MASTER PLAN REPORT

I-95 Managed Lanes Master Plan
From South of Linton Boulevard to Palm Beach/Martin County Line
Palm Beach County, Florida

Contract No.: C9O65
Financial Management No.: 436576-1-22-01
FAP Project No.: Not Assigned

Prepared for:
Florida Department of Transportation
District 4
3400 West Commercial Boulevard
Fort Lauderdale, Florida 33309

Prepared by:
AECOM Technical Services, Inc.
7650 Corporate Center Drive
Suite 400
Miami, Florida 33126

March 2019

Interstate 95 / SR 9 Managed Lanes Master Plan

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Project Summary

1.0 *Summary of Project*

1.1 *Project Purpose and Description*

The Florida Department of Transportation (FDOT) District Four conducted a Master Plan Study, hereafter referred to as the Plan, for the I-95 Corridor from South of Linton Boulevard (MP 7.5) to the Palm Beach/Martin County Line (MP 45), a distance approximately 37.5 miles, in Palm Beach County, Florida. The primary purpose of the study is to identify long-term capacity needs along the I-95 mainline and develop managed lanes design concepts to address any segments identified along the Corridor as operating below the Level of Service target adopted for this facility as part of the Strategic Intermodal System (SIS) designation. **Figure 1.1** depicts the project location and study limits for the Plan.

The Plan is a compilation of recommendations with phased implementation to bring the corridor into compliance with the SIS Standards of the Department, optimize system performance, and travel time reliability as well as to analyze alternatives and identify interim improvements to provide congestion relief within the corridor until completion of the long-term improvements. The recommendations will support scheduling for future Project Development and Environment (PD&E) studies, design projects, and/or construction projects, as necessary.

The Plan has been developed to meet the following objectives:

1. A comprehensive analysis identifying traffic operational deficiencies along the I-95 mainline from South of Linton Boulevard interchange through the Indiantown Road interchange, along with the timeframes(s) when improvements are needed.

2. Develop an ultimate capacity improvement plan for the corridor using traffic demand management and transit techniques to improve reliability and flow of traffic along the Corridor. The need for, type of, and cost of improvements is defined in the Plan. The following alternatives were analyzed as part of the Plan:

   Alternative A - Convert the existing High Occupancy Vehicle (HOV) lane to a managed lane while maintaining the existing number of general use lanes. Separation treatment: Buffered separation with tubular delineators.

   Alternative B - Convert the existing High Occupancy Vehicle (HOV) lane to a managed lane and adding a second managed lane while maintaining the existing number of general use lanes. Separation treatment: Buffered separation with tubular delineators.

   Alternative C - Convert the existing High Occupancy Vehicle (HOV) lane to a managed lane and adding a second managed lane while maintaining the existing number of general use lanes. Separation treatment: Concrete barrier separation between managed lanes and general use lanes with standard FDOT shoulder widths.

3. Compare design constraints, benefits, construction costs, right-of-way impacts and external stakeholder support and recommend a concept for further evaluation during a PD&E study or for design and construction.

4. Define an implementation plan for the corridor including the timing and sequencing of improvements, and any right-of-way acquisition requirements.

In summary, the Plan evaluated the following alternatives for the corridor:

Alternative A – One Managed Lane (buffered separated with delineators) in each direction
Alternative B – Two Managed Lanes (buffered separated with delineators) in each direction

- Alternative B1 – Two Managed Lanes corridor wide except the segment between SR 80/Southern Boulevard and Okeechobee Boulevard which implements one managed lane in each direction. The following access point options were evaluated under this condition:
  - 2012 I-95 Corridor Planning Study (CPS) Access Points
  - Recommended access points factoring Origin-Destination (OD) patterns, travel demand, design feasibility, and operations analysis.
- Alternative B2 – Two Managed Lanes Corridor wide from south of Linton Boulevard to Palm Beach/Martin County Line with the recommended access points factoring Origin-Destination (OD) patterns, travel demand, design feasibility, and operations analysis. Alternative B2 evaluated the following direct managed lanes connections to/from SR 80/Southern Boulevard alternatives.

- Direct connection from I-95 NB off-ramp to WB SR 80 and EB SR 80 to NB I-95 on-ramp.
- Median-to-Median direct connection from NB I-95 managed lanes to WB SR 80 and EB SR 80 to NB I-95 managed lanes. This option evaluated the following interchange configurations:
    1. Median-to-Median direct connections for movements above while providing standard lane and shoulder widths along I-95. This configuration would require construction of a new segmental bridge for the NB I-95 on-ramp from SR 80 adjacent to the existing segmental bridge for constructability purposes. This introduces right of way impacts to the northeast quadrant of the interchange.
    2. The same premise as the previous configuration, however, to avoid additional right of way impacts on the NE quadrant of the interchange, this configuration proposes to relocate the Belvedere Road NB off-ramp to the south of SR 80 which would diverge from the mainline into a depressed section under SR 80 and eventually tie into the existing Belvedere Road off-ramp terminal. The existing segmental bridge would still require being demolished but a new bridge will not be needed to accommodate NB on-ramp movement from SR 80.
    3. Similar to the first configuration discussed above, however, this interchange configuration introduces an opportunity to accommodate a direct connection from EB SR 80 to SB I-95 managed lanes.
- Median-to-Median direct connections from all approaches of I-95 and SR 80.

Alternative C – Two Managed Lanes (concrete barrier wall with full standard shoulder separation) in each direction.

The Plan was compiled to result in two documents:

1. Master Plan Technical Document, a companion document to this report. The Master Plan Technical Document provides the study findings and results. The document contains the following elements:
    - Traffic Forecasting and Analysis
    - Facility Enhancement Element
    - Facility Operations and Preservation Element
    - Environmental Element
2. Master Plan Report summarizes the findings and results from the Master Plan Technical Document.

Figure 1.1: Master Plan Location Map

1.2 *Project Development Process*

The project development and delivery process begin with planning studies and ends with a constructed project. The FDOT project development process is a comprehensive process involving: Planning, Project Development and Environment (PD&E), Design, Right of Way (ROW), and Construction phases. A project begins with the identification of transportation needs or deficiencies through a planning process that prioritizes short and long-range transportation improvements. Various studies can be performed during the Planning phase to define or refine project parameters; establish the purpose and need for the project; determine funding needs; identify alternatives, including alternative mode(s); and define the concept and scope of transportation improvement, including general location of the proposed improvement. Planning studies inform the development of the scope of work for PD&E studies. The Department's project development process supports the FDOT Statewide Acceleration Transformation (SWAT) process, which streamlines project development by following a structured process to develop project scopes and schedules; reducing duplicative work; performing initial data collection and analysis ahead of a PD&E study, as applicable; and performing design activities throughout the project before it is constructed. **Figure 1.2** shows the Department's project development and delivery process, along with the building blocks of each phase. The Plan was executed during the Planning phase of the project development and delivery process. The duration of the Planning phase is approximately 2 years, but time may vary on a project by project basis.

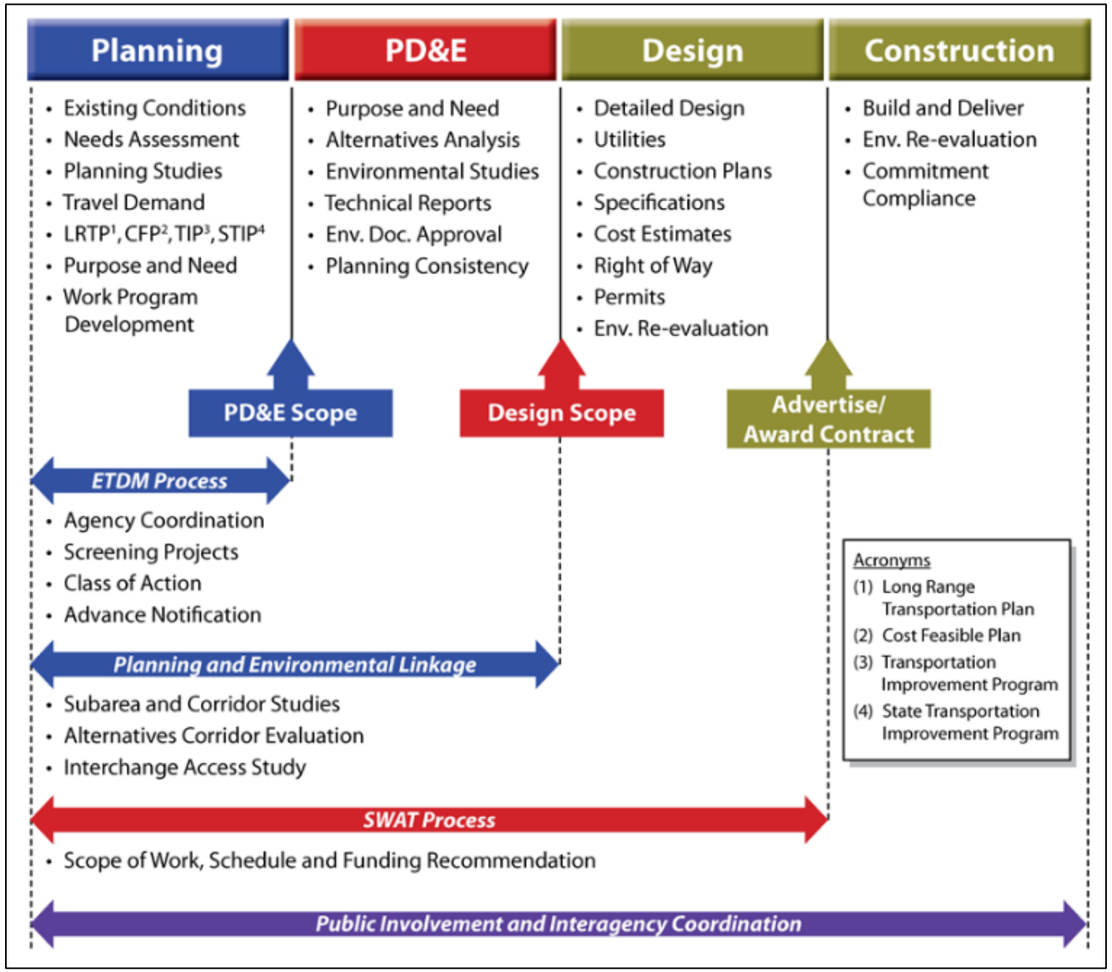


Figure 1.2: Project Development and Delivery Process

1.3 *Existing Corridor Conditions*

Within the study limits, I-95 is a ten-lane divided limited access facility. The posted speed is 65 MPH and the design speed 70 MPH for the corridor. The access management classification for the majority of the corridor is Access Class 1 (Area Type 1 – Central Business District (CBD) & CBD Fringe For Cities In Urbanized Areas) and approaching Martin County, the corridor is classified as Access Class 1 (Area Type 3 – Transitioning Urbanized Areas or Urban Areas Other Than Area Type 1 or 2). The existing roadway typical section varies but primarily consists of the following in each direction: a 12-foot (12') wide High Occupancy Vehicle (HOV) lane, four 12-foot (12') wide general use lanes (GUL), four-foot (4') wide buffer pavement striping separating the GUL from the HOV lanes, 15-foot (15') wide paved inside shoulders, 12-foot (12') wide outside shoulders (ten-foot (10') paved and two-foot (2') unpaved), or 10 to 12-foot (10'-12') wide paved shoulders (depending on the type roadside condition), and a 12-foot (12') wide auxiliary lanes at various locations. A two-foot (2') wide concrete barrier wall, double face guardrail, or open ditch varies along the centerline of I-95. The existing Limited Access Right-of-Way (LA R/W) width along I-95 mainline varies from 242 feet to 638 feet. The existing lighting along the corridor consists of conventional cobra head light fixtures mounted on standard aluminum poles. There is a total of 45 identified drainage basins throughout the corridor. Approximately, there are a total of 25 miles of existing noise walls along the corridor (15 miles in the northbound direction and 10 miles in the southbound direction). There is a total of 101 existing bridges identified within the study limits of the corridor. A total of 47 utility agencies and owners (UAOs) were identified within the corridor study limits.

For additional details, refer to the **Master Plan Technical Document**, a companion document to this report.

Summary of Technical Document

2.0 *Summary of Technical Document*

The following is a summary of all sections of the Technical Document. Important data findings, analyses, alternatives considered, and recommendations are discussed in this section.

2.1 *Traffic Forecasting and Analysis Memorandum*

The Master Plan team gathered the existing traffic conditions within the study area and provided a basis for the future traffic analysis. The Plan developed AADTs, and AM/PM peak hour design traffic volumes for the corridor. The existing year for this study is 2015 and the design year is 2040. The opening year will be determined in coordination with the Department, based on the project needs, availability of funds, and coordination with other studies in the region.

The purpose of this memorandum was to document the following traffic efforts:

- Traffic Data Collection – Documents the traffic counts compilation, process and locations. It also documents the origin-destination (O-D) survey expansion, existing field conditions and other operational information along the corridor.
- Existing and Future Travel Demand – Documents the travel demand modeling methodologies, process, approach and analysis standards. The objective of this documentation is to clearly describe the model calibration methods specific to the study, model forecasting procedures and modeling results.
- Volume Development – Documents the travel demand forecast for the study area, data analysis and calculation of the study area volumes and origin-destination matrices.
- Market Study Analysis and Access Points Determination – Summarizes the results of these efforts and assists in the screening and selection of a preferred corridor alternative.
- No-Build Operational Analysis – Presents the traffic analysis of the existing conditions and No-Build Alternative.

The area of influence for this study is the I-95 corridor from south of Linton Boulevard to north of Indiantown Road. The area of influence will include only the I-95 mainline and interchange ramps.

2.1.1 *Traffic Data Collection*

Traffic data was gathered and collected to evaluate the existing traffic conditions within the study area and provide a basis for the future traffic analysis. Acyclica WIFI equipment was deployed in this study to capture vehicle O-D patterns by detecting anonymous MAC addresses. This wireless identification number is used to connect WIFI technologies between mobile devices and vehicles. The following information was gathered and collected within the study area:

- 2014 and 2015 traffic volumes from the Florida Traffic Information (FTI) database
- 2016 48-hour arterial counts at each arterial interchange crossing (east and west of I-95)
- Volumes from other projects/studies along the corridor
- Origin and Destination Data
- Traffic field observations

For additional details, refer to **Section 3.0** of the **Master Plan Technical Document**.

2.1.2 *Origin and Destination Data Expansion*

Origin-destination matrices were expanded to match the existing traffic counts collected/gathered as part of this study. CUBE Analyst was used to expand the origin/destination matrices. A 2015 network was developed by closely comparing the study area network against aerial images. The 2014/2015 traffic counts were coded to the network at all the O-D stations. An exclusive CUBE Analyst Drive application was developed for this purpose. The process involved a feedback of matrix estimation and highway assignment. Multiple iterations of the feedback loop were performed until satisfactory Root Mean Square Error (RMSE) results are obtained. An RMSE of 10% or less is suitable for the tight subarea used in the expansion process.

Average trip length statistics was monitored for the O-D sample and the O-D expanded matrices. The O-D expansion was performed separately for each time period and a final daily vehicle matrix was developed. Reasonableness checks were conducted on the period matrices and the daily matrix to ensure the matrices reflect expected travel patterns.

For additional details, refer to **Section 3.7** of the **Master Plan Technical Document**.

2.1.3 *Travel Demand Forecasting*

2.1.3.1 *Existing and Future Travel Demand*

SERPM 7.062 was selected to develop traffic forecasts for this planning study. SERPM model is based on the Coordinated Travel Regional Activity-Based Modeling Platform (CT-RAMP) family of Activity-Based Models (ABM). The SERPM7 model was used to develop the recent 2040 Long Range Transportation Plan (LRTP) for the Transportation Planning Agency (TPA). The model has a 2010 base year and 2040 horizon year. The 2040 horizon year scenario already has the TPA approved 2040-TAZ data and the 2040 cost feasible network inputs. The model time periods include:

- Early Morning (EA) 10:00 PM-5:59 AM
- Morning Peak (AM) 6:00 AM-8:59 AM
- Mid-Day (MD) 9:00 AM-2:59 PM
- Evening Peak (PM) 3:00 PM-6:59 PM
- Evening (EV) 7:00 PM-9:59 PM

Design traffic forecast is a critical input to perform future year operational analysis. Therefore, the model performance within the corridor was thoroughly validated. **Figure 2.1** presents the Travel Demand Forecasting Methodology Flowchart.

For additional details, refer to **Section 3.9.2** of the **Master Plan Technical Document**.

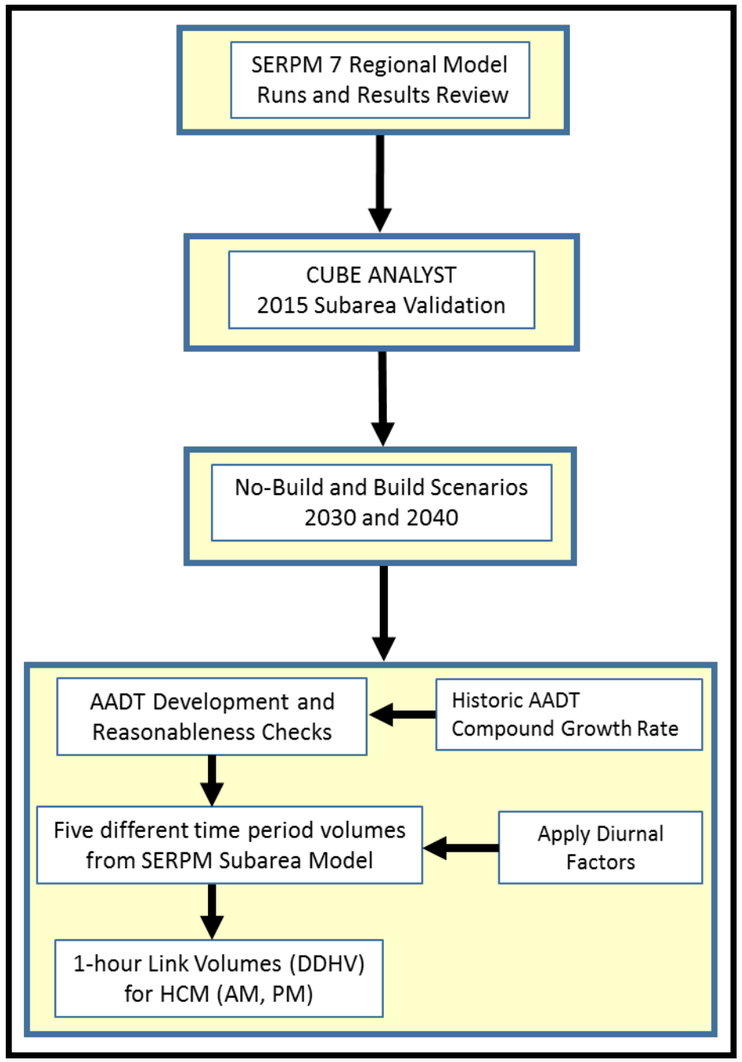


Figure 2.1: Travel Demand Forecasting Methodology Flowchart

2.1.3.1 *Highway Networks Development*

The following model runs were performed:

- **Validation Year:** 2015 Base Year Scenario
- **Design Year:** 2040 No-Build and Build Scenarios (One Managed Lane and Two Managed Lanes)

The network assumptions for the different model scenarios are listed below:

- **2015 Validation Year:** The 2010 network was used as the basis for this effort. This network, within the area of influence, was compared against the existing conditions using aerial images.
- **2040 No-Build Scenario:** Used the 2040 cost feasible regional LRTP network as the basis. A close review was performed for modifications that need to be included within the area of influence to reflect 2040 conditions. Any I-95 Managed Lane projects within the corridor were removed to match the No-Build scenario.
- **2040 Build 1 Scenario:** One managed lane in each direction was coded in place of the High Occupancy Vehicle (HOV) lanes. This scenario assumes the preliminary access points from the previous I-95 Corridor Planning Study (CPS).
- **2040 Build 2 Scenario:** Two managed lanes in each direction were coded in place of the HOV lanes. The following scenarios were evaluated using Build 2 to determine demand based on access points.
    1. Preliminary access points from the previous I-95 CPS.
    2. Two managed lanes from Congress Avenue to Forest Hill Road and North of Palm Beach Lakes to Indiantown Road. This option has no managed lanes going through Downtown West Palm Beach
    3. Refined access point positions based on the Park-and-Ride lot location and the findings from market study.

Three build alternatives were evaluated for the I-95/SR 80 Interchange direct connect to the SR 80 high speed lanes study. The direct connect ramps from the managed lanes and from the I-95 off-ramp to SR 80 high speed lanes were tested. The process of screening the SR 80 alternatives was documented in a separate report. The report summarizes the findings from the direct connect off-ramp from northbound I-95 managed lane to westbound SR 80 high speed lanes and the on-ramp from eastbound SR 80 high speed lanes to northbound I-95 managed lanes.

2.1.3.2 *AADT and DDHV Forecast Development*

The SERPM model is a time-of-day model that reports 3-hour AM peak volumes, 4-hour PM peak volumes and 17-hour off-peak volumes. The future AADT volumes were developed from the I-95 subarea model by combining AM, PM and off-peak period volumes. The DDHV volumes were developed using diurnal factors. The diurnal factors were applied to the model estimated peak periods (AM and PM) volumes.

The diurnal factors were calculated for the I-95 corridor within the study area. There are separate factors for the AM and PM analysis periods. The AM and PM analysis periods are 6:00 AM to 9:00 AM and 3:00 PM to 7:00 PM, respectively. The diurnal factor is the ratio of the peak hour traffic to the analysis period traffic (AM 3-hour period and PM 4-hour period).

The AM and PM period-specific diurnal factors were developed using synopsis reports from the 2015 Florida Transportation Information (FTI) traffic data. The traffic data was reported at 15-minute increments along the study corridor to analyze a traffic profile for both AM and PM conditions. This process is used to develop the AM and PM diurnal factors that convert the peak period traffic to 1-hour design traffic. Since congestion is expected to occur in the AM and PM conditions, the design hour forecasts were performed for typical AM and PM periods.

For additional details, refer to **Section 3.9.7** of the **Master Plan Technical Document**.

2.1.3.3 *Results*

The two-way AADT comparison of scenarios is shown in **Figure 2.2**. It is noted that the build scenario with two managed lanes has the maximum through volume.

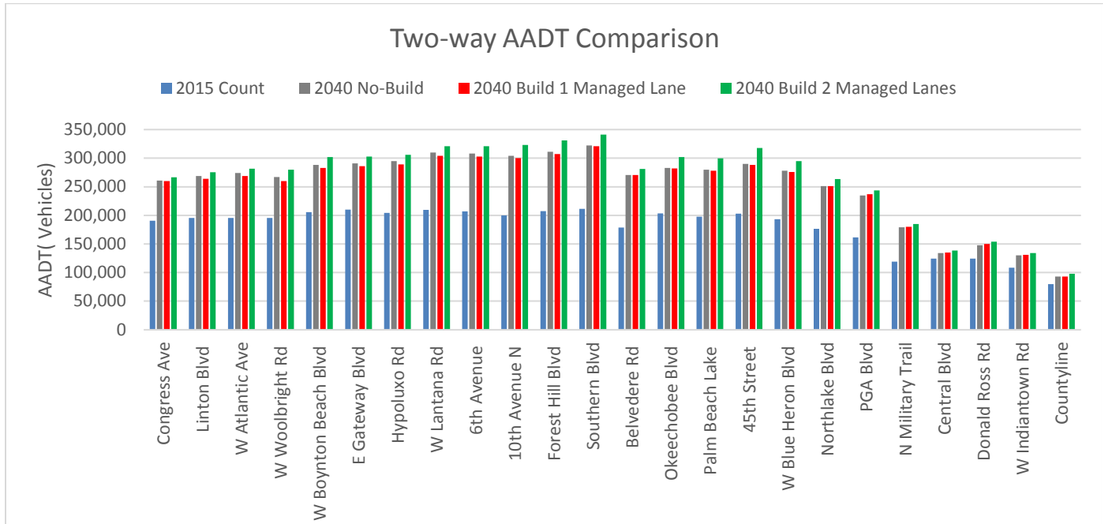


Figure 2.2: Two-way AADT Comparison

The general use lanes and managed lanes directional daily volumes are compared in **Figure 2.3** through **Figure 2.6**. **Figure 2.3** and **Figure 2.4** show that the build scenario with two managed lanes provides better relief to the general use lane. In addition, **Figure 2.5** and **Figure 2.6** indicate higher managed lanes demand for build scenario with two managed lanes.

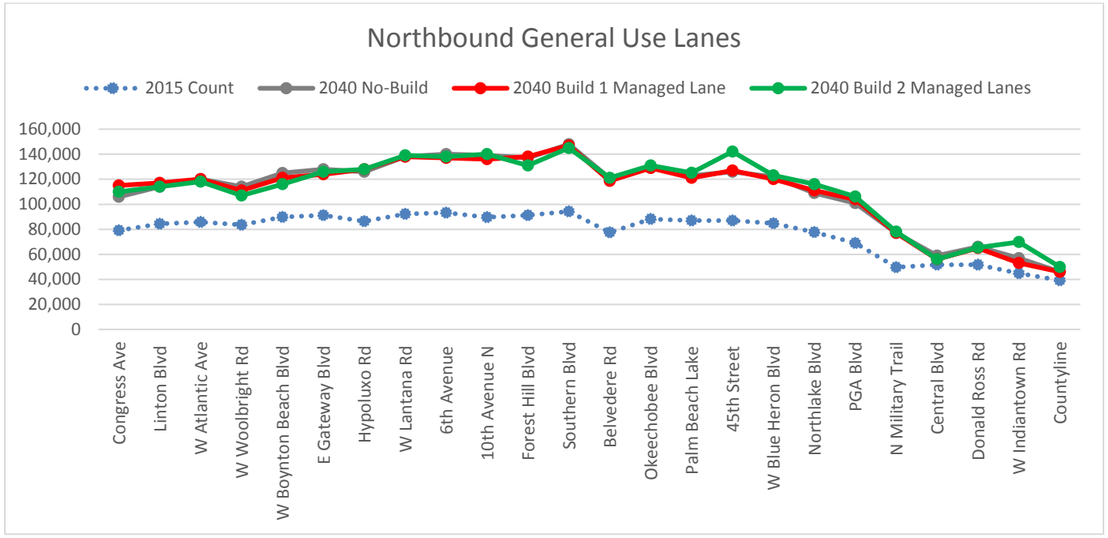


Figure 2.3: Daily Traffic along I-95 Northbound General Use Lanes

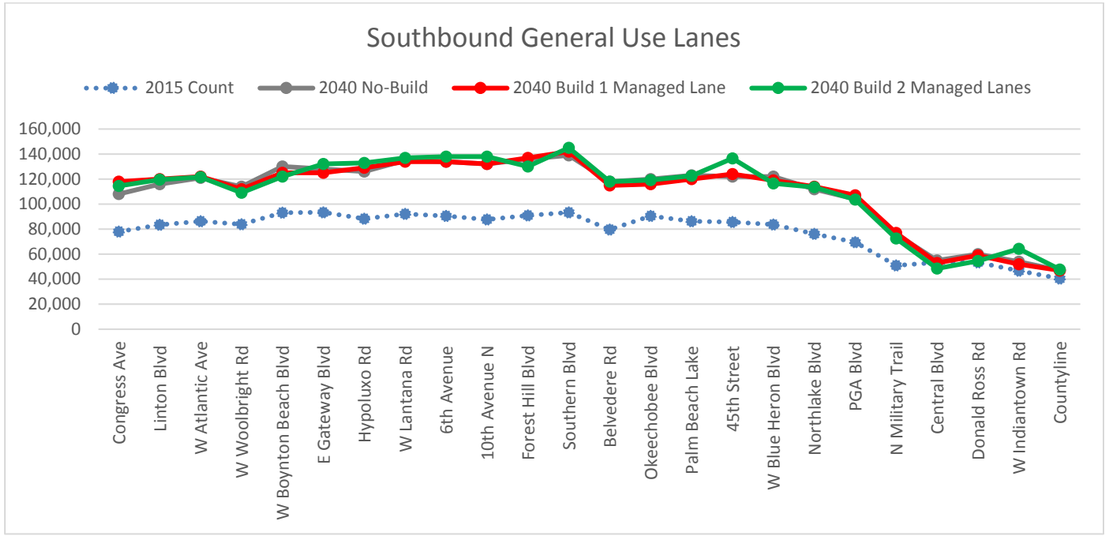


Figure 2.4: Daily Traffic along I-95 Southbound General Use Lanes

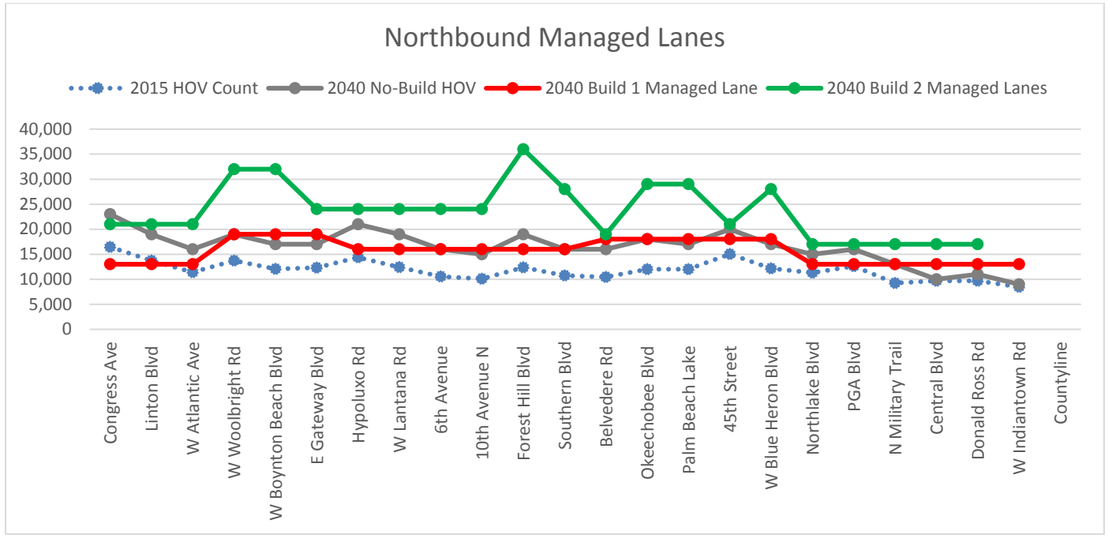


Figure 2.5: Daily Traffic along I-95 Northbound Managed Lanes

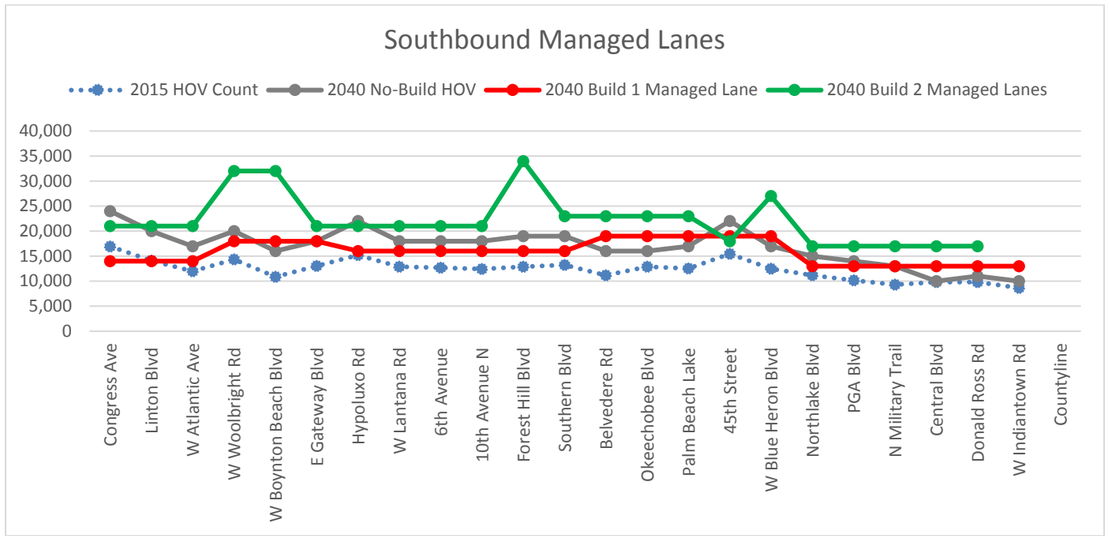


Figure 2.6: Daily Traffic along I-95 Southbound Managed Lanes

Figure 2.7 through **Figure 2.14** present the comparison of design hour traffic by scenarios, peak period and direction. In general, the managed lane system is well utilized in the build scenario with two managed lanes scenario. The managed lanes have the highest demand going northbound in the AM conditions and going southbound in the PM conditions.

Figure 2.7 and **Figure 2.8** depict the AM peak hour comparison of traffic along the general use lanes and managed lanes by scenario, direction and peak period**.** The northbound managed lanes segment traverses an average traffic of 2,000 vph between Woolbright Road and Blue Heron Boulevard in the AM conditions. The maximum traffic demand is 2,862 vph between 10th Avenue and Southern Boulevard in the AM conditions. The segment between Belvedere Road and Blue Heron Boulevard has an average traffic of 2,200 vph.

The southbound managed lanes segment traverses a maximum traffic of 2,142 vph between Woolbright Road and Gateway Boulevard in the AM conditions.

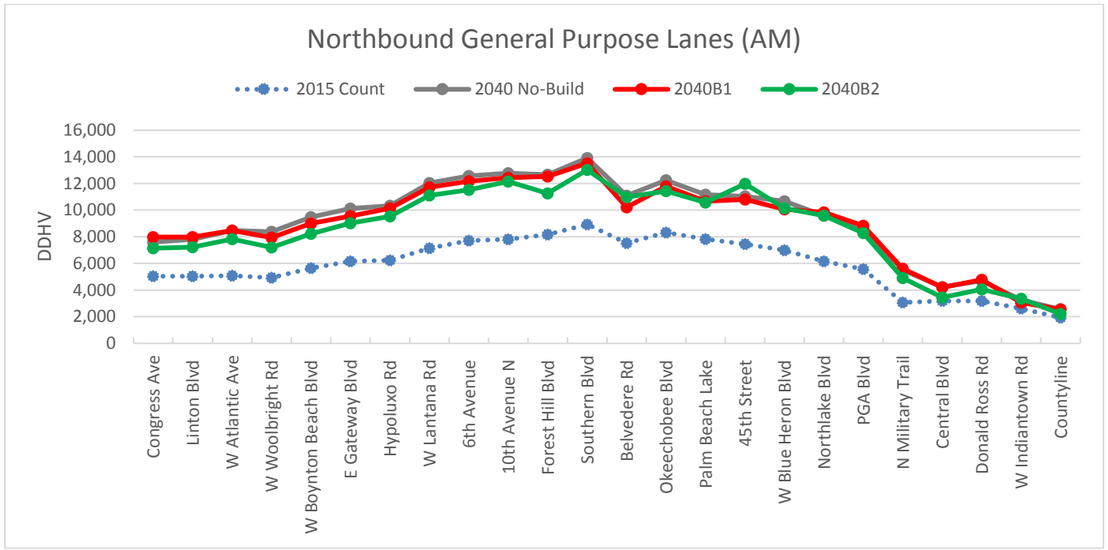


Figure 2.7: AM Peak Hour Traffic along I-95 Northbound General Use Lanes

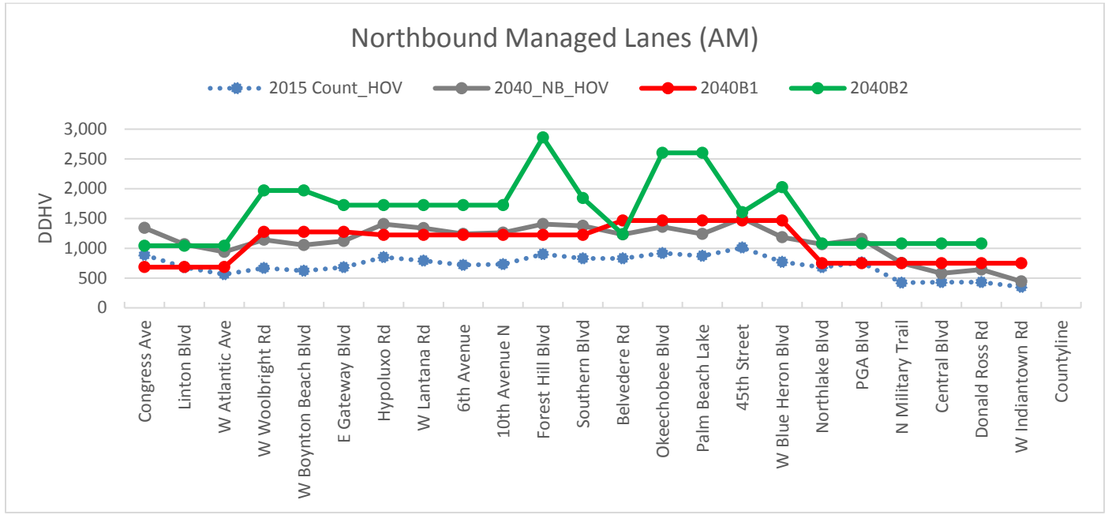


Figure 2.8: AM Peak Hour Traffic along I-95 Northbound Managed Lanes

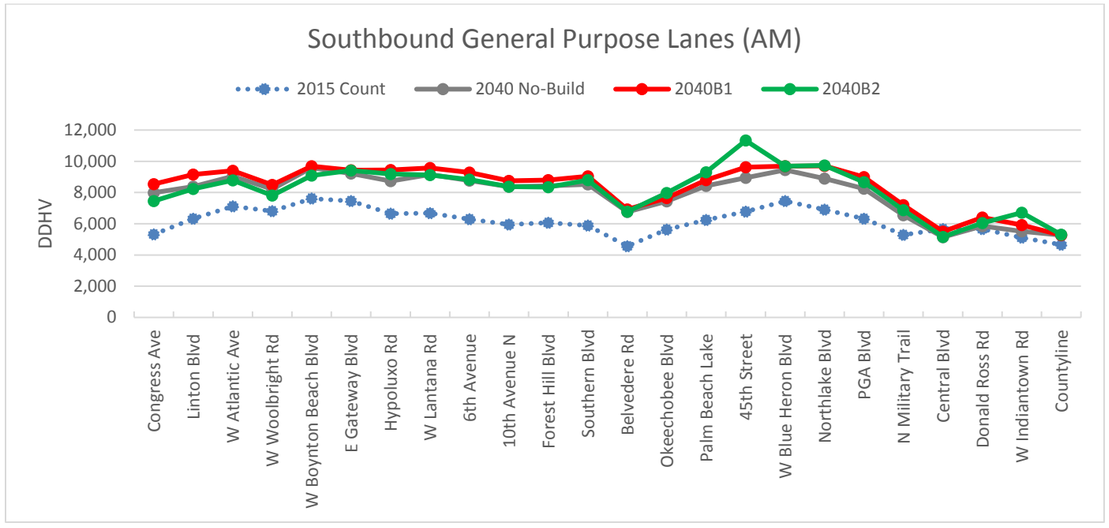


Figure 2.9: AM Peak Hour Traffic along I-95 Southbound General Use Lanes

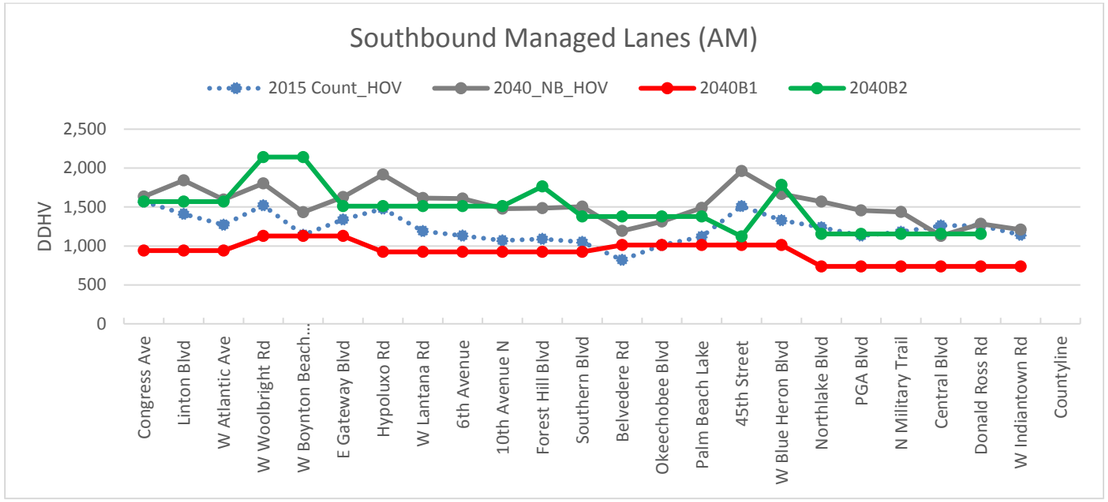


Figure 2.10: AM Peak Hour Traffic along I-95 Southbound Managed Lanes

Figure 2.11 through **Figure 2.14** show the PM peak hour comparison of traffic along the general use lanes and managed lanes by scenario, direction and peak period.

The northbound managed lanes segment traverses a maximum traffic of 2,221 vph between Woolbright Road and Gateway Boulevard. The southbound managed lanes segment traverses a maximum traffic of 2,615 vph between Southern Blvd and 10th Avenue in the PM conditions. The southbound managed lanes segment between Woolbright Road and Gateway Boulevard traverses 1,949 vph in the PM conditions.

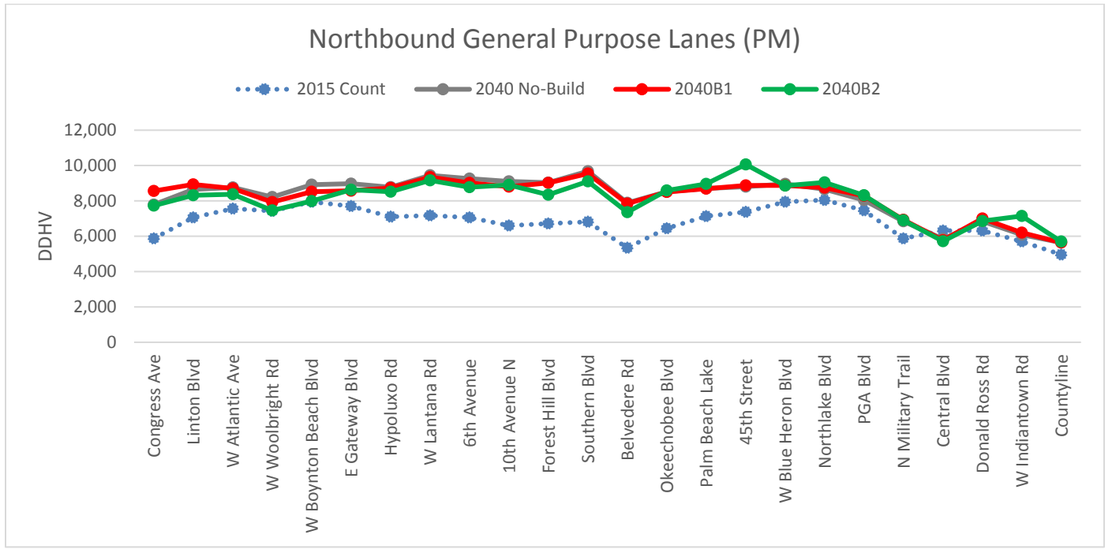


Figure 2.11: PM Peak Hour Traffic along I-95 Northbound General Use Lanes

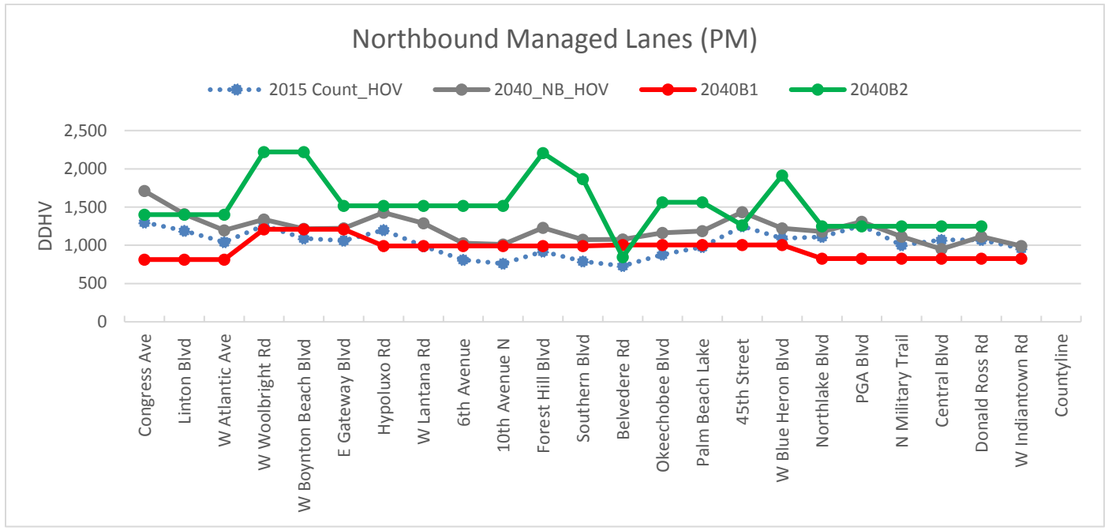


Figure 2.12: PM Peak Hour Traffic along I-95 Northbound Managed Lanes

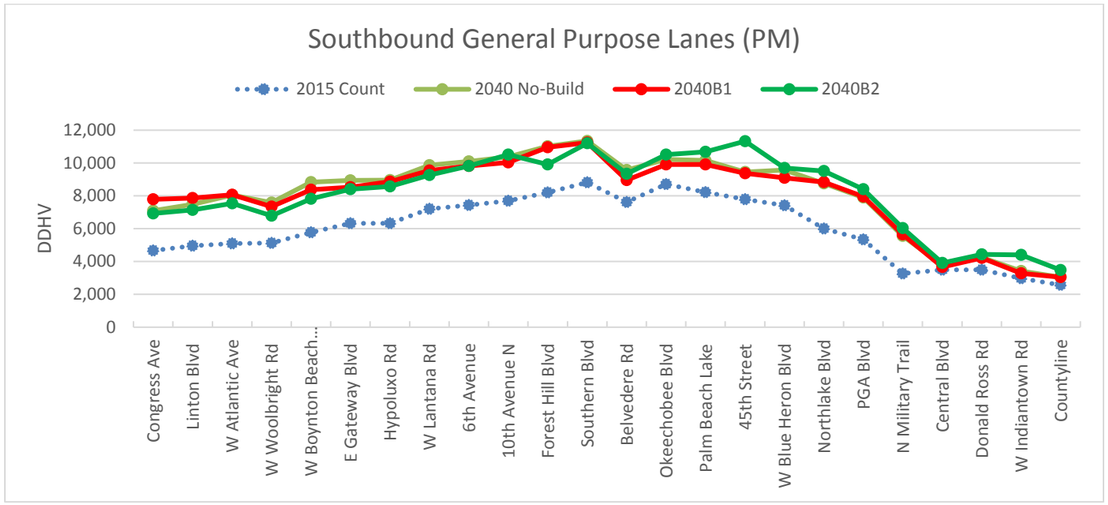


Figure 2.13: PM Peak Hour Traffic along I-95 Southbound General Use Lanes

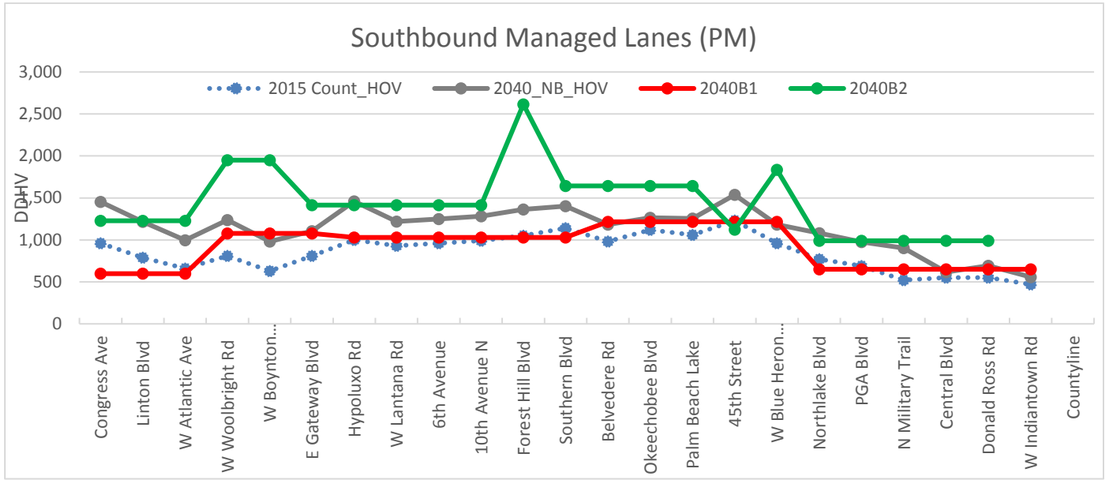


Figure 2.14: PM Peak Hour Traffic along I-95 Southbound Managed Lanes

The 2040 No-Build and Build scenarios balanced mainline and ramp volumes are documented in **Master Plan Technical Document** in **Appendix K** through **Appendix M.**

2.1.4 *Market Study Analysis*

A Market Study defines the existing and future trip making patterns of vehicles using a corridor. The study examines the vehicle types using the corridor, origin-destination patterns, trip lengths, willingness to pay a toll and the study area worker flow characteristics. In order to conduct the study, the following information was used during this effort:

- Bluetooth Origin-Destination Survey
- Stated Preference Survey
- Census Longitudinal Employer-Household Dynamics (LEHD) Data

As part of this study, a No-Build and two Build scenarios were evaluated.

- 2040 No-Build
- 2040 Build 1 – Two managed lanes along the I-95 corridor with selected access point locations (from the 2012 Corridor Planning Study (CPS))
- 2040 Build 2 – One managed lane between SR 80 and Palm Beach Lakes Boulevard and two managed lanes for the remaining of the corridor, within the study limits, with selected access point locations serving to major cities

2.1.4.1 *Access Point Preliminary Analysis*

The corridor was initially classified by major cities. Based on the potential demand and the design feasibility, preliminary managed lane access points were defined for the corridor. The cities in-between access points were defined as segments. The segment potential demand for each access point for each scenario is summarized in **Table 2.3** and **Table 2.4**. The results of the Market Study Analysis determined that Build 2 is the recommended access point configuration. Additional refinements are made to the recommended access point configuration taking into consideration traffic operations and engineering design. Further details are discussed in **Section 2.2.2** of this report.

- **Table 2.3**– 2040 B1 Build Two Managed Lanes (ML) with CPS Access points
- **Table 2.4**– 2040 B2 Build Two Managed Lanes with Recommended Access Points Factoring OD Demand, Design Feasibility, and Operations Analysis

Figure 2.15 shows the preliminary access point fact sheet developed as part of the study. The fact sheet depicts the continuation of the managed lanes system from the previous I-95 express phase (Phase 3B-2) and the overall current system of managed lanes in the South Florida Region. For additional details and data regarding the Market Study Analysis, refer to **Section 3.10** of the **Master Plan Technical Document**.

Figure 2.15: Preliminary Access Point Fact Sheet

2.1.5 *Safety Analysis*

The FDOT Crash Analysis Reporting System (CARS) was used to gather historical crash records for the I-95 study corridor. CARS is a database maintained annually by the FDOT for crashes reported along state highway facilities. The database provides information on various characteristics associated with each crash including: collision type, severity, weather conditions, road surface conditions, and date/time information. The CARS database was researched to identify and extract crashes reported along the study corridor within the project limits during the period of January 1, 2011 through December 31, 2015. The data analyzed covers the segment from milepost 6.165 to milepost 46.018. The crash data gathered from the FDOT's database included collisions along the mainline as well as crashes reported on the ramp systems. **Table 2.1** summarizes the crash data that was collected for I-95 roadway segment between Peninsula Corporate Drive/Congress Avenue interchange and Indiantown Road (SR 706) interchange. Detailed tabular crash data analysis is provided in **Appendix X** of the **Master Plan Technical Document**.

As shown in **Table 2.1**, a total of 9,515 crashes were reported along the I-95 segment within the study limits during the five-year period. 59 (0.6%) of these crashes involved fatalities and 3,769 (39.6%) of the crashes involved injuries. A total of 65 people were killed in crashes along I-95 and 5,830 persons were injured. The predominant crash patterns experienced along the study segment were rear-end collisions (35.2%), fixed object collisions (22.9%), and sideswipe collisions (17.3%).

Table 2.1: Crash Summary

SR 9/I-95 from South of Congress Avenue to North of Indiantown Road		Number of Crashes					5 Year Total Crashes	Mean Crashes Per Year	%
		Year							
		2011	2012	2013	2014	2015			
CRASH TYPE	Rear End	499	515	684	739	908	3,345	669	35.2%
	Head On	11	8	13	13	17	62	12	0.7%
	Angle	121	130	128	152	141	672	134	7.1%
	Sideswipe	283	279	325	340	423	1,650	330	17.3%
	Pedestrian	2	10	5	3	4	24	5	0.3%
	Fixed Object	334	424	510	449	463	2180	436	22.9%
	Other Non-Fixed Object Collisions	127	107	141	143	116	634	127	6.7%
	Non-Collisions	136	155	208	231	218	948	190	10.0%
	Total Crashes	**1,513**	**1,628**	**2,014**	**2,070**	**2,290**	**9,515**	**1,903**	**100.0%**
SEVERITY	PDO Crashes	837	957	1,245	1,276	1,372	5,687	1,137	59.8%
	Fatal Crashes	12	12	16	9	10	59	12	0.6%
	Injury Crashes	664	659	753	785	908	3769	754	39.6%

In accordance with the 2018 FDOT Design Manual Volume I, Table 122.6.1, the estimated average cost per crash for state roads is approximately $159,093. Based on this estimate and the historical crash records presented above, the annual economic loss due to crashes experienced along the I-95 segment was estimated at approximately $302,753,979 per year.

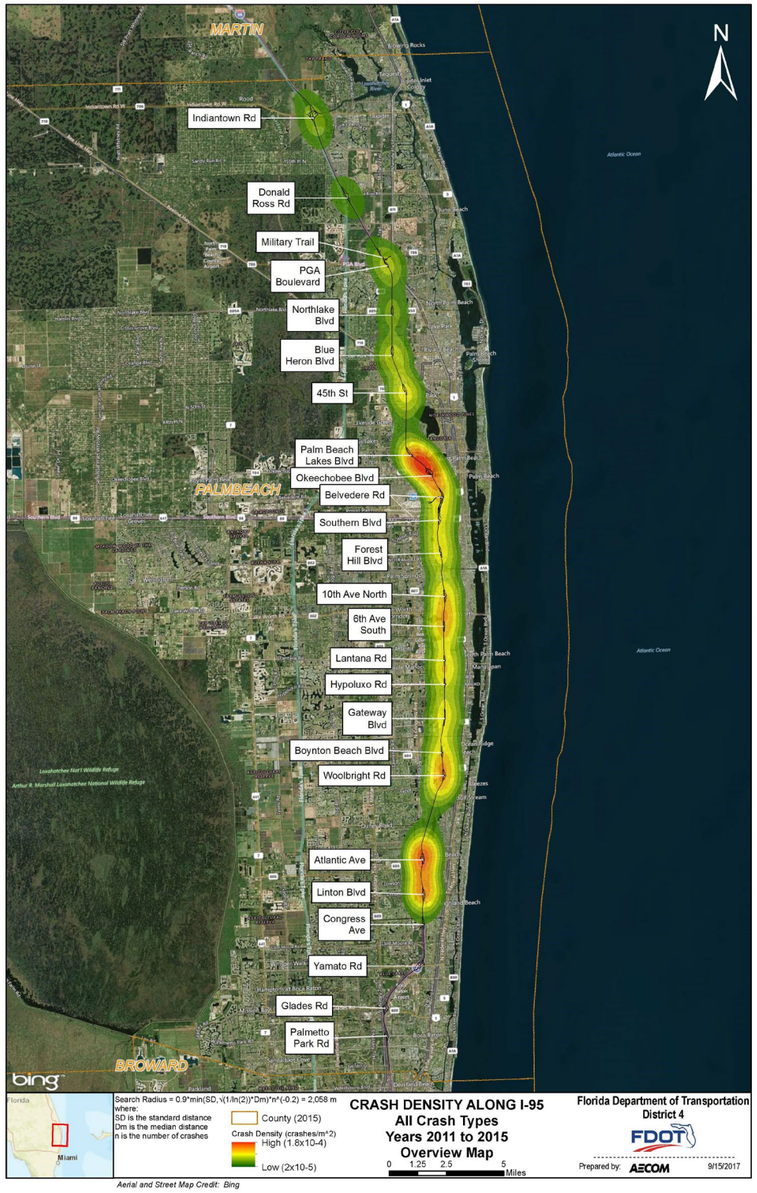
High Crash Locations – Based on the FDOT's high crash locations report, the following segments of the study corridor were identified as high crash location/segment:

Table 2.2: FDOT High Crash Locations - Road Segments

From Milepost	To Milepost
8.1	9.0
9.5	10.5
10.8	11.0
13.2	14.1
14.7	15.1
16.3	16.6
18.9	19.1
20.0	20.7
21.3	21.6
22.0	22.1
25.8	26.2
26.7	27.0
27.2	28.4
30.8	31.2
32.6	33.1
44.0	44.1

Based on the information provided in **Table 2.2,** approximately 7.9 miles of the study area are identified as high crash segment by FDOT for the study period 2011 to 2015. A straight line diagram showing the location of high crash segments is provided in **Appendix X** of the **Master Plan Technical Document**.

Additionally, crash heat maps were developed to identify the locations of high crash density. A heat map including all crashes on the study corridor is shown in **Figure 2.16**. Similarly, **Figure 2.17** and **Figure 2.18** show the heat maps for run off road crashes and sideswipes/rear end crashes respectively. Detailed maps for **Figure 2.16** through **Figure 2.18** are provided in **Appendix X** of the **Master Plan Technical Document**.



Aerial and Street Map Credit: Bing

Figure 2.16: Crash Density Map - All Crash Types

Aerial and Street Map Credit: Bing

Figure 2.17: Crash Density Map - Run Off Road Crashes

Aerial and Street Map Credit: Bing

Figure 2.18: Crash Density Map - Sideswipe and Rear End Crashes

The heat maps and the high crash segment summary show that more crashes occur at on-ramp or off-ramp areas along the study corridor. These on-ramp and off-ramp locations tend to be most susceptible to crashes as weaving, merging, diverging, and other lane changing maneuvers are most concentrated at these segments of the freeway system. Capacity issues are often a contributing cause for crashes at these locations as drivers compete in a limited space to execute desired lane changes, weaving, or merging activities. The proposed I-95 managed lane project will increase capacity throughout the corridor and this will help in addressing capacity issues and improving overall safety conditions along the corridor. It is also recognized that the proposed project will place additional access points along the freeway system to facilitate entry/exit to/from the managed lanes. From a safety perspective, attentiveness to safety improvements should be exercised to minimize the number of new access points and allow adequate spacing for drivers to safely accomplish desired weaving, merging, and diverging activities.

Table 2.3: 2040 B1 Build Two Managed Lanes (ML) with CPS Access Points

Access Points from CPS Study 2011

Cities	MilePoint	Segment		2015 Two-way AADT	2040NB Two-way AADT	2040B Two-way AADT			OD Segments From	OD Segments To	2015 Survey Expansion	2015 Base year Accessible Trips	2015 Base year Toll Eligible Trips	2040 NB Accessible Trips	2040 NB Toll Eligible Trips	2040 B2 Accessible Trips	2040 B2 Toll Eligible Trips
Jupiter	46.02	8	AADT	79,700	93,000	93,000	23	W Indiantown Rd	1,2,3,4,5	8	58,000	46,000	70	53,000	690	57,000	6,000
			N	15,700	39,000	38,000											
			S	44,700	76,000	78,000											
Jupiter	42.74	7	AADT	108,700	130,000	133,000	22	Donald Ross Rd									
			N	9,600	20,000	18,000											
			S	25,400	38,000	39,000											
Palm Beach Gardens	41.12		AADT	124,510	148,000	154,000	21	Central Blvd									
			N	0	9,000	8,300											
			S	0	46,570	44,000											
Palm Beach Gardens	38.12		AADT	124,510	134,000	140,000	20	N Military Trail									
			N	5,400	6,570	6,370											
			S														
Palm Beach Gardens	37.51		AADT	119,100	179,000	183,000	19	PGA Blvd									
			N	11,100	26,600	26,000											
			S	53,500	82,600	84,000											
Palm Beach Gardens	35.37		AADT	161,500	235,000	241,000	18	Northlake Blvd									
			N	22,700	40,000	41,000											
			S	37,700	56,000	57,000											
Riviera Beach	34.49		AADT	176,500	251,000	257,000	17	W Blue Heron Blvd									
			N	20,800	35,000	34,000											
			S	37,500	62,000	64,000											
West Palm Beach	32.28	6	AADT	193,200	278,000	287,000	16	45th Street	1,2,3,4,5	7	104,000	112,000	1,600	178,000	6,200	182,000	34,000
			N	29,900	47,000	47,000											
			S	39,900	59,000	60,000											
West Palm Beach	29.93	5	AADT	203,200	290,000	300,000	15	Palm Beach Lake	4,5	7,8	74,683	67,000	960	102,000	520	101,000	4,800
			N	30,000	51,000	51,000											
			S	24,700	41,000	41,000											
West Palm Beach	27.96		AADT	197,900	280,000	290,000	14	Okeechobee Blvd									
			N	31,600	47,500	47,100											
			S	37,300	50,500	49,700											
West Palm Beach	26.76		AADT	203,600	283,000	293,000	13	Belvedere Rd									
			N	12,800	16,300	15,700											
			S	18,400	41,000	41,800											
			N	8,900	9,800	10,100											
			S	7,800	9,950	10,450											
	25.50																

Cities	MilePoint	Segment		2015 Two-way AADT	2040NB Two-way AADT	2040B Two-way AADT			OD Segments From	OD Segments To	2015 Survey Expansion	2015 Base year Accessible Trips	2015 Base year Toll Eligible Trips	2040 NB Accessible Trips	2040 NB Toll Eligible Trips	2040 B2 Accessible Trips	2040 B2 Toll Eligible Trips
			AADT	178,720	270,750	285,650		Southern Blvd	2,3	7,8	49,000	47,000	430	74,000	520	80,000	26,000
West Palm Beach		4	N	29,400	37,900	39,800	12										
			S	32,800	51,450	52,350											
	24.48								1	4,5,6							
			AADT	211,510	322,000	332,000		Forest Hill Blvd									
West Palm Beach			N	25,000	50,000	51,000	11										
			S	21,000	39,000	37,000											
	22.77																
			AADT	207,510	311,000	318,000		10th Avenue N									
Lakeworth			N	29,600	48,000	46,000	10										
			S	22,000	41,000	39,000											
	20.70																
			AADT	199,900	304,000	311,000		6th Avenue									
Lakeworth			N	20,200	37,000	37,000	9										
			S	27,100	41,000	41,000											
	19.17	3									48,000	39,000	440	53,000	7,500	59,000	20,000
			AADT	206,800	308,000	315,000		W Lantana Rd									
Lantana			N	22,100	41,000	40,000	8										
			S	24,900	43,000	43,000											
	18.26																
			AADT	209,600	310,000	318,000		Hypoluxo Rd									
Lantana			N	26,000	43,000	43,000	7										
			S	20,700	28,000	29,000											
	17.00																
			AADT	204,300	295,000	304,000		E Gateway Blvd									
Boynton Beach			N	22,100	40,000	41,000	6										
			S	27,800	36,000	38,000											
	15.41								1	3							
			AADT	210,000	291,000	301,000		W Boynton Beach Blvd									
Boynton Beach			N	27,200	41,000	39,000	5										
			S	23,000	38,000	38,000											
	14.28	2									69,000	78,000	1,600	101,000	15,000	104,000	18,000
			AADT	205,800	288,000	300,000		W Woolbright Rd									
Boynton Beach			N	32,600	49,000	50,000	4										
			S	22,300	28,000	27,000											
	13.46								1	3,4,5,6,7,8							
			AADT	195,500	267,000	277,000		W Atlantic Ave									
Delray Beach			N	27,700	45,900	47,400	3										
			S	27,600	52,900	51,400											
	9.22																
		1	AADT	195,400	274,000	281,000		Linton Blvd			*155,000*	161,000	2,300	209,000	28,000	221,000	48,000
Delray Beach			N	24,200	50,000	53,000	2										
			S	24,400	45,000	44,000											
	7.71																
			AADT	195,610	269,000	272,000		Congress Ave									
Boca Raton			N	13,100	23,900	24,000	1										
			S	8,100	15,900	16,000											
	6.29						0										
			AADT	190,610	261,000	264,000											

Table 2.4: 2040 B2 Build Two Managed Lanes with Design Feasible Access points (Recommended)

Build 2Access Points Design Feasible (Recommended)

Cities	MilePoint	Segment		2015 Two-way AADT	2040NB Two-way AADT	2040B Two-way AADT			OD Segments From	OD Segments To	2015 Survey Expansion	2015 Base year Accessible Trips	2015 Base year Toll Eligible Trips	2040 NB Accessible Trips	2040 NB Toll Eligible Trips	2040 B2C Accessible Trips	2040 B2C Toll Eligible Trips
			AADT	79,700	93,000	97,700											
Jupiter	46.02		N	15,700	39,000	38,600	123	W Indiantown Rd									
			S	44,700	76,000	75,000											
Jupiter		9															
	42.74		AADT	108,700	130,000	134,100											
Jupiter			N	9,600	20,000	19,300	122	Donald Ross Rd									
			S	25,400	38,000	39,000											
	41.12						12,000 17,000		1,2,3,4,5,6	9							
			AADT	124,510	148,000	153,800	17,000 17,000										
Palm Beach Gardens			N	0	9,000	9,000	121	Central Blvd									
	38.12		S	0	46,570	46,500											
			AADT	124,510	134,000	138,700											
Palm Beach Gardens			N	5,400	6,570	6,670	120	N Military Trail									
			S								58,100	45,700	70	52,800	690	55,600	33,060
	37.51	8	AADT	119,100	179,000	184,700											
Palm Beach Gardens			N	11,100	26,600	25,600	119	PGA Blvd									
	35.37		S	53,500	82,600	84,600	17,000 17,000										
			AADT	161,500	235,000	243,700											
Palm Beach Gardens			N	22,700	40,000	40,000	118	Northlake Blvd									
	34.49		S	37,700	56,000	60,000			1,2,3,4,5,6	8, 9							
			AADT	176,500	251,000	263,700	10,000 11,000										
Riviera Beach			N	20,800	35,000	32,000	117	W Blue Heron Blvd									
	32.28		S	37,500	62,000	63,000					132,200	122,700	1,260	177,000	4,690	193,400	63,700
		7	AADT	193,200	278,000	294,700	27,000 28,000										
West Palm Beach			N	29,900	47,000	40,000	116	45th Street									
			S	39,900	59,000	63,000	9,000 7,000										
	29.93						18,000 21,000		4,5,6	8, 9	75,300	64,200	830	100,000	1,050	112,300	25,710
			AADT	203,200	290,000	317,700	5,000 8,000										
West Palm Beach			N	30,000	51,000	59,000	115	Palm Beach Lake	1,2,3,5	7,8,9							
	27.96		S	24,700	41,000	41,000											
			AADT	197,900	280,000	299,700											
West Palm Beach			N	31,600	47,500	43,900	114	Okeechobee Blvd									
	26.76	6	S	37,300	50,500	52,000	23,000 29,000				102,597	106,400	770	144,600	6,760	159,400	62,470
			AADT	203,600	283,000	302,000											
West Palm Beach			N	12,800	16,300	18,100	113	Belvedere Rd									
			S	18,400	41,000	41,300	23,000 29,000										
			N	8,900	9,800	11,900											
	25.50		S	7,800	9,950	9,200											
							10,000		5	7,8,9							
			AADT	178,720	270,750	281,000					*19,900*	*17,300*	*100*	*24,600*	*200*	*32,400*	*11,800*
West Palm Beach		5	N	29,400	37,900	32,000		Southern Blvd									
			S	32,800	51,450	51,000	9,000		*1,2,3*	*5*							
											25,000	*26,600*	*200*	*36,900*	*18,000*	*45,900*	*18,000*

Cities	MilePoint	Segment		2015 Two-way AADT	2040NB Two-way AADT	2040B Two-way AADT			OD Segments From	OD Segments To	2015 Survey Expansion	2015 Base year Accessible Trips	2015 Base year Toll Eligible Trips	2040 NB Accessible Trips	2040 NB Toll Eligible Trips	2040 B2C Accessible Trips	2040 B2C Toll Eligible Trips
	24.48								1,2,3	5,6							
			AADT	211,510	322,000	341,000	23,000 28,000										
West Palm Beach			N	25,000	50,000	47,000	111	Forest Hill Blvd									
			S	21,000	39,000	37,000	11,000 8,000										
	22.77	4									76,600	79,800	670	115,800	6,760	129,600	39,100
			AADT	207,510	311,000	331,000	34,000 36,000										
Lakeworth			N	29,600	48,000	48,000	110	10th Avenue N									
			S	22,000	41,000	40,000	13,000 13,000										
	20.70								2,3	5,6,7,8,9							
			AADT	199,900	304,000	323,000	21,000 24,000										
Lakeworth			N	20,200	37,000	42,000	109	6th Avenue									
	19.17		S	27,100	41,000	40,000											
			AADT	206,800	308,000	321,000											
Lantana			N	22,100	41,000	45,000	108	W Lantana Rd									
	18.26		S	24,900	43,000	45,000											
		3	AADT	209,600	310,000	321,000	21,000 24,000										
Lantana			N	26,000	43,000	44,000	107	Hypoluxo Rd									
			S	20,700	28,000	29,000											
	17.00																
			AADT	204,300	295,000	306,000	21,000 24,000										
Boynton Beach			N	22,100	40,000	42,000	106	E Gateway Blvd									
	15.41		S	27,800	36,000	39,000	11,000 8,000										
			AADT	210,000	291,000	303,000											
Boynton Beach			N	27,200	41,000	39,000	105	W Boynton Beach Blvd	1	3,4							
	14.28		S	23,000	38,000	38,000											
		2	AADT	205,800	288,000	302,000	32,000 32,000				69,000	78,500	1,600	101,400	15,410	108,900	38,630
Boynton Beach			N	32,600	49,000	49,000	104	W Woolbright Rd									
			S	22,300	28,000	27,000	11,000 11,000										
	13.46								1	3,4,5,6,7,8,9							
			AADT	195,500	267,000	280,000	20,000 20,000										
Delray Beach			N	27,700	45,900	49,900	103	W Atlantic Ave									
			S	27,600	52,900	51,500											
	9.22																
			AADT	195,400	274,000	281,600											
Delray Beach		1	N	24,200	50,000	53,000	102	Linton Blvd									
			S	24,400	45,000	47,000					*104,700*	110,100	1,610	146,000	13,470	152,400	47,610
	7.71																
			AADT	195,610	269,000	275,600											
Boca Raton			N	13,100	23,900	24,900	101	Congress Ave									
			S	8,100	15,900	15,800											
	6.29																
			AADT	190,610	261,000	266,500	21,000 21,000										
							8,800 10,900										

2.1.6 *Traffic Operational Analysis*

2.1.6.1 *Analysis Years and Tools*

The Highway Capacity Software (HCS 7) was used to perform the No-Build traffic operational analysis. HCS 7 is developed and maintained by McTrans Center, University of Florida. It includes updated modules to implement the Highway Capacity Manual 6th Edition (HCM) procedures for Signalized Intersections, Urban Streets, Alternative Intersections, Roundabouts, Freeway Facilities, Basic Freeway Segments, Freeway Weaving Segments, Freeway Merge and Diverge Segments, and Multilane Highways. The operational analysis was performed for the AM and PM peak hours. The analysis years are listed below:

- Existing Year: 2015
- Design Year: 2040

2.1.6.2 *Traffic Data and Factors*

The primary sources of the traffic data and traffic factors for this analysis are 2014/2015 traffic counts at the Bluetooth stations, 2015 FTI DVD and the SERPM7 model with base year 2010 and horizon year 2040.

The factors used for the 2040 No-Build traffic analysis include the T_{24}, Design Hourly Truck Percentage (DHT) and Peak Hour Factor (PHF). The factors varied throughout the project area, so a range of the traffic factors used is provided in **Table 2.5**.

The T_{24} factor is the adjusted annual daily percentage of truck traffic. The DHT factor is the percentage of truck traffic during the peak hour and can be estimated as half of the T_{24} factor.

Table 2.5: Summary of Traffic Factors

Roadway	T_{24}	DHT	PHF
I-95 Mainline	3.0%-9.3%	1.5%-4.7%	0.95
Ramps	2.4%-9.2%	1.2%-4.6%	0.95

A driver population factor (f_p) of 1.0 was used in the analysis due to the fact that the traffic stream characteristics within the study area are known to be representative of regular truck drivers and commuters who are familiar with the facilities.

2.1.6.3 *Level of Service Criteria*

FDOT maintains minimum acceptable operating Level of Service (LOS) targets for the State Highway System. The term LOS is defined as the system of six designated ranges from "A" (best) to "F" (worst) used to evaluate roadway facility performance. The FDOT minimum acceptable operating LOS targets were used. The LOS targets for major roadways analyzed are summarized below:

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

2.1.6.4 *Analysis Procedure*

The analysis of the I-95 system (mainline and interchange ramps) was based on criteria and policies detailed in the FDOT Traffic Analysis Handbook, March 2014 Edition. Freeway merge/diverge, and weaving operational analysis was conducted using HCS 7. Ramp roadways and major merge/diverge operational analysis was conducted using the guidelines set out by the HCM. The Measures of Effectiveness (MOEs) summarized and reported to evaluate the performance of the No-Build analysis are density, LOS and volume to capacity (v/c) ratio. The capacity of one or two-lane ramps, according to HCM, is 2,200 or 4,400 vehicles per hour, respectively. A v/c ratio less than one means the ramp can accommodate the volume needed.

The HCM methodology is generally classified as a series of analytical procedures (flow rate variables) that produce deterministic results (no randomness). Each transportation facility is analyzed using a unique methodology, which is performed independent of other adjacent facilities.

The analysis was performed for the following freeway elements described below.

Basic Freeway Segment

Freeway sections are defined by a geometric condition where no merge, diverge or weaving maneuvers occur (HCM Chapter 10 Section 2).

Merge

A merge condition occurs when two or more traffic streams combine to form a single traffic stream (HCM Chapter 10 Section 2).

Diverge

A diverge condition occurs when a single traffic stream divides to form two or more traffic streams (HCM Chapter 10 Section 2).

Major Merge

A Major Merge area is one in which two primary roadways, each having multiple lanes, merge to form a single freeway or when a major multilane high-speed ramp joins with a freeway. According to the HCM 6th edition, a v/c ratio is calculated, and if it is greater than 1.0, a major merge failure would be indicated. (HCM Chapter 14 Section 4).

Major Diverge

A Major Diverge area is one in which a freeway splits to become two separate freeways or when a major multilane high-speed ramp diverges from the freeway. According to the HCM 6th edition, a v/c ratio is calculated, and if it is greater than 1.0, a major diverge failure would be indicated. Also, for major diverge areas, the average density of all approaching freeway lanes is calculated using HCM equation 14-28. (HCM Chapter 14 Section 4).

Ramp Roadway

Ramp roadway sections occur when a one or two-lane on-ramp combines with the freeway segment to form additional freeway lanes. According to the HCM 6th edition, a v/c ratio is calculated, and if it is greater than 1.0, a major merge failure would be indicated.

Weaving

The segments in which two or more traffic streams travelling in the same general direction cross paths along a significant length of freeway without the aid of traffic control devices. Weaving segments occur when a diverge segment closely follows a merge segment or when a one lane off-ramp closely follows a one lane on ramp and the two are connected by a continuous auxiliary lane. (HCM Chapter 10 Section 2).

2.1.6.5 *Transportation Network*

The transportation network for the 2040 No Build includes general use lanes, high occupancy vehicle lanes and auxiliary lanes along the I-95 mainline corridor. The 2040 Build transportation network includes general use lanes, managed lanes and auxiliary lanes along the I-95 mainline corridor. **Table 2.6** and **Table 2.7** summarize the number of lanes along I-95 for each scenario within the study area limits.

Table 2.6: I-95 No Build Mainline Number of Lanes

From	To	Number of I-95 Lanes
Yamato Road	Congress Avenue	6 GUL + 2 HOV
Congress Avenue	Linton Boulevard	8 GUL + 2 HOV + 1 AUX
Linton Boulevard	Atlantic Avenue	8 GUL + 2 HOV + 2 AUX
Atlantic Avenue	Woolbright Road	8 GUL + 2 HOV
Woolbright Road	Boynton Beach Boulevard	8 GUL + 2 HOV + 3 AUX
Boynton Beach Boulevard	Gateway Boulevard	4 GUL + 2 HOV + 2 AUX
Gateway Boulevard	Hypoluxo Road	8 GUL + 2 HOV
Hypoluxo Road	Lantana Road	8 GUL + 2 HOV + 2 AUX
Lantana Road	6th Avenue	8 GUL + 2 HOV + 3 AUX
6th Avenue	10th Avenue	8 GUL + 2 HOV + 3 AUX
10th Avenue	Forest Hill Boulevard	4 GUL + 2 HOV 2 AUX
Forest Hill Boulevard	Southern Boulevard	9 GUL + 2 HOV + 2 AUX
Southern Boulevard	Okeechobee Boulevard	8 GUL + 2 HOV + 2 AUX
Okeechobee Boulevard	Palm Beach Lakes Boulevard	8 GUL + 2 HOV + 2 AUX
Palm Beach Lakes Boulevard	45th Street	8 GUL + 2 HOV
45th Street	Blue Heron Boulevard	8 GUL + 2 HOV + 2 AUX
Blue Heron Boulevard	Northlake Boulevard	8 GUL + 2 HOV + 2 AUX
Northlake Boulevard	PGA Boulevard	8 GUL + 2 HOV + 1 AUX
PGA Boulevard	Donald Ross Road	8 GUL + 2 HOV
Donald Ross Road	I-95 Northbound HOV Lane Drop	8 GUL + 2 HOV
I-95 Northbound HOV Lane Drop	Indiantown Road	8 GUL + 1 HOV
Indiantown Road	Bridge Road	6 GUL

Note: GUL – General Use Lane / HOV – High Occupancy Vehicle / AUX – Auxiliary Lane

Table 2.7: I-95 Build Mainline Number of Lanes

From	To	Number of I-95 Lanes
Yamato Road	Congress Avenue	6 GUL + 4 ML+ 2 AUX
Congress Avenue	Linton Boulevard	8 GUL + 4 ML + 2 AUX
Linton Boulevard	Atlantic Avenue	8 GUL + 4 ML + 2 AUX
Atlantic Avenue	Woolbright Road	8 GUL + 4 ML
Woolbright Road	Boynton Beach Boulevard	8 GUL + 4 ML + 4 AUX
Boynton Beach Boulevard	Gateway Boulevard	8 GUL + 4 ML + 2 AUX
Gateway Boulevard	Hypoluxo Road	8 GUL + 4 ML + 2 AUX
Hypoluxo Road	Lantana Road	8 GUL + 4 ML + 3 AUX
Lantana Road	6th Avenue	8 GUL + 4 ML + 3 AUX
6th Avenue	10th Avenue	8 GUL + 4 ML + 3 AUX
10th Avenue	Forest Hill Boulevard	8 GUL + 4 ML + 2 AUX
Forest Hill Boulevard	Southern Boulevard	9 GUL + 4 ML + 2 AUX
Southern Boulevard	Okeechobee Boulevard	8 GUL + 4 ML + 2 AUX
Okeechobee Boulevard	Palm Beach Lakes Boulevard	8 GUL + 4 ML + 2 AUX
Palm Beach Lakes Boulevard	45th Street	8 GUL + 4 ML + 2 AUX
45th Street	Blue Heron Boulevard	8 GUL + 4 ML + 2 AUX
Blue Heron Boulevard	Northlake Boulevard	8 GUL + 4 ML + 2 AUX
Northlake Boulevard	PGA Boulevard	8 GUL + 4 ML + 1 AUX
PGA Boulevard	Central Boulevard	8 GUL + 4 ML + 2 AUX
Central Boulevard	Donald Ross Road	10 GUL + 2 AUX
Donald Ross Road	Indiantown Road	10 GUL
Indiantown Road	Bridge Road	8 GUL

2.1.6.6 *HCM Based Operational Analysis*

The HCM based operational analysis were determined based on the procedure listed below, as discussed in **Section 2.1.6.4**.

- Basic Freeway Segment
- Diverge
- Major Merge
- Major Diverge
- Ramp Junction
- Weaving

The results for the 2040 No Build and Build scenarios are shown on **Table 2.8** through **Table 2.12**. In summary, the no build scenario depicts that approximately 65% of the corridor would be below LOS D in the 2040 design year and the build scenario depicts that approximately 49% of the corridor would be below LOS D in the 2040 design year.

Table 2.8: 2040 No-Build Freeway Elements Operating Below LOS Target D

Freeway Element	Direction	Analysis Type	Peak Hour	Analysis Result (Density LOS V/C)
I-95 Southbound North of Palm Beach Lakes Boulevard	SB	Basic Freeway	AM PM	F F
I-95 Southbound at Palm Beach Lakes Boulevard	SB	Basic Freeway	PM	35.9 E
I-95 Southbound Segment at Belvedere Road	SB	Basic Freeway	PM	F
I-95 Southbound PBIA Segment from PBIA Southbound Off Ramp to PBIA Southbound On Ramp	SB	Basic Freeway	PM	F
I-95 Southbound Segment at Southern Boulevard	SB	Basic Freeway	PM	F
I-95 Southbound North of Forest Hill Boulevard	SB	Basic	PM	F

Freeway Element	Direction	Analysis Type	Peak Hour	Analysis Result (Density LOS V/C)
		Freeway		
I-95 Southbound Segment at Forest Hill Boulevard	SB	Basic Freeway	PM	43.6 E
I-95 Southbound North of 10th Avenue	SB	Basic Freeway	PM	F
I-95 Southbound Segment at 10th Avenue	SB	Basic Freeway	PM	43.1 E
I-95 Southbound Segment at 6th Avenue	SB	Basic Freeway	PM	44.0 E
I-95 Southbound Segment at Lantana Road	SB	Basic Freeway	PM	43.2 E
I-95 Southbound Segment at Hypoluxo Road	SB	Basic Freeway	AM PM	36.7 E 40.7 E
I-95 Southbound North of Gateway Boulevard	SB	Basic Freeway	AM PM	44.3 E F
I-95 Southbound Segment at Boynton Beach Boulevard	SB	Basic Freeway	AM	35.1 E
I-95 Southbound North of Atlantic Avenue	SB	Basic Freeway	AM	38.3 E
I-95 Southbound Segment at Congress Avenue	SB	Basic Freeway	AM PM	F F
I-95 Northbound South of Congress Avenue	NB	Basic Freeway	AM PM	F F
I-95 Northbound Segment at Congress Avenue	NB	Basic Freeway	AM PM	F F
I-95 Northbound North of Atlantic Avenue	NB	Basic Freeway	AM PM	39.4 E 38.1 E

Freeway Element	Direction	Analysis Type	Peak Hour	Analysis Result (Density LOS V/C)
I-95 Northbound Segment at Woolbright Road	NB	Basic Freeway	AM	31.8 E
I-95 Northbound Segment at Boynton Beach Boulevard	NB	Basic Freeway	AM PM	39.2 E 33.8 E
I-95 Northbound North of Boynton Beach Boulevard	NB	Basic Freeway	AM	38.0 E
I-95 Northbound Segment at Gateway Boulevard	NB	Basic Freeway	AM	F
I-95 Northbound North of Gateway Boulevard	NB	Basic Freeway	AM PM	F 44.9 E
I-95 Northbound Segment at Hypoluxo Road	NB	Basic Freeway	AM	F
I-95 Northbound Segment at Lantana Road	NB	Basic Freeway	AM	F
I-95 Northbound North of Lantana Road	NB	Basic Freeway	AM	40.6 E
I-95 Northbound Segment at 6th Avenue	NB	Basic Freeway	AM	F
I-95 Northbound North of 6th Avenue	NB	Basic Freeway	AM	42.1 E
I-95 Northbound Segment at 10th Avenue	NB	Basic Freeway	AM	F
I-95 Northbound North of 10th Avenue	NB	Basic Freeway	AM	F
I-95 Northbound Segment at Forest Hill Boulevard	NB	Basic Freeway	AM	F
I-95 Northbound Segment at Southern Boulevard	NB	Basic	AM	F

Freeway Element	Direction	Analysis Type	Peak Hour	Analysis Result (Density LOS V/C)
		Freeway		
I-95 Northbound North of Southern Boulevard	NB	Basic Freeway	AM	39.0 E
I-95 Northbound Segment at Belvedere Road	NB	Basic Freeway	AM	44.8 E
I-95 Northbound Segment at Okeechobee Road	NB	Basic Freeway	AM	F
I-95 Northbound Segment at Okeechobee Road between On Ramps	NB	Basic Freeway	AM	F
I-95 Northbound North of Okeechobee Road	NB	Basic Freeway	AM	F
I-95 Northbound Segment at Palm Beach Lakes Boulevard	NB	Basic Freeway	AM	F
I-95 Northbound North of Palm Beach Lakes Boulevard	NB	Basic Freeway	AM PM	F F
I-95 Northbound Segment at 45th Street	NB	Basic Freeway	AM	41.8 E
I-95 Northbound North of 45th Street	NB	Basic Freeway	AM	42.2 E
I-95 Northbound Segment at Blue Heron Boulevard	NB	Basic Freeway	AM	38.2 E
I-95 Northbound North of Northlake Boulevard	NB	Basic Freeway	AM PM	41.7 E 37.5 E
I-95 On Ramp from 45th Street	SB	Merge	AM PM	F F
I-95 On ramp from Belvedere Road/PBIA	SB	Merge	PM	F
I-95 On Ramp from Hypoluxo Road	SB	Merge	PM	F

Freeway Element	Direction	Analysis Type	Peak Hour	Analysis Result (Density LOS V/C)
I-95 On Ramp from Gateway Boulevard	NB	Merge	AM PM	F F
I-95 On Ramp from Okeechobee Boulevard	NB	Merge	AM	F
I-95 On Ramp from Palm Beach Lakes Boulevard	NB	Merge	AM PM	F F
I-95 On Ramp from Indiantown Road	NB	Merge	PM	39.8 E
I-95 Southbound Off Ramp to Belvedere Road	SB	Diverge	PM	F
I-95 Southbound Off Ramp to Gateway Boulevard	SB	Diverge	AM PM	38.8 E F
I-95 Northbound Off Ramp to Congress Avenue	NB	Diverge	AM PM	F F
I-95 Southbound Off Ramp to 45th Street	SB	Major Diverge	AM PM	35.5 E 36.0 E
I-95 Southbound Off Ramp to Palm Beach Lakes Boulevard	SB	Major Diverge	PM	35.4 E
I-95 Southbound Off Ramp to Forest Hill Boulevard	SB	Major Diverge	PM	42.4 E
I-95 Southbound Off Ramp to 10th Avenue	SB	Major Diverge	PM	41.4 E
I-95 Northbound Off Ramp to Hypoluxo Road	NB	Major Diverge	AM	38.7 E
I-95 Northbound Off Ramp to Forest Hill Boulevard	NB	Major Diverge	AM	47.5 F
I-95 Northbound Off Ramp to PBIA/Belvedere Road	NB	Major Diverge	AM	41.4 E
I-95 Northbound Off Ramp to Palm Beach Lakes Boulevard	NB	Major Diverge	AM	41.8 E

Freeway Element	Direction	Analysis Type	Peak Hour	Analysis Result (Density LOS V/C)
I-95 Northbound Off Ramp to 45th Street	NB	Major Diverge	AM	41.4 E
I-95 Northbound Off Ramp to Blue Heron Boulevard	NB	Major Diverge	AM	40.0 E
I-95 Northbound Off Ramp to Northlake Boulevard	NB	Major Diverge	AM	36.1 E
I-95 Northbound On Ramp from Boynton Beach Boulevard	NB	Ramp Roadway	AM	1.04
I-95 Northbound On Ramp from 10th Avenue	NB	Ramp Roadway	AM	1.22
Weaving Segment from Palm Beach Lakes Boulevard to Okeechobee Boulevard	SB	Weaving	AM PM	F F
Weaving Segment from Okeechobee Boulevard to PBIA	SB	Weaving	PM	F
Weaving Segment from Southern Boulevard to Forest Hill Boulevard	SB	Weaving	AM PM	F F
Weaving Segment from 10th Avenue to 6th Avenue	SB	Weaving	AM PM	40.3 E F
Weaving Segment from 6th Avenue to Lantana Road	SB	Weaving	AM PM	F F
Weaving Segment from Lantana Road to Hypoluxo Road	SB	Weaving	AM PM	F F
Weaving Segment from Gateway Boulevard to Boynton Beach Boulevard	SB	Weaving	AM PM	F F
Weaving Segment from Boynton Beach Boulevard to Woolbright Road	SB	Weaving	AM PM	F F
Weaving Segment from Linton Boulevard to Congress Avenue	SB	Weaving	AM	F
Weaving Segment from Congress Avenue to Linton Boulevard	NB	Weaving	AM PM	39.2 E F
Weaving Segment from Woolbright Road to Boynton Beach Boulevard	NB	Weaving	AM PM	F F
Weaving Segment from Hypoluxo Road to Lantana Road	NB	Weaving	AM PM	F F
Weaving Segment from Forest Hill Boulevard to Southern Boulevard	NB	Weaving	AM	F
Weaving Segment from PBIA to Okeechobee Boulevard	NB	Weaving	AM PM	F 42.5 E

Table 2.9: 2040 Build Managed Lanes Access Points Analysis Summary

Managed Lanes Access Point Location	Ramp	Analysis Type	Mainline Volume		Ramp Volume		Density		Freeway V/C Ratio		Ramp V/C Ratio		LOS	
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
North of Atlantic Ave	NB Off ramp	Diverge	8,121	8,285	926	821	43.20	43.30	0.91	0.93	0.44	0.39	**E**	**E**
	SB On ramp	Merge	7,806	6,784	574	722	26.70	24.50	0.94	0.84	0.27	0.35	C	C
Between Boynton Beach Blvd Ramps	NB On ramp	Merge	6,926	6,580	246	703	22.90	25.20	0.81	0.83	0.12	0.34	C	C
	SB Off ramp	Diverge	8,044	6,918	632	533	41.80	36.20	0.92	0.79	0.30	0.26	**E**	**E**
Between 10th Ave Ramps	NB Off ramp	Diverge	10,421	7,518	1,139	690	-	40.20	**1.19**	0.86	0.55	0.33	**F**	**E**
	SB On ramp	Merge	6,628	7,328	253	1,199	20.70	30.40	0.78	0.96	0.12	0.57	C	D
Between Forest Hill Blvd Ramps	NB On ramp	Merge	9,242	7,109	1,019	341	-	23.10	**1.14**	0.83	0.49	0.16	**F**	C
	SB Off ramp	Diverge	7,343	9,139	385	974	37.00	-	0.83	**1.03**	0.18	0.47	**E**	**F**
North of Palm Beach Lakes Blvd (South of 45th St)	NB On ramp	Merge	10,978	9,764	1,000	301	-	24.30	**1.08**	0.91	0.48	0.14	**F**	C
	SB Off ramp	Diverge	10,683	11,330	109	520	40.40	-	0.97	**1.02**	0.05	0.25	**E**	**F**
Between 45th St Ramps	NB Off ramp	Diverge	9,196	8,254	422	652	-	43.00	**1.04**	0.93	0.20	0.31	**F**	**E**
	SB On ramp	Merge	7,939	7,740	515	713	27.00	27.80	0.95	0.95	0.25	0.34	C	C
Between Blue Heron Blvd Ramps	NB On ramp	Merge	7,340	6,889	945	664	29.30	25.60	0.95	0.86	0.45	0.32	D	C
	SB Off ramp	Diverge	8,102	8,042	629	845	41.90	42.80	0.93	0.92	0.30	0.40	**E**	**E**
Between Central Blvd Ramps	NB On ramp	Major Merge	3,592	6,273	1,081	1,249	-	-	0.42	0.70	0.52	0.60	-	-
	SB Off ramp	Major Diverge	6,791	5,161	1,155	990	25.40	19.30	0.63	0.46	0.28	0.24	C	B

Table 2.10: 2040 Build Basic Freeway Analysis Summary

Segment Description	AM Peak				PM Peak			
	Mainline Volume	Density	V/C Ratio	LOS	Mainline Volume	Density	V/C Ratio	LOS
I-95 NB Segment between								
South of Congress Ave/Peninsula Corporate Drive interchange	7,154	22.80	0.65	C	7,727	25.10	0.70	C
Between Congress Ave Off ramp/On ramp	6,447	26.50	0.73	D	6,893	29.10	0.78	D
South of Linton Blvd interchange	Analyzed as Weaving Section							
Between Linton Blvd Off ramp/On ramp	5,693	22.30	0.64	C	6,294	25.10	0.70	C
South of Atlantic Ave Interchange	Analyzed as Weaving Section							
Between Atlantic Ave Off ramp/On ramp	5,809	23.00	0.65	C	6,467	26.30	0.73	D
South of Woolbright Rd (South of ML Ingress)	8,121	37.20	0.91	**E**	8,285	38.60	0.93	**E**
South of Woolbright Rd (North of ML Ingress)	7,195	30.40	0.81	D	7,464	32.20	0.84	D
Between Woolbright Rd Off ramp/On ramp	6,222	25.00	0.70	C	6,147	24.60	0.69	C
South of Boynton Beach Blvd	Analyzed as Weaving Section							
Between Boynton Blvd Off ramp/On ramp (South of ML Egress)	6,926	29.30	0.79	D	6,580	27.30	0.75	D
Between Boynton Blvd Off ramp/On ramp (North of ML Egress)	7,172	30.90	0.82	D	7,283	31.70	0.83	D
South of Gateway Blvd Interchange	Analyzed as Weaving Section							
Between Gateway Blvd Off ramp/On ramp	7,805	35.50	0.89	**E**	7,154	30.80	0.81	D
South of Hypoluxo Rd Interchange	9,536	34.10	0.87	D	8,523	28.70	0.78	D
Between Hypoluxo Rd Off ramp/On ramp	8,693	43.90	0.99	**E**	7,274	31.60	0.83	D
South of Lantana Rd Interchange	Analyzed as Weaving Section							
Between Lantana Rd Off ramp/On ramp	9,192	-	**1.05**	**F**	6,839	28.80	0.78	D
South of 6th Ave Interchange	Analyzed as Weaving Section							
Between 6th Ave Off ramp/On ramp	9,329	-	**1.06**	**F**	7,175	30.90	0.82	D
South of 10th Ave Interchange	Analyzed as Weaving Section							
Between 10th Ave Off ramp/On ramp (S of ML)	10,421	-	**1.19**	**F**	7,518	33.30	0.86	D
Between 10th Ave Off ramp/On ramp (N of ML)	9,282		**1.06**	**F**	6,828	28.70	0.78	D
South of Forest Hill Blvd Interchange	11,262	-	**1.02**	**F**	8,342	27.50	0.75	D
Between Forest Hill Blvd Off ramp/On ramp (S of ML)	9,242	-	**1.03**	**F**	7,109	29.50	0.79	D
Between Forest Hill Blvd Off ramp/On ramp (S of ML)	10,261	-	**1.14**	**F**	7,450	31.70	0.83	D
South of SR 80 NB Off ramp	13,025	-	**1.01**	**F**	9,100	26.10	0.70	D
SR 80 NB Off ramp & Belvedere Rd NB Off ramp	10,972	-	**1.02**	**F**	7,366	25.30	0.68	C
Belvedere Rd NB Off ramp & SR 80 NB On ramp	8,534	44.10	0.99	**E**	5,930	25.40	0.69	C
North of SR 80 NB On ramp	10,121	-	**1.17**	**F**	7,175	32.50	0.83	D
South of Okeechobee Blvd Interchange	Analyzed as Weaving Section							

Segment Description	AM Peak				PM Peak			
	Mainline Volume	Density	V/C Ratio	LOS	Mainline Volume	Density	V/C Ratio	LOS
Between Okeechobee Blvd Off ramp/On ramp	9,135	-	**1.03**	**F**	6,759	28.00	0.76	D
Between Okeechobee Blvd On ramps	9,551	33.80	0.86	D	7,270	23.00	0.66	C
South of Palm Beach Lakes Blvd Interchange	10,569	40.80	0.95	**E**	8,960	30.60	0.81	D
Between Palm Beach Lakes Blvd Off ramp/On ramp	8,930	-	**1.01**	**F**	7,480	32.80	0.85	D
South of 45th St (South of ML Egress) Interchange	10,979	44.20	0.99	**E**	9,764	35.10	0.88	**E**
South of 45th St (North of ML Egress) Interchange	11,979	-	**1.08**	**F**	10,065	37.10	0.91	**E**
Between 45th St (South of ML Ingress) Interchange	9,196	-	**1.04**	**F**	8,254	38.80	0.93	**E**
Between 45th St Off ramp/On ramp	8,775	42.80	0.98	**E**	7,602	32.80	0.85	D
South of Blue Heron Blvd Interchange	10,148	36.70	0.90	**E**	8,867	29.50	0.79	D
Between Blue Heron Blvd Off ramp/On ramp (S of ML)	7,341	32.50	0.84	D	6,888	29.40	0.79	D
Between Blue Heron Blvd Off ramp/On ramp (N of ML)	8,285	40.40	0.95	**E**	7,553	34.00	0.87	D
South of North Lake Blvd Interchange	Analyzed as Weaving Section				9,044	31.30	0.82	D
Between North Lake Blvd Off ramp/On ramp	6,897	29.10	0.78	D	6,882	29.00	0.78	D
South of PGA Boulevard Interchange	8,284	39.80	0.94	**E**	8,319	40.10	0.95	**E**
Between PGA Blvd Off ramps	5,426	21.50	0.62	C	6,550	27.20	0.75	D
Between PGA Blvd Off ramp/On ramp	4,353	17.00	0.50	B	5,629	22.50	0.64	C
South of Off ramp to Central Blvd	Analyzed as Weaving Section							
South of On ramp from Military Trail	3,452	13.50	0.39	B	5,723	22.90	0.65	C
Between Military Trail On ramp and Central Blvd On ramp (S of ML)	3,592	14.10	0.41	B	6,273	25.70	0.72	C
Between Military Trail On ramp and Central Blvd On ramp (N of ML)	4,673	14.60	0.43	B	7,523	24.30	0.69	C
South of Donald Ross Rd Interchange	Analyzed as Weaving Section							
Between Donald Ross Rd Off ramp/On ramp	2,824	8.10	0.25	A	6,206	18.10	0.56	C
South of Indiantown Rd Interchange	3,349	9.70	0.30	A	7,146	21.80	0.65	C
Between Indiantown Rd Off ramps	1,627	5.90	0.19	A	5,421	20.40	0.62	C
Between Indiantown Rd Off ramp/On ramp	828	3.00	0.09	A	4,046	14.70	0.46	B
North of Indiantown Rd On ramp	2,209	8.00	0.25	A	5,697	21.70	0.65	C
I-95 SB Segment between								
North of Indiantown Rd Off ramp	5,297	19.90	0.60	C	3,483	12.70	0.40	B
Between Indiantown Off ramps	3,884	14.20	0.44	B	2,410	8.80	0.27	A
Between Indiantown Rd Off ramp/On ramp	3,087	11.30	0.35	B	1,900	6.90	0.22	A
North of Donald Ross Rd Off ramp	6,705	20.20	0.61	C	4,397	12.90	0.40	B
Between Donald Ross Rd Off ramp/On ramp	5,740	16.60	0.51	B	3,751	10.70	0.34	A
North of Central Blvd off ramp	Analyzed as Weaving Section							
Between Central Blvd Off ramp/Military Trail Off ramp (N of ML)	6,791	21.60	0.62	C	5,161	16.20	0.47	B

Segment Description	AM Peak				PM Peak			
	Mainline Volume	Density	V/C Ratio	LOS	Mainline Volume	Density	V/C Ratio	LOS
Between Central Blvd Off ramp/Military Trail Off ramp (N of ML)	5,636	22.50	0.64	C	4,171	16.30	0.48	B
Between Military Trail Off ramp and Central Blvd On ramp	5,166	20.40	0.59	C	3,919	15.30	0.45	B
Between Central Blvd On ramp/PGA Blvd Off ramp	Analyzed as Weaving Section							
Between PGA Blvd Off ramp/On ramp	5,705	22.80	0.65	C	5,271	20.80	0.60	C
Between PGA Blvd On ramps	7,225	23.20	0.66	C	6,826	21.70	0.62	C
North of Northlake Blvd Off ramp	8,672	29.50	0.79	D	8,411	28.30	0.77	D
Between Northlake Blvd Off ramp/On ramp	7,283	31.70	0.83	D	6,850	28.90	0.78	D
North of Blue Heron Blvd Off ramp	9,742	35.90	0.89	E	9,506	34.40	0.87	D
Between Blue Heron Blvd Off ramp/On ramp (N of ML)	8,102	38.60	0.93	E	8,042	38.10	0.92	E
Between Blue Heron Blvd Off ramp/On ramp (S of ML)	7,473	33.40	0.86	D	7,197	31.50	0.83	D
North of 45th St Off ramp	9,694	35.60	0.89	E	9,695	35.60	0.89	E
Between 45th St Off ramp/On ramp (N of ML Egress)	7,939	35.30	0.88	E	7,740	33.80	0.86	D
Between 45th St Off ramp/On ramp (S of ML Egress)	8,454	41.40	0.96	E	8,453	41.40	0.96	E
North of Palm Beach Lakes Blvd Off ramp (N of ML Ingress)	10,683	42.30	0.97	E	11,330	-	1.03	F
North of Palm Beach Lakes Blvd Off ramp (S of ML Ingress)	10,574	41.40	0.96	E	10,810	43.40	0.98	E
Between Palm Beach Lakes Blvd Off ramp/On ramp	7,879	35.80	0.89	E	8,454	40.90	0.96	E
North of Okeechobee Blvd Off ramp	Analyzed as Weaving Section							
Between Okeechobee Blvd Off ramp/On ramp	6,846	28.60	0.77	D	7,996	36.60	0.90	E
North of Belvedere Rd Off ramp	Analyzed as Weaving Section							
North of James L Turnage Blvd Off ramp	Analyzed as Weaving Section							
North of loop Off ramp to Belvedere Rd	7,575	33.30	0.86	D	9,290	-	1.05	F
Belvedere Rd Off ramp to Belvedere Rd & SR 80 SB Off ramp	6,968	30.60	0.80	D	8,935	-	1.03	F
SR 80 SB Off ramp & Belvedere Rd SB On ramp	5,373	22.40	0.62	C	6,827	29.70	0.79	D
Belvedere Rd SB On ramp & SR 80 SB On ramp	6,781	29.50	0.78	D	9,341	-	1.08	F
SR 80 SB On ramp & Forest Hill Blvd SB Off ramp	8,800	31.00	0.81	D	11,197	-	1.03	F
Between Forest Hill Blvd Off ramp/On ramp (N of ML)	7,343	33.10	0.85	D	9,139	-	1.05	F
Between Forest Hill Blvd Off ramp/On ramp (S of ML)	6,958	30.50	0.80	D	8,165	39.70	0.94	E
North of 10th Ave Off ramp	8,350	27.00	0.74	D	9,907	35.10	0.88	E
Between 10th Ave Off ramp/On ramp (N of ML Egress)	6,628	27.50	0.75	D	7,328	31.90	0.83	D
Between 10th Ave Off ramp/On ramp (S of ML Egress)	6,881	29.00	0.78	D	8,527	42.10	0.97	E
North of 6th Ave Off ramp	Analyzed as Weaving Section							
Between 6th Ave Off ramp/On ramp	7,235	31.30	0.82	D	8,682	43.70	0.99	E
North of Lantana Blvd Off ramp	Analyzed as Weaving Section							
Between Lantana Rd Off ramp/On ramp	7,459	32.90	0.85	D	8,188	38.80	0.93	E

Segment Description	AM Peak				PM Peak			
	Mainline Volume	Density	V/C Ratio	LOS	Mainline Volume	Density	V/C Ratio	LOS
North of Hypoluxo Blvd Off ramp	Analyzed as Weaving Section							
Between Hypoluxo Rd Off ramp/On ramp	7,888	36.20	0.90	**E**	7,727	34.90	0.88	D
North of Gateway Blvd Off ramp	Analyzed as Weaving Section							
Between Gateway Blvd Off ramp/On ramp	7,742	35.10	0.88	**E**	7,137	30.70	0.81	D
North of Boynton Beach Blvd Off ramp	9,410	33.40	0.86	D	8,400	28.10	0.76	D
Between Boynton Blvd Off ramp/On ramp (N of ML Ingress)	8,044	37.50	0.92	**E**	6,918	29.30	0.79	D
Between Boynton Blvd Off ramp/On ramp (S of ML Ingress)	7,412	32.50	0.84	D	6,385	26.20	0.73	D
North of Woolbright Rd off ramp	Analyzed as Weaving Section							
Between Woolbright Rd Off ramp/On ramp	6,867	28.60	0.77	D	5,849	23.20	0.66	C
North of Atlantic Ave Off ramp (N of ML Egress)	7,806	35.00	0.88	D	6,784	28.10	0.76	D
North of Atlantic Ave Off ramp (S of ML Egress)	8,380	39.90	0.94	**E**	7,506	32.70	0.85	D
Between Atlantic Ave Off ramp/On ramp	6,763	28.00	0.76	D	5,771	22.80	0.65	C
Between Atlantic Ave On ramps	7,302	31.30	0.82	D	6,360	25.70	0.72	C
North of Linton Blvd Off ramp	8,777	29.50	0.79	D	7,539	24.10	0.68	C
Between Linton Blvd Off ramp/On ramp	6,347	25.40	0.71	C	5,487	21.30	0.61	C
North of Congress Ave off ramp	Analyzed as Weaving Section							
Between Congress Ave Off ramp/On ramp	6,960	-	**1.06**	**F**	6,260	40.30	0.95	**E**
South of Congress Ave/Peninsula Corporate Drive interchange	7,454	32.90	0.85	D	6,925	29.30	0.79	D

Table 2.11: 2040 Build Ramp Junction Analysis Summary

Interchange	Ramp	Analysis Type	Mainline Volume		Ramp Volume		Density		Freeway V/C Ratio		Ramp V/C Ratio		LOS	
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Congress Ave	NB Off ramp	Major Diverge	7,154	7,727	707	834	26.75	28.90	0.72	0.77	0.36	0.42	C	D
	NB On ramp	Analyzed as Weaving Section												
	SB Off ramp	Analyzed as Weaving Section												
	SB On ramp	Major Merge	6,960	6,260	494	665	-	-	**1.03**	0.93	0.25	0.34		
Linton Boulevard	NB Off ramp	Analyzed as Weaving Section												
	NB On ramp													
	SB Off ramp	Major Diverge	8,777	7,539	2,430	2,052	32.82	28.19	0.78	0.67	0.62	0.52	D	D
	SB On ramp	Analyzed as Weaving Section												
Atlantic Ave	NB Off ramp	Analyzed as Weaving Section												
	NB On ramp	Merge	5,809	6,467	2,312	1,818	34.10	32.40	0.91	0.93	0.63	0.49	D	D
	SB Off ramp	Diverge	8,380	7,506	1,617	1,735	22.30	20.90	0.94	0.85	0.44	0.47	C	C
	SB On ramp (loop)	Merge	6,763	5,771	539	589	25.80	22.80	0.82	0.72	0.29	0.32	C	C
	SB On ramp	Major Merge	7,302	6,360	1,475	1,179	-	-	0.81	0.71	0.38	0.30	-	-
Woolbright Road	NB Off ramp	Diverge	7,195	7,464	973	1,317	17.40	18.40	0.81	0.84	0.26	0.35	B	B
	NB On ramp	Analyzed as Weaving Section												
	SB Off ramp	Analyzed as Weaving Section												
	SB On ramp	Merge	6,867	5,849	939	935	26.70	23.30	0.88	0.76	0.50	0.50	C	C
Boynton Beach Blvd	NB Off ramp	Analyzed as Weaving Section												
	NB On ramp													
	SB Off ramp	Major Diverge	9,410	8,400	1,366	1,482	35.19	31.41	0.90	0.77	0.35	0.38	**E**	D
	SB On ramp	Analyzed as Weaving Section												
Gateway Blvd	NB Off ramp	Analyzed as Weaving Section												
	NB On ramp	Major Merge	7,805	7,154	1,731	1,369	-	-	0.87	0.80	0.88	0.70	-	-
	SB Off ramp	Analyzed as Weaving Section												
	SB On ramp	Major Merge	7,742	7,137	1,668	1,263	-	-	0.86	0.79	0.85	0.64	-	-
Hypoluxo Rd	NB Off ramp	Major Diverge	9,536	8,523	843	1,249	35.66	31.87	0.97	0.81	0.21	0.32	**E**	D
	NB On ramp	Analyzed as Weaving Section												
	SB Off ramp	Analyzed as Weaving Section												
	SB On ramp	Analyzed as Weaving Section												
Lantana Rd	NB Off ramp	Analyzed as Weaving Section												
	NB On ramp	Analyzed as Weaving Section												
	SB Off ramp	Analyzed as Weaving Section												
	SB On ramp	Analyzed as Weaving Section												

Interchange	Ramp	Analysis Type	Mainline Volume		Ramp Volume		Density		Freeway V/C Ratio		Ramp V/C Ratio		LOS	
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
6th Ave	NB Off ramp	Analyzed as Weaving Section												
	NB On ramp	Analyzed as Weaving Section												
	SB Off ramp	Analyzed as Weaving Section												
	SB On ramp	Analyzed as Weaving Section												
10th Ave	NB Off ramp	Analyzed as Weaving Section												
	NB On ramp	Major Merge	9,282	6,828	1,980	1,514	-	-	**1.03**	0.76	0.50	0.39	-	-
	SB Off ramp	Major Diverge	8,350	9,907	1,722	2,579	31.23	37.05	0.74	0.88	0.44	0.66	D	**E**
	SB On ramp	Analyzed as Weaving Section												
Forest Hill Blvd	NB Off ramp	Major Diverge	11,262	8,342	2,020	1,233	42.12	31.20	**1.03**	0.79	0.51	0.31	**E**	D
	NB On ramp	Major Merge	10,261	7,450	2,763	1,651	-	-	**1.14**	0.83	0.70	0.42	-	-
	SB Off ramp	Major Diverge	8,800	11,197	1,457	2,058	32.91	41.87	0.82	**1.02**	0.37	0.52	D	**E**
	SB On ramp	Major Merge	6,958	8,165	1,392	1,742	-	-	0.77	0.91	0.35	0.44	-	-
SR 80	NB Off ramp	Major Diverge	13,025	9,100	2,053	1,735	40.59	28.36	0.98	0.68	0.52	0.44	**E**	D
	NB On ramp	Major Merge	8,534	5,929	1,587	1,245	-	-	0.95	0.66	0.40	0.32	-	-
	SB Off ramp	Diverge	6,968	8,935	1,595	2,108	18.70	-	0.79	**1.01**	0.41	0.54	B	**F**
	SB On ramp	Major Merge	6,781	9,341	2,019	1,856	-	-	0.78	**1.04**	**1.03**	0.94	-	-
Belvedere Rd	NB Off ramp	Major Diverge	10,972	7,365	2,438	1,436	41.03	27.54	0.98	0.66	0.62	0.37	**E**	C
	NB On ramp	Analyzed as Weaving Section												
	SB Off ramp (to James L Turnage Blvd)	Analyzed as Weaving Section												
	SB Off ramp (loop)	Diverge	7,575	9,290	607	355	32.00	-	0.86	**1.05**	0.32	0.19	D	**F**
	SB On ramp	Merge	5,373	6,827	1,408	2,514	25.50	-	0.77	**1.05**	0.38	0.68	C	**F**
Okeechobee Blvd	NB Off ramp	Analyzed as Weaving Section												
	NB On ramp (loop)	Major Merge	9,135	6,759	416	510	-	-	**1.02**	0.75	0.21	0.26	-	-
	NB On ramp	Merge	9,551	7,270	1,018	1,691	32.50	30.90	0.95	0.81	0.55	0.92	D	D
	SB Off ramp	Analyzed as Weaving Section												
	SB On ramp	Analyzed as Weaving Section												
Palm Beach Lakes Blvd	NB Off ramp	Major Diverge	10,569	8,960	1,639	1,481	39.53	33.51	0.99	0.83	0.42	0.38	**E**	D
	NB On ramp	Merge	8,930	7,479	2,049	2,284	-	-	**1.35**	**1.20**	0.55	0.61	**F**	**F**
	SB Off ramp	Major Diverge	10,574	10,810	2,695	2,356	39.68	40.57	0.94	0.97	0.69	0.60	**E**	**E**
	SB On ramp	Analyzed as Weaving Section												
45th St	NB Off ramp	Major Diverge	11,979	10,064	2,782	1,811	45.00	37.80	**1.07**	0.92	0.70	0.46	**E**	**E**
	NB On ramp	Major Merge	8,775	7,601	1,373	1,266	-	-	0.98	0.85	0.35	0.32	-	-
	SB Off ramp	Major Diverge	9,694	9,695	1,755	1,955	36.54	36.54	0.89	0.87	0.45	0.50	**E**	**E**
	SB On ramp	Major Merge	8,454	8,453	2,229	2,877	-	-	0.95	**1.01**	0.56	0.73	-	-

Interchange	Ramp	Analysis Type	Mainline Volume		Ramp Volume		Density		Freeway V/C Ratio		Ramp V/C Ratio		LOS	
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Blue Heron Blvd	NB Off ramp	Major Diverge	10,148	8,867	2,807	1,979	37.95	33.16	0.90	0.79	0.71	0.50	E	D
	NB On ramp*	Major Merge	-	7,553	-	1,492	-	-	-	0.84	-	0.38	-	-
	SB Off ramp	Major Diverge	9,742	9,506	1,640	1,464	36.72	35.83	0.91	0.90	0.42	0.38	E	E
	SB On ramp	Major Merge	7,473	7,197	2,221	2,498	-	-	0.87	0.87	0.60	0.70	-	-
Northlake Blvd	NB Off ramp*	Major Diverge	-	9,044	-	2,162	-	33.94	-	0.81	-	0.55	-	D
	NB On ramp	Merge	6,897	6,883	1,387	1,437	30.60	30.90	0.94	0.94	0.37	0.39	D	D
	SB Off ramp	Major Diverge	8,672	8,411	1,389	1,561	32.54	31.56	0.81	0.77	0.35	0.40	D	D
	SB On ramp	Major Merge	7,283	6,850	2,459	2,656	-	-	0.87	0.85	0.66	0.72	-	-
PGA Blvd	NB Off ramp	Diverge	8,284	8,319	2,858	1,769	30.60	23.20	0.95	0.95	0.77	0.47	D	C
	NB Off ramp (loop)	Diverge	5,426	6,550	1,073	922	19.50	23.40	0.62	0.75	0.58	0.49	B	C
	NB On ramp	Analyzed as Weaving Section												
	SB Off ramp	Analyzed as Weaving Section												
	SB On ramp (from EB PGA Blvd)	Merge	7,225	6,826	1,447	1,585	25.20	25.70	0.79	0.76	0.78	0.85	C	C
	SB On ramp (from WB PGA Blvd)	Major Merge	5,705	5,271	1,520	1,555	-	-	0.65	0.61	0.81	0.83	-	-
Military Trail	NB On ramp	Merge	3,452	5,723	140	550	11.50	22.60	0.41	0.71	0.08	0.30	B	C
	SB Off ramp	Diverge	5,636	4,171	470	252	28.50	21.30	0.64	0.48	0.25	0.14	D	C
Central Blvd	NB Off ramp	Analyzed as Weaving Section												
	NB On ramp	Analyzed as Weaving Section												
	SB Off ramp	Analyzed as Weaving Section												
	SB On ramp	Analyzed as Weaving Section												
Donald Ross Rd	NB Off ramp	Analyzed as Weaving Section												
	NB On ramp	Merge	2,824	6,206	525	940	14.10	25.40	0.30	0.65	0.28	0.51	B	C
	SB Off ramp	Diverge	6,705	4,397	965	646	16.00	7.30	0.77	0.50	0.26	0.17	B	A
	SB On ramp	Analyzed as Weaving Section												
Indiantown Rd	NB Off ramp	Major Diverge	3,348	7,147	1,722	1,726	12.58	26.85	0.30	0.64	0.44	0.44	B	C
	NB Off ramp (loop)	Diverge	1,627	5,421	799	1,374	11.70	30.30	0.19	0.62	0.44	0.75	B	D
	NB On ramp	Merge	828	4,047	1,381	1,651	16.20	29.30	0.25	0.65	0.74	0.89	B	D
	SB Off ramp	Diverge	5,297	3,483	1,413	1,073	28.50	19.30	0.60	0.40	0.77	0.59	D	B
	SB Off ramp (loop)	Diverge	3,884	2,410	797	510	20.80	13.20	0.44	0.27	0.44	0.28	C	B
	SB On ramp	Merge	3,087	1,900	3,618	2,497	33.40	21.20	0.61	0.40	0.99	0.68	D	C

*Analyzed as Weaving section form AM Peak hour

Table 2.12: 2040 Build Weaving Segments Analysis Summary

Weaving Segment Check													
Segment Description	**Distance between Ramps (ft)**	**AM/PM Peak Hours**	**Mainline Volume**	**On Ramp Volume**	**Off Ramp Volume**	**Weaving Volume**	**Weaving Volume Ratio**	**Number of Maneuver lanes**	**Maximum Weaving Length (ft)**	**Is weaving segment?**	**Density (pc/mi/ln)**	**V/C Ratio**	**LOS**
I-95 Northbound													
One Sided Weaving													
Congress Avenue to Linton Boulevard	3,000	AM	6,447	778	1,532	1,980	0.27	3	3,741	Yes	27.00	0.67	C
		PM	6,893	1,423	2,022	2,753	0.33	3	4,353	Yes	33.10	0.85	D
Linton Boulevard to Atlantic Avenue	4,700	AM	5,693	2,136	2,020	3,054	0.39	3	5,004	Yes	31.80	0.94	D
		PM	6,294	2,087	1,914	3,048	0.36	3	4,711	Yes	34.60	0.94	D
Woolbright Road to Boynton Beach Boulevard	2,200	AM	6,222	2,008	1,304	2,676	0.33	2	5,855	Yes	-	**1.21**	**F**
		PM	6,147	1,836	1,403	2,594	0.32	2	5,853	Yes	-	**1.17**	**F**
Boynton Beach Blvd to Gateway Blvd	3,500	AM	7,172	1,849	1,216	2,567	0.28	2	5,419	Yes	-	**1.15**	**F**
		PM	7,283	1,346	1,475	2,361	0.27	2	5,303	Yes	-	**1.06**	**F**
Gateway Boulevard to Hypoluxo Road	4,500	AM	7,805	1,731	843	2,268	0.24	3	3,361	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
		PM	7,154	1,369	1,249	2,217	0.26	3	3,594	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
Hypoluxo Road to Lantana Road	2,400	AM	8,693	2,423	1,924	3,508	0.32	2	5,752	Yes	-	**1.59**	**F**
		PM	7,274	1,884	2,319	3,249	0.35	2	6,179	Yes	-	**1.47**	**F**
Lantana Road to 6th Avenue	4,200	AM	9,192	2,323	2,186	3,627	0.31	2	5,745	Yes	-	**1.64**	**F**
		PM	6,839	1,939	1,603	2,834	0.32	2	5,830	Yes	-	**1.28**	**F**
6th Avenue to 10th Avenue	3,400	AM	9,329	2,813	1,721	3,737	0.31	2	5,667	Yes	-	**1.69**	**F**
		PM	7,175	1,723	1,380	2,569	0.29	2	5,463	Yes	-	**1.16**	**F**
10th Avenue to Forest Hill Boulevard	6,600	AM	9,282	1,980	2,020	3,290	0.29	3	3,934	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
		PM	6,828	1,514	1,233	2,299	0.28	3	3,758	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
Forest Hill Blvd to SR 80	4,200	AM	10,261	2,763	2,053	3,945	0.30	3	4,049	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
		PM	7,450	1,651	1,735	2,757	0.30	3	4,049	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
Belvedere Road to Okeechobee Boulevard	2,200	AM	10,121	1,310	2,296	3,080	0.27	3	3,692	Yes	-	**1.08**	**F**
		PM	7,174	1,416	1,831	2,643	0.31	3	4,100	Yes	34.50	0.83	D
Okeechobee Boulevard to Palm Beach Lakes Boulevard	4,400	AM	9,135	1,434	1,639	2,628	0.25	3	3,474	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
		PM	6,759	2,201	1,481	2,954	0.33	3	4,339	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
45th Street to Blue Heron Boulevard	5,800	AM	8,775	1,373	2,807	3,420	0.34	3	4,418	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
		PM	7,601	1,266	1,979	2,680	0.30	3	4,042	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
Blue Heron Boulevard to	6,000	AM	8,286	1,295	2,684	3,253	0.34	2	6,012	Yes	-	**1.48**	**F**

Weaving Segment Check													
Segment Description	**Distance between Ramps (ft)**	**AM/PM Peak Hours**	**Mainline Volume**	**On Ramp Volume**	**Off Ramp Volume**	**Weaving Volume**	**Weaving Volume Ratio**	**Number of Maneuver lanes**	**Maximum Weaving Length (ft)**	**Is weaving segment?**	**Density (pc/mi/ln)**	**V/C Ratio**	**LOS**
Northlake Boulevard		PM	7,552	1,492	2,162	2,941	0.33	2	5,856	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
PGA Boulevard to Central Boulevard	2,300	AM	4,353	556	1,457	1,683	0.34	3	4,482	Yes	17.50	0.53	B
		PM	5,628	1,277	1,182	2,022	0.29	3	3,941	Yes	27.30	0.67	C
Central Boulevard to Donald Ross Road	5,200	AM	4,672	455	2,304	2,350	0.46	2	7,344	Yes	-	**1.07**	**F**
		PM	7,523	580	1,896	2,205	0.27	2	5,287	Yes	-	**1.01**	**F**
I-95 Southbound													
One Sided Weaving													
Donald Ross Road to Central Boulevard	3,300	AM	5,740	1,461	410	1,705	0.24	2	4,916	Yes	25.40	0.78	C
		PM	3,751	1,673	263	1,774	0.33	2	5,876	Yes	18.60	0.81	B
Central Boulevard to PGA Blvd	1,900	AM	5,166	1,713	1,174	2,302	0.33	3	4,392	Yes	28.50	0.72	D
		PM	3,919	2,118	766	2,347	0.39	3	4,989	Yes	25.70	0.73	C
PGA Boulevard to Northlake Boulevard	8,500	AM	5,705	2,967	1,389	3,406	0.39	2	6,600	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
		PM	5,251	3,140	1,561	3,533	0.42	2	6,918	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
Northlake Boulevard to Blue Heron Blvd	6,100	AM	7,283	2,459	1,640	3,271	0.34	3	4,405	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
		PM	6,850	2,656	1,464	3,302	0.35	3	4,531	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
Blue Heron Blvd to 45th St	5,700	AM	7,473	2,221	1,755	3,172	0.33	3	4,312	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
		PM	7,197	2,498	1,955	3,446	0.36	3	4,620	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
Palm Beach Lakes Boulevard to Okeechobee Blvd	2,500	AM	7,879	1,423	2,456	3,128	0.34	3	4,410	Yes	-	**1.40**	**F**
		PM	8,454	2,231	2,689	3,797	0.36	3	4,619	Yes	-	**1.70**	**F**
Okeechobee Blvd to Belvedere Blvd	2,700	AM	6,846	1,122	393	1,404	0.18	2	4,294	Yes	33.30	0.76	D
		PM	7,996	2,515	1,221	3,152	0.30	2	5,583	Yes	-	**1.41**	**F**
SR 80 to Forest Hill Blvd	4,300	AM	6,781	2,019	1,457	2,807	0.32	3	4,222	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
		PM	9,341	1,856	2,058	3,232	0.29	3	3,896	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
Forest Hill Blvd to 10th Ave	6,100	AM	6,958	1,392	1,722	2,540	0.30	3	4,063	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
		PM	8,165	1,742	2,579	3,414	0.34	3	4,501	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
10th Ave to 6th Ave	3,100	AM	6,881	1,501	1,147	2,237	0.27	3	3,665	Yes	34.50	0.78	D
		PM	8,527	1,978	1,823	3,114	0.30	3	3,980	Yes	-	0.98	**F**
6th Ave to Lantana Rd	4,400	AM	7,235	1,603	1,379	2,482	0.28	2	5,379	Yes	-	**1.12**	**F**
		PM	8,682	1,144	1,638	2,401	0.24	2	4,995	Yes	-	**1.08**	**F**
Lantana Rd to Hypoluxo Rd	2,000	AM	7,459	1,658	1,229	2,440	0.27	2	5,239	Yes	-	**1.10**	**F**
		PM	8,188	1,074	1,535	2,253	0.24	2	4,983	Yes	-	**1.01**	**F**

Weaving Segment Check													
Segment Description	Distance between Ramps (ft)	AM/PM Peak Hours	Mainline Volume	On Ramp Volume	Off Ramp Volume	Weaving Volume	Weaving Volume Ratio	Number of Maneuver lanes	Maximum Weaving Length (ft)	Is weaving segment?	Density (pc/mi/ln)	V/C Ratio	LOS
Hypoluxo Rd to Gateway Blvd	3,900	AM	7,888	1,304	1,450	2,343	0.25	2	5,105	Yes	42.70	0.99	**E**
		PM	7,727	854	1,444	2,011	0.23	2	4,890	Yes	33.60	0.74	D
Gateway Blvd to Boynton Beach Blvd	4,100	AM	7,742	1,668	1,366	2,550	0.27	3	3,709	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
		PM	7,137	1,263	1,482	2,299	0.27	3	3,737	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
Boynton Beach Blvd to Woolbright Rd	2,400	AM	7,412	1,672	2,217	3,073	0.34	2	5,998	Yes	-	**1.38**	**F**
		PM	6,385	1,434	1,970	2,681	0.34	2	6,048	Yes	-	**1.21**	**F**
Atlantic Blvd to Linton Blvd	4,700	AM	7,302	1,475	2,430	3,088	0.35	3	4,580	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
		PM	6,360	1,179	2,052	2,589	0.34	3	4,488	No	Analyzed as Major Merge, Basic Freeway & Major Diverge Section		
Linton Blvd to Congress Ave	2,900	AM	6,347	1,879	1,266	2,567	0.31	3	4,148	Yes	34.80	0.80	D
		PM	5,487	1,651	878	2,123	0.30	3	3,990	Yes	29.20	0.67	D

For additional details and data regarding the Traffic Operational Analysis, refer to **Section 3.11** and **3.12** of the **Master Plan Technical Document**.

2.2 *Facility Enhancement Element*

This section documents the need, type, extent, and estimated cost of each improvement for each segment of the Corridor to meet the SIS criteria and standards. Selection of design concept and scope is the goal and the element include a comparison of existing facilities to appropriate SIS standards including level of service as well as geometric features. Consideration of alternatives to physical improvements is included which consists of utilization of alternative modes and Transportation System Management (TSM) techniques. The selection of the recommended alternative considers analysis of all alternatives.

Refer to **Section 4.0** of the **Master Plan Technical Document** for additional details.

2.2.1 *Alternatives*

2.2.1.1 *Alternative Corridors and Modes*

The corridors listed below were considered as reasonable alternatives to adding managed lanes along I-95 through Palm Beach County (See **Figure 2.19).**

- South Florida Rail Corridor/CSX Rail Line
- SR 821 / Florida's Turnpike
- SR 809 / CR 809 / Military Trail
- SR 5 / US 1
- SR A1A

As discussed in **Section 4.2.1** of the **Master Plan Technical Document**, the corridors listed above were determined to be unviable alternative corridors based on market sheds that each corridor serves, and constraints to potential capacity expansion due to availability of right of way.

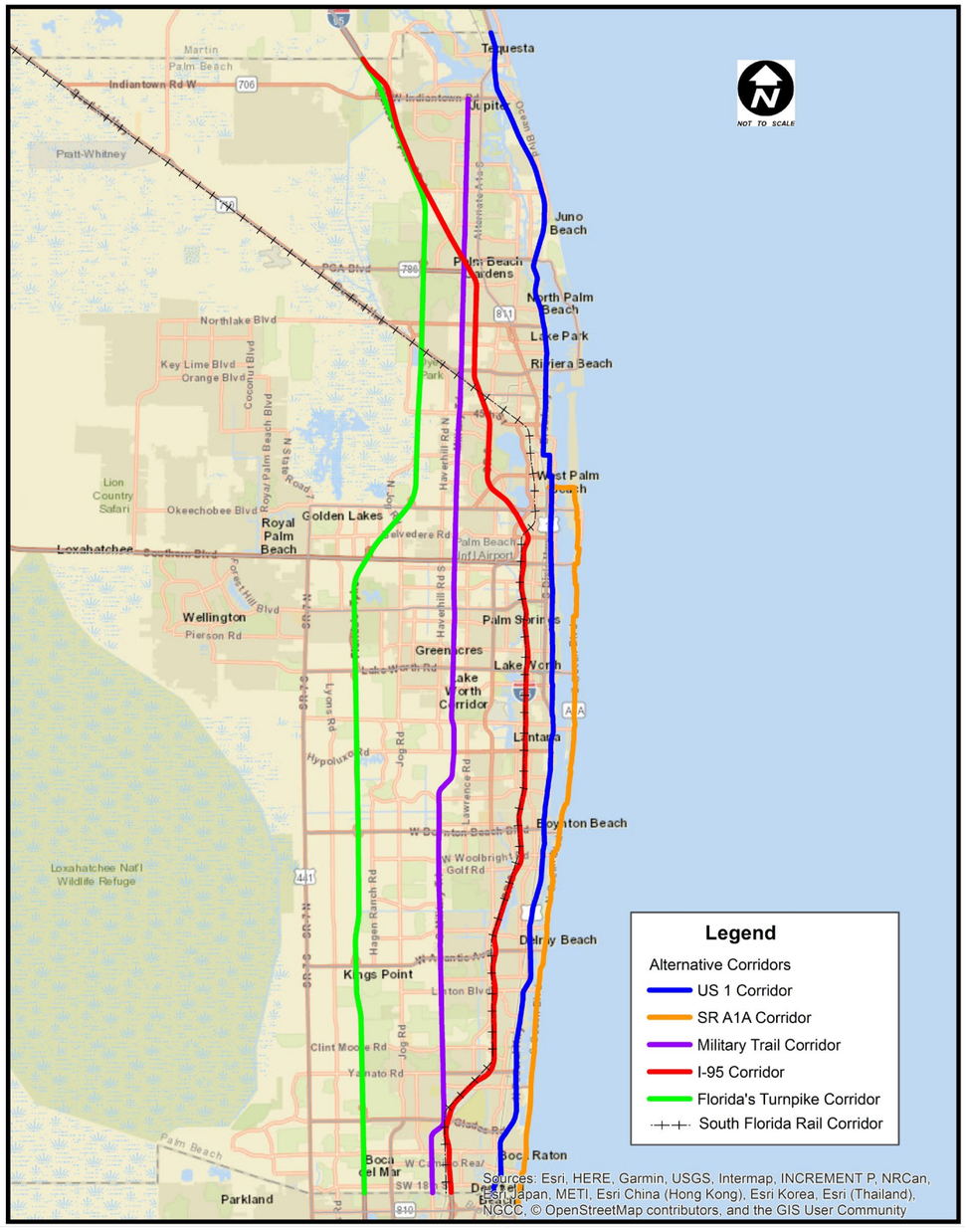


Figure 2.19: Alternative Corridors

2.2.1.2 *Capacity Improvement Alternatives Decision Tree*

The Plan followed FDOT Procedure Topic No.: 525-030-020-a to determine if the corridor supports a regional managed lanes network. As outlined in Topic 525-030-020a, the evaluation of capacity improvement alternatives utilizing managed lanes strategies inclusive of express lanes was considered on I-95, an existing limited access facility on the state highway system (SHS). Although the decision tree and traffic demand modeling were conducted assuming express toll lanes, additional analysis needs to be conducted for potential toll implementation. As a result, the Plan assumed that future additional capacity along the I-95 corridor will be operated with management applications and final determination of those management scheme(s) would be decided during the next phase(s) of the project. **Figure 2.20** shows the procedure followed to determine if there was an additional capacity need on an existing limited access SHS facility.

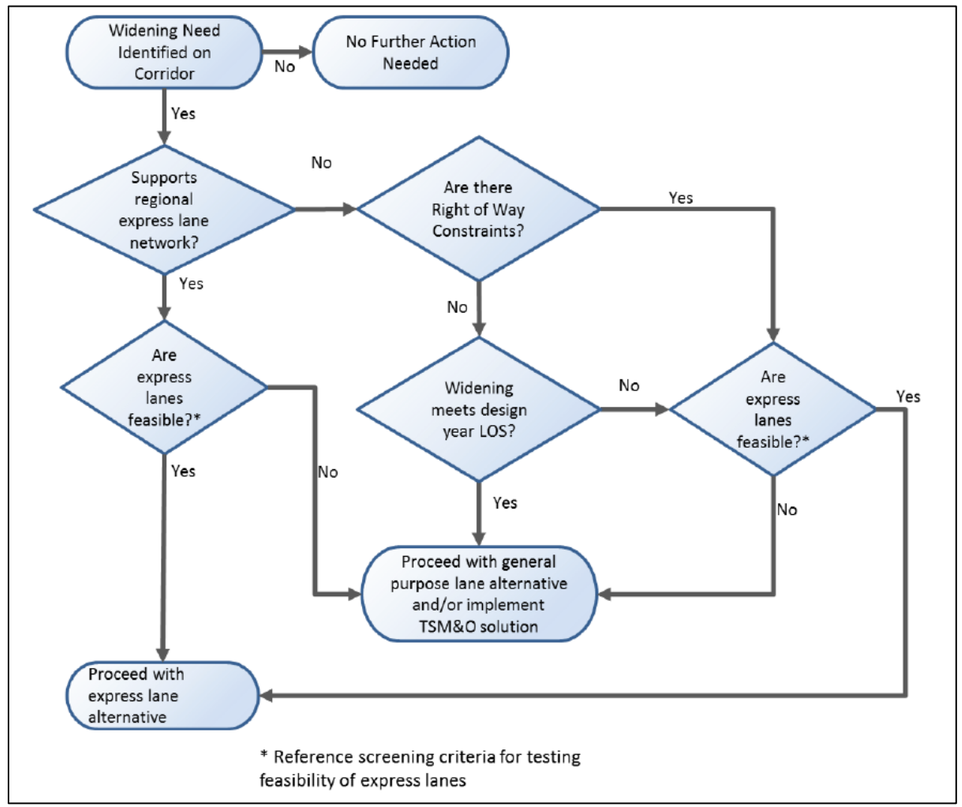


Figure 2.20: Capacity Improvement Alternatives Decision Tree

2.2.1.3 *Roadway Improvements*

The Plan's primary purpose is to identify long-term capacity needs along the I-95 mainline and develop managed lanes design concepts to address any segments identified along the Corridor as operating below the Level of Service standard adopted for this facility as part of the Strategic Intermodal System (SIS) designation.

The Plan has been developed to meet the following objectives:

1. A comprehensive analysis identifying traffic operational deficiencies along the I-95 mainline from South of Linton Boulevard interchange through the Indiantown Road interchange, along with the timeframes(s) when improvements are needed.
2. Develop an ultimate capacity improvement plan for the corridor using traffic demand management and transit techniques to improve reliability and flow of traffic along the Corridor. The need for, type of, and cost of improvements is defined in the Plan.
3. Compare design constraints, benefits, construction costs, right-of-way impacts and public support, and recommend a concept for further evaluation during a PD&E study or for design and construction. Define an implementation plan for the corridor including the timing and sequencing of improvements, and any right-of-way acquisition requirements.

The following alternatives were analyzed as part of the Plan:

Alternative A - Convert the existing High Occupancy Vehicle (HOV) lane to a managed lane while maintaining the existing number of general use lanes. Separation treatment: Buffered separation with tubular delineators.

Alternative B - Convert the existing High Occupancy Vehicle (HOV) lane to a managed lane and adding a second managed lane while maintain the existing number of general use lanes. Separation treatment: Buffered separation with tubular delineators.

Alternative C - Convert the existing High Occupancy Vehicle (HOV) lane to a managed lane and adding a second managed lane while maintain the existing number of general use lanes. Separation treatment: Concrete barrier separation between managed lanes and general use lanes with standard FDOT shoulder widths.

2.2.1.3.1 *Proposed I-95 Managed Lanes Typical Sections*

A total of three managed lanes typical sections was developed as part of the Plan; one for each alternative. The proposed typical section elements comply with the 2018 FDOT Design Manual (FDM). The proposed typical sections provide the minimum travel and auxiliary lane widths of 12-foot as per Section 211.2 of the FDM and minimum shoulder widths as per FDM Table 211.4.1. The desired 4-foot buffered separation is maintained with tubular delineators between the proposed managed lanes and general use lane, which is typical practice in the State of Florida within urbanized/constrained areas of the State Highway System. In addition, the proposed typical section provides the minimum 10-foot paved shoulder that is usable for travel on Emergency Shoulder Use (ESU) routes consistent with the FDOT's Emergency Management and Florida's Disaster Preparedness Evacuation Route and Zone Maps[1]. The new policy for implementation of ESU for Limited Access Facilities was provided in the FHWA Approved FDOT Roadway Design Bulletin 18-05, dated April 26, 2018.

[1] https://www.floridadisaster.org/planprepare/disaster-preparedness-maps/

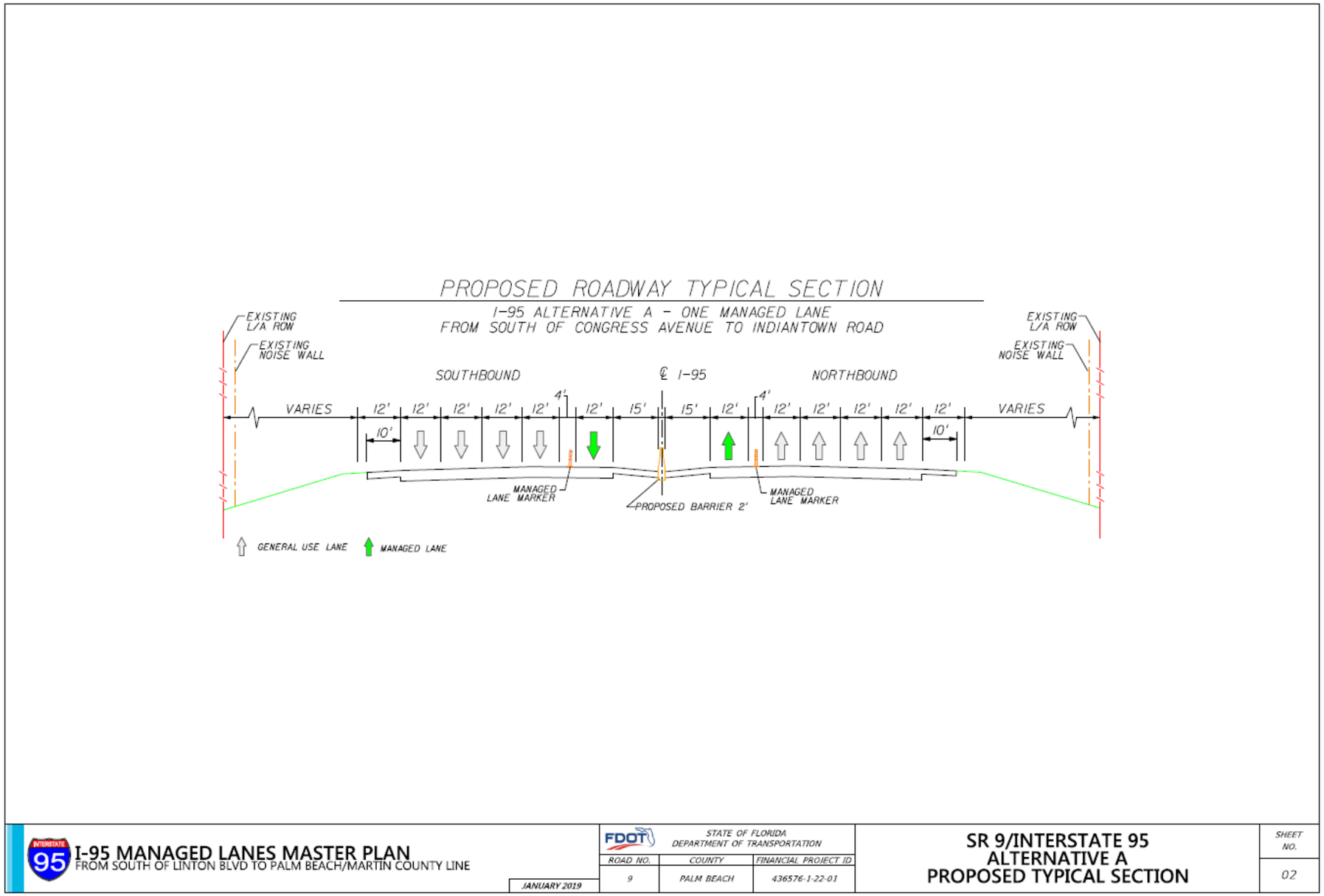


Figure 2.21: Proposed Typical Section - Alternative A

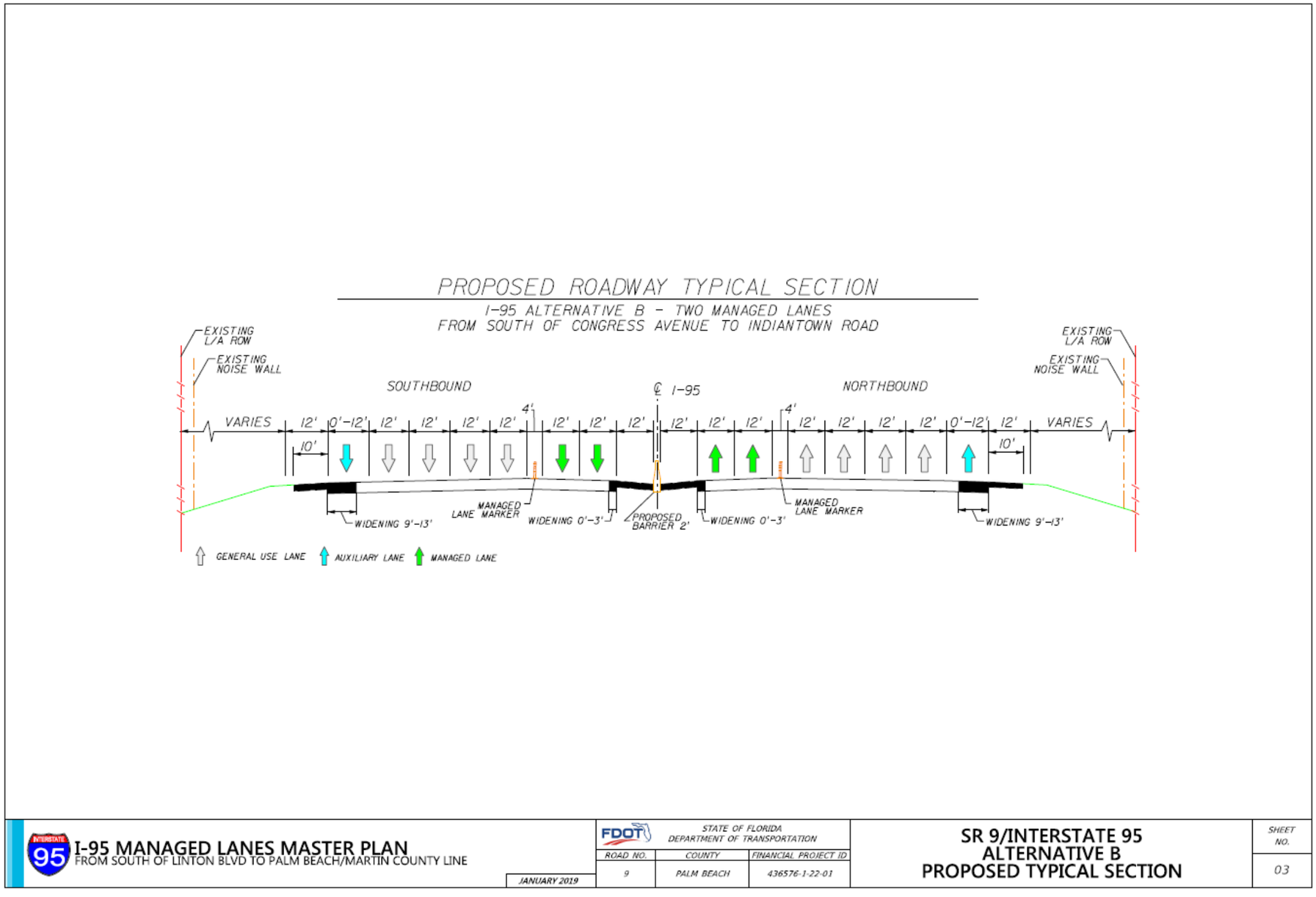


Figure 2.22: Proposed Typical Section - Alternative B

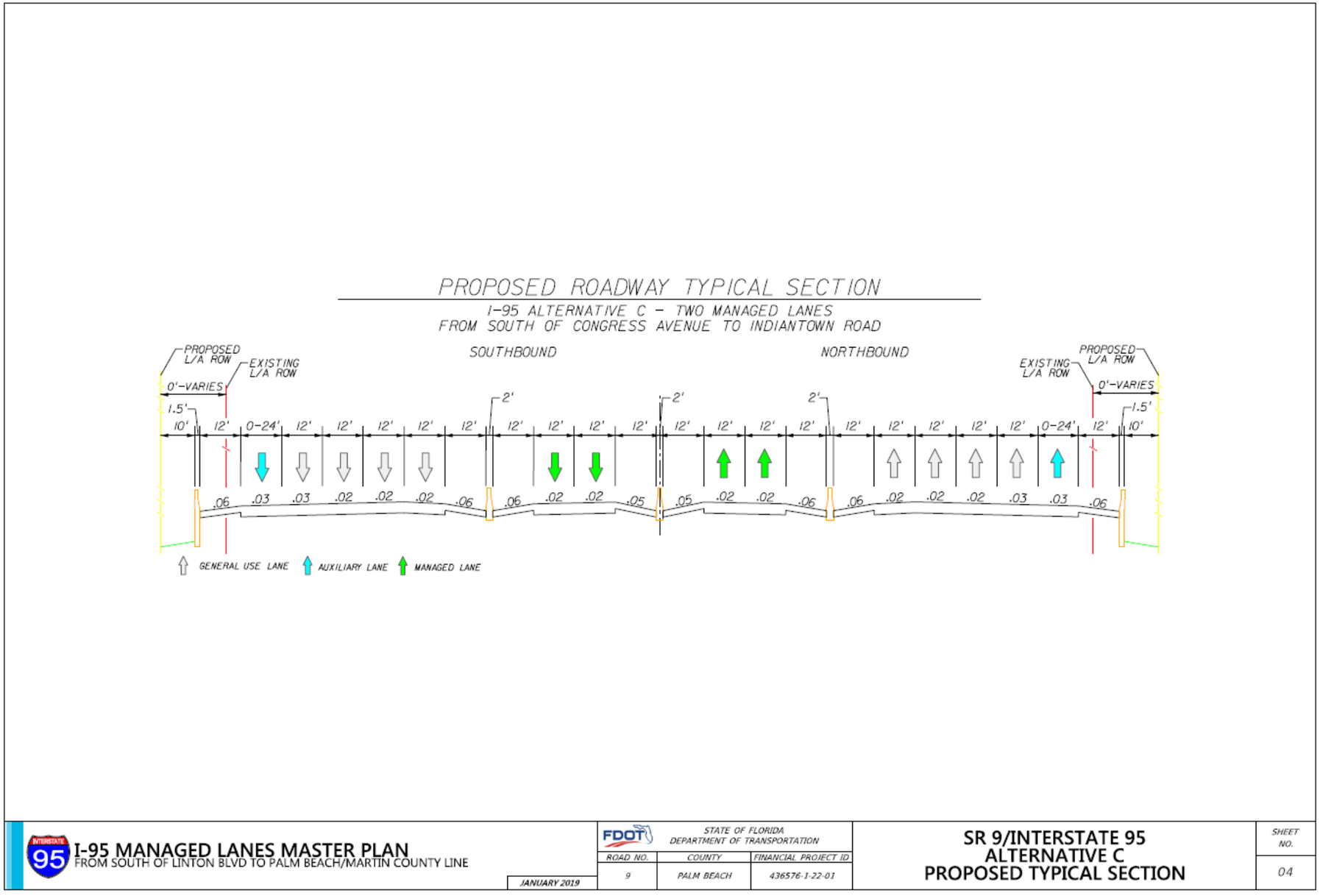


Figure 2.23: Proposed Typical Section - Alternative C

2.2.1.4 *Corridor Wide Structural Assessment*

2.2.1.4.1 *Data Collection and Evaluation of the Existing Bridges*

The existing bridge characteristics and conditions data was collected and compiled for all the bridge structure within the project limits along the I-95 corridor. Refer to **Appendix N** of the **Master Plan Technical Document** for a summary of the assessment of the 101 existing bridge structures, within the I-95 corridor, associated with Alternatives B and C, respectively. Alternative A does not involve widening of the corridor, therefore there were zero structural impacts with Alternative A. Alternative B involve widening of the corridor, which resulted in 43 bridge widenings and 36 bridge replacements for a total of 79 bridge impacts. Alternative C involves extended widening of the corridor, which resulted in 39 bridge widenings and 51 bridge replacements for a total of 90 bridge impacts. The structural cost of each proposed alternative is also included in **Appendix N** of the **Master Plan Technical Document**. **Table 2.13** provides a summary of the structural cost for each alternative.

Table 2.13: Summary of Structural Cost

Alternative	Structural Cost (in millions)
Alternative A	$0
Alternative B	$515
Alternative C	$865

2.2.1.4.2 *James L. Turnage Blvd at I-95 Ramp Structures Assessment*

The James L. Turnage Blvd at I-95 interchange is composed of a series of segmental concrete box bridges that provide access to Palm Beach International (PBI) Airport. In Alternatives B and C, the proposed managed lanes typical section would require widening of the corridor which would impact the existing bridge piers of the bridges at the James L. Turnage interchange. The Plan conducted a feasibility analysis that would minimize impacts to the existing bridge structures for Bridge No. 930482 (Ramp E) and Bridge No. 930483 (Ramp D). The Plan proposes to retrofit Piers 11-D, 13-D, and 7-E which support Bridges D and E. In addition, the bridges are proposed to be raised implementing bridge jacking operations by up to a foot to assure compliance with the vertical clearance criteria (16.5 feet) over I-95. **Figure 2.24** shows the proposed retrofit of Pier 7-E and **Figure 2.25** shows the retrofit of the existing footing for Pier 7-E. **Figure 2.26** depicts the adjusted profile of Ramp E due to incremental raising of the roadway profile to adjust the vertical geometry to assure vertical clearance criteria compliance. Piers 11-D and 13-D would experience a similar retrofit.

For additional details regarding structures, refer to **Section 4.2.5.2** of the **Master Plan Technical Document**.

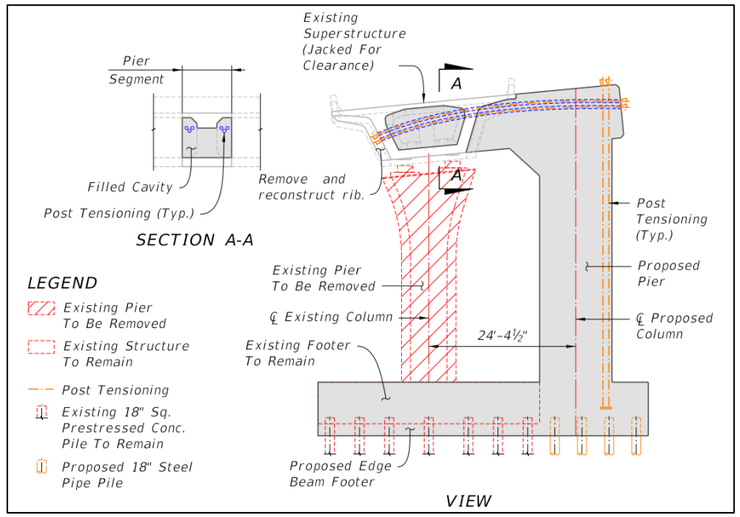


Figure 2.24: Proposed cantilever pier retrofit at Pier 7-E

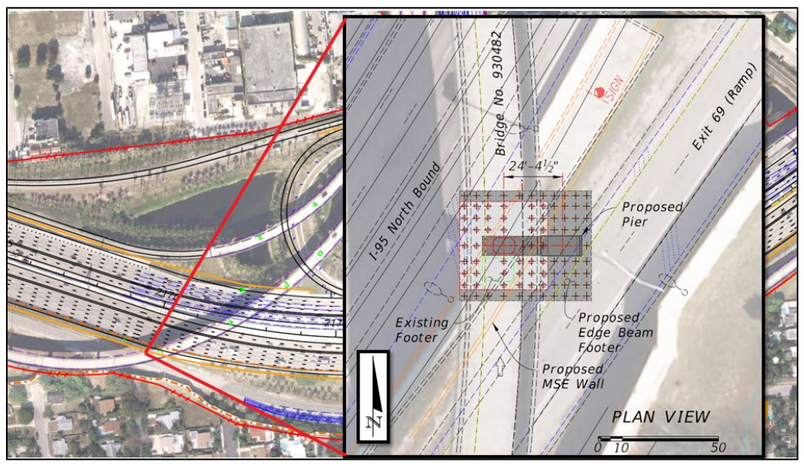
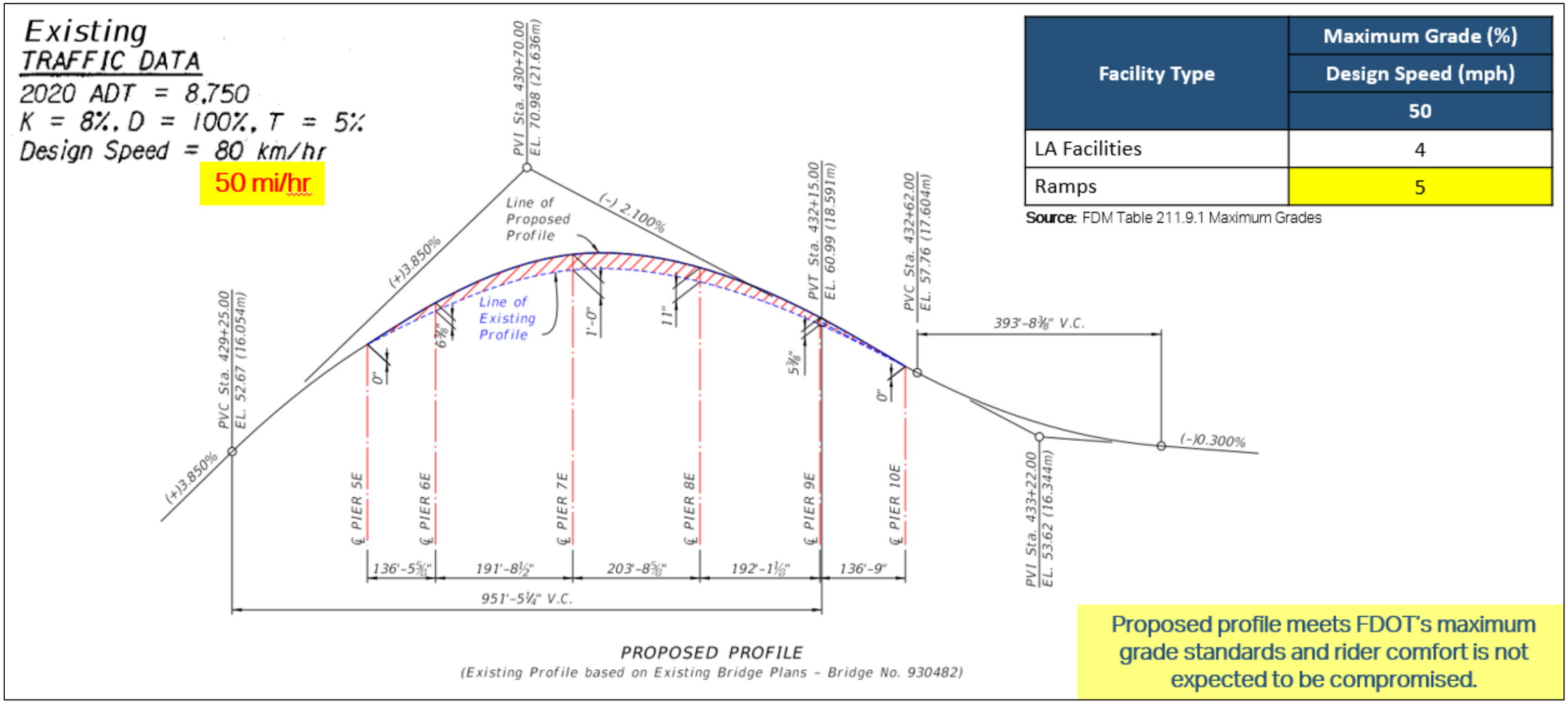


Figure 2.25: Existing footing retrofit for Pier 7-E



Facility Type	Maximum Grade (%)
	Design Speed (mph)
	50
LA Facilities	4
Ramps	5

Source: FDM Table 211.9.1 Maximum Grades

Proposed profile meets FDOT's maximum grade standards and rider comfort is not expected to be compromised.

Figure 2.26: Ramp E Profile Adjustment

2.2.1.5 *Park and Ride Lots*

The following Park-and-Ride lots are located within the study limits and were considered in the evaluation of managed lanes access points.

- Delray Beach Tri-Rail Station (345 South Congress Avenue, Delray Beach, FL 33445)
- Boynton Beach Tri-Rail Station (2800 High Ridge Road, Boynton Beach, FL 33426)
- Lake Worth Tri-Rail Station (1703 Lake Worth Road, Lake Worth, FL 33460)
- West Palm Beach Tri-Rail/Amtrak Station (203 South Tamarind Avenue, West Palm Beach, FL 33401)
- Mangonia Park Tri-Rail Station (1415 45th Street, West Palm Beach, FL 33407)
- Indiantown Road and Turnpike Park & Ride (North of 7737 W Indiantown Rd, Jupiter, FL 33478)
- Indiantown Road and Central Blvd Park & Ride (6401 W Indiantown Rd Jupiter, FL 33458)

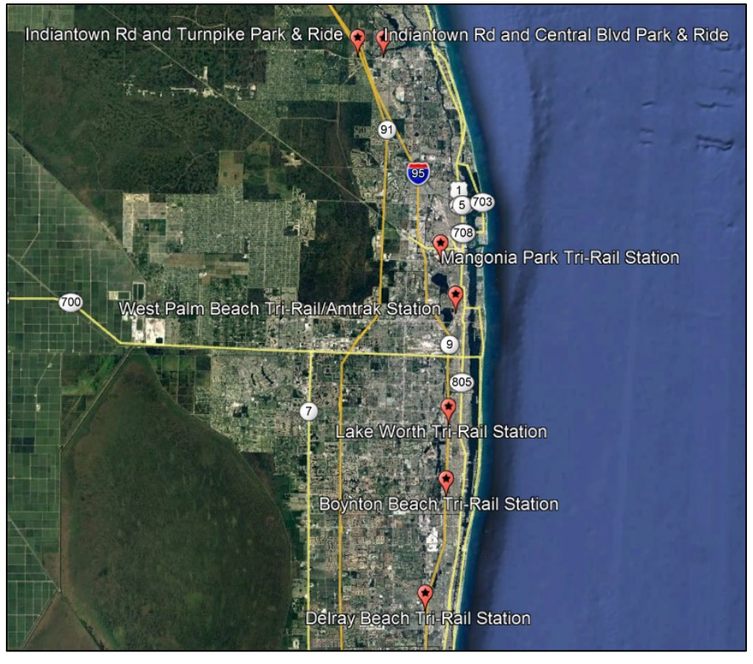


Figure 2.27: Existing Park-and-Ride Lots

A new express bus service via I-95 from Indiantown Rd to the West Palm Beach Intermodal Center is included in the 2020-2040 Desires Plan of Palm Beach County's 2040 Long Range Transportation Plan. Based on the 2018 Fall Park-and-Ride Inventory completed by the FDOT District Four, the following Park-and-Ride lots are not fully utilized and can potentially serve the planned express bus route.

- West Palm Beach Tri-Rail/Amtrak Station (64% utilization)[2]
- Indiantown Road and Turnpike Park & Ride (53% utilization) [2]
- Indiantown Road and Central Blvd Park & Ride (33% utilization) [2]

An analysis was conducted to identify potential Park-and-Ride locations to serve express bus routes. The analysis was based on accessibility between the Park-and-Ride lots and the managed lanes. The table below indicates the number of interchanges to be cleared before entering the managed lanes from the Park-and-Ride locations and the number of interchanges to be cleared before exiting the managed lanes to the Park-and-Ride locations. This analysis only considered potential express bus service access to the I-95 corridor arriving/departing a potential park and ride facility candidate to the proposed managed lanes ingress/egress access points. The analysis does not consider express bus direct connect routes to/from park and ride facilities.

[2] Utilization information from the 2018 Fall Park-and-Ride Inventory by the FDOT District Four Office of FLPO

Table 2.14: Park-and-Ride Analysis

	Destinations North of Park-and-Ride Lot		Destinations South of Park-and-Ride Lot	
	Northbound	Southbound	Southbound	Northbound
	Number of interchanges crossed before entering Managed Lanes	Number of interchanges crossed after exiting Managed Lanes	Number of interchanges crossed before entering Managed Lanes	Number of interchanges crossed after exiting Managed Lanes
Delray Beach Tri-Rail Station	0	0	1	1
Boynton Beach Tri-Rail Station	3	3	0	0
Lake Worth Tri-Rail Station	1	0	3	3
West Palm Beach Tri-Rail/Amtrak Station	0	0	2	2
Mangonia Park Tri-Rail Station	No access	No access	0	0
Indiantown Rd and Turnpike Park-and-Ride	N/A	N/A	1	1
Indiantown Rd and Central Blvd Park-and-Ride	N/A	N/A	1	1

Based on the above results, the best Park-and-Ride locations to potentially serve express bus routes are Delray Beach Tri-Rail Station, West Palm Beach Tri-Rail/Amtrak Station, Indiantown Rd & Turnpike, and Indiantown Rd at Central Blvd. These results are solely based on accessibility between the existing Park-and-Ride locations and the proposed managed lanes. Further analysis would be required to determine the adequacy of these locations.

Selecting an adequate location for a Park-and-Ride facility is a process that should consider the type of facility, demand estimations, facility sizing, and evaluation of potential facilities. A separate analysis is recommended to identify new suitable Park-and-Ride locations for express bus service. This process should incorporate methodologies from the State Park-and-Ride Guide by the Florida Department of Transportation Office of Freight, Logistics and Passenger Operations (FLPO).

2.2.2 *Managed Lanes Access Points*

As discussed in **Section 2.1.4.1**, to further refine these access points, all the major origins and destinations within the study area were identified. The initial access points were then modified to serve the major origin/destinations within the corridor. The segment-specific total trips toll eligible trips were evaluated for various access points' combinations and sensitivity tests. Any access points that did not attract reasonable demand were eliminated. The access points' locations were further refined using input from agency coordination, geometric feasibility, traffic operations analysis and safety analysis. During this process, the Plan confirmed that Build 2 (**Table 2.4**) continues to be the recommended alternative for the managed lanes access points. The recommended locations of the access points are shown on **Appendices J** and **V** of the **Master Plan Technical Document**.

2.2.3 *Corridor Wide Direct Connection Analysis*

Once the final draft set of access points were determined using model sensitivity tests, the study team also performed efforts to identify any potential direct connections accessing the managed lanes directly from the arterial systems. The select group analysis demands are summarized in **Table 2.15**. The top five arterials with select group volumes are highlighted in pink. The top five arterials and their managed lanes volumes from the table are provided below:

1. **SR 80/Southern Blvd:** 41, 364
2. **Gateway Blvd:** 11, 034
3. **PGA Blvd:** 10,709
4. **45th Street:** 9,998
5. **Lantana Road:** 9308

As it can be seen from **Table 2.15**, SR 80 has high number of trips accessing the managed lanes. All of the other arterials within the top five ranking have about 10,000 managed lanes trips each. It was concluded from the travel demand perspective alone that none of the other arterials can be a good direct connection candidate by itself. However, by combining shared access with the adjacent roadways, braided systems can be designed for areas of critical operational/ geometric constraints. The Plan evaluated direct connection design options for SR 80 due to the high demand and results of the no build general use lane operations. Refer to **Section 4.2.6.1** of the **Master Plan Technical Document** for additional details.

2.2.3.1 *Direct Connection Opportunity with City of West Palm Beach Downtown*

During the study, external stakeholder coordination was conducted with adjacent municipalities along the corridor. The City of West Palm Beach provided feedback which encouraged further investigation of a potential direct connection from the proposed managed lanes to the city's downtown area. The Master Plan team determined that this improvement does provide benefits such as transit connectivity opportunities and potential relief to Okeechobee Blvd arterial traffic which connects to downtown, but it also presents some constrains and limitations. The skew angle of Okeechobee Blvd with I-95 presents a challenge for a direct connection design that can lead to additional right of way impacts. As per FDM Section 201.4 Design Speed, minimum design speed for ramps for direct connections is 50 MPH. The challenge is providing a feasible design that meets the design speed criteria, while minimizing right of way impacts. In addition, to reach an acceptable vertical clearance to braid over I-95 mainline, the existing Australian Avenue overpass may be a point of conflict for potential MSE walls along the median. This could lead to a much longer bridge to avoid impacts to the overpass which translates to higher cost to the project. Due to the potential of right of way impacts, there is the potential for environmental resources that may be affected within the vicinity of the existing interchange. Further investigation would be needed to confirm this possibility. The Plan recommends an in-depth analysis to be considered for the implementation of a direct connection from the managed lanes to Downtown West Palm Beach in the following phases of this project.

2.2.3.2 *Braided Direct Connect Ramp Opportunities*

The Plan conducted a high-level planning assessment for potential braided ramp and/or Collector-Distributor (C-D) system(s) for proposed access points that operate lower than LOS D in the build condition. HCS analysis was performed for evaluating the operations of I-95 general use lane road segments at the managed lanes access points. A diverge analysis was performed to evaluate the ingress points to managed lanes and a merge analysis was performed for egress points from managed lanes. For further details on the traffic operations analysis, refer to **Appendices I** and **J** of the **Master Plan Technical Document**. The following access points were identified as potential candidates for a braided ramp and/or Collector-Distributor (C-D) system(s):

- SB Ingress at Boynton Beach Blvd
- NB Ingress at 10th Ave North
- NB Egress at Forest Hill Blvd
- SB Ingress at Forest Hill Blvd
- NB Ingress at 45th St
- SB Egress at 45th St
- SB Ingress at Blue Heron Blvd

Based on this high-level planning assessment, below is a summary of recommendations for each of the locations listed in this section:

- **SB Ingress at Boynton Beach Blvd**
  - A braided direct connect ramp was determined to be feasible at this location, however, right of way impacts on the west side of the corridor between Woolbright Rd and Boynton Beach Blvd is expected. It was assumed the I-95 mainline maintains the current alignment with this recommendation.
- **NB Ingress at 10th Ave North**
  - A braided direct connect ramp was determined to be feasible at this location. Based on the preliminary assessment, it is anticipated there may be potential impacts to ten homes or less in the NE quadrant of the 10th Ave North interchange. This location may be supplemented with a C-D system but it can introduce additional impacts. The introduction of a C-D system may open new opportunities to provide additional access, however, it is recommended that additional in-depth analyses is to be conducted in the subsequent phases of the project.
- **NB Egress at Forest Hill Blvd**
  - A braided direct connect ramp was determined to be feasible at this location, however, the introduction of a braided ramp may not be able to coexist with the previous potential braided ramp described above at the NB Ingress at 10th Ave North due to the close proximity of the access points. This location may be supplemented with a C-D system but it can introduce additional impacts. The introduction of a C-D system may open new opportunities to provide additional access, however, it is recommended that additional in-depth analyses is to be conducted in the subsequent phases of the project.
- **SB Ingress at Forest Hill Blvd**
  - A braided direct connect ramp is feasible at this location, however, traffic operation and design challenges may be encountered that would likely require a realignment of the I-95 corridor to minimize impacts to the SFRC right of way. This location may be supplemented with a C-D system but it can introduce additional impacts. The introduction of a C-D system

may introduce new opportunities to provide additional access, however, it is recommended that additional in-depth analyses is to be conducted in the subsequent phases of the project.

- **NB Ingress at 45th St**
  - A braided ramp is not recommended at this location due to the close proximity of upstream and downstream access points in combination with the locations of the general use lane on and off ramps. This location may be a candidate for a C-D system to potentially avoid the constrains and limitations described above but it can introduce additional impacts. The introduction of a C-D system may open new opportunities to provide additional access, however, it is recommended that additional in-depth analyses is to be conducted in the subsequent phases of the project.
- **SB Egress at 45th St**
  - For similar reasons to the NB Ingress at 45th St, a braided ramp is not recommended at this location.
- **SB Ingress at Blue Heron Blvd**
  - A braided direct connect ramp was determined to be feasible at this location, however, right of way impacts are anticipated on the west side of the Blue Heron Blvd interchange. This location may be supplemented with a C-D system but it can introduce additional impacts. The introduction of a C-D system may introduce new opportunities to provide additional access, however, it is recommended that additional in-depth analyses is to be conducted in the subsequent phases of the project.

Additional analysis using microsimulation is necessary to make further recommendations on potential locations where braided ramps are required as the HCS software has limitations on speed for merge and diverge ramps. The HCS software limits the ramp speed to a maximum of 55 mph. However, the operating speed of ramps to and from managed lanes may be higher. Higher speed would result in higher capacity and may enhance the operations at the access points. Hence, the locations requiring braided ramp connections will be finalized in the microsimulation analysis performed in the subsequent phases of the project.

Table 2.15: Direct Connection Select Group Analysis

Milepost	City	Interchange	SB Access Volumes	Access points	NB Access Volumes	Total (Daily Managed Lane Demand by Interchange)			Distance (Miles)		
						Managed Lanes (ML)	General Use Lanes (GUL)	Ranking	Access points	Ingress	Egress
	Juipter	W Indiantown Rd				8,547	115,661	6			
38.3	Juipter	**Donald Ross Rd**	**16,000**		**17,000**	5,385	57,869	16	5.4		5.4
	Palm Beach Gardens	Central Blvd		16,000 / 17,000		3,399	55,220	20			
	Palm Beach Gardens	N Military Trail				0	4,534	23			
	Palm Beach Gardens	PGA Blvd				**10,709**	109,132	**3**			
32.9	Riviera Beach	**Northlake Blvd**	**11,000**		**11,000**	6,747	100,546	11	2.3		4.2
	Riviera Beach	W Blue Heron Blvd		27,000 / 28,000		7,165	97,376	10			
30.6	West Palm Beach	**45th Street**	**9,000**		**8,000**	**9,998**	112,812	**4**	1.9	8.8	
28.7	West Palm Beach	**Palm Beach Lake**	**8,000**		**7,000**	6,446	97,646	13	5.5		5.5
	West Palm Beach	Okeechobee Blvd		28,000 / 29,000		6,511	91,994	12			
	West Palm Beach	Belvedere Rd				6,149	62,236	15			
23.2	West Palm Beach	**Southern Blvd**	9,000		10,000	**41,364**	113,388	**1**	3.2		8.6
			9,000		9,000						
			7,000		**8,000**						
	West Palm Beach	Forest Hill Blvd		36,000 / 36,000		3,101	81,612	21			
21.8	Lakeworth	10th Avenue N				4,319	82,656	17			
20	Lakeworth	**6th Avenue**			**12,000**	8,123	81,521	7	5.4	10.1	
20	Lantana	**W Lantana Rd**	**14,000**	22,000 / 24,000		**9,308**	84,769	**5**			
	Lantana	Hypoluxo Rd				7,838	73,745	8			
14.6	Boynton Beach	**E Gateway Blvd**	**10,000**		**9,000**	**11,034**	80,815	**2**	2.9		7.8
	Boynton Beach	W Boynton Beach Blvd		32,000 / 33,000		3,594	78,498	19			
	Boynton Beach	W Woolbright Rd				3,623	76,121	18			
11.7	Delray Beach	**W Atlantic Ave**	**11,000**		**12,000**	7,791	100,590	9	4.9	9.2	
	Delray Beach	Linton Blvd		21,000 / 21,000		6,435	99,665	14			
	Boca Raton	Congress Ave				2,902	40,783	22			
6.8	I95 South	I-95 South				23,294	108,718				
Grand Total						203,783	2,007,907	Average Distance	3.9	9.4	6.3

2.2.4 *SR 80/Southern Blvd at I-95 Interchange*

The SR 9 / I-95 at SR 80 / Southern Boulevard interchange is located between the Forest Hill Boulevard interchange (1.45 miles to the south), and the Belvedere Road interchange (1.01 miles to the north), and in proximity to multiple municipalities including the City of West Palm Beach, Town of Cloud Lake, Town of Glen Ridge, and unincorporated Palm Beach County. **Figure 2.28** depicts the location of the interchange.

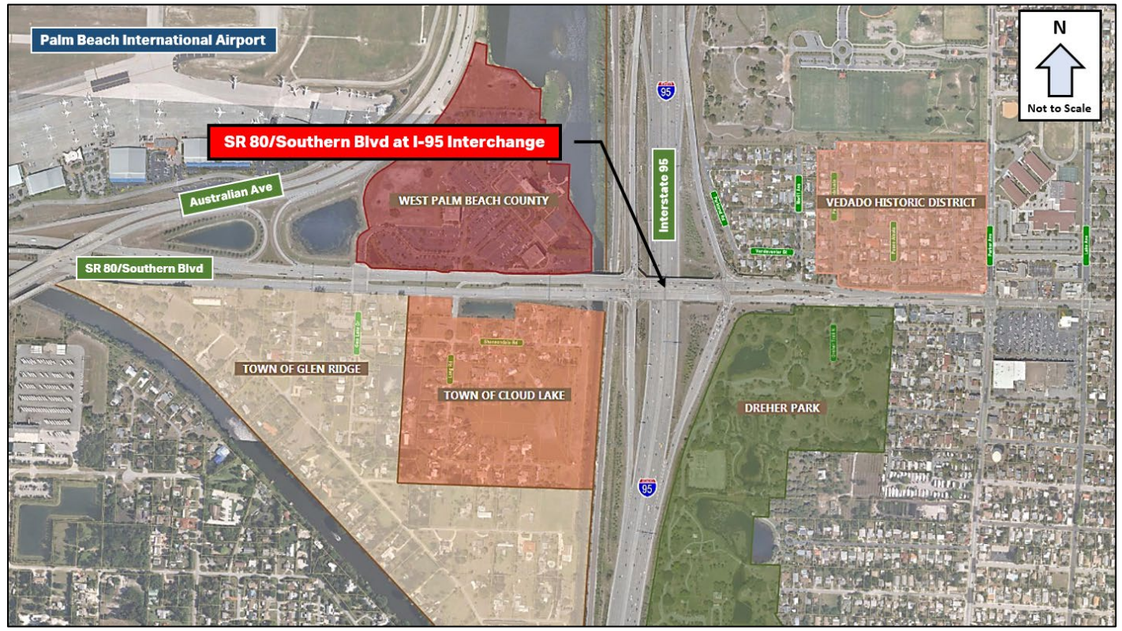


Figure 2.28: SR 80/Southern Blvd at I-95 Interchange

The study team considered multiple improvements that overlaps or is adjacent to the I-95 Manages Lanes Master Plan study limits. Since there was evidence of high traffic demand to/from SR 80, the interchange was included as part of the managed lanes evaluation. The following projects were considered in the evaluation:

- SR 9/I-95 at SR 80/Southern Blvd PD&E Study (Alternative 4)
- SR 80 Corridor Action Plan (Alternative 3)
- Palm Beach International (PBI) Airport Master Plan Airport Layout Plan (ALP)

2.2.4.1 *Analysis*

2.2.4.1.1 *Traffic Forecasting*

The plan evaluated multiple concepts that analyzed direct ramp connections between SR 80 and I-95. The direct ramp connection was designed to tie into the SR 80 Action Plan elevated high-speed through lanes (Alternative 3 of the Action Plan). The analysis was compared against the I-95/SR 80 interchange PD&E Study Recommended Alternative (Alternative 4 of the PD&E Study). The evaluation determined which direct connection alternative resulted in the desired and/or optimal solution to address the congestion and operational needs between the two corridors.

The following are the three alternatives coded, as part of this effort:

Alternative B4: This scenario involved coding direct connection from I-95 northbound off ramp to westbound SR 80 elevated high-speed through lanes and eastbound SR 80 elevated high-speed through lanes to northbound I-95 on ramp.

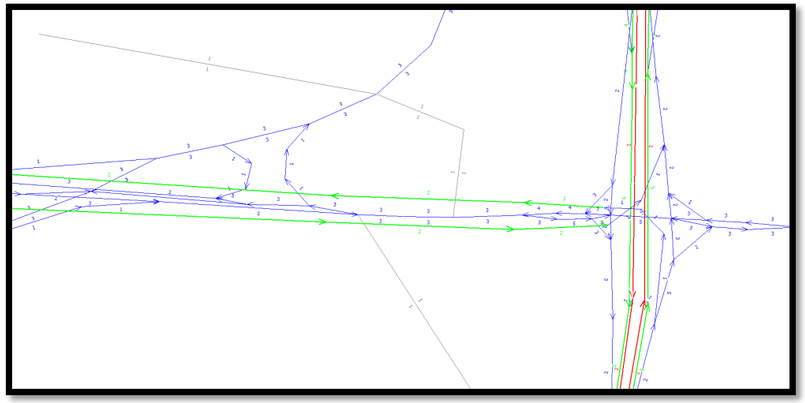


Figure 2.29: Alternative B4 2040 Network

Alternative B5: This scenario involved coding direct connection from I-95 northbound managed lanes to westbound SR 80 elevated high-speed through lanes and eastbound SR 80 elevated high-speed through lanes to northbound I-95 managed lanes.

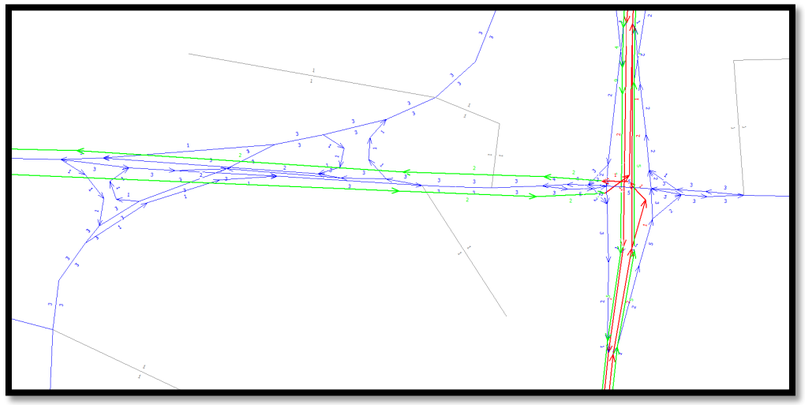


Figure 2.30: Alternative B5 2040 Network

Alternative B6: This scenario involved coding of reciprocal movements to the direct connection ramps listed in Alternative B5. Please note that it was coded in addition to Alternative B5.

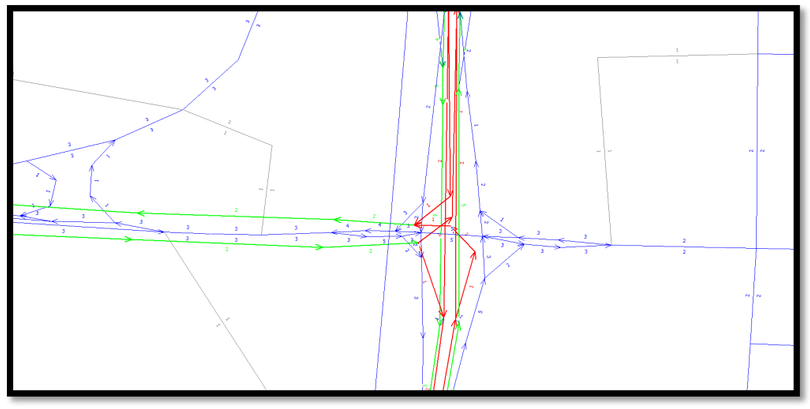


Figure 2.31: Alternative B6 2040 Network

To maintain consistency of trip tables among different scenarios, the Alternative 6 regional model run trip tables were locked. The subarea trip tables were then extracted using the subarea assignment of the individual alternatives. The model volumes were extracted to spreadsheets for further post-processing and balancing. **Table 2.16** presents the AADT growth comparison between different scenarios. **Table 2.17** presents the daily demand along I-95 corridor by alternative. **Table 2.18** shows the peak hour directional demand along I-95 corridor by alternative. **Table 2.19** shows the peak hour directional demand comparison along SR 80 corridor within the study area. **Table 2.20** compares the left turns at southbound and northbound ramp terminals.

Overall, the Alternative B4 has relatively most demand on elevated high-speed through lanes. In addition, number of left turns are reduced significantly.

For additional details, refer to **Section 4.2.7.3.1** of the **Master Plan Technical Document**.

Table 2.16: AADT Comparison Table

Location	2015 AADT		2040 CAGR AADT*	2040 B4 AADT	2040 B5 AADT	2040 B6 AADT
	Count	Model Volume	CAGR Volume	Model Volume	Model Volume	Model Volume
I-95 South of Forest Hill	207,500	215,000	258,000	332,000	332,000	333,000
I-95 South of SR 80	211,500	219,000	263,000	344,000	341,000	343,000
I-95 NB Off-Ramp to SR 80	17,100	19,000	21,000	44,000	24,000	24,000
I-95 NB On-Ramp from SR 80	14,500	13,000	18,000	41,000	14,000	14,000
I-95 SB Off-Ramp to SR 80	14,900	14,000	19,000	19,500	17,500	16,000
I-95 SB On-Ramp from SR 80	15,700	17,000	19,000	27,000	27,000	22,000
WB SR 80 East of I-95	16,300	15,800	20,000	20,000	22,000	21,000
EB SR 80 East of I-95	16,300	16,100	20,000	22,000	22,000	23,000
WB SR 80 West of I-95	31,000	31,000	38,000	25,000	36,000	34,000
EB SR 80 West of I-95	31,000	29,000	38,000	31,500	35,500	32,500
I-95 South of Okeechobee Blvd	206,800	203,100	257,000	308,000	297,000	302,300
SR 80 High Speed Through Lanes				67,000	19,000	37,000

*CAGR AADT is the compound annual growth rate based AADT estimated to evaluate the forecasts

Table 2.17: Daily Demand along I-95 between Alternatives

I-95 Corridor	Alternative B4				Alternative B5				Alternative B6			
	Northbound		Southbound		Northbound		Southbound		Northbound		Southbound	
	Managed Lanes	General Use Lanes	Managed Lanes	General Use Lanes	Managed Lanes	General Use Lanes	Managed Lanes	General Use Lanes	Managed Lanes	General Use Lanes	Managed Lanes	General Use Lanes
South of Forest Hill Blvd	36,000	132,000	35,000	129,000	36,000	131,000	35,000	130,000	36,000	131,000	36,000	130,000
South of SR 80	26,000	150,000	23,000	145,000	28,000	145,000	23,000	145,000	28,000	145,000	29,000	141,000
North of Belvedere Rd	26,000	136,900	23,000	122,100	29,200	127,900	23,400	117,100	29,200	126,900	28,400	118,400

Table 2.18: Peak Hour Directional Demand along I-95 between Alternatives

I-95 Corridor	Peak Hour	Alternative B4				Alternative B5				Alternative B6			
		Northbound		Southbound		Northbound		Southbound		Northbound		Southbound	
		Managed Lanes	General Use Lanes	Managed Lanes	General Use Lanes	Managed Lanes	General Use Lanes	Managed Lanes	General Use Lanes	Managed Lanes	General Use Lanes	Managed Lanes	General Use Lanes
South of Forest Hill Blvd	AM	2,976	11,183	1,770	8,358	2,862	11,262	1,763	8,350	2,941	11,299	2,006	8,316
	PM	2,036	8,512	2,614	9,962	2,208	8,342	2,615	9,907	2,219	8,356	2,652	9,978
South of SR 80	AM	2,174	13,060	1,363	8,934	1,843	13,025	1,378	8,800	1,799	13,353	1,793	8,566
	PM	1,557	9,487	1,645	11,132	1,867	9,100	1,642	11,197	1,925	9,102	1,911	10,890
North of Belvedere Rd	AM	2,174	12,469	1,363	7,864	2,604	11,361	1,378	7,818	2,503	11,443	1,543	7,863
	PM	1,557	8,923	1,645	10,552	1,562	8,340	1,642	10,211	1,626	8,400	2,310	10,109

Table 2.19: Peak Hour Directional Demand Comparison along SR 80 Corridor

SR 80 Corridor	Peak Hour	Alternative B4				Alternative B5				Alternative B6			
		Eastbound		Westbound		Eastbound		Westbound		Eastbound		Westbound	
		High Speed Lanes	General Use Lanes	High Speed Lanes	General Use Lanes	High Speed Lanes	General Use Lanes	High Speed Lanes	General Use Lanes	High Speed Lanes	General Use Lanes	High Speed Lanes	General Use Lanes
East of I-95 North Terminal	AM		2,163		1,738		2,112		1,651		2,258		1,660
	PM		1,725		2,225		1,701		2,076		1,729	980	2,085
East of I-95 South Terminal	AM	2,816	1,895	2,095	1,285	1,368	2,099	606	2,104	2,148	2,207	1,194	2,081
	PM	2,055	1,545	2,391	1,939	716	1,823	1,021	2,688	1,241	1,879	1,940	2,707
East of Gem Lake Drive	AM	2,816	3,047	2,095	1,948	1,368	3,089	606	2,670	2,148	2,864	1,194	2,618
	PM	2,055	1,903	2,391	2,815	716	2,135	1,021	3,252	1,241	1,993	1,940	3,228
West of Australian Avenue	AM	2,816	4,220	2,095	1,762	1,368	4,527	606	2,466	2,148	4,110	1,194	2,407
	PM	2,055	2,306	2,391	3,157	716	2,323	1,021	3,569	1,241	2,242	1,940	3,975
Average	AM	***2,816***	***2,880***	***2,095***	***1,691***	***1,368***	***2,989***	***606***	***2,264***	***1,889***	***2,865***	***1,074***	***2,229***
	PM	***2,055***	***1,989***	***2,391***	***2,408***	***716***	***2,006***	***1,021***	***2,894***	***1,105***	***1,952***	***1,748***	***2,974***

Table 2.20: Left Turns at Southbound and Northbound Ramp Terminals

Location	Peak Hour	Alternative B4	Alternative B5	Alternative B6
Northbound terminal left turns NB off ramp to WB SR 80	AM	297	1,173	1,160
Northbound terminal left turns NB off ramp to WB SR 80	PM	364	1,277	1,292
Northbound terminal left turns EB SR 80 to NB onramp	AM	708	867	924
Northbound terminal left turns EB SR 80 to NB onramp	PM	249	580	610
Southbound terminal left turns SB off ramp to EB SR 80	AM	639	648	644
Southbound terminal left turns SB off ramp to EB SR 80	PM	819	762	788
Southbound terminal left turns WB SR 80 to SB onramp	AM	394	381	376
Southbound terminal left turns WB SR 80 to SB onramp	PM	652	782	696

2.2.4.1.2 *Traffic Operations*

An evaluation of different alternatives was conducted that would provide direct ramp connections between SR 80 (Southern Boulevard) and I-95. The direct ramp connection is proposed to tie into the preferred alternative from the SR 80 Corridor Action Plan elevated high-speed through lanes (Alternative #3). The alternatives evaluated for the traffic operations analysis are given below:

- **Alternative B4:** Direct connections from I-95 northbound off ramp to westbound SR 80 elevated high-speed through lanes and eastbound SR 80 elevated high-speed through lanes to northbound I-95 on ramps
- **Alternative B5:** Direct connections from northbound I-95 managed lanes to westbound SR 80 elevated high-speed through lanes and eastbound SR 80 high-speed through lanes to northbound I-95 managed lanes
- **Alternative B6:** Direct connections listed in Alternative B5 and direct connect ramps to serve the reciprocal movements of the critical movements listed in Alternative B5

Figure 2.32 shows the study area and intersections.

The intersections under study include:

- SR 80 at Australian Avenue
- SR 80 at Gem Lane Drive
- SR 80 at I-95 Southbound Ramps
- SR 80 at I-95 Northbound Ramps

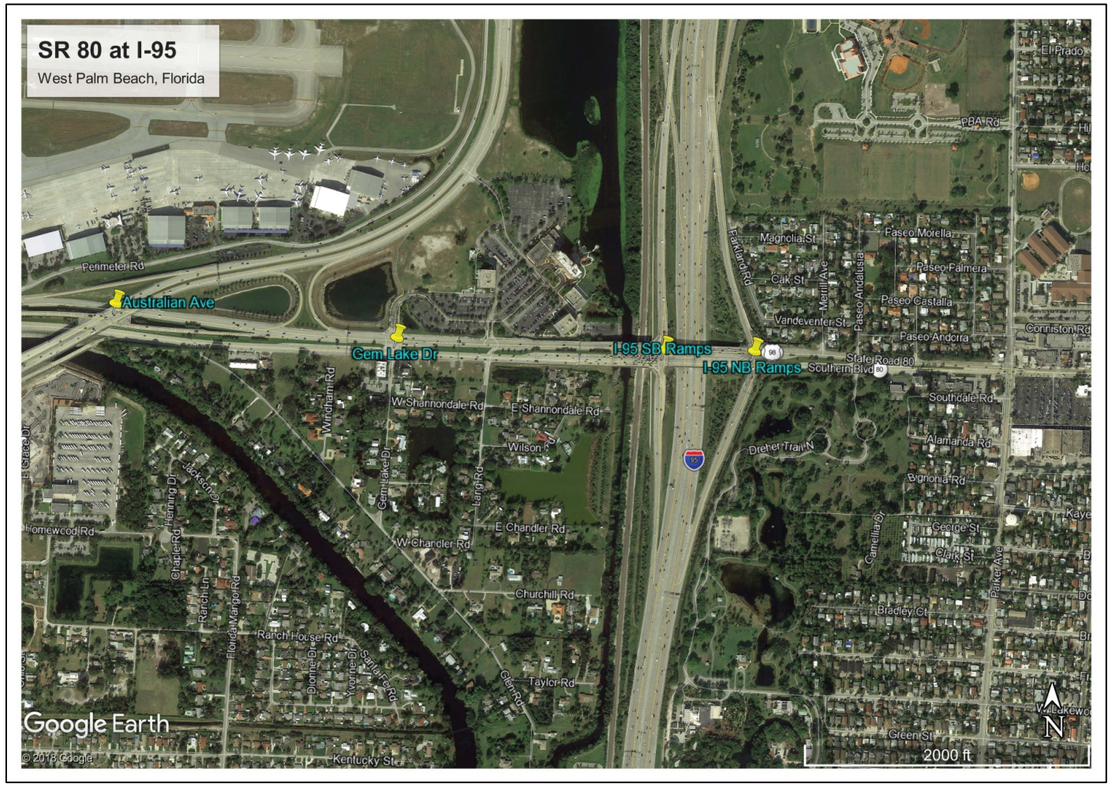


Figure 2.32: Study Area and Intersections

An operational analysis results for Design Year 2040 was conducted for this analysis. The Highway Capacity Software (HCS 7) was used to perform the freeway analysis. HCS 7 is developed and maintained by McTrans Center, University of Florida. It includes updated modules to implement the Highway Capacity Manual 6th Edition (HCM) procedures for Signalized Intersections, Urban Streets, Alternative Intersections, Roundabouts, Freeway Facilities, Basic Freeway Segments, Freeway Weaving Segments, Freeway Merge & Diverge Segments, and Multilane Highways.

Synchro (version 9) was used to perform intersection operations analysis. Synchro is developed and maintained by Trafficware and is widely used by traffic engineers to evaluate intersection operations.

Turning movement volumes developed from the average annual daily traffic obtained from the South East Regional Planning Model (SERPM) for Year 2040 were provided for all alternatives. Traffic factors were primarily obtained from 2016 FTI DVD and the I-95 at SR 80 Interchange Modification Report (dated October 2017).

The factors used for the traffic analysis include the T_{24}, Design Hourly Truck Percentage (DHT) and Peak Hour Factor (PHF). Traffic factors used in the analysis are provided in **Table 2.21**.

Table 2.21: Summary of Traffic Factors

Roadway	T_{24}	DHT	PHF
I-95 Mainline	6.5%	3%	0.95
Ramps	6.5%	3%	0.95
SR 80	7.5%	3.5%	0.95

A driver population factor (f_p) of 1.0 was used in the analysis due to the fact that the traffic stream characteristics within the study area are known to be representative of regular truck drivers and commuters who are familiar with the facilities

FDOT maintains minimum acceptable operating Level of Service (LOS) targets for the State Highway System. The FDOT minimum acceptable operating LOS targets were used. The LOS targets for major roadways analyzed are summarized below:

- I-95 Interstate Mainline: LOS D
- Ramps Merge/Diverge: LOS D
- Weave: LOS D
- State roadways: LOS D

The analysis was performed for the following freeway elements described below as per HCM Chapter 10 and 14.

- Basic Freeway Segment
- Merge
- Diverge
- Major Merge
- Major Diverge
- Ramp Roadway
- Weaving

SR 80 is a four-lane divided roadway within the study area. The posted speed limit is 45 mph. The existing transportation network includes general use lanes, high occupancy vehicle lanes and auxiliary lanes along the I-95 mainline corridor. **Table 2.22** and **Table 2.23** summarize the number of lanes along I-95 within the study area limits.

Table 2.22: I-95 Existing Mainline Number of Lanes

From	To	Number of I-95 Lanes
10th Avenue	Forest Hill Boulevard	8 GUL + 2 HOV + 2 AUX
Forest Hill Boulevard	Southern Boulevard	9 GUL + 2 HOV + 2 AUX
Southern Boulevard	Okeechobee Boulevard	8 GUL + 2 HOV + 2 AUX

Table 2.23: I-95 Future Mainline Number of Lanes

From	To	Number of I-95 Lanes
10th Avenue	Forest Hill Boulevard	8 GUL + 4 ML+ 2 AUX
Forest Hill Boulevard	Southern Boulevard	9 GUL + 4 ML + 2 AUX
Southern Boulevard	Okeechobee Boulevard	8 GUL + 4 ML + 2 AUX

The following summarizes the results of the traffic operational analysis:

Intersection Operations Analysis

Study intersections were analyzed using the turning movement volume and existing signal timing. Signal timing and phasing were then adjusted for each alternative to allow most efficient operation of the intersection. **Table 2.24** and **Table 2.25** shows the AM and PM peak hour analysis results for all alternatives, respectively.

Freeway Operations Analysis

Table 2.26, **Table 2.27**, and **Table 2.28** summarize the results for basic freeway segments, weaving segments and ramp junctions, respectively.

Basic Freeway Segments

The results of the operational analysis show that three out of the seven mainline segments operate below the acceptable LOS target during the AM peak hour for Alternative B4. For Alternative B5, four out of nine and for Alternative B6, five out of nine segments operate below acceptable levels of service during AM peak hour.

During the PM peak hour, five out of eight segments are anticipated to operate below acceptable levels of service for Alternative B4. For Alternatives B5 and B6, four out of nine segments are anticipated to operate below acceptable levels of service during the evening peak hour.

Table 2.26 summarizes the basic freeway segment analysis.

Weaving Segments

Based on HCM 6, segments with auxiliary lanes were evaluated using the maximum weaving length formula provided in HCM 6 (equation 13-4) before performing weaving analysis. The formula defines the maximum distance of turbulence due to vehicular lane changes as a function of ratio of weaving vehicles to total volume. **Table 2.27** shows the computation of maximum weaving length, the available weaving distance and the operations performances of weaving segments. Additionally, two-sided weaving segments were identified within the study area between the proposed access point to/from EL in both northbound and southbound direction. The distance from the EL access point to SR 80 interchange was assumed to be 2,500 ft for analysis.

As shown in **Table 2.27**, the NB I-95 segment between Forest Hill Boulevard and SR 80 is evaluated as a weaving segment for Alternative B4 AM and PM peak hours and the SB I-95 segment between SR 80 and Forest Hill Boulevard is evaluated as weaving segment only during the AM peak hour. During the PM peak hour, the section is evaluated as a double-sided weaving segment between SR 80 SB on ramp and access point to EL. The remaining section is evaluated as basic freeway segment and a major diverge section. Both NB and SB I-95 roadway segment between SR 80 and Forest Hill Boulevard have two weaving segments in both directions – one between the two interchanges and the second one between the access point to/from EL and SR 80 interchange. Due to the limitation of HCS software to exactly replicate this condition, the volume from the EL access point was added to freeway volume for the NB segment analysis.

Based on HCM, all one-sided weaving segments operate below acceptable levels of service and all two-sided segments operate at LOS F during AM or PM peak hour based on the peak hour directionality.

Ramp Junctions

Ramp junction analysis involves evaluation of merge sections, diverge sections, major merge sections and major diverge section. A major merge or major diverge section was identified by difference in number of lanes upstream and downstream of a ramp junction. **Table 2.28** shows the type of analysis for each junction and summarizes the analysis results.

Based on **Table 2.28**, all ramp junctions operate below acceptable levels of service or with V/C ratios greater than 1.0 for either AM or PM peak hour for Alternative B4. For Alternatives B5 and B6, all ramp junctions are anticipated to operate below acceptable levels of service or V/C ratios greater than 1.0 for either AM or PM peak hour, with the exception of the northbound on ramp from SR 80, which operates within capacity during morning and evening peak hours.

Based on the intersection analysis performed for Design Year 2040, SR 80 at Australian Avenue and SR 80 at Gem Lake Drive are anticipated to operate at generally similar conditions for all alternatives. However, SR 80 at the ramp terminal intersections are projected to operate with lower delays during both the AM and PM peak hours for Alternative B4 when compared to Alternatives B5 and B6. Similarly, the freeway analysis shows that, all sections are anticipated to operate with similar conditions for all alternatives with the exception of the northbound on ramp from SR 80 which operates with V/C ratio greater than 1.0 for Alternative B4 and a V/C ratio lower than 1.0 for Alternatives B5 and B6. A full traffic microsimulation analysis of the study area is recommended in order to evaluate system-wide pros and cons of each alternative.

For additional details, refer to **Section 4.2.7.3.2** of the **Master Plan Technical Document**.

Table 2.24: Year 2040 AM Peak Hour Intersection Operations Analysis Summary

Intersection	Approach	Movement	Alternative B4				Alternative B5				Alternative B6			
			Delay (sec/veh)	LOS	V/C Ratio	95th Queue (ft)	Delay (sec/veh)	LOS	V/C Ratio	95th Queue (ft)	Delay (sec/veh)	LOS	V/C Ratio	95th Queue (ft)
SR 80 at Australian Ave*	Eastbound	L	87.1	F	1.10	921	85.1	F	1.10	1120	102.9	F	1.14	1222
	Westbound	L	22.7	C	0.51	280	18.4	B	0.44	257	21.3	C	0.46	287
	Northbound	T	84.5	F	1.09	854	93.9	F	1.10	802	100.1	F	1.11	923
	Southbound	T	26.1	C	0.54	286	36.1	D	0.66	366	35.2	D	0.61	364
Intersection Overall			***65.8***	***E***	***1.10***	**-**	***69.3***	***E***	***1.10***	**-**	***78.2***	***E***	***1.14***	**-**
SR 80 at Gem Lake Dr**	Eastbound	L	85.0	F	0.44	97	80.3	F	0.45	118	76.7	E	0.40	112
		T	23.2	C	0.80	717	21.0	C	0.78	686	21.3	C	0.75	628
	Westbound	L	81.8	F	0.46	128	85.6	F	0.47	117	87.1	F	0.45	116
		T	5.8	A	0.40	120	4.5	A	0.58	223	4.2	A	0.59	181
		R	0.4	A	0.13	0	4.2	A	0.13	12	3.4	A	0.13	11
	Northbound	L	72.5	E	0.46	143	76.7	E	0.47	131	71.1	E	0.40	121
		T	63.2	E	0.16	82	66.3	E	0.17	85	64.1	E	0.15	83
	Southbound	L	67.9	E	0.31	94	79.2	E	0.47	107	74.8	E	0.43	103
		T	60.7	E	0.02	27	63.4	E	0.02	28	61.6	E	0.02	28
Intersection Overall			***20.4***	***C***	***0.71***	**-**	***17.7***	***B***	***0.71***	**-**	***17.5***	***B***	***0.66***	**-**
SR 80 at I-95 SB Off ramps**	Eastbound	T	47.8	D	0.94	578	53.0	D	0.99	693	52.6	D	1.00	747
		R	41.8	D	0.99	1285	38.5	D	0.94	1138	24.5	C	0.73	830
	Westbound	L	52.4	D	0.51	269	50.8	D	0.41	222	45.4	D	0.41	220
		T	59.7	E	0.78	412	11.8	B	0.57	335	10.9	B	0.54	339
	Southbound	L	44.7	D	0.57	361	58.7	E	0.74	412	63.9	E	0.80	422
		R	13.1	B	0.46	267	96.2	F	1.03	604	112.8	F	1.08	604
Intersection Overall			***41.7***	***D***	***1.16***	**-**	***45.5***	***D***	***1.07***	**-**	***45.2***	***D***	***1.04***	**-**
SR 80 at I-95 NB Off ramps**	Eastbound	L	74.4	E	1.01	507	101.7	F	1.11	620	105.4	F	1.13	655
		T	6.1	A	0.47	188	3.6	A	0.42	143	4.1	A	0.46	168
	Westbound	T	26.6	C	0.30	187	41.3	D	0.40	223	46.6	D	0.45	234
		R	18.8	B	0.71	590	20.7	C	0.71	593	23.1	C	0.74	654
	Northbound	L	58.1	E	0.35	136	60.6	E	0.86	495	53.1	D	0.78	468
		R	68.9	E	0.97	760	140.3	F	1.15	795	142.0	F	1.17	872
Intersection Overall			***37.7***	***D***	***1.09***	**-**	***58.7***	***E***	***1.17***	**-**	***60.4***	***E***	***1.22***	**-**

*Note: * Synchro based HCM 2010 results are provided. Synchro based HCM 2010 results does not show overall intersection V/C ratio. Therefore, maximum V/C ratio is reported for overall intersection*

*** Synchro based HCM 2000 results are provided*

Table 2.25: Year 2040 PM Peak Hour Intersection Operations Analysis Summary

Intersection	Approach	Movement	Alternative B4				Alternative B5				Alternative B6			
			Delay (sec/veh)	LOS	V/C Ratio	95th Queue (ft)	Delay (sec/veh)	LOS	V/C Ratio	95th Queue (ft)	Delay (sec/veh)	LOS	V/C Ratio	95th Queue (ft)
SR 80 at Australian Ave*	Eastbound	L	21.4	C	0.60	139	22.7	C	0.70	164	22.2	C	0.68	155
	Westbound	L	27.4	C	0.85	211	26.8	C	0.85	205	26.3	C	0.84	200
	Northbound	T	12.1	B	0.57	234	11.6	B	0.52	211	11.5	B	0.51	209
	Southbound	T	11.1	B	0.48	186	11.3	B	0.50	201	10.8	B	0.44	177
Intersection Overall			***16.2***	***B***	***0.85***	***-***	***16.4***	***B***	***0.85***	***-***	***16.2***	***B***	***0.84***	***-***
SR 80 at Gem Lake Dr**	Eastbound	L	49.9	D	0.40	46	38.4	D	0.09	17	45.0	D	0.29	37
		T	27.2	C	0.84	295	27.9	C	0.88	334	29.0	C	0.88	315
	Westbound	L	37.7	D	0.79	160	43.4	D	0.81	163	40.7	D	0.78	168
		T	25.3	C	0.78	425	24.3	C	0.91	520	28.4	C	0.92	576
		R	52.6	D	0.08	18	30.2	C	0.08	7	30.1	C	0.08	10
	Northbound	L	30.7	C	0.28	66	31.5	C	0.28	65	30.3	C	0.26	63
		T	26.7	C	0.03	0	27.6	C	0.03	0	26.7	C	0.03	0
	Southbound	L	46.7	D	0.72	179	**65.3**	**E**	0.87	220	**59.2**	**E**	0.84	222
		T	27.0	C	0.05	35	27.6	C	0.03	27	26.9	C	0.05	33
Intersection Overall			***28.3***	***C***	***0.81***	***-***	***28.2***	***C***	***0.94***	***-***	***30.4***	***C***	***0.94***	***-***
SR 80 at I-95 SB Off ramps**	Eastbound	T	**68.5**	**E**	0.64	358	**68.5**	**E**	0.90	504	**70.8**	**E**	0.90	516
		R	20.9	C	0.74	418	13.3	B	0.63	396	11.9	B	0.53	326
	Westbound	L	37.8	D	0.63	407	**71.1**	**E**	0.91	418	**60.9**	**E**	0.78	378
		T	44.6	D	0.84	569	19.9	B	0.72	407	19.8	B	0.73	443
	Southbound	L	**59.2**	**E**	0.83	519	47.3	D	0.67	443	51.1	D	0.73	474
		R	27.2	C	0.76	609	**122.2**	**F**	**1.13**	869	**101.6**	**F**	**1.07**	767
Intersection Overall			***39.8***	***D***	***1.00***	***-***	***55.0***	***D***	***1.17***	***-***	***49.8***	***D***	***1.11***	***-***
SR 80 at I-95 NB Off ramps**	Eastbound	L	**57.4**	**E**	0.36	135	**56.8**	**E**	0.83	344	**59.6**	**E**	0.87	382
		T	2.2	A	0.38	9	1.8	A	0.38	45	2.3	A	0.40	76
	Westbound	T	30.5	C	0.49	322	34.2	C	0.48	305	36.8	D	0.50	318
		R	14.6	B	0.57	332	16.1	B	0.63	459	16.2	B	0.63	466
	Northbound	L	**58.3**	**E**	0.41	162	**153.2**	**F**	**1.18**	690	**116.9**	**F**	**1.10**	663
		R	**80.2**	**F**	0.87	363	**65.8**	**E**	0.76	345	**60.3**	**E**	0.70	337
Intersection Overall			***28.5***	***C***	***0.73***	***-***	***56.8***	***E***	***1.00***	***-***	***49.1***	***D***	***1.00***	***-***

*Note: * Synchro based HCM 2010 results are provided. Synchro based HCM 2010 results does not show overall intersection V/C ratio. Therefore, maximum V/C ratio is reported for overall intersection*
*** Synchro based HCM 2000 results are provided*

Table 2.26: Year 2040 AM & PM Peak Hour Basic Freeway Operations Analysis Summary

Segment Description	Alternative B4				Alternative B5				Alternative B6			
	Mainline Volume	Density	V/C Ratio	LOS	Mainline Volume	Density	V/C Ratio	LOS	Mainline Volume	Density	V/C Ratio	LOS
AM Peak												
I-95 NB Segment between												
Forest Hill Blvd NB On ramp & Managed Lane On ramp	Analyzed as weaving segment				12,005	38.80	0.93	E	12,211	40.00	0.94	E
Managed Lane On ramp & SR 80 NB Off ramp	Analyzed as weaving segment				Analyzed as weaving segment				Analyzed as weaving segment			
SR 80 NB Off ramp & Belvedere Rd NB Off ramp	9,692	36.70	0.90	E	10,972	-	1.02	F	11,218	-	1.04	F
Belvedere Rd NB Off ramp & SR 80 NB On ramp	6,837	30.30	0.79	D	8,534	44.10	0.99	E	8,600	44.80	1.00	E
North of SR 80 NB On ramp	11,111	-	1.29	F	10,121	-	1.17	F	10,263	-	1.19	F
I-95 SB Segment between												
North of loop Off ramp to Belvedere Rd	7,621	35.10	0.88	E	7,575	34.70	0.87	D	7,620	35.10	0.88	E
Belvedere Rd Off ramp to Belvedere Rd & SR 80 SB Off ramp	7,035	31.00	0.81	D	6,968	30.60	0.80	D	7,021	30.90	0.81	D
SR 80 SB Off ramp & Belvedere Rd SB On ramp	5,339	22.20	0.62	C	5,373	22.40	0.62	C	5,464	22.70	0.63	C
Belvedere Rd SB On ramp & SR 80 SB On ramp	6,749	29.30	0.78	D	6,781	29.50	0.78	D	6,889	30.10	0.79	D
SR 80 SB On ramp & Managed Lane Off ramp	Analyzed as weaving segment				Analyzed as weaving segment				Analyzed as weaving segment			
Managed Lane Off ramp to Forest Hill Blvd SB Off ramp	Analyzed as weaving segment				8,415	29.10	0.78	D	8,353	28.90	0.77	D
PM Peak												
I-95 NB Segment between												
Forest Hill Blvd NB On ramp & Managed Lane On ramp	Analyzed as weaving segment				8,760	25.00	0.68	C	8,089	23.00	0.63	C
Managed Lane On ramp & SR 80 NB Off ramp	Analyzed as weaving segment				Analyzed as weaving segment				Analyzed as weaving segment			
SR 80 NB Off ramp & Belvedere Rd NB Off ramp	6,303	21.50	0.59	C	7,365	25.30	0.68	C	7,350	25.20	0.68	C
Belvedere Rd NB Off ramp & SR 80 NB On ramp	4,727	20.20	0.55	C	5,929	25.40	0.69	C	5,959	25.60	0.69	C
North of SR 80 NB On ramp	7,681	36.10	0.89	E	7,174	32.50	0.83	D	7,239	32.90	0.84	D
I-95 SB Segment between												
North of loop Off ramp to Belvedere Rd	9,507	-	1.10	F	9,290	-	1.07	F	9,575	-	1.10	F
Belvedere Rd Off ramp to Belvedere Rd & SR 80 SB Off ramp	9,137	-	1.05	F	8,935	-	1.03	F	9,173	-	1.06	F
SR 80 SB Off ramp & Belvedere Rd SB On ramp	6,790	29.50	0.78	D	6,827	29.70	0.79	D	7,168	31.90	0.83	D

Segment Description	Alternative B4				Alternative B5				Alternative B6			
	Mainline Volume	Density	V/C Ratio	LOS	Mainline Volume	Density	V/C Ratio	LOS	Mainline Volume	Density	V/C Ratio	LOS
Belvedere Rd SB On ramp & SR 80 SB On ramp	9,303	-	1.07	F	9,341	-	1.08	F	9,292	-	1.07	F
SR 80 SB On ramp & Managed Lane Off ramp	Analyzed as weaving segment				Analyzed as weaving segment				Analyzed as weaving segment			
Managed Lane Off ramp to Forest Hill Blvd SB Off ramp	10,163	39.30	0.94	E	10,223	39.70	0.94	E	10,149	39.30	0.94	E

Table 2.27: Year 2040 AM & PM Peak Hour Weaving Segment Check & Operations Analysis Summary

Segment Description	Distance between Ramps (ft)	Alternative	AM/PM Peak Hours	Mainline Volume	On Ramp Volume	Off Ramp Volume	Weaving Volume	Weaving Volume Ratio	Number of Maneuver lanes	Maximum Weaving Length (ft)	Is weaving segment?	Density (pc/mi/ln)	V/C Ratio	LOS
One Sided Weaving														
I-95 NB on ramp from Forest Hill Blvd to I-95 NB Off ramp to SR 80 Weaving segment	4,200	B4	AM	10,294	2,766	3,368	4,707	0.36	3.00	4,675	Yes	-	**1.46**	**F**
		B4	PM	7,774	1,713	3,184	3,747	0.39	3.00	5,059	Yes	-	**1.16**	**F**
		B5	AM	10,261	2,763	2,053	3,945	0.30	3.00	4,049	No	-	-	-
		B5	PM	7,450	1,651	1,735	2,757	0.30	3.00	4,049	No	-	-	-
		B6	AM	6,889	1,677	1,396	2,526	0.29	3.00	3,963	No	-	-	-
		B6	PM	9,292	1,598	2,028	3,031	0.28	3.00	3,787	No	-	-	-
I-95 SB on ramp from SR 80 to I-95 SB Off ramp to Forest Hill Blvd Weaving segment	4,300	B4	AM	6,749	2,185	1,499	2,951	0.33	3.00	4,345	Yes	39.10	0.91	**E**
		B4	PM	9,303	1,829	2,009	3,178	0.29	3.00	3,863	No	-	-	-
		B5	AM	6,781	2,019	1,457	2,807	0.32	3.00	4,222	No	-	-	-
		B5	PM	9,341	1,856	2,058	3,232	0.29	3.00	3,896	No	-	-	-
		B6	AM	10,561	2,792	2,135	4,034	0.30	3.00	4,040	No	-	-	-
		B6	PM	7,400	1,702	1,752	2,799	0.31	3.00	4,099	No	-	-	-
Two Sided Weaving														
I-95 NB on ramp from Managed Lane to I-95 NB Off ramp to SR 80 Weaving segment	2,500	B5	AM	12,005	1,019	2,053	161	0.012	0.00	5,842	Yes	-	**1.10**	**F**
		B5	PM	8,760	341	1,735	65	0.007	0.00	5,794	Yes	27.60	0.77	C
		B6	AM	12,211	1,142	2,135	183	0.014	0.00	5,854	Yes	-	**1.13**	**F**
		B6	PM	8,809	293	1,752	56	0.006	0.00	5,784	Yes	27.50	0.77	C
I-95 SB on ramp from SR 80 to I-95 SB Managed Lane Off Ramp Weaving segment	2,500	B4	PM	9,303	1,829	969	159	0.014	0.00	5,859	Yes	-	**1.13**	**F**
		B5	AM	6,781	2,019	385	88	0.010	0.00	5,820	Yes	32.80	0.89	D
		B5	PM	9,341	1,856	974	161	0.014	0.00	5,860	Yes	-	**1.13**	**F**
		B6	AM	6,889	1,677	213	42	0.005	0.00	5,773	Yes	31.10	0.86	D
		B6	PM	9,292	1,598	741	109	0.010	0.00	5,820	Yes	-	**1.10**	**F**

Table 2.28: Year 2040 AM & PM Peak Ramp Junction Operations Analysis Summary

Segment	Analysis Type	Mainline Volume		Ramp Volume		Density (pc/mi/ln)		Freeway V/C Ratio		Ramp V/C Ratio		LOS	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Alternative B4													
I-95 NB													
On ramp from Forest Hill Blvd	Analyzed as weaving section												
On ramp from Managed lanes													
Off ramp to SR 80													
Off ramp to Belvedere Rd	Major Diverge	9,692	6,303	2,855	1,576	37.25	23.57	0.89	0.56	0.73	0.40	**E**	C
On ramp from SR 80	Major Merge	6,837	4,727	4,274	2,954	-	-	0.99	0.68	**1.09**	0.75	-	-
I-95 SB													
Loop off ramp to Belvedere Rd	Diverge	7,621	9,507	586	370	32.90	-	0.86	**1.07**	0.33	0.21	D	**F**
Off ramp to SR 80	Diverge	7,035	9,137	1,696	2,347	0.00	-	0.79	**1.03**	0.44	0.61	A	**F**
On ramp from Belvedere Rd	Merge	5,339	6,790	1,410	2,513	15.40	-	0.76	**1.05**	0.38	0.68	B	**F**
On ramp from SR 80	Analyzed as weaving section												
Off ramp to Managed lanes													
Off ramp to Forest Hill Blvd*	Major Diverge	-	10,163	-	2,009	-	38.01	-	0.91	-	0.51	-	**E**
Alternative B5													
I-95 NB													
On ramp from Forest Hill Blvd	Major Merge	9,242	7,109	2,763	1,651	-	-	**1.03**	0.79	0.70	0.42	-	-
On ramp from Managed lanes	Analyzed as weaving section												
Off ramp to SR 80													
Off ramp to Belvedere Rd	Major Diverge	10,972	7,365	2,438	1,436	41.03	27.54	0.98	0.66	0.62	0.37	**E**	C
On ramp from SR 80	Major Merge	8,534	5,929	1,587	1,245	-	-	0.95	0.66	0.40	0.32	-	-
I-95 SB													
Loop off ramp to Belvedere Rd	Diverge	7,575	9,290	607	355	32.80	-	0.86	**1.05**	0.35	0.20	D	**F**
Off ramp to SR 80	Diverge	6,968	8,935	1,595	2,108	0.00	-	0.79	**1.01**	0.41	0.54	A	**F**
On ramp from Belvedere Rd	Merge	5,373	6,827	1,408	2,514	15.50	-	0.77	**1.05**	0.38	0.68	B	**F**
On ramp from SR 80	Analyzed as weaving section												
Off ramp to Managed lanes													
Off ramp to Forest Hill Blvd	Major Diverge	8,415	10,223	1,457	2,058	31.47	38.23	0.77	0.91	0.37	0.52	D	**E**
Alternative B6													
I-95 NB													
On ramp from Forest Hill Blvd	Major Merge	9,417	7,107	2,792	1,702	-	-	**1.05**	0.79	0.71	0.43	-	-
On ramp from Managed lanes	Analyzed as weaving section												
Off ramp to SR 80													

Segment	Analysis Type	Mainline Volume		Ramp Volume		Density (pc/mi/ln)		Freeway V/C Ratio		Ramp V/C Ratio		LOS	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Off ramp to Belvedere Rd	Major Diverge	11,218	7,350	2,618	1,391	41.95	27.49	1.00	0.66	0.67	0.35	**E**	C
On ramp from SR 80	Major Merge	8,600	5,959	1,663	1,280	-	-	0.96	0.66	0.42	0.33	-	-
I-95 SB													
Loop off ramp to Belvedere Rd	Diverge	7,620	9,575	599	402	33.00	-	0.86	**1.08**	0.34	0.23	D	**F**
Off ramp to SR 80	Diverge	7,021	9,173	1,557	2,005	0.00	-	0.79	**1.04**	0.40	0.52	A	**F**
On ramp from Belvedere Rd	Merge	5,464	7,168	1,425	2,124	15.90	-	0.78	**1.05**	0.39	0.58	B	**F**
On ramp from SR 80	Analyzed as weaving section												
Off ramp to Managed lanes													
Off ramp to Forest Hill Blvd	Major Diverge	8,353	10,149	1,396	2,028	31.24	37.95	0.77	0.90	0.36	0.52	D	**E**

** Segment analyzed as weaving section for the Morning peak*

2.2.4.1.3 *SR 80 at I-95 Recommended Traffic Alternative*

Several factors were considered to evaluate the alternatives analyzed for SR 80/Southern Blvd Interchange. A qualitative determination was made by scoring each alternative based on five main components or criteria that was considered as part of the evaluation (listed below). Each alternative was scored on a scale of one to three, one meaning the best, and three meaning the worst score. The scores of each criterion were totaled for each alternative, and the alternative resulting in the lowest score is selected as the recommended alternative.

- Traffic Forecasting
- Traffic Operations
- Engineering
- Right of Way Impacts
- Cost

At the early stages of the analysis, the Master Plan team determined that Alternative B4 did not meet the purpose and need of the Master Plan. Additionally, it was also determined that the alternative was unviable due to operation and safety concerns. Scoring was assigned to Alternative B4 for the purposes of completing the evaluation matrix, however, it was not considered in the selection of the recommended alternative. **Table 2.29** shows the results of the analysis performed. As shown, Alternative B5 resulted in the lowest score (17), when compared to Alternative B4 (22) and Alternative B6 (18), therefore Alternative B5 is recommended alternative for the SR 80/Southern Blvd Interchange at I-95.

Table 2.29: SR 80 at I-95 - Evaluation Matrix

Alternatives		Traffic Forecast			Operations		Engineering			Right of Way Impacts	Cost	Total Rank
	Description	Direct Connect Demand	SR 80 Demand	Congestion Relief	Signalized Intersections	I-95 General Use/Managed Lane Operations	System to System Connectivity	Access	Safety			
ALT B4	SR 80 at I-95 PD&E Alternative to SR 80 High Speed Through Lanes (HSTL) Direct Connections **(Discarded from Further Evaluation)**	1	1	3	3	3	2	2	3	2	2	**22**
ALT B5	I-95 Managed Lanes to SR 80 High Speed Through Lanes (HSTL) - Median to Median NB/WB & EB/NB Direct Connections	3	3	2	1	1	1	1	1	2	2	**17**
ALT B6	I-95 Managed Lanes to SR 80 High Speed Through Lanes (HSTL) - Median to Median All Movements Direct Connections	2	2	1	2	2	1	1	1	3	3	**18**

Note: The ranking system range represents the following: 1 - Best; 3 - Worst

2.2.4.1.4 *SR 80/Southern Blvd Interchange Alternative B5 & Connection Concepts*

As discussed in **Section 2.2.4.1.3**, the recommended traffic alternative for SR 80/Southern Blvd at I-95 Interchange is Alternative B5. Alternative B5 involves a median to median direct connection from I-95 managed lanes to the SR 80 elevated high-speed through lanes. The Plan evaluated three concepts to accommodate the movements of Alternative B5. In addition, three corresponding concepts were developed to the connection between the SR 80 Corridor Action Plan Alternative #3, and SR 80 Alternative B5.

The design criterion and navigable airspace requirements are provided in **Section 4.2.7.3.4.1** and **4.2.7.3.4.2** of the **Master Plan Technical Document**.

The design speed criteria for direct connect ramps is outlined per FDM Section 201.4.1.1 Ramps. According to the FDM, the minimum design speed for direct connect ramps is 50 mph. However, this resulted significant right of way impacts. A preliminary assessment was conducted to develop direct connect concepts that shows the differences in geometry in increments of 5 mph, ranging from 35 mph to 50 mph. As a result, the Plan determined that a direct connect ramp designed at 50 mph would be unfeasible due to the significant impacts affecting the communities in the SW quadrant of the interchange. As a result, the Master Plan team concluded a design would be developed to maximize the design speed for the direct connects, therefore a feasible design speed for the direct connect ramps is proposed at 40 mph. See **Figure 2.33** for a comparison diagram of the different geometric designs of the direct connect ramps based on different design speeds and their impacts to the surrounding areas.

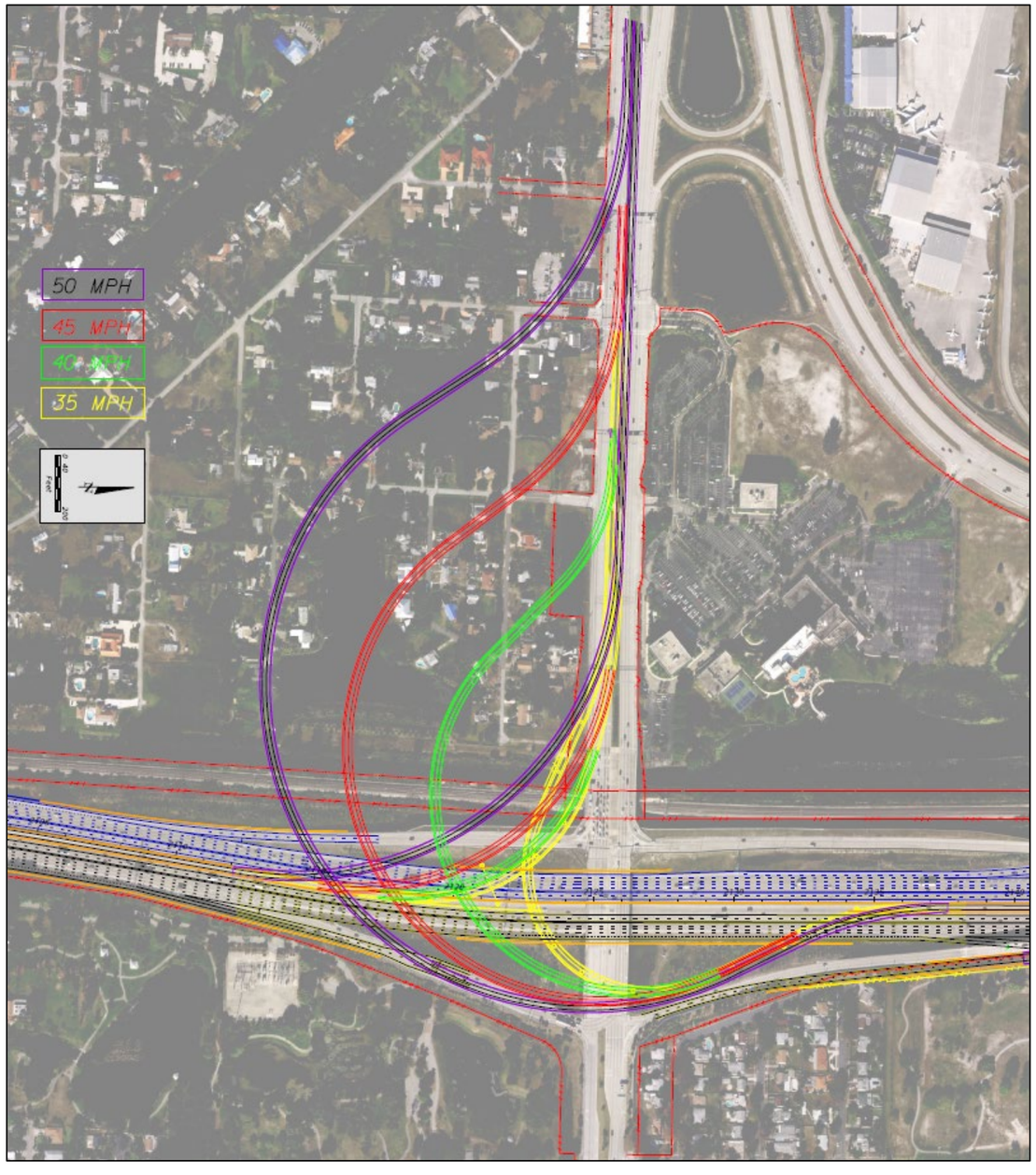


Figure 2.33: SR 80 direct connect ramp design speed comparison analysis

2.2.4.1.4.1 *SR 80/Southern Blvd Interchange Concepts*

The following is a description of each evaluated concept for SR 80/Southern Blvd at I-95 Interchange (Alternative B5):

- **Option A**
  - Provides a direct connect ramp from NB I-95 managed lanes to WB SR 80 elevated high-speed through lanes.
  - Provides a direct connect ramp from EB SR 80 elevated high-speed through lanes to NB I-95 managed lanes.
  - Incorporates arterial & ramp terminal improvements from the SR 80 PD&E Study Preferred Alternative (Alternative 4).
  - Incorporates mainline improvements from the Plan's Alternative B which provides full standard cross-sectional roadway elements.
  - Bridge #930478 (segmental bridge) is to be re-designed to accommodate a two-managed lane I-95 mainline typical section. A new bridge would be constructed adjacent to the existing segmental bridge. This introduces right-of-way impacts to the NE quadrant of the interchange.
  - Direct connect ramps were designed with consideration to new flight paths introduced by the PBI Airport ALP.

- **Option B**
  - Provides a direct connect ramp from NB I-95 managed lanes to WB SR 80 elevated high-speed through lanes.
  - Provides a direct connect ramp from EB SR 80 elevated high-speed through lanes to NB I-95 managed lanes.
  - Incorporates arterial & ramp terminal improvements from the SR 80 PD&E Study Preferred Alternative (Alternative 4).
  - Incorporates mainline improvements from the Plan's Alternative B which provides full standard cross-sectional roadway elements.
  - Relocates existing NB off-ramp to Belvedere Rd directly south of SR 80, and a depressed ramp connection would pass under SR 80 that would eventually tie back to the existing Belvedere Rd NB off-ramp as it approaches the existing arterial intersection. This approach would reduce right-of-way impacts to the NE quadrant of the interchange.
  - Bridge #930478 (segmental bridge) would be demolished.
  - Location of NB I-95 on-ramp from SR 80 would be relocated to the west of the existing location to accommodate the new depressed Belvedere Rd off-ramp exit.
  - Direct connect ramps were designed with consideration to new flight paths introduced by the PBI Airport ALP.

- **Option C**
  - Provides a direct connect ramp from NB I-95 managed lanes to WB SR 80 elevated high-speed through lanes.
  - Provides a direct connect ramp from EB SR 80 elevated high-speed through lanes to NB I-95 managed lanes.
  - Provides a direct connect ramp from EB SR 80 elevated high-speed through lanes to SB I-95 managed lanes.
  - Incorporates arterial & ramp terminal improvements from the SR 80 PD&E Study Preferred Alternative (Alternative 4).
  - Incorporates mainline improvements from the Plan's Alternative B which provides full standard cross-sectional roadway elements.
  - Bridge #930478 (segmental bridge) is to be re-designed to accommodate a two-managed lane I-95 mainline typical section. A new bridge would be constructed adjacent to the existing segmental bridge. This introduces right-of-way impacts to the NE quadrant of the interchange.
  - Direct connect ramps were designed with consideration to new flight paths introduced by the PBI Airport ALP.

Refer to **Appendix R** of the **Master Plan Technical Document** for detailed exhibits for each option.

Several factors were considered to determine a recommended concept for SR 80/Southern Blvd at I-95 Interchange. A qualitative analysis was conducted by scoring each concept based on six main components or criteria that was considered as part of the evaluation (listed below).

- Complexity
- Connectivity to I-95 Managed Lanes
- Maintenance of Traffic

- Constructability
- Right of Way Impacts
- Cost

Each concept was scored on a scale of one to three, one meaning the best, and three meaning the worst score. The scores of each criterion were totaled for each alternative, and the alternative resulting in the lowest score is selected as the recommended alternative. **Table 2.30** shows the results the evaluation. As shown, Option A resulted in the lowest score (10), when compared to Option B (15) and Option C (12), therefore Option A is recommended concept for the SR 80/Southern Blvd Interchange at I-95. **Figure 2.34** shows the concept design for Option A.

Table 2.30: SR 80/Southern Blvd at I-95 Comparison Matrix

Alternatives	Complexity	Connectivity to Managed Lanes	Maintenance of Traffic	Constructability	Right of Way Impacts	Cost	Total Rank
Option A	1	2	2	1	2	2	**10**
Option B	3	2	3	3	1	3	**15**
Option C	2	1	2	2	2	3	**12**

Note: The ranking system range represents the following: 1 - Best; 3 - Worst

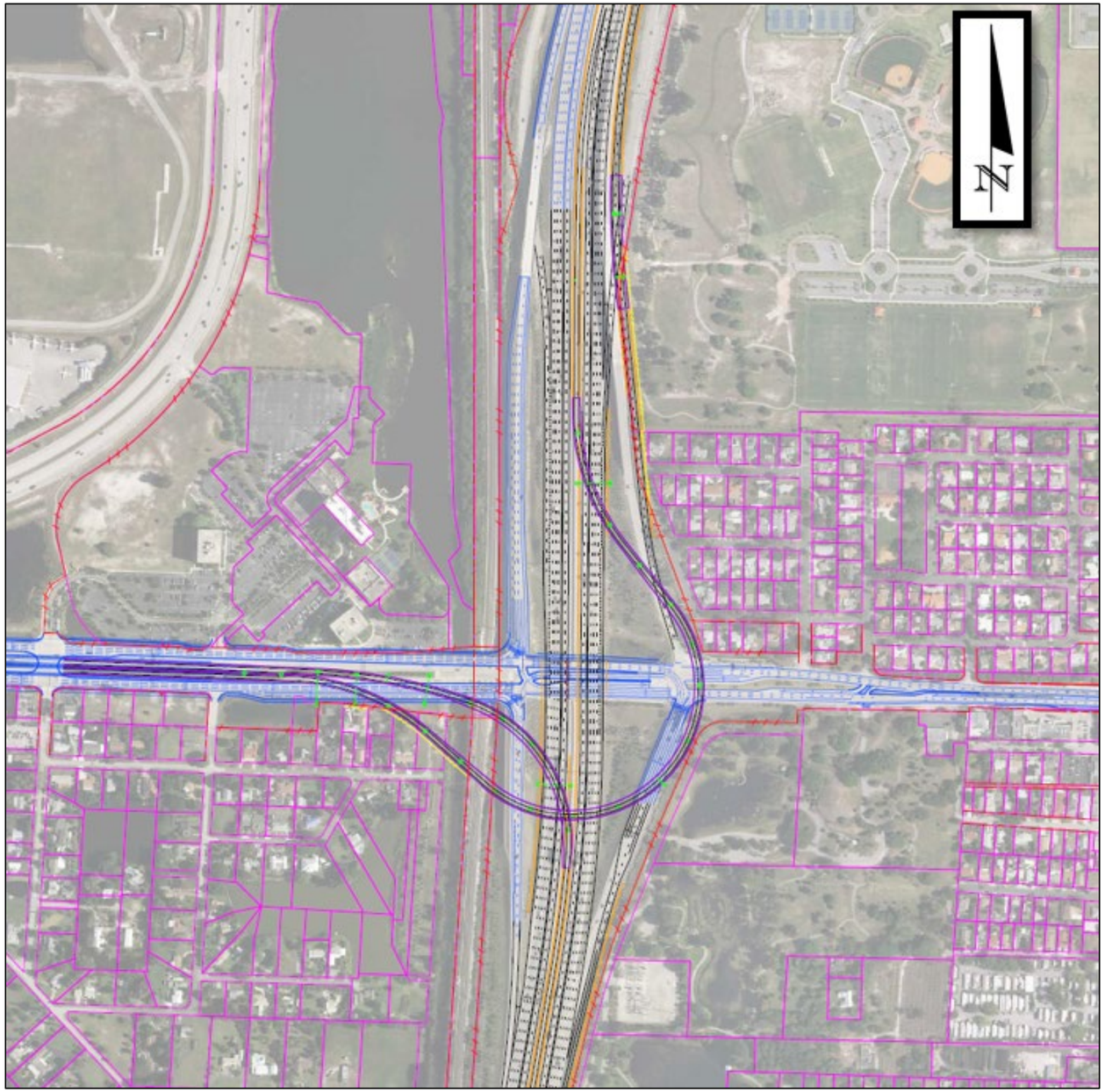


Figure 2.34: SR 80 Interchange Option A

2.2.4.1.4.2 *SR 80 at I-95 Interchange to SR 80 Action Plan Connection Concepts*

The second part of the SR 80 at I-95 interchange evaluation is the connection to the SR 80 Action Plan. Alternative 3 of the SR 80 Action Plan was considered as part of the overall evaluation of to the system to system connection between SR 80 high-speed through lanes and I-95 managed lanes.

The following is a description of each evaluated concept for the system to system connection:

- **Option 1** – Depressed connection between SR 80 Action Plan (Alternative 3) and SR 80/Southern at I-95 Interchange (Option A) while minimizing impacts to the Congress/Australian Ave Interchange.

- **Option 2** – Elevated connection between SR 80 Action Plan (Alternative 3) and SR 80/Southern Blvd at I-95 Interchange (Option A) while minimizing impacts to the Congress/Australian Ave Interchange.

- **Option 3** – Re-configure the Congress/Australian Ave Interchange to connect SR 80 Action Plan (Alternative 3) and SR 80/Southern at I-95 Interchange (Option A).

Refer to **Appendix S** of the **Master Plan Technical Document** for detailed exhibits for each option.

Additional factors were considered to determine a recommended concept for SR 80/Southern Blvd at I-95 interchange. Those factors included maintenance of traffic (MOT), engineering design, cost, right of way, aesthetics, mobility, and safety. Below is a summary of each of the three interchange concepts.

Option A

- **Maintenance of Traffic (MOT)/Constructability**
  - Compared to Options B & C, Option A is the least complex in terms of maintenance of traffic and constructability.
- **Engineering Design**
  - Direct connect ramps meet 40 mph design speed criteria horizontally and vertically.
- **Cost**
  - Lower than Option C, similar to Option B
- **Right of Way**
  - SW Quadrant: Four impacted properties due to the direct connect ramps including a billboard.
  - NE Quadrant: Impact to portion of a park on the Marshall and Vera Lea Rinker Athletic Campus property.
- **Aesthetics**
  - 3rd level ramps visible from homes in SW and NE quadrants.
- **Mobility**
  - Two major signalized left turn movements (NB to WB and EB to NB) are greatly alleviated by the two direct connect ramps, reducing congestion and improving throughput.
- **Safety**
  - Two major signalized left turn movements (NB to WB and EB to NB) are greatly alleviated by the two direct connect ramps, reducing congestion and hazardous cross-traffic movements, thus reducing crashes and improving safety.

Option B

- **Maintenance of Traffic (MOT)/Constructability**
  - Same as Option A except for NE quadrant: The offramp to Belvedere Rd is pushed south of SR 80 requiring a "punch through" under SR 80 just east of the existing SR 80 overpass. Also, for MOT purposes the NB on-ramp from SR 80 needs to be realigned closer to I-95 and additional bridge structure is required to allow the relocated off-ramp (to Belvedere Rd) to pass under. This additional bridge structure replaces the braided structure adjacent to the park on the Marshall and Vera Lea Rinker Athletic Campus property required in Option A.
- **Engineering Design**
  - All direct connect ramps meet 40mph design speed criteria horizontally and vertically.
- **Cost**
  - Similar to Option A.
- **Right of Way**
  - SW Quadrant: Same as option A.
  - NE Quadrant: Impacts are significantly less than Option A. The surrounding neighborhood is unaffected, and there are minimal impacts to the park on the Marshall and Vera Lea Rinker Athletic Campus property.
- **Aesthetics**
  - 3rd level ramps same as Option A. On-ramp from SR 80 to I-95 NB pulled away from the park on the Marshall and Vera Lea Rinker Athletic Campus property and adjacent

neighborhood. The braided structure along the park required in Option A is not required in Option B.

- **Mobility**
  - Same as Option A.
- **Safety**
  - No significant change from Option A.

Option C

- **Maintenance of Traffic (MOT)/Constructability**
  - EB to SB direct connect ramp is added in Option C in SW quadrant. Further widening is required along I-95 SB between SR 80 and Forest Hill Blvd. For the NE quadrant, Option A and B are interchangeable.
- **Engineering Design**
  - All direct connect ramps meet 40 mph design speed criteria horizontally and vertically.
- **Cost**
  - High cost than Option A and B
- **Right of Way**
  - SW quadrant: Slightly more impact to the 4 quadrants impacted in Option A and B, however, no new impacts are expected.
  - NE quadrant: No change due to Option C, but Option A and B are valid and interchangeable with Option C.
- **Aesthetics**
  - 3rd level structure is slightly closer to the neighborhood in the SW quadrant.
- **Mobility**
  - Option C adds a direct connection from EB SR 80 to the SB I-95 managed lanes.
- **Safety**
  - Further improvement to Options A and B with significantly less traffic passing through the signalized intersections of the interchange; more traffic will remain in the EB SR 80 managed lane reducing weaving and conflicts along that portion of SR 80 at grade.

A qualitative analysis was conducted by scoring each concept based on six main components or criteria that was considered as part of the evaluation (listed below).

- Complexity
- Connectivity to I-95 Managed Lanes
- Maintenance of Traffic
- Constructability
- Right of Way Impacts
- Cost

Each option was scored on a scale of one to three, one meaning the best, and three meaning the worst score. The scores of each criterion were totaled for each alternative, and the alternative resulting in the lowest score is selected as the recommended alternative. **Table 2.31** shows the results the evaluation. As shown, Option 1 resulted in the lowest score (11), when compared to Option 2 (14) and Option 3 (16), therefore Option 1 is the recommended concept for the system to system connection between SR 80 at I-95 Interchange Alternative B5 Option A to SR 80 Action Plan Alternative 3. **Figure 2.35** shows the concept design for Option 1.

Table 2.31: SR 80 at I-95 Interchange to SR 80 Action Plan Connection Comparison Matrix

Alternatives	Complexity	Connectivity to Managed Lanes	Maintenance of Traffic	Constructability	Right of Way/Impacts	Cost	Total Rank
Option 1	2	1	2	2	2	2	**11**
Option 2	2	1	3	2	3	3	**14**
Option 3	3	1	3	3	3	3	**16**
Note: The ranking system range represents the following: 1 - Best; 3 - Worst							

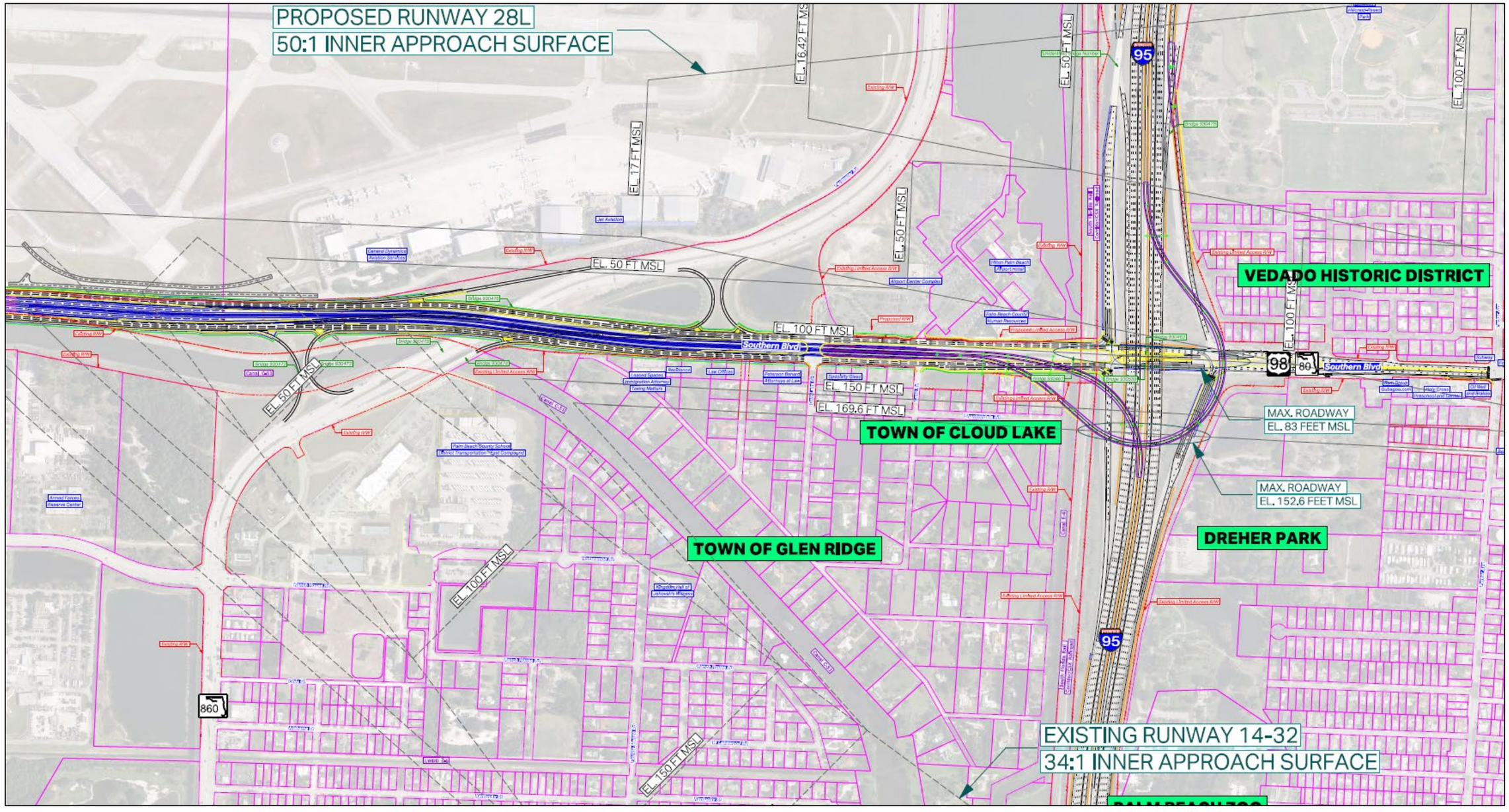


Figure 2.35: Option 1- Depressed System to System Connection

2.2.5 *I-95 Managed Lanes Recommended Alternative*

As discussed in **Section 2.2.1.3** of this report, three I-95 managed lanes alternatives were evaluated as part of the Master Plan. In addition to the findings discussed in the summary for **Section 2.1** of this report, each corridor design alternatives were also evaluated based on the following evaluation criterion:

- Construction Cost
- Right of Way Impacts
- Environmental Impacts
- Preliminary Maintenance of Traffic (MOT)

The following sections describe the results of the comparison between alternatives to arrive at the recommendation from the Master Plan.

2.2.5.1 *Alternative Evaluation*

2.2.5.1.1 *Construction Cost*

A preliminary cost estimate was conducted for Alternatives A through C for both the roadway and structures component of each alternative. Cost determinations were developed using historical costs and Cost Per Mile (CPM) Models for Long Range Estimates (LRE) as published by the FDOT. The team compared costs from Areas 12 and 13, which includes historical costs from various projects implemented in Miami-Dade, Broward, and Palm Beach Counties. Both sources of historical cost data were considered in the preliminary cost estimate.

For the roadway component, applicable pay items from the historical costs were extracted and applied to the cost assessment of each alternative, where applicable. Examples include the Flexible High Performance 36” Delineators, and Shoulder Concrete Barrier for Rigid Shoulders. In addition, CPM models were referenced to determine an applicable cost per mile for the roadway components. The following CPM models were referenced for this analysis:

- Mill & Resurface 1 Additional Lane Rural Interstate (R-19)
- New Construction Extra Cost for Additional Lane on Urban Interstate (U-11)
- Widen 6 Lane Urban Interstate with Closed Median to 8 Lanes (Outside); Mill & Resurface Existing; 10’ Shoulders Outside (U-25)

The team filtered applicable pay items per alternative by considering both the historical costs and CPM models listed above. **Table 2.32** shows a sample list of pay items considered as part of the cost estimate based on the CPM models.

Table 2.32: CPM Model Pay Item List

Pay Item	Description
101-1	MOBILIZATION
102-1	MAINTENANCE OF TRAFFIC
120-6	EMBANKMENT
160-4	TYPE B STABILIZATION
285-704	OPTIONAL BASE, BASE GROUP 04
285-709	OPTIONAL BASE, BASE GROUP 09
334-1-23	SUPERPAVE ASPH CONC, TRAF C, PG76-22, PMA
334-1-24	SUPERPAVE ASPH CONC, TRAF D, PG76-22,PMA
337-7-22	ASPH CONC FC, INC BIT, FC-5, PG76-22, PMA
400-2-2	CONC CLASS II, ENDWALLS
425-1-541	INLETS, DT BOT, TYPE D
425-1-891	INLETS, BARRIER WALL
425-2-71	MANHOLES, J-7
430-174-142	PIPE CULV, OPT MATL, ROUND, 42" SD
430-174-154	PIPE CULV, OPT MATL, ROUND, 54" SD
430-175-130	PIPE CULV, OPT MATL, ROUND, 30" S/CD
430-175-142	PIPE CULV, OPT MATL, ROUND, 42" S/CD
430-175-154	PIPE CULV, OPT MATL, ROUND, 54" S/CD
430-94-1	DESILTING PIPE, 0-24"
430-94-2	DELSILTING PIPE, 25-36"
430-94-3	DESILTING PIPE, 37-48"
521-72-3	SHLDR CONC BARRIER WALL, RIGID-SHLDR
546-72-51	RUMBLE STRIPS, GROUND-IN, 16" MIN. WIDTH
570-1-2	PERFORMANCE TURF, SOD
700-1-11	SINGLE POST SIGN, F&I GM
700-1-12	SINGLE POST SIGN, F&I GM, 12-20 SF
700-1-50	SINGLE POST SIGN, RELOCATE
700-1-60	SINGLE POST SIGN, REMOVE
700-2-14	MULTI-POST SIGN, F&I GM, 31-50 SF
700-2-60	MULTI-POST SIGN, REMOVE
706-3	RETRO-REFLECTIVE PAVEMENT MARKERS
711-15-111	THERMOPLASTIC, STD-OP, WHITE, SOLID, 6"
711-15-131	THERMOPLASTIC, STD-OP, WHITE, SKIP, 6"

For the structural component, a structural assessment was conducted during this study to determine if a bridge would need to be widened or replaced for each alternative (see **Appendix N** of the **Master Plan Technical Document**). The structural team referenced the existing conditions of the bridges along the corridor and analyzed how the existing bridges were impacted by each alternative and if any new bridges were proposed as part of the study. The available information for the existing bridges consisted of bridge design plans/as-built plans and Bridge Inspection Reports. The *January 2018 FDOT Structures Design Guidelines, Section 9 – BDR Cost Estimating* procedure was referenced in obtaining the applicable historical cost for each bridge improvement.

The cost for the proposed SR 80 improvements west of the I-95 corridor were not included as part of the Alternative A cost summary based on the results of the traffic demand model during the traffic analysis portion of the study. As discussed in the **Master Plan Technical Document**, Alternative A was not considered for further evaluation due to the low manage lanes volume demand throughput. Based on these results, a system to system direct connection from I-95 to SR 80 in Alternative A was not considered in the cost estimate. From a traffic demand perspective, the two managed lane traffic alternative resulted in the maximum managed lanes volume demand throughput. As a result, the traffic demand model and direct connection analysis indicates the applicable build alternatives for a system to system direction connection from I-95 to SR 80 to be Alternatives B and C, therefore the SR 80 improvements were considered in the cost estimate of Alternatives B and C.

Table 2.33 through **Table 2.35** show the preliminary cost estimates for each alternative. The total cost (in millions) are as follows:

- **Alternative A:** $188 M
- **Alternative B:** $2,275 M
- **Alternative C:** $2,878 M

Refer to **Appendix T** of the **Master Plan Technical Document** for preliminary cost estimate calculations.

Table 2.33: Alternative A Preliminary Cost Estimate

I-95 Managed Lanes Master Plan - Alternative A - Cost Summary (High Level Planning Estimate without SR 80 Improvements)	
Roadway Cost	$131,539,064
Design Fee (12%)	$15,784,688
Construction Engineering Inspection (11%)	$14,469,297
Contingency (25%)	$32,884,766
Structures Cost (Includes Contingency)	$0
Design Fee (12%)	$0
Construction Engineering Inspection (11%)	$0
Total Cost	**$194,677,815**

Table 2.34: Alternative B Preliminary Cost Estimate

I-95 Managed Lanes Master Plan - Alternative B - Cost Summary (High Level Planning Estimate with SR 80 Improvements)	
I-95 Mainline Corridor (Planning Level)	
Roadway Cost	$652,487,750
Design Fee (12%)	$78,298,530
Construction Engineering Inspection (11%)	$71,773,653
Contingency (25%)	$163,121,938
Structures Cost (Includes Contingency)	$436,552,804
Design Fee (12%)	$52,386,336
Construction Engineering Inspection (11%)	$48,020,808
SR 80 Improvements	
Roadway Cost	$68,228,815
Design Fee (12%)	$8,187,458
Construction Engineering Inspection (11%)	$7,505,170

I-95 Managed Lanes Master Plan - Alternative B - Cost Summary (High Level Planning Estimate with SR 80 Improvements)	
Structures Cost	$560,338,473
Design Fee (12%)	$67,240,617
Construction Engineering Inspection (11%)	$61,637,232
Total Cost	**$2,275,779,583**

Table 2.35: Alternative C Preliminary Cost Estimate

I-95 Managed Lanes Master Plan - Alternative C - Cost Summary (High Level Planning Estimate with SR 80 Improvements)	
Roadway Construction Cost	$850,540,023
Design Fee (12%)	$102,064,803
Construction Engineering Inspection (11%)	$93,559,402.53
Contingency (25%)	$212,635,006
Structures Cost (Includes Contingency)	$688,354,041
Design Fee (12%)	$82,602,485
Construction Engineering Inspection (11%)	$75,718,945
SR 80 Improvements	
Roadway Cost	$68,228,815
Design Fee (12%)	$8,187,458
Construction Engineering Inspection (11%)	$7,505,170
Structures Cost	$560,338,473
Design Fee (12%)	$67,240,617
Construction Engineering Inspection (11%)	$61,637,232
Total Cost	**$2,878,612,469**

2.2.5.1.2 *Right of Way Impact Assessment*

A preliminary evaluation for right of way impacts was conducted for all alternatives. The No Build alternative does not propose improvements to the corridor, thus no right of way impacts is anticipated. Alternative A involves utilizing the existing footprint of the corridor. The HOV lane will be re-designated as a separate managed lane and minimal widening is expected at proposed access points, however, no right of way impacts is anticipated in Alternative A. Alternative B involves widening of the I-95 corridor for one additional lane to accommodate the two managed lane typical section throughout the corridor. Therefore, the footprint of the corridor increases which results in impacts to a total of 12 parcels. The total anticipated right of way impacts varies from 5 to 11 feet. Alternative C involves widening of the I-95 corridor for one additional lane to accommodate the two managed lane typical section throughout the corridor, including additional room to provide full standard width shoulders between the managed lanes and general use lanes for the concrete barrier wall separation treatment. Due to the increase in the footprint in Alternative C, which requires a larger footprint when compared to Alternative B due to the separation treatment type, results in impacts to a total of 360 parcels. The total anticipated right of way impacts varies from 5 to 65 feet. See **Table 2.36** for a summary of the right of way impact assessment.

Table 2.36: Right of Way Impact Assessment Table

Assessment	No Build		Alternative A		Alternative B		Alternative C	
Parcel Impacts	Residential	0	Residential	0	Residential	3	Residential	298
	Industrial	0	Industrial	0	Industrial	3	Industrial	36
	Commercial	0	Commercial	0	Commercial	2	Commercial	10
	Recreation	0	Recreation	0	Recreation	0	Recreation	8
	Public	0	Public	0	Public	4	Public	6
	Utility	0	Utility	0	Utility	0	Utility	2
	0		0		12		360	
Right of Way Impacts	0 feet		0 feet		5-11 feet		5-65 feet	

2.2.5.1.3 *Environmental Impacts*

A high-level environmental review was completed for the Plan. The review included the use of GIS databases from the Palm Beach County Enterprise GIS Data Catalog, Florida Geographic Data Library, the USFWS, and the SFWMD. The evaluation of the data was conducted to determine existing and project-related environmental conditions or constraints for subsequent analysis in a Project Development phase. The environmental review was oriented to support future anticipated Federal Highway Administration approval and the ETDM Programming Screen leading to Class of Action Determination for corridor improvement segments. These data were graphically displayed on maps of the entire 37.5-mile project corridor to highlight those areas of concern that lay within the project boundary which is one-quarter mile on either side of the corridor.

The analysis included a social impact evaluation that looked at current land use of the property within the project corridor; community cohesion, which looked at potential division of existing communities; and relocation potential. Community services included identification of medical facilities, cultural areas, government buildings, and parks and recreation within the project corridor that could potentially be impacted by the project. The analysis also looked at natural and physical environmental factors including wetlands, farmlands and potential noise sensitive areas. Areas with potential contamination, including existing waste clean-up sites, and identified petroleum sites were identified. All of these factors are graphically displayed on the maps included **Section 6.0** of the **Master Plan Technical Document**.

The Plan does not propose to significantly expand on the existing I-95 right-of-way, therefore it is unlikely that there will be significant impacts to any of the environmental elements evaluated. As this project transitions to the PD&E phase, further environmental analysis will be conducted in compliance with the FDOT PD&E Manual.

2.2.5.1.4 *Preliminary Maintenance of Traffic (MOT) Plan*

The Plan proposes a preliminary breakdown of individual construction projects for the next transportation phases of PD&E, Design, and Construction. The Plan recommends construction projects by segments based on the needs of the corridor and constructability of the roadway improvements. The Maintenance of Traffic (MOT) plan will include all the necessary roadway improvements to accommodate two managed lanes in each direction. It is not known at this time if the segmented projects will be implemented as part of a Design-Build or Design-Build-Finance initiative, or a Conventional Design Bid-Build scenario.

2.3 *Facility Operations and Preservation Element*

This element discusses the implementation plan of the recommended alternative. Interim improvements are identified as part of the corridor to preserve the level of service prior to construction of major capacity improvements and to guide local government corridor protection initiatives. Design control and standards for Strategic Intermodal System (SIS) facilities was used to develop interim improvements to the I-95 study corridor. The proposed improvements follow all applicable manuals and guidelines including the FDOT, FHWA, and AASHTO's.

A capacity analysis was conducted to determine the segments that are anticipated to be deficient by the design year 2040. The analysis also determined the year of failure of the deficient segments based on the capacity check.

The year of capacity deficiency analysis was performed for the Build alternative utilizing the design year traffic volume and lane geometry for the general use lane. The capacity of the roadway segments was calculated using the LOS D maximum service volume (2080 pc/h/ln) as provided in the HCM 6th edition. Similar to the capacity adjustments in FDOT QLOS Tables, I-95 general use lane capacity was adjusted based on a future year peak hour factor of 0.95, heavy vehicle percentage of 3.0% and a driver population factor 0.91. Additional capacities due to the presence of auxiliary lanes were calculated from the FDOT QLOS Tables. Similar to the freeway capacity, the ramp capacity was also obtained from the HCM 6th edition and adjusted for the peak hour factor, heavy vehicle percentage and driver population factor. The calculated freeway and ramp capacity were compared against the maximum of AM or PM peak hour traffic volume. Any roadway or ramp segment anticipated to have a design year volume higher than the calculated maximum service volume is considered to have capacity deficiency. These segments were further looked at to identify the year of capacity deficiency. Traffic volume for each year between 2020 and 2040 were compared against the maximum service volume to identify the year of capacity deficiency. **Section 3.2.1** of this report discusses the year of capacity analysis results.

In addition, the Department has programmed a series of interchange improvement projects along the study corridor which will need to be coordinated with during the PD&E phase. These projects are currently programmed at different stages from PD&E to Construction. **Section 3.2.2** of this report discusses programmed projects and preliminary recommendations. Coordination with these projects will be required during the PD&E phase.

Local comprehensive plans for municipalities traversed by the I-95 corridor were reviewed for consistency with the Master Plan. SIS standards for the I-95 corridor as well as transportation corridor management strategies were discussed with the municipalities and agencies to evaluate consistency with local development regulations. No inconsistencies were identified that could affect implementation of the Master Plan recommendations.

Refer to **Section 5.0** of the **Master Plan Technical Document** for additional details.

2.4 *Environmental Element*

A high-level environmental review was completed for the I-95 Mainline Managed Lanes Master Plan from south of Linton Boulevard to the Palm Beach/Martin County Line. The review included the use of GIS databases from the Palm Beach County Enterprise GIS Data Catalog, Florida Geographic Data Library, the USFWS, and the SFWMD. The evaluation of the data was conducted to determine existing and project-related environmental conditions or constraints for subsequent analysis in a Project Development phase. The environmental review was oriented to support future anticipated Federal Highway Administration approval and the ETDM Programming Screen leading to Class of Action Determination for corridor improvement segments. These data were graphically displayed on maps of the entire 37.5-mile project corridor to highlight those areas of concern that lay within the project boundary which is one-quarter mile on either side of the corridor.

The analysis included a social impact evaluation that looked at current land use of the property within the project corridor; community cohesion, which looked at potential division of existing communities; and relocation potential. Community services included identification of medical facilities, cultural areas, government buildings, and parks and recreation within the project corridor that could potentially be impacted by the project. The analysis also looked at natural and physical environmental factors including wetlands, farmlands and potential noise sensitive areas. Areas with potential contamination, including existing waste clean-up sites, and identified petroleum sites were identified. All of these factors are graphically displayed on the maps included in this Master Plan Technical Report.

As the scope of this project does not propose to expand on the existing I-95 ROW, it is unlikely that there will be significant impacts to any of the environmental elements evaluated. If the scope of the project proposes to expand on the current ROW, then a more detailed analysis must be completed as part of the PD&E study. Particularly, the potential impacts to wetlands and surface waters along the corridor, as well as noise impacts to surrounding residential neighborhoods, would need to be analyzed.

Refer to **Section 6.0** of the **Master Plan Technical Document** for additional details.

Recommendations

3.0 *Recommendations*

3.1 *Interim Roadway Development Standards*

Roadway design standards and criteria provide the framework for evaluating current geometric and operational deficiencies and future designs to meet mobility needs. The standards and criteria established will determine the roadway typical section, cross-sections and acceptable interchange configurations.

Design control and standards for Strategic Intermodal System (SIS) facilities shall be used to develop interim improvements to the I-95 study corridor. The proposed improvements shall be in compliance with all applicable manuals and guidelines including the FDOT, FHWA, and AASHTO's. The current edition, including updates, of the following manuals and guidelines shall be used in the development of interim improvements.

- Florida Department of Transportation Design Manual (FDM)
  https://www.fdot.gov/roadway/fdm/default.shtm
- Florida Department of Transportation Roadway Plans Preparation Manuals (PPM)
  http://www.fdot.gov/roadway/PPMManual/PPM.shtm
- Florida Department of Transportation Design Standards
  http://www.fdot.gov/roadway/DesignStandards/Standards.shtm
- Florida Department of Transportation Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways
  http://www.fdot.gov/roadway/FloridaGreenbook/FGB.shtm
- Florida Department of Transportation Standard Specifications for Road and Bridge Construction (Divisions II & III), Special Provisions and Supplemental Specifications
  http://www.fdot.gov/programmanagement/default.shtm
- AASHTO – A Policy on Geometric Design of Highways and Streets
  https://bookstore.transportation.org/collection_detail.aspx?ID=110
- MUTCD - 2009
  http://mutcd.fhwa.dot.gov/

3.2 *Recommended Interim Improvements*

An evaluation of corridor improvement strategies shall be made in the PD&E phase wherein various elements or types of improvements may be combined for the best program to preserve level of service prior to construction of major capacity improvements and to guide local government corridor protection initiatives.

3.2.1 *Capacity Analysis*

A capacity analysis was conducted to determine the segments that are anticipated to be deficient by the design year 2040. The analysis also determined the year of failure of the deficient segments based on the capacity check.

The year of capacity deficiency analysis was performed for the Build alternative utilizing the design year traffic volume and lane geometry for the general use lane. The capacity of the roadway segments was calculated using the LOS D maximum service volume (2080 pc/h/ln) as provided in the HCM 6th edition. Similar to the capacity adjustments in FDOT QLOS Tables, I-95 general use lane capacity was adjusted based on a future year peak hour factor of 0.95, heavy vehicle percentage of 3.0% and a driver population factor 0.91. Additional capacities due to the presence of auxiliary lanes were calculated from the FDOT QLOS Tables. Similar to the freeway capacity, the ramp capacity was also obtained from the HCM 6th edition and adjusted for the peak hour factor, heavy vehicle percentage and driver population factor. The calculated freeway and ramp capacity were compared against the maximum of AM or PM peak hour traffic volume. Any roadway or ramp segment anticipated to have a design year volume higher than the calculated maximum service volume is considered to have capacity deficiency. These segments were further looked at to identify the year of capacity deficiency. Traffic volume for each year between 2020 and 2040 were compared against the maximum service volume to identify the year of capacity deficiency. **Table 3.1** shows the year of capacity analysis results.

Based on the guidance provided by the Department, deficient roadway segments without any auxiliary lanes were identified for potential capacity improvements. Three locations were identified for potential improvements – I-95 between Northlake Boulevard and PGA Boulevard, I-95 between SR 80 and James L Turnage Boulevard and I-95 between Atlantic Ave and Woolbright Road. All these segments have either one or no auxiliary lanes proposed for the Build Alternative. **Table 3.2** shows the year 2040 proposed geometry and the required geometry for these segments.

Table 3.1 Corridor Capacity Analysis

Location	I-95 Mainline and Ramps	Year 2040 # Lanes: General Use Lane	Year 2040 # Lanes: Auxiliary	Year 2040 Maximum Service Volume[1] and Ramp Capacity	DHV[2]: Existing	DHV[2]: 2040	Over Capacity by Year 2040?	Year of Capacity Deficiency
	Mainline	6	0	**10,630**	7,530	12,227	Yes	2032
	SB Off Ramp	2		**3,650**	960	2,595	No	-
Indiantown Road (SR 706)	NB On Ramp	1		**1,870**	930	1,938	Yes	2039
	SB On Ramp	2		**3,740**	2,550	2,042	No	-
	NB Off Ramp	3		**5,330**	2,630	3,640	No	-
	Mainline	8	0	**14,170**	8,750	13,553	No	-
	SB Off Ramp	1		**1,780**	710	1,133	No	-
Donald Ross Road	NB On Ramp	1		**1,780**	740	1,104	No	-
	SB On Ramp	2		**3,560**	1,380	1,964	No	-
	NB Off Ramp	2		**3,560**	1,460	2,705	No	-
	Mainline	8	2	**15,660**	9,900	15,881	Yes	2040
	SB Off Ramp	1		**1,870**	0	481	No	-
Central Boulevard	NB On Ramp	1		**1,870**	0	681	No	-
	SB On Ramp	2		**3,740**	0	2,487	No	-
	NB Off Ramp	2		**3,740**	0	1,711	No	-
	Mainline	8	2	**15,660**	9,900	15,195	No	-
	SB Off Ramp	1		**1,870**	450	552	No	-
Military Trail	NB On Ramp	1		**1,870**	500	646	No	-
	Mainline	8	0	**14,170**	9,250	11,321	No	-
	SB Off Ramp	2		**3,740**	870	1,378	No	-
PGA Boulevard (SR 786)	NB On Ramp	1		**1,870**	670	1,499	No	-
	SB On Ramp	2		**3,840**	2,670	3,687	No	-
	NB Off Ramp	3		**5,520**	3,140	4,615	No	-
	Mainline	8	1	**15,000**	12,970	19,908	Yes	2023
	SB Off Ramp	2		**3,740**	990	1,833	No	-
Northlake Boulevard	NB On Ramp	2		**3,740**	1,200	1,687	No	-
	SB On Ramp	2		**3,740**	1,680	3,118	No	-
	NB Off Ramp	2		**3,740**	1,640	3,151	No	-
	Mainline	8	2	**15,660**	14,000	22,687	Yes	2021
	SB Off Ramp	2		**3,930**	1,360	1,926	No	-
Blue Heron Boulevard (SR 708)	NB On Ramp	2		**3,930**	1,250	1,752	No	-
	SB On Ramp	2		**3,930**	2,230	2,933	No	-
	NB Off Ramp	2		**3,930**	1,620	3,296	No	-
	Mainline	8	2	**15,660**	15,320	23,296	Yes	2020

Table 3.1 Corridor Capacity Analysis (Continued)

Location	I-95 Mainline and Ramps	Year 2040 # Lanes: General Use Lane	Year 2040 # Lanes: Auxiliary	Year 2040 Maximum Service Volume[1] and Ramp Capacity	DHV[2]: Existing	DHV[2]: 2040	Over Capacity by Year 2040?	Year of Capacity Deficiency
	SB Off Ramp	2		**3,930**	1,780	2,295	No	-
45th Street	NB On Ramp	2		**3,930**	1,460	1,612	No	-
	SB On Ramp	2		**3,930**	1,680	3,378	No	-
	NB Off Ramp	2		**3,930**	1,900	3,266	No	-
	Mainline	8	0	**14,170**	15,260	26,607	Yes	Existing
	SB Off Ramp	2		**3,930**	1,780	3,164	No	-
Palm Beach Boulevard	NB On Ramp	2		**3,930**	1,560	2,682	No	-
	SB On Ramp	2		**3,930**	1,400	2,619	No	-
	NB Off Ramp	2		**3,930**	1,280	1,924	No	-
	Mainline	8	2	**15,660**	15,320	23,330	Yes	2020
	SB Off Ramp	2		**3,930**	1,730	3,157	No	-
Okeechobee Blvd (SR 704)	NB On Ramp	2		**3,840**	1,980	1,985	No	-
	SB On Ramp	1		**1,970**	2,260	2,953	Yes	Existing
	NB Off Ramp	2		**3,930**	1,820	2,696	No	-
	Mainline	8	2	**15,660**	15,130	22,776	Yes	2020
	SB Off Ramp	2		**3,740**	1,030	1,850	No	-
James L Turnage Blvd	NB On Ramp	2		**3,840**	1,010	1,390	No	-
	SB On Ramp	2		**3,740**	1,470	2,952	No	-
	NB Off Ramp	2		**3,930**	1,670	2,862	No	-
	Mainline	8	1	**15,000**	12,930	20,844	Yes	2023
	SB Off Ramp	2		**3,930**	1,720	2,475	No	-
Southern Blvd (SR 80)	NB On Ramp	2		**3,930**	1,890	1,863	No	-
	SB On Ramp	2		**3,930**	1,570	2,370	No	-
	NB Off Ramp	2		**3,930**	1,540	2,410	No	-
	Mainline	8	3	**16,490**	15,480	25,624	Yes	2020
	SB Off Ramp	2		**3,930**	1,470	2,416	No	-
Forest Hill Blvd (SR 882)	NB On Ramp	2		**3,930**	1,500	3,244	No	-
	SB On Ramp	2		**3,930**	1,120	2,045	No	-
	NB Off Ramp	2		**3,930**	1,020	2,372	No	-
	Mainline	8	2	**15,660**	14,880	23,026	Yes	2020
	SB Off Ramp	2		**3,930**	1,380	3,028	No	-
10th Ave	NB On Ramp	2		**3,930**	1,310	2,325	No	-
	SB On Ramp	2		**3,930**	1,100	2,322	No	-
	NB Off Ramp	2		**3,930**	970	2,021	No	-
	Mainline	8	3	**16,490**	14,130	23,800	Yes	2022
	SB Off Ramp	2		**3,930**	1,070	2,140	No	-
6th Ave	NB On Ramp	2		**3,930**	1,020	3,303	No	-
	SB On Ramp	1		**1,970**	1,280	1,882	No	-
	NB Off Ramp	2		**3,930**	1,420	2,567	No	-

Table 3.1 Corridor Capacity Analysis (Continued)

Location	I-95 Mainline and Ramps	Year 2040 # Lanes: General Use Lane	Year 2040 # Lanes: Auxiliary	Year 2040 Maximum Service Volume[1] and Ramp Capacity	DHV[2]: Existing	DHV[2]: 2040	Over Capacity by Year 2040?	Year of Capacity Deficiency
Lantana Rd (SR 812)	Mainline	8	3	**16,490**	14,330	23,896	Yes	2022
	SB Off Ramp	1		**1,970**	1,160	1,923	No	-
	NB On Ramp	2		**3,930**	1,260	2,727	No	-
	SB On Ramp	1		**1,970**	1,280	1,947	No	-
	NB Off Ramp	2		**3,930**	1,180	2,723	No	-
Hypoluxo Rd	Mainline	8	3	**16,490**	14,350	23,755	Yes	2022
	SB Off Ramp	1		**1,970**	1,400	1,802	No	-
	NB On Ramp	2		**3,930**	1,410	2,845	No	-
	SB On Ramp	1		**1,970**	960	1,531	No	-
	NB Off Ramp	2		**3,930**	1,140	1,466	No	-
Gateway Blvd	Mainline	8	2	**15,660**	13,520	21,988	Yes	2023
	SB Off Ramp	1		**1,970**	970	1,702	No	-
	NB On Ramp	1		**1,970**	1,000	2,032	Yes	2039
	SB On Ramp	1		**1,970**	1,410	1,958	No	-
	NB Off Ramp	1		**1,970**	1,060	1,732	No	-
Boynton Beach Blvd (SR 804)	Mainline	8	2	**15,660**	13,970	20,609	Yes	2023
	SB Off Ramp	2		**3,930**	1,450	1,740	No	-
	NB On Ramp	2		**3,930**	1,060	2,171	No	-
	SB On Ramp	2		**3,930**	1,160	1,963	No	-
	NB Off Ramp	2		**3,930**	1,230	1,647	No	-
Woolbright Rd	Mainline	8	4	**17,150**	13,620	20,328	Yes	2029
	SB Off Ramp	2		**3,930**	1,450	2,603	No	-
	NB On Ramp	2		**3,930**	1,520	2,358	No	-
	SB On Ramp	1		**1,970**	1,020	1,102	No	-
	NB Off Ramp	2		**3,930**	1,180	1,546	No	-
Atlantic Ave	Mainline	8	0	**14,170**	12,670	19,374	Yes	2022
	SB Off Ramp	2		**3,740**	1,070	2,037	No	-
	NB On Ramp	2		**3,930**	1,330	2,714	No	-
	SB On Ramp	2		**3,930**	1,090	2,365	No	-
	NB Off Ramp	2		**3,930**	1,240	2,372	No	-
Linton Blvd	Mainline	8	2	**15,660**	12,610	19,497	Yes	2028
	SB Off Ramp	2		**3,930**	1,580	2,853	No	-
	NB On Ramp	2		**3,930**	1,180	2,508	No	-
	SB On Ramp	2		**3,930**	950	2,206	No	-
	NB Off Ramp	2		**3,740**	920	2,374	No	-
	Mainline	8	2	**15,660**	12,120	18,144	Yes	2030

Note:
1. HCM 6th Edition LOS D Capacity - 2080 pc/h/
2. Worst Case AM or PM Peak Hour. General Use Lane Volumes (Veh/Hr)

Factors for Capacity Adjustment
Peak Hour Factor - 0.95
Truck Percentage - 3%
Driver Population Factor - 0.91

The results shown here are for general planning purposes only

Table 3.2: I-95 Required Geometry for Selected Locations

I-95 Between	Proposed Geometry: # General Use Lanes	Proposed Geometry: # Auxiliary Lanes	Required Geometry: # General Use Lanes	Required Geometry: # Auxiliary Lanes
Northlake Blvd and PGA Blvd	8	1	11	1
SR 80 and James L Turnage Blvd	8	1	12	1
Atlantic Ave & Woolbright Rd	8	0	11	0

Additionally, following ramp segments were identified to have design year traffic volume higher than the capacity:

- Indiantown Road NB on ramp
- Okeechobee Boulevard SB on ramp
- Gateway Boulevard NB on ramp

Year 2040 geometry shows that these ramp segments are single lane segments. Based on the projected traffic volume, one more additional lane will be required to have the ramp segments operate within capacity.

3.2.2 *Programmed Projects Considerations*

The Department has programmed a series of interchange improvement projects along the study corridor which will need to be coordinated with during the PD&E phase. These projects are currently programmed at different stages from PD&E to Construction. **Table 3.3** includes projects that will require revisions to the interchanges to accommodate the I-95 Master Plan typical section (two managed lanes in each direction). **Table 3.4** includes projects that were identified as having no conflicts with the I-95 Master Plan typical section (two managed lanes in each direction). Revisions to these interchanges are not needed; however, I-95 bridges will need to be modified. Interchange improvements identified in the I-95 Interchange Master Plan Concept Study[3] and pending programming into the FDOT Work Program are shown in **Table 3.5**. Coordination with these projects will be required during the PD&E phase.

Table 3.3: Programmed Projects Requiring Interchange Revisions

FM No.	Project Description
231932-1	SR-9/I-95 AT GATEWAY BLVD INTERCHANGE
412733-1	SR-9/I-95 AT 10TH AVE NORTH IN LAKE WORTH
413257-1	SR-9/I-95 AT HYPOLUXO ROAD
413265-1	SR-9/I-95 AT PGA BOULEVARD/CENTRAL BLVD *Note: Donald Ross Rd is included in this study, but only Donald Ross Rd bridges will be impacted (no changes to interchange).
435804-1	SR-9/I-95 AT SR-804/BOYNTON BEACH BLVD INTERCHANGE
436963-1	SR-9/I-95 AT 6TH AVENUE SOUTH
437279-1	SR-9/I-95 FROM SOUTH OF WOOLBRIGHT ROAD TO NORTH OF WOOLBRIGHT ROAD
435516-1	SR-9/I-95 AT SR-80/SOUTHERN BLVD. INTERCHANGE ULTIMATE IMPROVEMENT
413258-1	SR-9/I-95 @ LANTANA ROAD

Table 3.4: Programmed Projects Not Requiring Interchange Revisions

FM No.	Description	Bridge(s) Affected	Assumption
434722-1	SR-9/I-95 AT SR-806/ATLANTIC AVENUE INTERCHANGE	930503 930504	REPLACEMENT REPLACEMENT
435803-1	SR-9/I-95 AT NORTHLAKE BOULEVARD INTERCHANGE	930516	WIDENING
436519-1	SR-9/I-95 FROM S OF 45TH STREET TO N OF 45TH ST	930520	REPLACEMENT
413265-1	SR-9/I-95 AT PGA BOULEVARD/CENTRAL BOULEVARD *Note: This refers to the Donald Ross Road bridge impacts	930382 930383	REPLACEMENT REPLACEMENT
439759-1	SR-9/I-95 AT BELVEDERE RD NB OFF-RAMP	N/A	N/A
435384-1	SR-9/I-95 AT LINTON BOULEVARD INTERCHANGE	930499 930500	REPLACEMENT REPLACEMENT
413252-2	SR-9/I-95 AT INDIANTOWN ROAD	930371 930372 930385	REPLACEMENT REPLACEMENT REPLACEMENT

Table 3.5: Projects Pending Programming

FM No.	Interchange	Revisions to Interchange Required	Bridge(s) Affected	Assumption
N/A	SR-9/I-95 AT FOREST HILL BLVD	No	930294	REPLACEMENT
N/A	SR-9/I-95 AT BLUE HERON BLVD	Yes	930519	REPLACEMENT
N/A	SR-9/I-95 AT OKEECHOBEE BLVD	No	930183, 930210	REPLACEMENT
N/A	SR-9/I-95 AT PALM BEACH BLVD	No	930530, 930531	WIDENING

3.3 *Recommended Build Alternative*

The Plan evaluated and compared the different advantages and disadvantages of each alternative analyzed during this study. Below are the alternatives evaluated during this study:

Alternative A – One Managed Lane (buffered separated with delineators) in each direction

Alternative B – Two Managed Lanes (buffered separated with delineators) in each direction

- Alternative B1 – Two Managed Lanes corridor wide except the segment between SR 80/Southern Boulevard and Okeechobee Boulevard which implements one managed lane in each direction. The following access point options were evaluated under this condition:
  - 2012 I-95 Corridor Planning Study (CPS) Access Points
  - Recommended access points factoring Origin-Destination (OD) patterns, travel demand, design feasibility, and operations analysis.
- Alternative B2 – Two Managed Lanes Corridor wide from south of Linton Boulevard to Palm Beach/Martin County Line with the recommended access points factoring Origin-Destination (OD) patterns, travel demand, design feasibility, and operations analysis. Alternative B2 evaluated the following direct managed lanes connections to/from SR 80/Southern Boulevard alternatives.
  - Direct connection from I-95 NB off-ramp to WB SR 80 and EB SR 80 to NB I-95 on-ramp.

[3] I-95 (SR 9) Interchange Master Plan Palm Beach County (December 2015). Florida Department of Transportation – District Four.

- Median-to-Median direct connection from NB I-95 managed lanes to WB SR 80 and EB SR 80 to NB I-95 managed lanes. This option evaluated the following interchange configurations:
    1. Median-to-Median direct connections for movements above while providing standard lane and shoulder widths along I-95. This configuration would require construction of a new segmental bridge for the NB I-95 on-ramp from SR 80 adjacent to the existing segmental bridge for constructability purposes. This introduces right of way impacts to the northeast quadrant of the interchange.
    2. The same premise as the previous configuration, however, to avoid additional right of way impacts on the NE quadrant of the interchange, this configuration proposes to relocate the Belvedere Road NB off-ramp to the south of SR 80 which would diverge from the mainline into a depressed section under SR 80 and eventually tie into the existing Belvedere Road off-ramp terminal. The existing segmental bridge would still require being demolished but a new bridge will not be needed to accommodate NB on-ramp movement from SR 80.
    3. Similar to the first configuration discussed above, however, this interchange configuration introduces an opportunity to accommodate a direct connection from EB SR 80 to SB I-95 managed lanes.
- Median-to-Median direct connections from all approaches of I-95 and SR 80.

Alternative C – Two Managed Lanes (concrete barrier wall with full standard shoulder separation) in each direction.

Alternative A proposed a managed lane improvement that would convert the existing HOV lane to a managed lane. The Plan determined that a one-managed lane concept does not create as much demand in the managed lanes when compared to the two-managed lane concept. The two managed lane alternative provides the maximum through volume.

Alternative B and C both provide a two managed lane improvement to the corridor, the difference in the alternatives is the separation treatment between the managed lanes and general use lanes offered by each alternative. As previously described, Alternative B proposes a buffered separation with tubular delineators and Alternative C a proposes concrete barrier separation with full width standard shoulders. The main difference between Alternative B and C is the footprint of the improvement. **Table 3.6** provides a summary of the impact assessment of each alternative.

The Plan recommends implementation of Alternative B to the I-95 corridor within the study limits. Alternative B resulted in minimal impacts to the corridor while meeting the study purpose and objectives.

Table 3.6: Alternative Evaluation Matrix

Assessment	No Build		Alternative A		Alternative B		Alternative C	
Right of Way Impacts	**None**		**Minor**		**Minor**		**Significant**	
Structure Impacts	Widening	0	Widening	0	Widening	43	Widening	39
	Replacement	0	Replacement	0	Replacement	36	Replacement	51
	0		**0**		**79**		**90**	
Maintenance of Traffic	**None**		**Minor**		**Moderate**		**Significant**	
Environmental	**Minor**		**Minor**		**Minor**		**Minor**	
Construction Cost (in Millions)	Roadway	$0	Roadway	$188	Roadway	$1,049	Roadway	$1,343
	Structural	$0	Structural	$0	Structural	$1,226	Structural	$1,535
	$0		**$188**		**$2,275**		**$2,878**	

Notes:

1.) Bridge analysis did not include load ratings.

2.) Roadway cost estimate was based on the FDOT's Long Range Estimates (LRE) Cost Per Mile (CPM) models. The models include pay items for Milling & Resurfacing on Interstates, New Construction for Additional Lane on Urban Interstate, and Shoulder Construction. The LRE CPM models includes maintenance of traffic and mobilization costs. Items include full depth mainline pavements, Type B Stabilization, Optional Base Group 04 & 09, shoulder concrete rigid barrier wall, shoulder pavement, milling & resurfacing, drainage, signing & pavement markings.

3.) The *January 2018 FDOT Structures Design Guidelines, Section 9 – BDR Cost Estimating* procedure was referenced in obtaining the applicable historical cost for each bridge improvement. The cost per square foot of new construction for short, medium, and long span bridges are provided for planning use. Planning costs are also provided for bridge demolition and widening of bridges in cost per square foot.

3.4 *Benefit-Cost Analysis*

A Benefit-Cost Analysis (BCA) was conducted to quantify the benefits of converting the existing HOV lanes on I-95 to Managed Lanes and adding two new Managed Lanes to the corridor, for a total of four Managed Lanes (two lanes in each direction).

Based on the FDOT Express Lanes Handbook (2015), some of the benefits of express lanes include reduced travel times, increased travel speeds, reduced weaving, reduced queuing, improved trip reliability, improved operations in the general use lanes, reduced pollution from vehicular emissions and enhancement to the regional transit. For purposes of this analysis, a quantitative BCA was performed with regards to traffic safety and traffic operations. The safety benefit of the managed lanes was calculated utilizing the FDOT Benefit-Cost Analysis spreadsheet; and benefit pertaining to traffic operations were computed using the FHWA Tool for Operations Benefit/Cost (TOPS-BC) Version 3.0 spreadsheet. Detailed operational benefits of managed lanes should be identified when a micro-simulation analysis is performed. At this point, other intangible benefits such as reduction in emissions were not used in the computation of benefit-cost ratio. **Table 3.7** and **Table 3.8** show the preliminary cost based on the FDOT Long Range Estimate (LRE) and the annualized cost used in the analysis respectively. The cost estimate will be refined in subsequent phases (i.e. PD&E and Design phases) of the project.

Table 3.7: Cost Summary (Alternative B)

Type	Cost
Roadway Cost	$672,325,847
Design (12%)	$80,679,102
Construction Engineering Inspection (11%)	$73,955,843
Drainage Cost	$140,232,130
Design (12%)	$16,827,856
Construction Engineering Inspection (11%)	$15,425,534
Structures	$968,804,993
Design (12%)	$116,256,599
Construction Engineering Inspection (11%)	$106,568,549
Total	**$2,191,076,453**

Note: Total cost includes the interchange improvement at SR 80

Table 3.8: Annualized Cost (Alternative B)

Type	Cost
P.E.C.E.I.	$ 17,615,898.35
Structure	$ 41,174,212.20
Roadway	$ 49,483,182.34
Drainage	$ 10,321,084.77
Other	$ 15,732,997.80
Annual Cost	**$ 134,327,375.45**

Note: Total cost includes the interchange improvement at SR 80

3.4.1 *FDOT Benefit-Cost Analysis Tool*

Crash data obtained from the CARS database for years 2011 through 2015 was utilized to determine the relationship between number of crashes and the AADT of each year. The AADT for years 2011 to 2015 was obtained from the Florida Transportation Information (FTI) website. **Table 3.9** shows the number of crashes and AADT for each segment by year. The AADT obtained from the FTI website is the sum of vehicles using HOV lanes and general use lanes (GUL).

A linear growth rate calculated between existing and future traffic volume was used to predict future crashes of each segment of I-95. As the existing AADT is a combination of vehicles on HOV lanes and GUL, future AADT used for the analysis is the sum of vehicles on HOV lanes (for No Build Alternative) or Managed Lanes (for Build Alternative) and GUL. Considering AADT as the only parameter to predict future crashes, it is anticipated to predict that the alternative with higher AADT will have more crashes. Subsequently, the Build Alternative, which is predicted to serve more traffic than the No Build Alternative, was estimated to have more crashes in the design year 2040. **Table 3.9** summarizes the crashes and AADT of each segment of I-95 within the study area.

Additionally, considering the fact that the analysis was performed for roadways with no barrier separation between HOV lanes and GUL, a crash reduction factor was applied to quantify the safety benefit of having physically separated managed lanes. Based on the Crash Modification Factor (CMF) Clearing house website, CMF ID 2988, a 5% reduction in all types of crashes is applied to the Build Alternative due to the presence of the physical separator. This factor was used in the calculation of benefit-cost ratio using the FDOT approved Benefit-Cost Analysis spreadsheet. As there is no cost associated with the No Build

Alternative; the BCA was performed only for the Build Alternative. Calculation of the Benefit-Cost ratio and the CMF information is provided in **Appendix U** of the **Master Plan Technical Document.**

Based on the FDOT Benefit-Cost Analysis spreadsheet, converting the HOV lanes to Managed Lanes (separated by tubular delineators) results in an annualized benefit of $22,379,949 with a B/C ratio of **0.17**. This ratio was calculated using the annualized cost shown in **Table 3.8**, number of crashes predicted for the Design Year of the Build Alternative shown in **Table 3.9** and a Crash Reduction Factor of 5%. Similar to crash reduction in design year, additional safety benefits will be accrued over the design life of the project. A more detailed safety analysis using tools such as ISATe would help better quantify the safety benefits of converting HOV lanes to Managed Lanes.

Table 3.9: Crash by Segment - Existing and Year 2040

Location			# Crashes						AADT					Year 2040 AADT						Year 2040 Crashes		
														No Build			Build					
I-95 between	From MP	To MP	2011	2012	2013	2014	2015	Total	2011	2012	2013	2014	2015	GP Lanes	HOV Lane	Total	GP Lanes	Managed Lanes	Total	No Build	Build	Build X CMF
South of Congress Ave to Congress Ave	6.20	7.09	11	7	0	9	4	31	173,000	210,000	209,500	208,500	210,000	214,000	47,000	261,000	224,500	42,000	266,500	8	8	8
Congress Ave to Linton Blvd	7.09	8.38	53	58	53	59	52	275	186,200	188,500	190,000	187,500	202,000	230,000	39,000	269,000	233,600	42,000	275,600	78	79	75
Linton Blvd to Atlantic Ave	8.38	9.92	118	108	141	142	186	695	192,500	185,500	192,000	195,500	203,000	241,000	33,000	274,000	239,600	42,000	281,600	197	202	192
Atlantic Ave to Woolbright Rd	9.92	13.76	183	208	257	207	210	1,065	173,500	174,498	181,062	186,390	195,661	228,000	39,000	267,000	238,000	42,000	280,000	312	327	311
Woolbright Rd to Boynton Beach Blvd	13.76	14.75	60	63	72	71	82	348	152,000	174,500	201,000	187,500	223,000	255,000	33,000	288,000	238,000	64,000	302,000	107	112	106
Boynton Beach Blvd to Gateway Blvd	14.75	16.26	64	67	104	99	93	427	200,000	160,500	190,000	183,500	232,000	256,000	35,000	291,000	258,000	45,000	303,000	129	134	127
Gateway Blvd to Hypoluxo Rd	16.26	17.74	80	61	74	87	108	410	176,500	201,000	197,000	210,000	209,000	252,000	43,000	295,000	261,000	45,000	306,000	122	126	120
Hypoluxo Rd to Lantana Rd	17.74	18.78	48	67	64	73	73	325	224,500	217,000	224,000	194,000	202,500	273,000	37,000	310,000	276,000	45,000	321,000	95	98	93
Lantana Rd to 6th Ave	18.78	20.27	71	88	101	99	95	454	204,500	207,500	195,500	221,000	190,500	274,000	34,000	308,000	276,000	45,000	321,000	137	143	136
6th Ave to 10th Ave	20.27	21.57	72	101	154	103	90	520	275,400	204,600	213,500	239,500	219,000	271,000	33,000	304,000	278,000	45,000	323,000	137	146	139
10th Ave to Forest Hill Blvd	21.57	23.48	65	94	94	110	148	511	194,500	190,000	203,000	216,000	226,000	273,000	38,000	311,000	261,000	70,000	331,000	154	164	156
Forest Hill Blvd to SR 80	23.48	24.91	54	90	96	91	111	442	198,500	192,000	208,000	201,000	226,000	287,000	35,000	322,000	290,000	51,000	341,000	139	147	140
SR 80 to Belvedere Rd	24.91	25.94	33	37	64	70	58	262	137,000	139,000	191,500	181,000	185,500	222,900	32,000	254,900	220,000	52,000	272,000	80	85	81
Belvedere Rd to Okeechobee Blvd	25.94	27.01	57	78	94	92	160	481	169,000	194,500	199,000	205,500	222,000	249,000	34,000	283,000	250,000	52,000	302,000	137	147	140
Okeechobee Blvd to Palm Beach Blvd	27.01	28.27	90	120	169	168	212	759	166,198	169,693	177,265	187,075	197,639	246,000	34,000	280,000	247,700	52,000	299,700	237	253	240
Palm Beach Blvd to 45th St	28.27	31.05	83	85	73	134	160	535	179,500	185,000	195,500	201,000	214,000	248,000	42,000	290,000	278,700	39,000	317,700	159	174	165
45th St to Blue Heron Blvd	31.05	32.80	65	69	79	97	107	417	195,800	199,600	201,900	217,600	216,000	244,000	34,000	278,000	239,700	55,000	294,700	112	119	113
Blue Heron Blvd to Northlake Blvd	32.80	34.55	49	38	71	66	58	282	180,500	184,500	188,500	204,000	199,500	221,000	30,000	251,000	229,700	34,000	263,700	74	78	74
Northlake Blvd to PGA Blvd	34.55	36.76	78	45	63	73	86	345	145,000	149,000	150,000	164,500	160,500	205,000	30,000	235,000	209,700	34,000	243,700	105	109	104
PGA Blvd to Military Trail	36.76	37.46	30	30	48	37	19	164	97,800	97,600	94,600	106,900	115,300	153,000	26,000	179,000	150,700	34,000	184,700	57	59	56
Military Trail to Donald Ross Rd	37.46	40.17	34	35	47	44	46	206	103,700	103,500	101,000	113,500	121,500	126,000	22,000	148,000	119,800	34,000	153,800	56	58	55
Donald Ross Rd to Indiantown Rd	40.17	43.96	78	42	60	86	99	365	93,387	96,366	96,148	99,078	105,303	130,000	-	130,000	134,100	-	134,100	97	100	95
North of Indiantown Rd	43.96	46.00	37	37	36	53	33	196	66,000	68,000	67,000	71,500	76,000	93,000	-	93,000	97,700	-	97,700	52	55	52
Total			**1,513**	**1,628**	**2,014**	**2,070**	**2,290**	**9,515**	**Total**											**2,781**	**2,923**	**2,777**

Note:

- Year 2040 Crashes estimated by applying average traffic volume growth rate to the average number of crashes during the years 2011 to 2015
- Crash data obtained from FDOT CARS Database
- AADT obtained from FDOT FTI website
- Crash Modification Factor (CMF) ID: 2988 (95%) applied to the build alternative crashes

3.4.2 *FHWA Tool for Operations Benefit/Cost (TOPS-BC) Version 3.0 Tool*

TOPS-BC is a sketch-planning level decision support tool developed by the FHWA Office of Operations. It is intended to provide support and guidance to transportation practitioners in the application of BCA for a wide range of Transportation System Management and Operations (TSMO) strategies. The tool was developed based on guidance and input from planning and operations practitioners with the primary purpose of helping in screening multiple TSMO strategies and for providing "order of magnitude" BCA estimates. The tool contains various default parameters such as crash cost, value of person hour, etc. which were adjusted to match the Florida standards.

The following factors were adjusted in the spreadsheet to calculate the benefit-cost ratio:

Capacity of General Use Lanes (GUL) and Managed Lanes (ML) – GUL capacity was calculated based on LOS D service flow rate obtained from HCM 6th Edition. Similar to the capacity adjustment applied in FDOT QLOS tables, the service flow rate was adjusted using the heavy vehicle adjustment factor, peak hour factor and driver population factor. The ML capacity was obtained from the FHWA Freeway Management and Operations Handbook (Chapter 8.0 – Managed lanes). The ML capacity was adjusted based on peak hour factor and driver population factor similar to GUL.

Annualized Cost Calculation – Annualized Cost calculation factors from the FDOT Benefit-Cost Analysis Spreadsheet were used to calculate the annualized cost in the TOPS-BC spreadsheet. This was performed to obtain same annualized cost of improvement for the two BCAs performed.

Dollar value of person hour – The cost of person hour used in the computation of travel time cost, travel time savings cost and reliability benefit were updated to match the person hour cost for cities in Florida. The cost was obtained from Texas Transportation Institute's 2015 Urban Mobility Scorecard which provides the operation cost of vehicles for major cities in the US. The Mobility Scorecard provides the value of time for personal vehicles ($17.67) and commercial vehicles ($94.04). For a conservative analysis, the value of $17.67 was used for Person-Hour-Auto while the national average value of $29.96 from the TOPS-BC spreadsheet was used for commercial vehicles.

Discount rate – The discount rate was updated to 4.0% based on the Florida Design Manual.

The following are other inputs required to calculate the Benefit-Cost ratio:

Volume and Speed – Traffic volume and travel speed for GUL (Build and No Build Alternative), ML (Build Alternative) and HOV (No Build Alternative) were entered in the spreadsheet. **Table 3.10** shows the volume and speeds for each alternative.

Geometry – For the No Build alternative the geometry consists of 8 GUL and 2 HOV lanes. For the Build Alternative, the geometry consists of 8 GUL and 4 ML.

Preliminary construction cost provided in **Table 3.7** was used to calculate the annualized cost. Results of the BCA are summarized in **Table 3.11** and the analysis sheets are provided in **Appendix U** of the **Master Plan Technical Document**. The combined benefit-cost ratio for converting HOV lanes to Managed Lanes is **1.69 (0.17 + 1.52)**. A detailed microsimulation analysis is recommended to better quantify the operational benefits of converting HOV lanes to Managed Lanes.

Table 3.10: TOPS-BC Analysis Inputs

Input Data	Baseline (No Build)	Improved (Build)
Volume – GUL(Vehicle/hour)	19,723	18,959
Volume – HOV/ML(Vehicle/hour)	2,470	3,242
Speed – GUL (mph)	50.26	52.24
Speed – HOV/ML (mph)	50.47	72.67

Note: 1. Volume shown is sum of average segment volume in NB and SB directions
2. Speed shown is average of both NB & SB directions

Table 3.11: TOPS-BC Annual Benefit and Cost

Benefit Type	$ Value
Benefit	
Travel Time	9,114,273
Travel Time Savings: (Non-recurring Delay)	(1,950,393)
Reliability	197,402,676
Total Benefit	**204,567,006**
Annual Cost	**134,327,375**
Benefit-Cost Ratio	**1.52**

3.5 *Implementation Plan*

Based on the results discussed in **Section 3.3**, Alternative B was recommended for programming into the FDOT Work Program. An implementation plan has been established by the Department to deliver the project in four segments according to the needs and funding availability. The project segmentation is included in **Table 3.12** below.

Table 3.12: Project Segmentation

FM	Facility	From	To
444202-1	SR-9/I-95	S. of Linton Blvd	6th Ave South
444202-2	SR-9/I-95	6th Ave South	N. of Okeechobee Blvd
444202-3	SR-9/I-95	N. of Okeechobee Blvd	S. of Indiantown Rd
413252-2	SR-9/I-95	S. of Indiantown Rd	Palm Beach/Martin Co Ln

3.6 *Priorities*

The segments from South of Linton Blvd to 6th Ave South (FM No. 444202-1) and from 6th Ave South to North of Okeechobee Blvd (FM No. 444202-2) have been prioritized by the Department and are currently funded for the PD&E phase in year 2024. The Department is currently pursuing funding for future phases for the project segment between North of Okeechobee Blvd and South of Indiantown Rd (FM No. 444202-3). The segment between South of Indiantown Rd and the Palm Beach/Martin County Line (FM No. 413252-2) is currently funded for the PD&E phase in year 2025.

Local Regulations or Plans

4.0 *Local Regulations or Plans*

4.1 *Local Government Coordination*

The following municipalities are located within the study area and were coordinated with during the development of the study.

- City of Boca Raton
- City of Delray Beach
- City of Boynton Beach
- Town of Lantana
- City of Lake Worth
- Town of Lake Clarke Shores
- City of West Palm Beach
- Town of Glen Ridge
- Town of Cloud Lake
- Town of Mangonia Park
- City of Riviera Beach
- City of Palm Beach Gardens
- Town of Jupiter

A list of coordination meetings held during the course of the study with local government agencies, including Palm Beach County, Palm Beach Transportation Planning Agency (TPA), and TPA subcommittees is provided in **Table 4.1**. Meeting notes, presentations and handouts are provided in the Public Involvement Summary Report, a companion document to this report. The City of Boynton Beach and Town of Lantana were unresponsive to the Master Plan's meeting requests.

Table 4.1 Project Coordination Meetings

Agency / Municipality	Date
City of Delray Beach	01/26/2017
Town of Clarke Shores	07/25/2017
City of West Palm Beach	07/25/2017
City of Boca Raton	08/07/2017
City of Lake Worth	08/08/2017
Town of Jupiter	08/08/2017
Town of Mangonia Park	09/20/2017
Town of Cloud Lake	10/17/2017
Town of Glen Ridge	10/17/2017
City of Palm Beach Gardens	10/20/2017
City of Riviera Beach	10/20/2017
Palm Beach TPA	02/14/2018
Palm Beach Department of Airports	04/11/2018
City of Delray Beach	06/05/2018
Palm Beach Department of Airports	10/30/2018
City of Lake Worth	11/14/2018
City of Boca Raton	11/15/2018
Palm Beach TPA Technical Advisory Committee (TAC)	12/05/2018
Palm Beach TPA Citizen's Advisory Committee (CAC)	12/05/2018
Town of Cloud Lake	12/06/2018
Town of Glen Ridge	12/06/2018
City of West Palm Beach	12/06/2018
Town of Mangonia Park	12/12/2018
City of Delray Beach	12/12/2018
City of Boynton Beach	12/13/2018
Palm Beach TPA Governing Board	12/13/2018
Town of Lake Clarke Shores	12/18/2018

Local comprehensive plans for municipalities traversed by the I-95 corridor were reviewed for consistency with the Master Plan. SIS standards for the I-95 corridor as well as transportation corridor management strategies were discussed with the municipalities and agencies to evaluate consistency with local development regulations. No inconsistencies were identified that could affect implementation of the Master Plan recommendations.

Refer to the I-95 Managed Lanes Master Plan Public Involvement Summary Report, a companion document to this report, for further information.

Needs Summary Table

5.0 *Needs Summary Table*

The needs summary table was developed for the recommended alternative of the Master Plan (Alternative B). The table includes the four segments as discussed in **Section 3.5** of this report. It includes the logical termini for each segment, and the cost for all applicable phases. The needs summary table was developed for programming purposes for the different projects and respective phases as segmented as part of the Master Plan. The table provided in this section is a function of the Long Rate Estimate (LRE) that was developed for Alternative B. The FDOT LRE Review Guideline (Updated January 2019) was followed to develop the LRE for the recommended alternative. In addition, **Figure 5.1** and **Figure 5.2** were referenced and utilized to determine the design, post design, construction engineering and inspection (CEI) costs for each project. **Table 5.1** depicts the Needs Summary Table for the segmented projects of the Master Plan. **Table 5.2** to **Table 5.5** depicts the summary of each LRE segment by detailing the costs of each structure and if they are within an interchange influence area.

DISTRICT IV DESIGN CONSULTANT MANAGEMENT													
DESIGN COST (PHASE 32) AS A PERCENTAGE OF CONSTRUCTION COST (PHASE 52) (FOR PROGRAMMING PURPOSES ONLY)													
CONSTRUCTION COST ESTIMATE		UNDER $500K		$500K to $1.5 M		$1.5M to $3.5 M		$3.5M to $5M		$5M to $10 M		OVER $10M	
DESIGN COST ESTIMATE	ON-SYSTEM	SW AVG - 53% D4 AVG - 47%	40%	SW AVG - 30% D4 AVG - 31%	25%	SW AVG - 22% D4 AVG - 23%	18%	SW AVG - 20% D4 AVG - 19%	16%	SW AVG - 17% D4 AVG - 16%	13%	SW AVG - 15% D4 AVG - 15%	12%
	OFF-SYSTEM	SW AVG - 65%	45%	SW AVG - 37%	35%	SW AVG - 24%	19%	SW AVG - 20%	17%	SW AVG - 20%	15%	SW AVG - 19%	15%
PERCENTAGES ABOVE ARE BASED ON STATEWIDE (SW) AND D-4 HISTORICAL DATA COMPARING ACTUAL COMPLETED DESIGN COST (PHASE 32) TO ACTUAL CONSTRUCTION COST (PHASE 52) OVER A FIVE YEAR PERIOD FROM FY 2010 TO FY 2015													
PERCENTAGES ABOVE HAVE BEEN REDUCED FROM THE ACTUAL DATA FOR ALLOWANCE OF DESIGN SUPPLEMENTAL AGREEMENTS													
POST-DESIGN COST (PHASE 62-40) AS A PERCENTAGE OF CONSTRUCTION COST (PHASE 52) (FOR PROGRAMMING PURPOSES ONLY)													
POST-DESIGN COST ESTIMATE	ON-SYSTEM		8%		4%		2.5%		1.7%		1.5%		1.5%
	OFF-SYSTEM		9%		5%		3.5%		2.5%		1.7%		1.5%

Figure 5.1: FDOT District 4 Design and Post Design Cost Factors

Cost History Database

Percent of Construction Cost to Program for CEI
(updated 9/6/2017)

Construction Cost Estimate	Phase 62 Amount to Program	Phase 61 Amount to Program
< $500,000	16.0%	9.0%
$500,000 - $1m	15.0%	8.0%
$1m - $3.5m	12.5%	4.5%
$3.5m - $5m	16.5%	2.0%
$5m - $25m	12.5%	1.5%
Over 25m	11.0%	0.7%

Figure 5.2: FDOT District 4 CEI Guidance Factors

Table 5.1: I-95 Master Plan Needs Summary Table

FM	Facility	From	To	Roadway Id	Begin MP	End MP	Improvement Type	Phase Cost Estimate (millions)							
								PRE-PD&E (22-01)	PD&E (22-02)	PE (32)	ROW	CST (52)	CEI		
													61	62	62-40
444202-1	SR-9/I-95	S. of Linton Blvd	6th Ave North	93220000	7.500	21.000	Add managed lanes	0.40	2.00	64.02	-	533.48	3.73	58.68	8.00
444202-2	SR-9/I-95	6th Ave North	N. of Okeechobee Blvd	93220000	21.000	27.627	Add managed lanes	0.80	4.50	108.65	2.10	905.44	6.34	99.60	13.58
444202-3	SR-9/I-95	N. of Okeechobee Blvd	S. of Indiantown Rd	93220000	27.627	43.000	Add managed lanes	0.40	2.50	35.97	1.62	299.75	2.10	32.97	4.50
413252-2	SR-9/I-95	S. of Indiantown Rd	Palm Beach/Martin County Line	93220000	43.000	46.018	Add Lanes	0.30	1.50	5.12	-	42.69	0.30	4.70	0.64

Legend

FM: Financial Management
MP: Mile Post
PD&E: Project Development and Environment
PE: Preliminary Engineering
CST: Construction
CEI: Construction Engineering and Inspection

Table 5.2: LRE Summary for FM 444202-1

FM No.	Facility		From	To
444202-1	SR-9/I-95		S. of Linton Blvd	N. of 6th Ave South
Roadway Component - I-95				
Item				**Cost**
Roadway Improvements including the following components: Earthwork, Shoulder, Drainage, Signing, Lighting, and Retaining Walls				$225,025,038.08
			Roadway Subtotal	**$225,025,038.08**
Structural Component - I-95				
Structure Number	**Location**	**Within an Interchange**	**Improvement**	**Cost**
930184	I-95 SB over the C-15 Canal	✗	Widening	$875,234.87
930445	I-95 NB over the C-15 Canal	✗	Widening	$756,683.53
930499	I-95 SB over Linton Blvd	✓	Widening	$520,708.10
930500	I-95 NB over Linton Blvd	✓	Widening	$520,756.10
930501	I-95 SB over SW 10th St/Lowson Blvd	✗	Widening	$257,937.35
930502	I-95 NB over SW 10th St/Lowson Blvd	✗	Widening	$257,937.35
930503	I-95 SB over Atlantic Avenue	✓	Widening	$423,766.70
930504	I-95 NB over Atlantic Avenue	✓	Widening	$423,766.70
930497	I-95 NB over El Rio Canal and Depot Ave	✗	Widening	$680,756.96
930498	I-95 SB over El Rio Canal and Depot Ave	✗	Widening	$610,913.15
930495	I-95 NB over Lake Ida Rd	✗	Widening	$369,949.91
930496	I-95 SB over Lake Ida Rd	✗	Widening	$329,476.10
930455	I-95 over Lateral Canal 30	✗	Replacement	$4,713,892.68
930490	I-95 over Lake Ida Canal	✗	Widening	$357,879.53
930304	SW 23rd Avenue over I-95	✗	Replacement	$8,826,310.71
930301	Woolbright Rd over I-95	✓	Replacement	$7,571,049.63
930285	Boynton Beach Blvd over I-95	✓	Replacement	$8,354,323.98
930287 (930286)	I-95 over Canal C-16	✗	Widening	$897,781.82
930434	Gateway Blvd over I-95	✓	Replacement	$7,147,729.73
930433	Gateway Blvd over SFRC	✓	Replacement	$5,069,616.85
930435	I-95 NB Off Ramp to Gateway Blvd	✓	Replacement	$10,663,478.07
930307	Hypoluxo Rd over I-95 and SFRC	✓	Replacement	$11,650,431.40
930298	I-95 SB On Ramp from Hypoluxo Rd	✓	Replacement	$2,641,253.49
930299	I-95 SB Off Ramp to Hypoluxo Rd	✓	Replacement	$3,449,281.23
930276	Lantana Rd over I-95 and SFRC	✓	Replacement	$11,895,959.07
930274	I-95 SB On Ramp from Lantana Rd	✓	Replacement	$2,528,947.26

930275	I-95 SB Off Ramp to Lantana Rd	✓	Replacement	$4,806,884.03
930273	I-95 over 12th Ave South	✗	Replacement	$7,501,168.68
930458	I-95 over 6th Ave South	✓	Widening	$425,908.32
930511	I-95 NB On Ramp from 6th Ave South	✓	Widening	$679,494.35
930261	I-95 SB over Lake Worth Rd	✗	Replacement	$55,958,912.19
930262	I-95 NB over Lake Worth Rd	✗	Replacement	$62,603,945.61
			Structures Subtotal	**$223,772,135.45**
			Segment Subtotal	$448,797,173.53
			Maintenance of Traffic (10%)	$44,879,717.35
			Mobilization (8%)	$39,494,151.27
			Initial Contingency (Non-Bid)	$150,000.00
			Dispute Review Meetings (Non-Bid)	$158,400.00
			FM No. (444202-1) Total	**$533,479,442.15**

Table 5.3: LRE Summary for FM 444202-2

FM No.	Facility		From	To
444202-2	SR-9/I-95		N. of 6th Ave South	N. of Okeechobee Blvd
Roadway Component - I-95				
Item				**Cost**
Roadway Improvements including the following components: Earthwork, Shoulder, Drainage, Signing, Lighting, and Retaining Walls				$156,555,513.71
			I-95 Roadway Subtotal	**$156,555,513.71**
Roadway Component - SR 80/Southern Blvd				
Sequence				**Cost**
Roadway Improvements including the following components: Earthwork, Shoulder, Drainage, Signing, Lighting, and Retaining Walls				$57,431,662.74
			SR 80 Roadway Subtotal	**$57,431,662.74**
Structural Component - I-95				
Structure Number	**Location**	**Within an Interchange**	**Improvement**	**Cost**
930260	10th Ave N over I-95	✓	Widening	$1,129,466.63
930259	I-95 over 17th Ave N	✗	Replacement	$6,633,391.34
930508	I-95 SB over Canal C-51	✗	Replacement	$7,172,903.97
930509	I-95 NB over Canal C-51	✗	Replacement	$7,172,903.97
930294	I-95 over Forest Hill Blvd	✓	Replacement	$8,478,406.31
930291	I-95 SB over Summit Blvd	✗	Replacement	$3,880,048.36
930292	I-95 NB over Summit Blvd	✗	Replacement	$4,493,482.15
930539	EB SR 80/Southern Blvd over I-95	✓	Replacement	$3,075,096.00
930462	WB SR 80/Southern Blvd over I-95	✓	Widening	$954,173.28
930478	I-95 NB Off Ramp from SR 80/Southern Blvd	✓	Replacement	$5,132,694.91
930482	James L. Turnage Blvd NB Connector Ramp Over I-95 & SFRC	✓	Special	$1,923,610.20
930483	James L. Turnage Blvd NB Connector Ramp Over I-95 & SFRC	✓	Special	$2,086,045.65
930487	I-95 NB over Belvedere Rd	✓	Widening	$636,867.61
930486	I-95 SB over Belvedere Rd	✓	Widening	$481,083.65
930488	I-95 NB over Mercer Ave and SFRC	✗	Widening	$845,739.35
930489	I-95 SB over Mercer Ave and SFRC	✗	Widening	$614,244.99
930529	Australian Ave over I-95	✗	Replacement	$6,307,810.11
930190	I-95 over Drainage Canal North of Australian Ave	✗	Widening	$63,825.00
930210	EB Okeechobee Blvd over I-95	✓	Replacement	$6,082,134.74
930183	WB Okeechobee Blvd over I-95	✓	Replacement	$5,955,798.74
			I-95 Structures Subtotal	**$73,119,726.96**

Structural Component - SR 80/Southern Blvd				
Structure Number	**Location**	**Within an Interchange**	**Improvement**	**Cost**
TBD	SR 80 EB to I-95 NB Direct Connect	✓	New	$23,283,490.87
TBD	I-95 NB to SR WB Direct Connect	✓	New	$12,040,867.87
TBD	SR 80 High Speed Through Lanes (HSTL) over SR 80/Southern Blvd	✗	New	$94,972,162.87
TBD	SR 80High Speed Through Lanes (HSTL) Open Cut Transition (Both Sides)	✗	New	$45,688,860.00
TBD	SR 80 High Speed Through Lanes (HSTL) Underground Structure at Australian Ave	✓	New	$295,680,000.00
930461 (930524)	SR 80 over SFRC/CSX Railroad	✓	Widening	$1,517,546.72
930473	SB Australian Ave to EB SR 80 over Canal C-51	✓	Replacement	$1,609,035.58
			SR 80 Structures Subtotal	**$474,791,963.91**
			Segment Subtotal	$761,898,867.32
			Maintenance of Traffic (10%)	$76,189,886.73
			Mobilization (8%)	$67,047,100.32
			Initial Contingency (Non-Bid)	$150,000.00
			Dispute Review Meetings (Non-Bid)	$158,400.00
			FM No. (444202-2) Total	**$905,444,254.38**

Table 5.4: LRE Summary for FM 444202-3

FM No.	Facility		From	To
444202-3	SR-9/I-95		N. of Okeechobee Blvd	S. of Indiantown Rd
Roadway Component - I-95				
Sequence				**Cost**
Roadway Improvements including the following components: Earthwork, Shoulder, Drainage, Signing, Lighting, and Retaining Walls				$216,717,404.14
			Roadway Subtotal	**$216,717,404.14**
Structural Component - I-95				
Structure Number	**Location**	**Within an Interchange**	**Improvement**	**Cost**
930528	Congress Ave over I-95	✗	Replacement	$4,242,679.80
930530	I-95 SB over Palm Beach Lakes Blvd	✓	Widening	$403,674.83
930531	I-95 NB over Palm Beach Lakes Blvd	✓	Widening	$563,630.70
930540	I-95 over West Palm Beach Drainage Canal	✗	Replacement	$3,491,038.31
930520	I-95 over 45th St	✓	Widening	$1,046,655.21
930172	I-95 SB over Dr Martin Luther King Jr Blvd and CSX	✗	Widening	$801,498.83
930173	I-95 NB over Dr Martin Luther King Jr Blvd and CSX	✗	Widening	$1,028,451.54
930519	I-95 over Blue Heron Blvd	✓	Widening	$1,528,887.91
930516	I-95 over Northlake Blvd	✓	Widening	$920,582.50
930517	I-95 over Holly Dr	✗	Widening	$563,474.50
930518	I-95 SB over Burns Rd	✗	Widening	$592,122.31
930521	I-95 NB over Burns Rd	✗	Widening	$598,684.59
930335	I-95 SB over PGA Blvd	✓	Replacement	$4,674,342.61
930336	I-95 NB over PGA Blvd	✓	Replacement	$5,751,902.86
930388	I-95 SB Flyover On Ramp from WB PGA Blvd	✓	Replacement	$7,980,978.45
930378	I-95 over Military Trail	✗	Widening	$1,148,828.34
			Structures Subtotal	**$35,337,433.29**
			Segment Subtotal	$252,054,837.43
			Maintenance of Traffic (10%)	$25,205,483.74
			Mobilization (8%)	$22,180,825.69
			Initial Contingency (Non-Bid)	$150,000.00
			Dispute Review Meetings (Non-Bid)	$158,400.00
			FM No. (444202-3) Total	**$299,749,546.87**

Table 5.5: LRE Summary for FM 413252-2

FM No.	Facility		From	To
413252-2	SR-9/I-95		S. of Indiantown Rd	Palm Beach/Martin County Line
Roadway Component - I-95				
Sequence				**Cost**
Roadway Improvements including the following components: Earthwork, Shoulder, Drainage, Signing, Lighting, and Retaining Walls				$27,798,499.50
			Roadway Subtotal	**$27,798,499.50**
Structural Component - I-95				
Structure Number	**Location**	**Within an Interchange**	**Improvement**	**Cost**
930371	I-95 SB over Indiantown Rd	✓	Replacement	$3,838,682.69
930375	I-95 over Northwest Fork of Loxahatchee River	✗	Widening	$217,511.80
930372	I-95 NB over Indiantown Rd	✓	Replacement	$3,537,552.75
930386	I-95 SB over Canal C-18	✓	Widening	$348,936.92
			Structures Subtotal	**$7,942,684.16**
			Segment Subtotal	$35,741,183.66
			Maintenance of Traffic (10%)	$3,574,118.37
			Mobilization (8%)	$3,145,224.16
			Initial Contingency (Non-Bid)	$150,000.00
			Dispute Review Meetings (Non-Bid)	$79,200.00
			FM No. (413252-2) Total	**$42,689,726.19**

W. Indiantown Rd

INTERSTATE 95

Palm Beach County

Linton Blvd