	AM		PM	
	Delay	LOS	Delay	LOS
I-10 EB Ramp Terminal	15.2	C	16.5	C
I-10 WB Ramp Terminal	10.0	A	10.6	B

[1]Delay (seconds/vehicle) and LOS represents movement with the highest delay utilizing HCM 2000 methodology

The results of the analysis show that the two study intersections operate at a LOS C or better in the Existing Year 2015.

The queue analysis for the study intersections is shown in **Table 3-4**, which shows the available storage provided compared to the 95% queue (ft) as reported in Synchro. The available storage is calculated to include the storage lanes for each respective turning movement. The eastbound left (EBL) and westbound left (WBL) available storage for the ramp terminals represents the length of the ramp, including the storage bay, minus the deceleration length of 730 ft – 70 mph to a stop condition. In all cases, the provided available storage length is not exceeded by the 95% queue length.

Table 3-4 Existing Year (2015) Intersection Queues

Intersection	Movement	Available Storage (ft)	AM Queue (ft)	PM Queue (ft)
I-10 EB Ramp Terminal	NBR	400	0	0
	SBL	300	6	6
	EBL	870[1]	15	21
I-10 WB Ramp Terminal	NBL	275	0	1
	SBR	500	0	0
	WBL	870[1]	6	10

[1]Available storage represents the length of the ramp, including the storage bay, minus the deceleration length of 730 ft – 70 mph to a stop condition (2019 FDM Table 211.10.2).

3.2.3.2 Existing Highway Capacity Software (HCS) Analysis

The freeway facility module of HCS 7 was used to analyze the freeway segments along the I-10 mainline. The HCS results are summarized in **Table 3-5** which shows the peak hour LOS for each segment in both the eastbound and westbound direction. The analysis indicates that all study roadway segments operate at LOS A in the existing year.

Table 3-5 Existing Year (2015) Freeway LOS and Density

Direction	Segment	Type	AM		PM	
			LOS	Density[1]	LOS	Density[1]
Eastbound	I-10 (West of SR 79 Interchange)	Basic	A	3.1	A	4.1
	I-10 Off Ramp to SR 79	Diverge	A	5.6	A	6.9
	I-10 (Between SR 79 Interchange)	Basic	A	2.5	A	3.4
	I-10 On Ramp from SR 79	Merge	A	2.6	A	3.6
	I-10 (East of SR 79 Interchange)	Basic	A	3.5	A	4.4
Westbound	I-10 (East of SR 79 Interchange)	Basic	A	3.4	A	4.9
	I-10 Off Ramp to SR 79	Diverge	A	5.6	A	7.5
	I-10 (Between SR 79 Interchange)	Basic	A	2.8	A	3.9
	I-10 On Ramp from SR 79	Merge	A	3.0	A	4.3
	I-10 (West of SR 79 Interchange)	Basic	A	3.4	A	4.4

[1]Density = pc/mi/ln

3.3 Consistency with Master Plans, LRTP, LGCP and DRIs

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

- FDOT Five Year Work Program
- FDOT SIS plans
- State Transportation Improvement Program (STIP)

4.0 NEED

SR 79, a four lane north/south facility within the study area, is an Emerging Strategic Intermodal System (SIS) corridor as well as a designated hurricane evacuation route. In the existing conditions, the ramp terminals operate at a LOS C or better. However, the ramp terminal intersections will not be able to accommodate future traffic if operational improvements are not implemented at the interchange. Traffic conditions are expected to operate below the LOS target C in the Opening and Design Years. In the No Build Alternative, the eastbound ramp terminal is expected to operate at LOS D in 2025 and LOS F in 2045.

Implementation of traffic signals at the SR 79/I-10 ramp terminal intersections is anticipated to provide an acceptable LOS (LOS B or better) at both intersections and reduce intersection delay in the Opening Year 2025 and Design Year 2045.

5.0 FUTURE CONDITIONS

This section documents the future conditions within the study area of influence for the Opening Year 2025 and Design Year 2045 horizons. The operational analysis includes the future year daily and peak hour traffic forecasts for the area of influence.

5.1 Future Transportation Network

The FDOT Five Year Work Program, the SIS Adopted 5-Year Plan, and the State Transportation Improvement Program (STIP) were reviewed to determine whether there were any planned or programmed improvements within the IOAR's area of influence. Based on review of these plans, there are no planned improvements to I-10, or SR 79 within the study area between the existing year and the design year. Therefore, the study area's future roadway network will be the same as the existing condition.

6.0 ALTERNATIVES

This section offers a discussion on the alternatives considered as part of this IOAR, which are as follows:

- No-Build Alternative
- Build Alternative

The alternatives were analyzed to assess their effectiveness in meeting the future travel demand of the area, as well as the physical impacts and safety associated with each alternative.

6.1 Future Year Design Traffic

The SR 79 DTTM included an extensive future growth rate analysis that concluded that the growth rates derived from the NWFRPM were preferred for the study area. The selected growth rate for the project study area for both the No-Build and Build alternatives is 1.0% annually. Opening Year 2025 traffic was derived by interpolating between the Existing Year 2015 traffic volumes and Design Year 2045 traffic volumes.

The future year AADTs for 2025 and 2045 are shown in **Figure 6-1**. The AM and PM peak hour volumes for Opening Year 2025 are presented in **Figure 6-2**. Design Year 2045 peak hour volumes for the No-Build and Build Alternatives are presented in **Figure 6-3.** The future year traffic remains consistent between the No-Build and Build Alternatives since the same growth rate was used for both alternatives.

6.2 No-Build Alternative

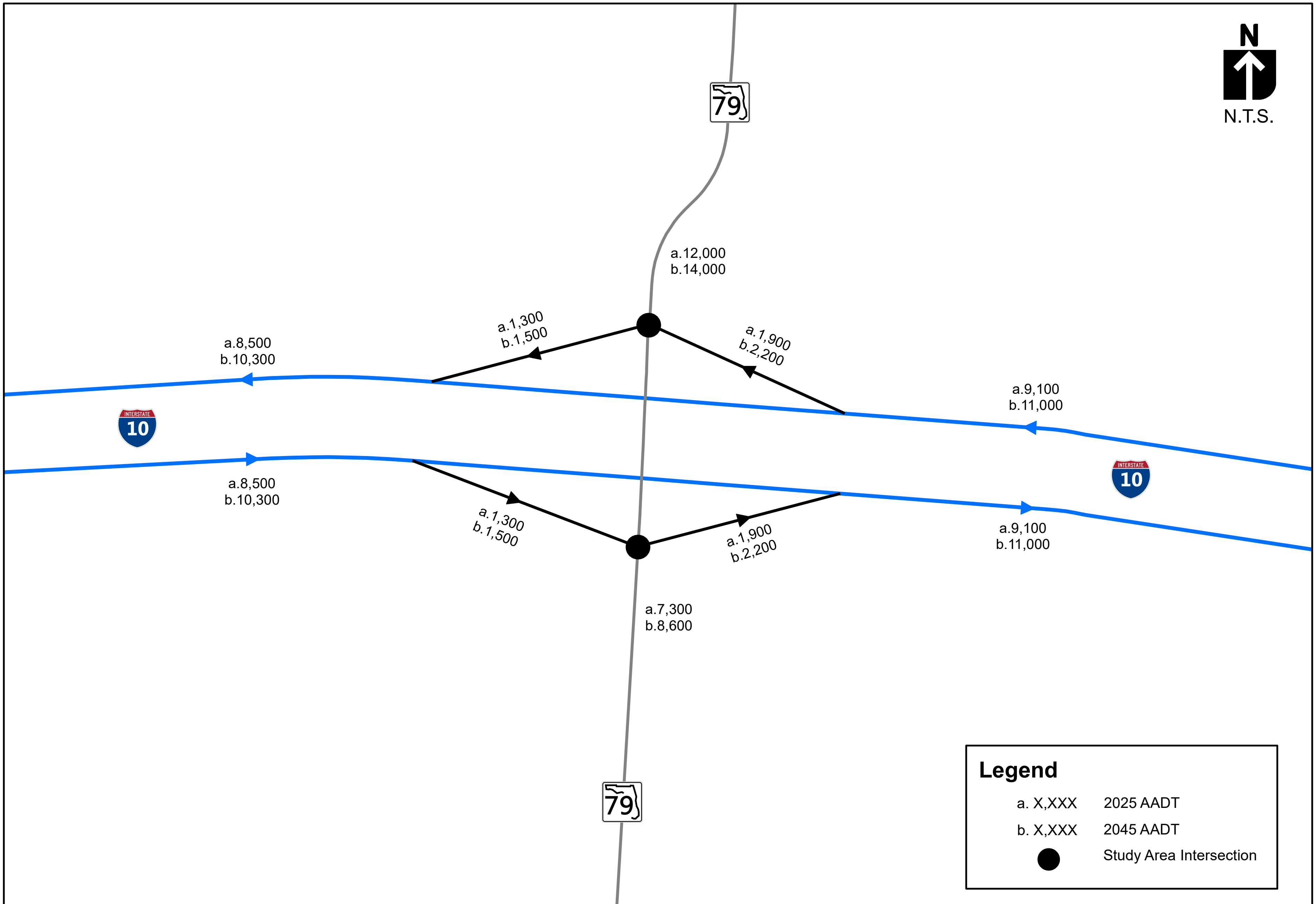
The No-Build Alternative provides a baseline for comparison to all study alternatives. This alternative represents the existing physical and operational conditions within the area of influence in addition to all planned and programmed roadway improvements over the course of the analysis years.

The No-Build Alternative assumes the existing plus committed roadway network improvements that are associated with current and future studies that could potentially add capacity north of the I-10 and SR 79 interchange. With the added capacity being outside the project study area, the No-Build Alternative assumes the existing roadway geometry. It should be noted that the No-Build Alternative does not satisfy the objectives of this project.

6.3 Build Alternative

The Build Alternative implements traffic signals at the I-10 at SR 79 ramp terminal intersections. This intersection treatment is expected to improve safety and operations at the ramp terminal intersections.

The lane configuration remains consistent between the No-Build and Build Alternatives. The lane configuration is shown in **Figure 6-4**.

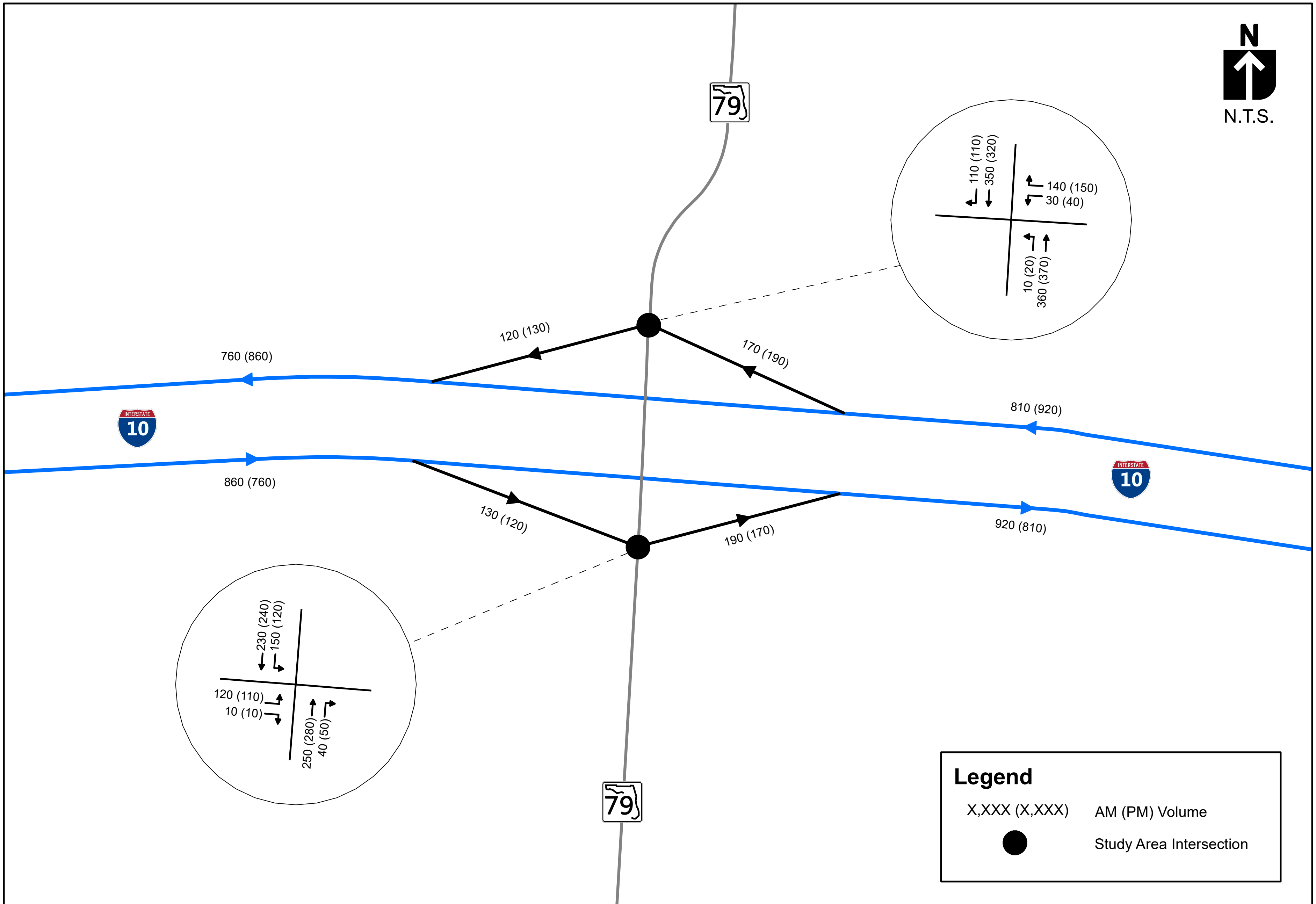


FDOT

SR 79 at I-10 Interchange
Operational Analysis Report (IOAR)

Opening Year 2025 and Future Year 2045
Annual Average Daily Traffic (AADT) Volumes

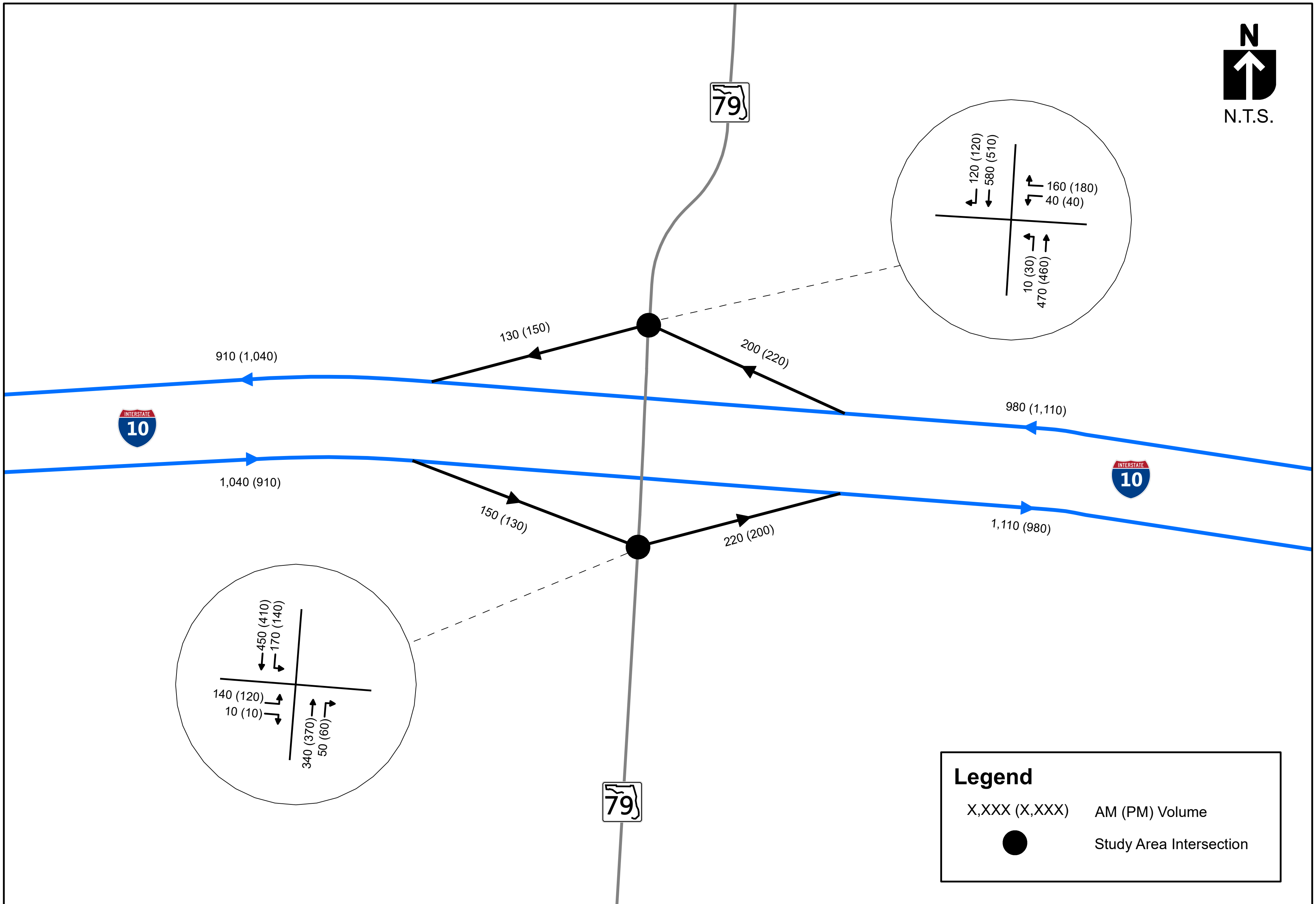
Figure
6-1



SR 79 at I-10 Interchange
Operational Analysis Report (IOAR)

Opening Year 2025
AM (PM) Peak Hour Volumes

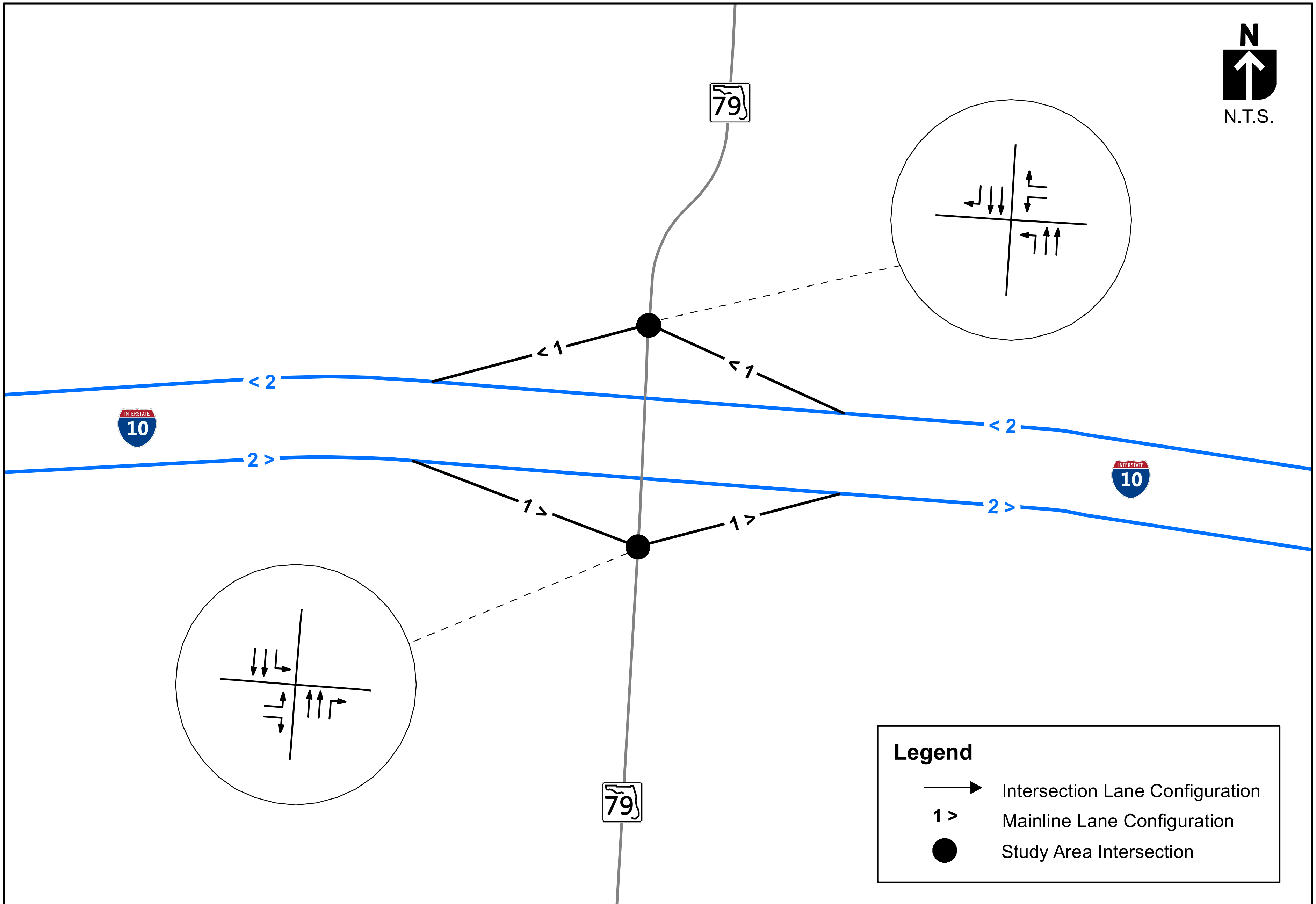
Figure 6-2



SR 79 at I-10 Interchange
Operational Analysis Report (IOAR)

Design Year 2045
AM (PM) Peak Hour Volumes

Figure 6-3



FDOT

SR 79 at I-10 Interchange
Operational Analysis Report (IOAR)

Opening Year 2025 and Design Year 2045
Lane Configuration

Figure
6-4

7.0 EVALUATION OF ALTERNATIVES

7.1 Introduction

This section will discuss the analysis of alternatives based on engineering and safety. The No-Build and Build Alternatives are analyzed and compared in this section. The evaluation criteria include:

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

7.2 Conformance with Local, Regional and State Transportation Plans

This IOAR is consistent with the State Transportation Improvement Program (STIP) and the SIS Plan for the area.

7.3 Compliance with FHWA Requirements

The interchange improvements proposed as part of the Build Alternative documented in this IOAR will be designed to meet all FDOT and FHWA design standards. No design variations or exceptions are expected for the proposed modifications.

7.4 Traffic Operational Performance

A detailed capacity analysis using Synchro 10 and HCS 7 was conducted to evaluate the operational performance of the study interchange and the I-10 mainline and ramp junctions. Synchro and HCS were used to analyze the Opening Year 2025 and Design Year 2045 AM and PM peak hours for the No-Build and Build Alternatives. The primary objective of this analysis was to establish the No-Build and Build operational conditions along the I-10 mainline and at the study intersections. The results of the future year analysis were compared to determine the preferred Alternative for this IOAR.

7.4.1 2025 Operational Analysis

Capacity analysis was performed for the study area intersections and the freeway segments along the I-10 mainline. Intersection delay and LOS were reported for the ramp terminal intersections using Synchro 10. Mainline and ramp LOS and density were reported using HCS 7. **Appendix E** contains the Opening Year 2025 Synchro and HCS reports.

2025 No-Build Alternative

The No-Build Alternative provides a baseline for comparison to the Build Alternative. No changes were made to the project area compared to the existing network. The model forecasted AADTs for the No-Build Alternative resulted in a project annual growth rate of 1%.

The Synchro analysis provided results for intersection LOS and delay for the SR 79/I-10 ramp terminal intersections. The No-Build intersection operational analysis for the 2025 AM and PM peak hours are located in **Table 7-1**. Since the interchange is unsignalized, the movement with the highest delay using HCM 2000 methodology is represented in the table. The movement with the highest delay is the left-turn movement from both I-10 off-ramps.

Table 7-1 2025 No-Build Intersection Delay and LOS[1]

Location	AM		PM	
	Delay	LOS	Delay	LOS
I-10 EB Ramp Terminal	26.1	D	22.4	C
I-10 WB Ramp Terminal	11.4	B	11.8	B

[1]Delay (seconds/vehicle) and LOS represents movement with the highest delay utilizing HCM 2000 methodology

For the AM peak hour, the results of the analysis show that the westbound ramp terminal operates at a LOS B in the No-Build Alternative for the Opening Year 2025, but the eastbound ramp terminal does not meet the LOS target of C for a rural area.

For the PM peak hour, the results of the analysis show that both study intersections operate at a LOS C or better.

The queue analysis for the study intersections is shown in **Table 7-2**, which shows the available storage provided compared to the 95% queue (ft) as reported in Synchro. The available storage is calculated to include the storage lanes for each respective turning movement. The eastbound left (EBL) and westbound left (WBL) available storage for the ramp terminals represents the length of the ramp, including the storage bay, minus the deceleration length of 730 ft – 70 mph to a stop condition. In all cases, the provided available storage length is not exceeded by the 95% queue length.

Table 7-2 2025 No-Build Intersection Queues

Intersection	Movement	Available Storage (ft)	AM Queue (ft)	PM Queue (ft)
I-10 EB Ramp Terminal	NBR	400	0	0
	SBL	300	11	9
	EBL	870[1]	56	44
I-10 WB Ramp Terminal	NBL	275	1	1
	SBR	500	0	0
	WBL	870[1]	17	19

[1]Available storage represents the length of the ramp, including the storage bay, minus the deceleration length of 730 ft – 70 mph to a stop condition (2019 FDM Table 211.10.2).

The freeway facility module of HCS 7 was used to analyze the freeway segments along the I-10 mainline for the No-Build Alternative. The HCS results are summarized in **Table 7-3** which show the peak-hour LOS for each segment in both the eastbound and westbound directions. The analysis indicates that all study roadway segments operate at LOS B or better in the No-Build Alternative for both the AM and PM peak hours.

Table 7-3 2025 No-Build Freeway LOS and Density

Direction	Segment	Type	AM		PM	
			LOS	Density	LOS	Density
Eastbound	I-10 (West of SR 79 Interchange)	Basic	A	7.4	A	6.6
	I-10 Off Ramp to SR 79	Diverge	B	11.1	A	10.0
	I-10 (Between SR 79 Interchange)	Basic	A	6.3	A	5.5
	I-10 On Ramp from SR 79	Merge	A	7.5	A	6.5
	I-10 (East of SR 79 Interchange)	Basic	A	7.9	A	7.0
Westbound	I-10 (East of SR 79 Interchange)	Basic	A	7.0	A	7.9
	I-10 Off Ramp to SR 79	Diverge	B	10.1	B	11.3
	I-10 (Between SR 79 Interchange)	Basic	A	5.5	A	6.3
	I-10 On Ramp from SR 79	Merge	A	6.6	A	7.6
	I-10 (West of SR 79 Interchange)	Basic	A	6.6	A	7.4

[1]Density = pc/mi/ln

2025 Build Alternative

Compared to the No-Build network, the Build network implements signalized intersections at the SR 79/I-10 interchange. Similar to the No-Build Alternative, the forecasted AADTs for the Build Alternative resulted in a project annual growth rate of 1%. Therefore the same traffic was utilized for the Build Alternative analysis as the No-Build Alternative analysis.

The Synchro analysis provided results for overall intersection LOS and delay for the SR 79/I-10 ramp terminal intersections. The Build intersection operational analysis for 2025 AM and PM peak hours utilized Synchro methodology and are located in **Table 7-4**.

Table 7-4 2025 Build Intersection Delay and LOS[1]

Location	AM		PM	
	Delay	LOS	Delay	LOS
I-10 EB Ramp Terminal	10.0	A	9.6	A
I-10 WB Ramp Terminal	2.7	A	2.9	A

[1]Delay (seconds/vehicle) and LOS represents overall intersection results utilizing Synchro methodology

The results of the analysis show that all study intersections operate at a LOS A in the Build Alternative for both peak hours in the Opening Year 2025.

The queue analysis for the study intersections is shown in **Table 7-5**, which shows the available storage provided compared to the 95% queue (ft) as reported in Synchro. The available storage is calculated to include the storage lanes for each respective turning movement. The eastbound left (EBL) and westbound left (WBL) available storage for the ramp terminals represents the length of the ramp, including the storage bay, minus the deceleration length of 730 ft – 70 mph to a stop condition. In all cases, the provided available storage length is not exceeded by the 95% queue length.

Table 7-5 2025 Build Intersection Queues

Intersection	Movement	Available Storage (ft)	AM Queue (ft)	PM Queue (ft)
I-10 EB Ramp Terminal	NBR	400	0	0
	SBL	300	9	11
	EBL	870[1]	84	78
I-10 WB Ramp Terminal	NBL	275	m0[2]	m0[2]
	SBR	500	0	9
	WBL	870[1]	32	38

[1]Available storage represents the length of the ramp, including the storage bay, minus the deceleration length of 730 ft – 70 mph to a stop condition (2019 FDM Table 211.10.2).
[2]m – Queue is metered by the upstream intersection

Similar to the No-Build analysis, the freeway facility module of HCS 7 was used to analyze the freeway segments along the I-10 mainline for the Build Alternative. The Build Alternative HCS results are identical to the No-Build Alternative HCS results, however, the results are summarized in **Table 7-6**. The analysis indicates that all study roadway segments operate at LOS B or better.

Table 7-6 2025 Build Freeway LOS and Density

Direction	Segment	Type	AM		PM	
			LOS	Density[1]	LOS	Density[1]
Eastbound	I-10 (West of SR 79 Interchange)	Basic	A	7.4	A	6.6
	I-10 Off Ramp to SR 79	Diverge	B	11.1	A	10.0
	I-10 (Between SR 79 Interchange)	Basic	A	6.3	A	5.5
	I-10 On Ramp from SR 79	Merge	A	7.5	A	6.5
	I-10 (East of SR 79 Interchange)	Basic	A	7.9	A	7.0
Westbound	I-10 (East of SR 79 Interchange)	Basic	A	7.0	A	7.9
	I-10 Off Ramp to SR 79	Diverge	B	10.1	B	11.3
	I-10 (Between SR 79 Interchange)	Basic	A	5.5	A	6.3
	I-10 On Ramp from SR 79	Merge	A	6.6	A	7.6
	I-10 (West of SR 79 Interchange)	Basic	A	6.6	A	7.4

[1]Density = pc/mi/ln

7.4.2 2045 Operational Analysis

Similar to Opening Year 2025, capacity analysis was performed for the study area intersections and the freeway segments along the I-10 mainline for Design Year 2045. Intersection delay and LOS were reported for the ramp terminal intersections using Synchro 10. Mainline and ramp LOS and delay were reported using HCS 7. **Appendix F** contains the Design Year 2045 Synchro and HCS reports.

2045 No-Build Alternative

The No-Build Alternative provides a baseline for comparison to the Build Alternative. No changes were made to the project area compared to the existing network. The forecasted AADTs for the No-Build Alternative resulted in a project annual growth rate of 1%.

The Synchro analysis provided results for intersection LOS and delay for SR 79/I-10 ramp terminal intersections. The No-Build intersection operational analysis for 2045 AM and PM peak hours can be found in **Table 7-7.** Since the interchange is unsignalized, the movement with the highest delay using HCM 2000 methodology is represented in the table. The movement with the highest delay is the left-turn movement from both I-10 off-ramps.

Table 7-7 2045 No-Build Intersection Delay and LOS[1]

Location	AM		PM	
	Delay	LOS	Delay	LOS
I-10 EB Ramp Terminal	107.9	F	52.8	F
I-10 WB Ramp Terminal	13.5	B	13.5	B

[1]Delay (seconds/vehicle) and LOS represents movement with the highest delay utilizing HCM 2000 methodology

The results of the analysis show that the westbound ramp terminal operates at a LOS B in the No-Build Alternative for the Design Year in both the AM and PM peak hours. However, the eastbound ramp terminal operates at LOS F in both the AM and PM peak hours. Thus, this study intersection does not meet the LOS target of C for a rural area.

The queue analysis for the study intersections is shown in **Table 7-8**, which shows the available storage provided compared to the 95% queue (ft) as reported in Synchro. The available storage is calculated to include the storage lanes for each respective turning movement. The eastbound left (EBL) and westbound left (WBL) available storage for the ramp terminals represents the length of the ramp, including the storage bay, minus the deceleration length of 730 ft – 70 mph to a stop condition. In all cases, the provided available storage length is not exceeded by the 95% queue length.

Table 7-8 2045 No-Build Intersection Queues

Intersection	Movement	Available Storage (ft)	AM Queue (ft)	PM Queue (ft)
I-10 EB Ramp Terminal	NBR	400	0	0
	SBL	300	14	11
	EBL	870[1]	183	106
I-10 WB Ramp Terminal	NBL	275	1	3
	SBR	500	0	0
	WBL	870[1]	23	26

[1]Available storage represents the length of the ramp, including the storage bay, minus the deceleration length of 730 ft – 70 mph to a stop condition (2019 FDM Table 211.10.2).

Using the freeway facility module of HCS 7, freeway segments along the I-10 mainline for the No-Build Alternative were analyzed. The HCS results are summarized in **Table 7-9** which shows the peak hour LOS and density for each segment in both the eastbound and westbound directions. The analysis indicates that all study roadway segments operate at LOS B or better in the No-Build Alternative.

Table 7-9 2045 No-Build Freeway Delay and LOS

Direction	Segment	Type	AM		PM	
			LOS	Density	LOS	Density
Eastbound	I-10 (West of SR 79 Interchange)	Basic	A	9.0	A	7.8
	I-10 Off Ramp to SR 79	Diverge	B	13.1	B	11.6
	I-10 (Between SR 79 Interchange)	Basic	A	7.7	A	6.7
	I-10 On Ramp from SR 79	Merge	A	9.3	A	8.1
	I-10 (East of SR 79 Interchange)	Basic	A	9.6	A	8.5
Westbound	I-10 (East of SR 79 Interchange)	Basic	A	8.5	A	9.6
	I-10 Off Ramp to SR 79	Diverge	B	12.0	B	13.4
	I-10 (Between SR 79 Interchange)	Basic	A	6.7	A	7.7
	I-10 On Ramp from SR 79	Merge	A	8.1	A	9.3
	I-10 (West of SR 79 Interchange)	Basic	A	7.8	A	9.0

[1]Density = pc/mi/ln

2045 Build Alternative

Similar to the 2025 Build Alternative, the 2045 Build network implements signalized intersections at the I-10 and SR 79 ramp terminals. The model forecasted AADTs for the Build Alternatives resulted in a project annual growth rate of 1%. Therefore, the same traffic was utilized for the Build Alternative analysis as the No-Build Alternative analysis.

The Synchro analysis provided results for overall intersection LOS and delay for the SR 79/I-10 ramp terminal intersections. The Build intersection operational analysis for 2045 AM and PM peak hours utilized Synchro methodology and can be found in **Table 7-10**.

Table 7-10 2045 Build Intersection Delay and LOS[1]

Location	AM		PM	
	Delay	LOS	Delay	LOS
I-10 EB Ramp Terminal	10.9	B	9.6	A
I-10 WB Ramp Terminal	3.7	A	4.5	A

[1]Delay (seconds/vehicle) and LOS represents overall intersection results utilizing Synchro methodology

The results of the analysis show that all study intersections operate at a LOS B or better in the Build Alternative for Design Year 2045 for both AM and PM peak hours. While the signals change the north/south approaches of the terminal intersections from a free condition to a signalized condition, these approaches also operate at LOS B or better for Design Year 2045. The eastbound approach at the eastbound ramp terminal operates at LOS D in the AM and PM peak due to approach volumes that cause the phase to gap out. Signal timings refined during implementation could produce improved operations for the approach.

The queue analysis for the study intersections is shown in **Table 7-11**, which shows the available storage provided compared to the 95% queue (ft) as reported in Synchro. The available storage is calculated to include the storage lanes for each respective turning movement. The eastbound left (EBL) and westbound left (WBL) available storage for the ramp terminals represents the length of the ramp, including the storage bay, minus the deceleration length of 730 ft – 70 mph to a stop condition. In all cases, the provided available storage length is not exceeded by the 95% queue length.

Table 7-11 2045 Build Intersection Queues

Intersection	Movement	Available Storage (ft)	AM Queue (ft)	PM Queue (ft)
I-10 EB Ramp Terminal	NBR	400	0	2
	SBL	300	12	4
	EBL	870[1]	135	120
I-10 WB Ramp Terminal	NBL	275	m4[2]	8
	SBR	500	21	22
	WBL	870[1]	54	54

[1]Available storage represents the length of the ramp, including the storage bay, minus the deceleration length of 730 ft – 70 mph to a stop condition (2019 FDM Table 211.10.2).
[2]m – Queue is metered by upstream intersection

In order to analyze the freeway segments along the I-10 mainline, the freeway facility module of HCS 7 was used. The Build Alternative HCS results are identical to the No-Build Alternative HCS results, however, the results are summarized in **Table 7-12**. The analysis indicates that all study roadway segments operate at LOS B or better.

Table 7-12 2045 Build Freeway Delay and LOS

Direction	Segment	Type	AM		PM	
			LOS	Density[1]	LOS	Density[1]
Eastbound	I-10 (West of SR 79 Interchange)	Basic	A	9.0	A	7.8
	I-10 Off Ramp to SR 79	Diverge	B	13.1	B	11.6
	I-10 (Between SR 79 Interchange)	Basic	A	7.7	A	6.7
	I-10 On Ramp from SR 79	Merge	A	9.3	A	8.1
	I-10 (East of SR 79 Interchange)	Basic	A	9.6	A	8.5
Westbound	I-10 (East of SR 79 Interchange)	Basic	A	8.5	A	9.6
	I-10 Off Ramp to SR 79	Diverge	B	12.0	B	13.4
	I-10 (Between SR 79 Interchange)	Basic	A	6.7	A	7.7
	I-10 On Ramp from SR 79	Merge	A	8.1	A	9.3
	I-10 (West of SR 79 Interchange)	Basic	A	7.8	A	9.0

[1]Density = pc/mi/ln

7.5 Alternatives Safety Analysis

The AASHTO Highway Safety Manual (HSM) methodology was used to compare the observed crashes to the predicted crashes of the Build Alternative. The locations analyzed were along the SR 79 facility within a 250 foot radius of the I-10 ramp terminal intersections which is considered to be the intersection area of influence. The intersection influence areas experienced a total of 4 crashes. The locations analyzed have the same geometry between No-Build and Build Alternatives with an intersection treatment of installing a traffic signal at the ramp terminal intersections.

Crash Modification Factors (CMFs) are applied to the observed crash frequency in order to estimate the predicted crashes for the Build Alternative. According to Table 14-7 in the HSM, the CMFs for installing a traffic signal on a rural minor road are applied based on the following crash types and severities:

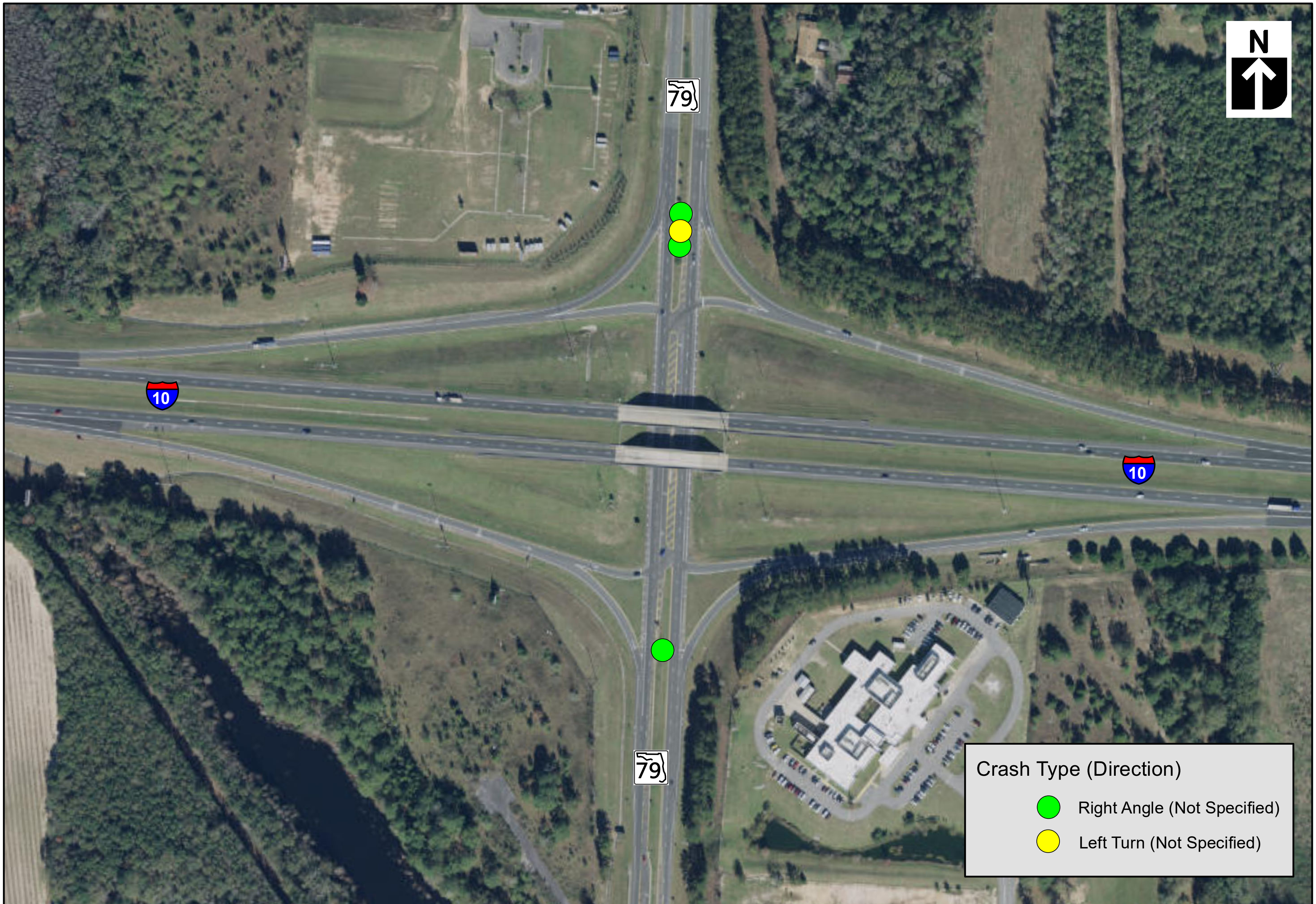
- All Types (All severities)
- Right Angle (All severities)
- Left Turn (All severities)
- Rear End (All severities)

The CMFs listed in **Table 7-13** are applied to the observed crash frequency by crash type to determine the effectiveness of the alternative and determine the reduction in crashes. **Table 7-13** also contains the total observed crashes and total predicted crashes for the Build Alternative for each applicable crash type separated by intersection location. As indicated by the CMF values, the installation of a traffic signal decreases the number of right angle and left turn crashes while increasing the number of rear end crashes. Introducing signalized protected left turn phases provides safer conditions for vehicles traveling to and from the off ramps. Vehicles traveling on the major road, SR 79, now have to stop for these protected left turn phases which introduces the increased probability of the occurrence of rear end crashes. However, zero rear end crashes were observed in the 5 years of crash data. **Figure 7-1** displays the crash types analyzed with respect to their geographical location. **Appendix G** contains the HSM analysis summary.

Table 7-13 Total Predicted Crashes (per year)

Crash Type	Observed Crash Frequency (Crashes/Year)		*CMF*[1]	Build Alternative Predicted Crash Frequency (Crashes/Year)		Total Reduction in Crashes
	Eastbound Terminal	Westbound Terminal		Eastbound Terminal	Westbound Terminal	
Rear End	0	0	*1.58*	0	0	0.00
Right Angle	0.2	0.4	*0.23*	0.05	0.09	-0.31
Left Turn	0	0.2	*0.4*	0	0.08	-0.12
Other	0	0	*0.56*	0	0	0.00
Total Predicted Crashes	**0.8**		**-**	**0.22**		**-0.58**

[1]Italic text is used to show the information obtained from the Highway Safety Manual Table 14-7



FDOT

SR 79 at I-10 Interchange Operational Analysis Report (IOAR)

Intersection Influence Area Crashes (2011-2015)

Figure 7-1

The crash data evaluated in Section 3.2.2 showed that there are high crash locations within the study area defined as locations in which the segment actual crash rate exceeds the statewide average crash rate for similar facilities. SR 79 is a high crash location for years 2013-2015. The number of crashes on this 1 mile segment are 5 crashes, 3 crashes, and 7 crashes for 2013, 2014, and 2015, respectively, for a total of 15 crashes. Only four of the total 15 crashes on the SR 79 segment are located within the intersection area of influence, a 250 foot radius.

In regards to the four crashes that are located within the intersection area of influence, right angle crashes were the most common type of crash accounting for 75% of total crashes. These primarily occur due to vehicles approaching the intersection at a perpendicular angle and colliding due to one vehicle's failure to stop or yield. The intersection area of influence also had 1 left turn crash accounting for 25% of total crashes.

The Build Alternative is expected to reduce the 0.8 observed crashes per year by 0.58 crashes per year, a 73% reduction. The signal implementation will reduce both right angle and left turn crashes since both are attributed to failure to stop in the event of an opposing vehicle. For these reasons, the Build Alternative is expected to provide safety enhancements over the No-Build, which is upheld by the results of the HSM-based safety analysis discussed above.

7.6 Recommended Alternative

The No-Build Alternative will not be able to accommodate the future travel needs within the study area. The analysis presented in this IOAR shows that the Build Alternative provides acceptable operations within the study area through the Design Year 2045. This report supports the conclusion that the installation of traffic signals at the study interchange will benefit the safety and operations of the study area.

The Design Year 2045 operational analysis results show that the SR 79/I-10 interchange performs significantly better under the Build Alternative. The No-Build Alternative operates at LOS F at the eastbound ramp terminal during both peak hours in Design Year 2045. The Build Alternative provided substantial operational improvements at the interchange with both intersections in Design Year 2045 operating at LOS B or better. In terms of safety, the HSM-based analysis shows that the Build Alternative is expected to reduce facility crashes by 0.58 crashes per year, which is a reduction of approximately 73%.

Based on safety and traffic operational benefits, the Build Alternative is considered the preferred alternative for this IOAR.

8.0 JUSTIFICATION FOR PROJECT

The proposed installation of traffic signals in the Build Alternative provide significant improvements in traffic operations and enhance safety within the area of influence through the Design Year 2045.

8.1 Compliance with FHWA General Requirements

The following requirements serve as the primary decision criteria used in approval of interchange modification projects. Responses to the two FHWA policy points are provided to show that the proposed project is viable based on the analysis performed to date.

8.1.1 The request does not have a significant adverse impact on the safety and operation of the freeway system

An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis shall, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (23 CFR 625.2(a), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, shall 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 must 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 must also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d), and 23 CFR 655.603(d)).

The Build Alternative is expected to reduce the observed crashes at the intersection influence area, a radius of 250 feet around each ramp terminal, by 73% with the installation of a traffic signal at the ramp terminals of the SR 79 at I-10 interchange. This signal implementation will reduce both right angle and left turn crashes since both are attributed to failure to stop at an intersection in the event of an opposing vehicle. From 2011-2015, four crashes were located within the intersection area of influence with right angle crashes being the most common type of crash accounting for 75% of total crashes. The intersection area of influence also had 1 left turn crash accounting for 25% of total crashes. The Build Alternative is expected to provide safety enhancements over the No-Build, which is upheld by the results of the HSM-based safety analysis discussed in Section 7.5.

The Design Year 2045 operational analysis results show that the Build Alternative provides significantly better traffic operations within the SR 79/I-10 study area compared to the No-Build.

During the 2045 AM and PM peak, the No-Build Alternative exhibits operational failure (LOS F) at the eastbound ramp terminal. The current stop controlled ramp movement cannot accommodate the future Design Year demand. During both peak hours, the implementation of a signal at the stop controlled ramp junctions is expected to alleviate the operational issues at the SR 79/I-10 interchange and provide overall intersection LOS of B or better at both ramp terminals.

The Build Alternative is expected to improve the safety and operations of the SR 79 at I-10 interchange in both the Opening Year 2025 and Design Year 2045.

8.1.2 The proposed access connects to a public road only and will provide for all traffic movements

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.

The proposed operational improvements will maintain current access for all traffic movements for the project interchange. The current diamond interchange configuration will be maintained while the control for the ramp terminal intersections will be changed from stop control to signalized control.

9.0 CONCEPTUAL FUNDING PLAN/CONSTRUCTION SCHEDULE

Funding for this IOAR was available through the FDOT District 3. The design phase identified in the PD&E for SR 79 from north of I-10 to north of CR 177 is currently funded in the FDOT Work Program in 2021. The right-of-way phase is funded in years 2025, 2026, and 2027. The construction phase is not yet programmed.

Table 9-1 Five Year Work Program Funding Plan

Description	Phase Name	2020	2021	2022	2023	2024
SR 79 WAUKESHA ST FROM NORTH OF SR 8 (1-10) TO SR 10 (US 90)	Preliminary Engineering	0.00	$1,815,000.00	0.00	0.00	0.00

The cost of installing each signal is approximately $164,000 totaling in approximately $328,000 for the project. Appendix H contains the cost breakdown per intersection.