Interstate 95 Multimodal Master Plan
TREASURE COAST

I-95 Multimodal Master Plan
Traffic Analysis Methodology

November 10, 2017

FDOT

Prepared for: Florida Department of Transportation – District Four (D4)

Prepared by: RS&H, Inc.

I-95 Multimodal Master Plan

Palm Beach/Martin County Line to Indian River/Brevard County Line

TRAFFIC ANALYSIS METHODOLOGY

Florida Department of Transportation
District Four

Financial Management No.:
436577-1-22-01

November 10, 2017

1 INTRODUCTION

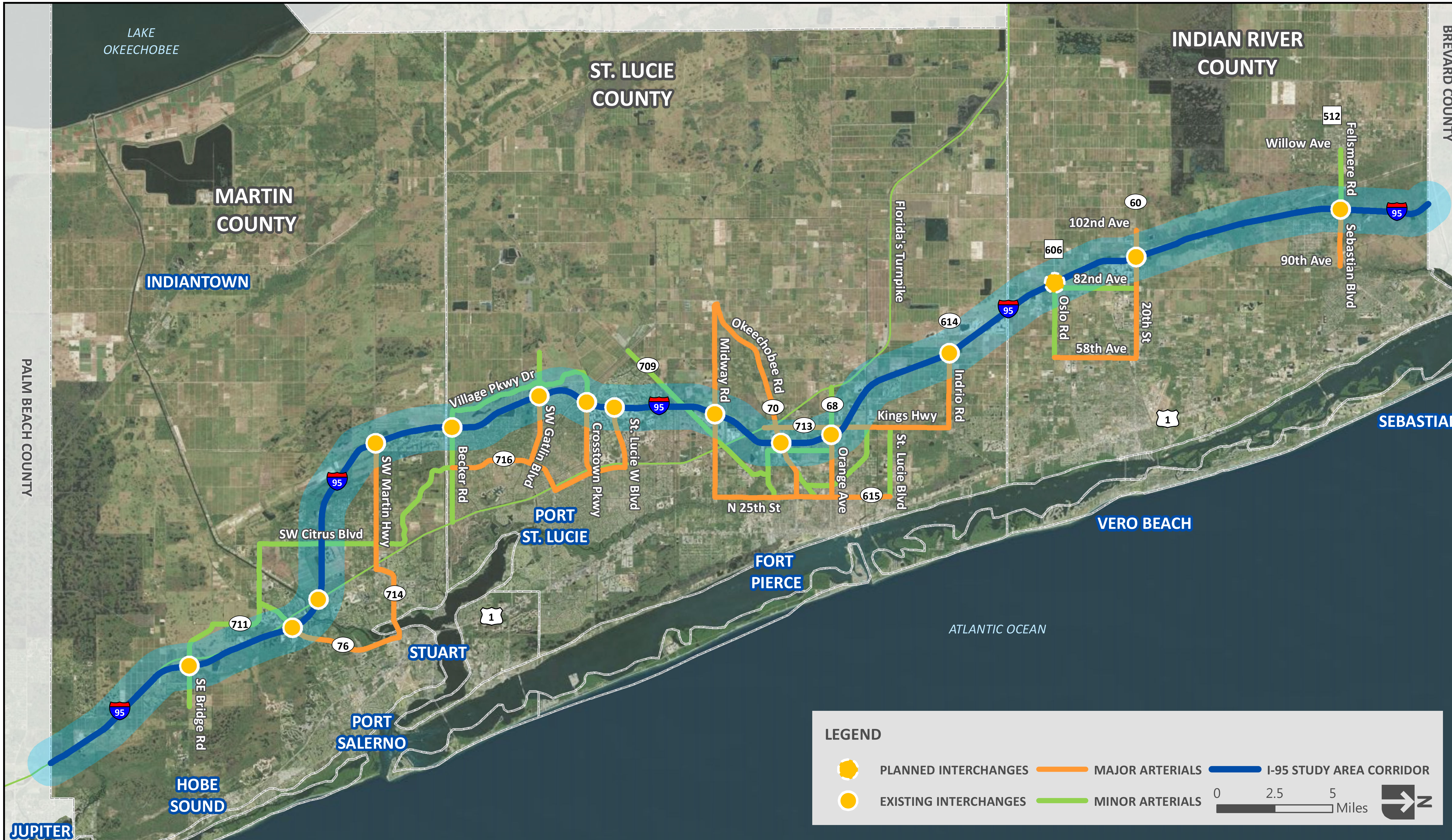
Interstate-95/SR-9 is a part of the Florida's Strategic Intermodal System (SIS), serving regional commerce and long distance trips, and providing connectivity between major cities and towns along the east coast of the state. In May 2017 the Florida Department of Transportation (FDOT) initiated a study to prepare a new Multimodal Master Plan for the portion of I-95 extending from the Palm Beach/Martin County line to the Indian River/Brevard County line, a distance of approximately 71 miles. The preparation of a Multimodal Master Plan is an integral part of the continuing process for the development of the SIS and in reaching overall regional mobility goals. The Master Plan will identify short-term and long-term capacity and operational improvements necessary to bring the facility to SIS standards. It will also recommend actions to be taken by the FDOT and the relevant local governments to protect and enhance the facility through horizon year 2045. This document describes the methodology that will be followed for conducting travel demand forecasting and traffic operations analysis for the Multimodal Master Plan.

2 STUDY ROADWAYS

The study limits for the I-95 Master Plan include the I-95 mainline, interchanges, and other road segments and intersections within the anticipated area for the project (see Figure 2.1). Study roadways include the following:

- I-95/SR-9 from Palm Beach/Martin County Line to Indian River/Brevard County Line.
- CR-708/SE Bridge Road from Pratt-Whitney Road to SE 138th Street.
- SR-76/SW Kanner Highway from Pratt-Whitney Road to SR-714/SW Martin Downs Boulevard
- CR-714/SW Martin Highway from SW Long Drive to west of I-95/SR-9
- SR-714/SW Martin Highway from east of I-95/SR-9 to SR-714/SW Martin Downs Boulevard
- SR-714/SW Martin Downs Boulevard from SR-714/SW Martin Highway to SR-76/SW Kanner Highway
- SW Becker Road from Village Parkway Drive to west of Florida's Turnpike

- SW Tradition Parkway from its west limit to west of I-95/SR-9
- SW Gatlin Boulevard from east of I-95/SR-9 to SW Port St. Lucie Boulevard
- Crosstown Parkway from its west limit to SW Bayshore Boulevard
- St Lucie West Boulevard from west of I-95/SR-9 to SW Bayshore Boulevard
- W Midway Road from SR-70/Okeechobee Road to SR-615/ S 25th Street
- SR-70/Okeechobee Road from W Midway Road to Hartman Road
- SR-70/Virginia Avenue from Hartman Road to SR-615/ S 25th Street
- SR-68/Orange Avenue from Florida’s Turnpike to SR-615/ S 25th Street (designated as CR-68 between Florida’s Turnpike and SR-713/King’s Highway)
- SR-614/ Indrio Road from I-95/SR-9 to SR-713/King’s Highway
- SR-60/20th Street from 102nd Avenue to 58th Avenue
- CR-512/Fellsmere Road from Willow Street to 90th Avenue
- CR-711/Pratt-Whitney Road from CR-708/SE Bridge Road to SR-76/SW Kanner Highway
- CR-76A/SW 96 Street from SW Citrus Boulevard to SR-76/SW Kanner Highway
- SW Citrus Boulevard from CR-76A/SW 96 Street to SW Becker Road
- SW Port St. Lucie Boulevard from SW Becker Road to Florida’s Turnpike
- SR-716/ SW Port St. Lucie Boulevard from Florida’s Turnpike to SW Bayshore Boulevard
- SW Bayshore Boulevard from SR-716/ SW Port St. Lucie Boulevard to St. Lucie West Boulevard
- SW Village Parkway from SW Becker Road to Crosstown Parkway
- SW Savona Blvd from SW Becker Road to SW California Boulevard
- SW California Boulevard from SW Savona Boulevard to NW East Torino Parkway
- NW East Torino Parkway from SW California Boulevard to West Midway Road
- Glades Cut Off Road from C-24 Canal Road to Selvitz Road
- Selvitz Road from Glades Cut Off to Edwards Road
- Edwards Road from S. Jenkins Road to S 25th Street



FDOT

95 Multimodal Master Plan TREASURE COAST

I-95 Multimodal Master Plan

FPID No.: 436577-1-22-01

FDOT - District 4

Title: **STUDY AREA MAP**

Figure: **2-1**

If necessary, the study limits may be expanded to include additional road segments and/or intersections (not specified herein) that may be substantially impacted by the proposed projects. Any changes to the study limits will be based on recommendations following an assessment of field conditions and require approval from the Department.

3. ANALYSIS YEARS

The corridor will be analyzed for the following years:

- Existing Year 2017
- Interim Year (To Be Determined)
- Design Year 2045

In addition, analyses will be performed to determine the anticipated failure year for road segments that are forecasted to operate below the Level of Service targets set by FDOT Policy before design year 2045.

4. EXISTING YEAR (2017) ROADWAY AND TRAFFIC CONDITIONS

Existing conditions analyses will include collecting existing year (2017) roadway and traffic data for the study roadways. This will include: roadway geometric characteristics, roadway and intersection traffic controls, roadway and intersection traffic volumes, and vehicle classification. These are described below.

4.1 Existing Roadway Characteristics

Field reviews will be conducted and aerial photographs inspected to establish existing roadway and intersection lane configurations and traffic controls (stop signs, speed limits, turn restrictions, signal locations, pedestrian and bicycle facilities).

4.2 Traffic Counts

4.2.1 Machine Counts: Machine traffic counts will be gathered for study roadways as follows:

- I-95 Mainline Segments: Historical machine counts will be gathered from FDOT's traffic counting stations located along I-95 mainline. Data will be sourced through FDOT Florida Traffic Online and District 4, Planning Office.
- I-95 Ramps: A search will be conducted to gather available historical machine counts for the I-95 on-ramps and off-ramps at the existing fourteen (14) interchanges within the study limits. The effort will involve coordination with FDOT to gather traffic count data from prior studies or on-going traffic data collection programs. Historical counts that were collected within calendar years 2015 or 2016 will be accepted for use in the project (pending quality control checks). New 48-hour continuous machine counts will be collected on each I-95 on-ramp and off-ramp at locations where acceptable historical traffic counts are not available. The counts will be collected during typical weekday conditions (Tuesday through Thursday).
- I-95 Cross Roads (Roadways with Interchanges on I-95): New 48-hour continuous machine counts will be collected at select locations along the I-95 cross roads. These locations are identified in Figure 4.1.

Traffic counts collected for the Master Plan will be compared to available historical counts. If the data is not reasonably comparable to historical counts, then a recent historical count may be used instead, or a new count will be collected.

4.2.2 Intersection Turning Movement Counts

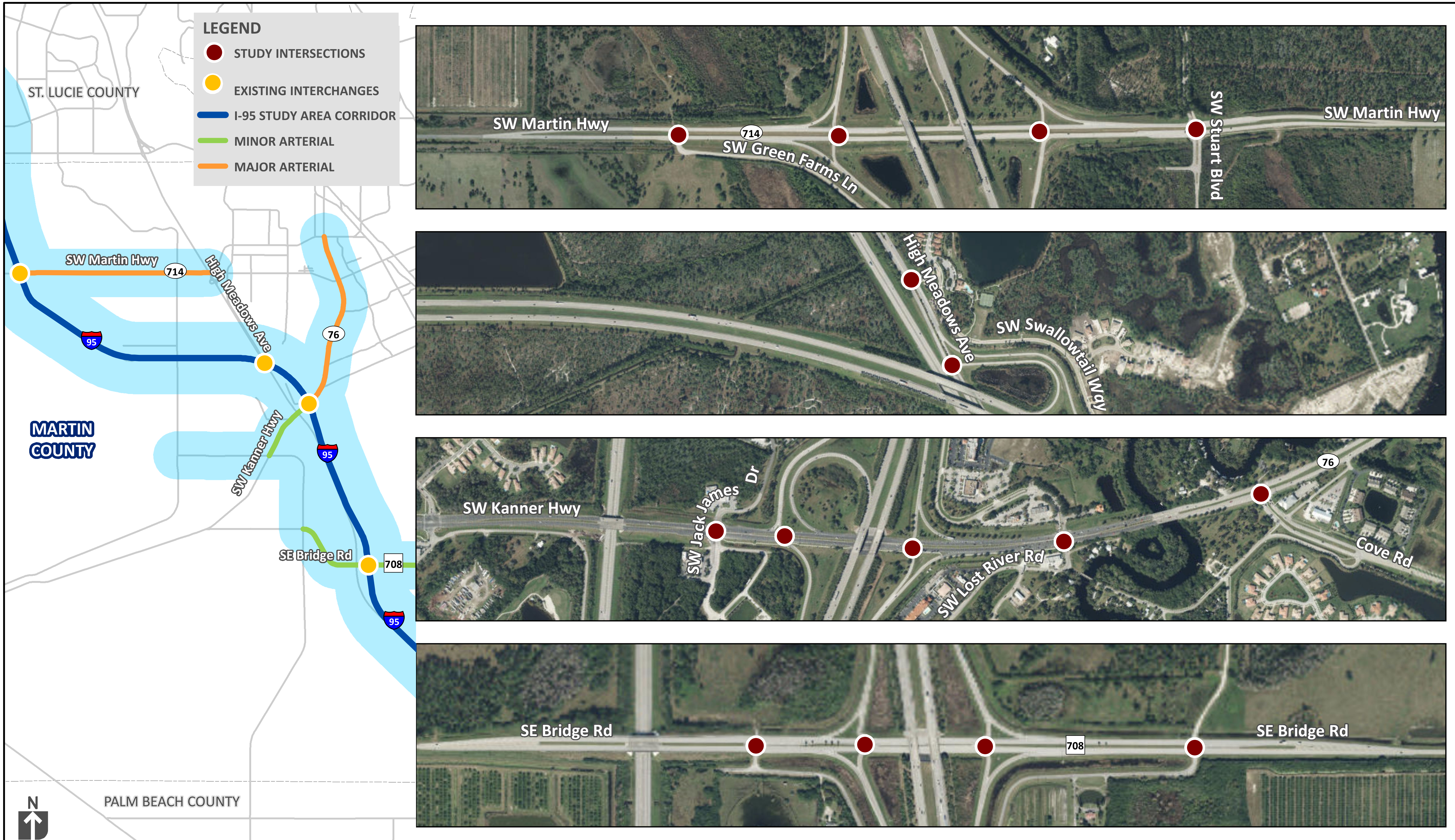
A search will be conducted to gather available historical turning movement counts for the study intersections identified in Table 4-1 and Figure 4-1. The effort will involve coordination with FDOT and local government agencies to gather traffic count data from prior studies or on-going traffic data collection programs. Historical counts that were collected within calendar years 2015 or 2016 will be accepted for use in the project (pending quality control checks). The 2015 and 2016 counts that are obtained from available sources will be adjusted using a historical growth rate, so that all "existing" counts will represent 2017. New intersection turning movement counts will be collected at locations where acceptable historical traffic counts are not available. The turning movement counts (with approach and departure counts) will be collected for 6 hours (6-9 AM, and 4-7 PM) on a typical weekday (Tuesday, Wednesday or Thursday). The counts will be recorded in 15-minute increments with separate tabulations for trucks and pedestrians/bicyclists.

Table 4-1: Traffic Count Locations

Interchange	Intersection Count Location
1. Bridge Road	Unnamed Section Line Road approximately 0.7 miles west of SB off ramp
	I-95 SB Ramp Terminal
	I-95 NB Ramp Terminal
	1760 Bridge Rd Access
2. SR 76/Kanner Highway	Jack James Drive (west)
	I-95 SB Ramp Terminal (Include W to S loop)
	I-95 NB Ramp Terminal
	SW Lost River Road
	Cove Road (east)
3. High Meadows Avenue	I-95 NB and SB Ramp Terminal (Include N of E ramp)
	Swallowtail Way
4. SR 714/Martin Highway	SW Green Farms Lane
	I-95 SB Terminal (include free flow movements)
	I-95 NB Terminal (include free flow movements)
	SW Stuart W Boulevard
5. Becker Road	Village Parkway Drive
	I-95 SB Terminal
	I-95 NB Terminal
	SW Hallmark Street
6. Gatlin Boulevard	Village Parkway Drive
	I-95 SB Terminal (include free flow movements)
	I-95 NB Terminal (include free flow movements)
	SW Brescia Street
	SW Savage Boulevard
7. Crosstown Parkway	SW Visconti Way
	I-95 SB Terminal
	I-95 NB Terminal
	SW California Boulevard

Table 4-1: Traffic Count Locations (Continued)

Interchange	Intersection Count Location
8. St. Lucie West Boulevard	Commerce Centre Drive
	I-95 SB Terminal (include free flow movements)
	I-95 NB Terminal (include free flow movements)
	NW Peacock Boulevard
9. Midway Road	Gordy Road
	I-95 SB Terminal (include free flow movements)
	I-95 NB Terminal (include free flow movements)
	Glades Cut-Off Road
10. SR 70/Okeechobee Road	Kings Highway
	Crossroads Parkway
	I-95 SB Terminal (Include WB to SB loop)
	I-95 NB Terminal (Include EB to NB loop)
	Jenkins Road
11. SR 68/Orange Avenue	Kings Highway
	I-95 SB Terminal (include free flow and loop movements)
	I-95 NB Terminal (include free flow and loop movements)
	Jenkins Road
12. SR 614/Indrio Road	AICO Road
	I-95 SB Terminal (include free flow movements)
	I-95 NB Terminal (include free flow movements)
	Spanish Lakes Boulevard
13. CR 606/Oslo Road	86th Avenue
	82nd Avenue
14. SR 60/20th Street	98th Avenue
	I-95 SB Terminal (include free flow movements)
	I-95 NB Terminal (include free flow movements)
	90th Avenue
15. CR 512/Fellsmere Road	Willow Street
	I-95 SB Terminal
	I-95 NB Terminal
	108th Avenue



I-95 Multimodal Master Plan

FPID No.: 436577-1-22-01

FDOT - District 4

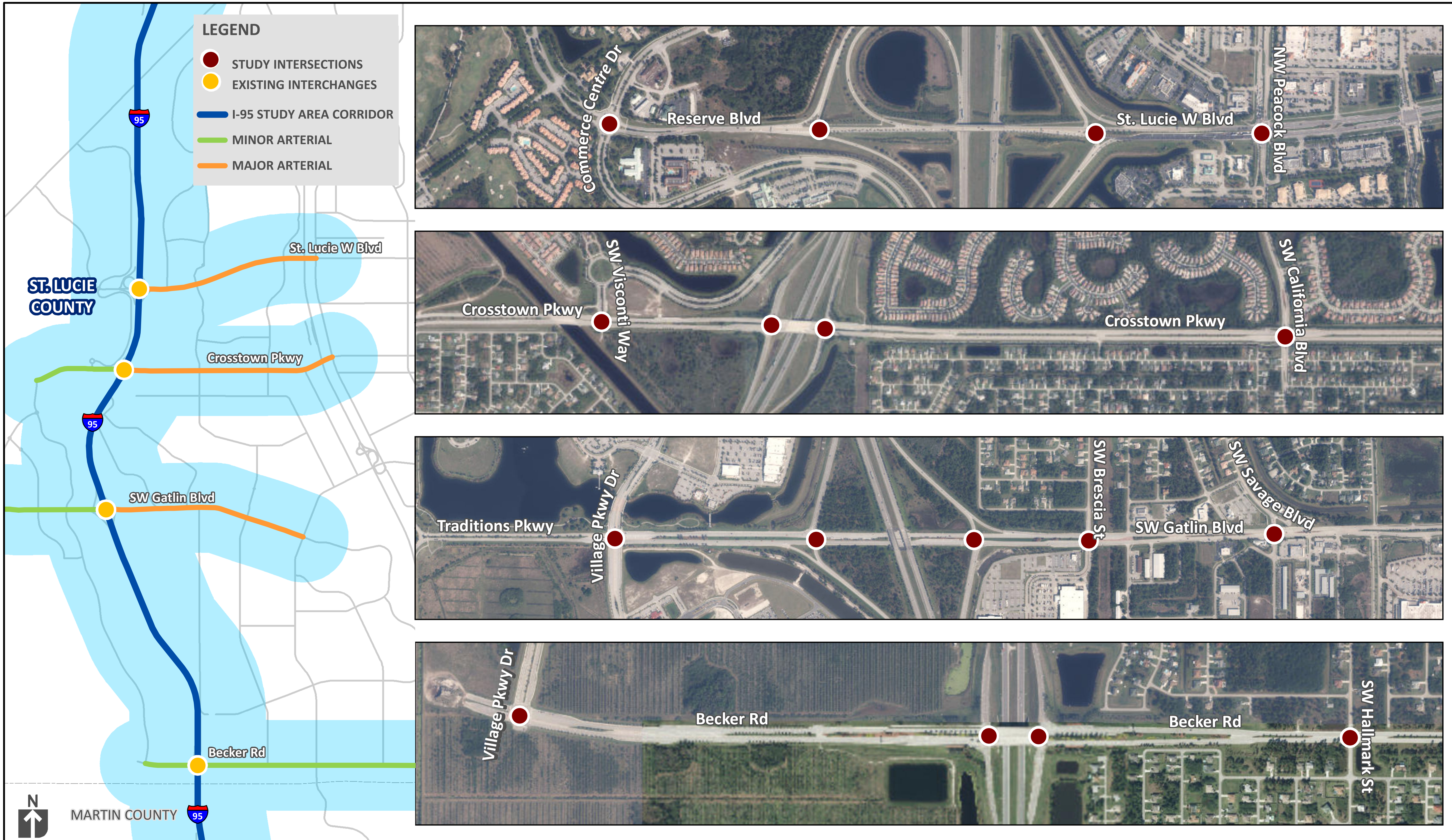
Title:

MARTIN COUNTY TRAFFIC COUNT LOCATIONS

Figure:

4-1

Sheet 1 of 4



I-95 Multimodal Master Plan

FPID No.: 436577-1-22-01

FDOT - District 4

Title:

ST. LUCIE COUNTY (SOUTH) TRAFFIC COUNT LOCATIONS

Figure: **4-1**

Sheet 2 of 4

I-95 Multimodal Master Plan

FPID No.: 436577-1-22-01

FDOT - District 4

Title: **ST. LUCIE COUNTY (NORTH) TRAFFIC COUNT LOCATIONS**

Figure: **4-1**

Sheet 3 of 4

FDOT

95 Multimodal Master Plan TREASURE COAST

I-95 Multimodal Master Plan

FPID No.: 436577-1-22-01

FDOT - District 4

Title: **INDIAN RIVER COUNTY TRAFFIC COUNT LOCATIONS**

Figure: **4-1**

Sheet 4 of 4

4.3 Existing Signal Timings

Existing traffic signal timing sheets will be gathered from local agencies for the signalized intersections in Table 4.1.

4.4 Existing AADT and AM and PM Peak Traffic

Common system-wide peak hours will be established for the AM and PM peak periods. AADTs will be estimated from the 48-hour machine counts by applying applicable seasonal adjustments factors and axle correction factors. AM and PM peak hour volumes will be developed from the turning movement counts for the common system-wide peak hours. AADTs, and the AM and PM peak hour volumes will be checked for balanced flow and adjusted as needed.

5 TRAVEL DEMAND MODELING AND DESIGN TRAFFIC DEVELOPMENT – FUTURE YEARS

The model is one of the tools that the team will rely on during the initial screening of study area roadways to determine failing segments and capacity improvement needs. The model forecasts will also be one of the key sources that will assist the team in forecasting traffic demand for the 2045 horizon year and developing design traffic volumes.

5.1 Travel Demand Model

The Treasure Coast Regional Planning Model (TCRPM, version 4) will be used as the benchmark model for travel demand forecasting for the study. TCRPM 4 is the approved 2040 long range transportation planning (LRTP) model used by the region's three Metropolitan/Transportation Planning Organizations (M/TPOs). The model has a base year of 2010 and a horizon year of 2040. It is based on the CT-RAMP (Coordinated Travel Regional Activity-Based Modeling Platform) family of Activity-Based Models (ABM).

Since the adoption of the 2040 M/TPO LRTPs, FDOT D4 developed a project-specific TCRPM model for the Strategic Intermodal System (SIS) 2045 Unfunded Needs Plan Assessment. Utilizing TCRPM 4, this model was updated to incorporate two key elements: (1) Cube Analyst adjustment procedures that adjust the model trip tables to better reflect the 2010 traffic counts in the region, and (2) a 2045 model. These adjustments are documented in a FDOT District 4 report *SIS Unfunded Needs Forecasting Analysis Documentation.* This project-specific version of TCRPM will be utilized as the primary travel demand model for traffic projections in this study.

Before applying the model for this study, a model validation review will be performed as described in Section 5.3.

5.2 Model Years and Runs

The analysis years for travel demand modeling are 2010 (TCRPM base year) and 2045 (design year). The study's interim year will be determined upon future consultations with FDOT. Travel demand estimates for the interim year will be estimated by interpolation of the forecasts from the 2010 and 2045 models.

Socio-economic data that was developed for year 2045 for the SIS Needs Plan will be utilized. The growth and allocation (beyond the approved 2040 data) will be discussed with the local agencies. Consistent with the SIS study, the 2045 projections based on the 2040 LRTP trend analysis will be utilized.

The 2045 No Build highway network for this study will reflect the 2040 regional cost feasible network developed as part of TCRPM 4 and LRTP adoption. The only exceptions will be the laneage and interchange access provided on Florida's Turnpike. Currently, the 2040 cost feasible network reflects four lanes on the Turnpike in the Treasure Coast region. The Turnpike mainline will be updated to include six lanes in 2040, based on coordination with FDOT District 4 and Florida's Turnpike. In addition, new interchange access connections will be assumed along the Turnpike at the following locations:

- Midway Road (full interchange)
- St. Lucie West Boulevard (partial interchange with connections to and from the north)
- Crosstown Parkway (partial interchange with connections to and from the south)
- SR 76/Kanner Highway (full interchange)
- I-95 at MP 124 (direct connections to and from the south in the approximate vicinity south of Bridge Road)

The study will use the transit network developed for the 2040 LRTP adoption.

For developing the unconstrained demand growth rate, the following model runs will be made:

- No Build 2045 Alternative with a highway network that reflects 6 Lanes on I-95, with a short segment as 8 lanes.
- Three 2045 build model run scenarios, that reflect:
    A. I-95 to be 8 lanes for the entire length of the study area. These lanes are coded as general purpose lanes only and do not include express lanes.
    B. I-95 to be 10 lanes for the entire length of the study area. These lanes are coded as general purpose lanes only and do not include express lanes.
    C. I-95 to be 10 lanes, with additional new interchanges (to be defined at a later stage of the study).

Model runs will be conducted with trip tables not locked (i.e. allow the trip tables to change) for highway network volume assignment for the 2045 No Build and 2045 build model run scenarios. Since the build model run scenarios reflect major freeway capacity improvements, it can be reasonably expected that these improvements may change the travel patterns in the region.

Model run outputs will be considered in developing a Build Alternative to be further evaluated. The process of developing a Build Alternative will allow for varying mainline cross sections to be considered. The cross section for each segment of I-95 will be determined based on an assessment of the need for improvement for each segment, the travel demand, and other factors that may influence the recommended cross section such as physical, environmental or policy constraints, and recommended interchange improvements.

5.3 Model Validation and Review

The 2010 base year model was validated to the year 2010 Annual Average Daily Traffic (AADT). Overall, the adopted TCRPM 4 2010 base year model volume root-mean-square error (RMSE) is within the allowable ranges mentioned in the Florida Project Traffic Forecasting Handbook. The RMSE statistics for the regional volume is 35.36% with an overall volume to count ratio of 1.02.

The model volume estimates are further refined using Cube Analyst adjustments procedures in the project-specific model that will be used for this study to closely match the traffic counts. The RMSE for the adjusted model volume is 12.72%, which is within the maximum allowable ranges, with an overall volume-to-count ratio of 1.0. The 2045 adjusted Origin-Destination (OD) matrices will be developed based on the sum of the difference of the OD matrices between the 2010 and 2045 scenarios of the TCRPM regular models and the 2010 adjusted OD matrices.

The following checks will be performed and results will be shared with the FDOT's modeling coordinator.

- Review of the input TAZ-level population and employment growth along I-95
- Network checks (with focus on I-95 and Turnpike)
    - Number of lanes
    - Posted speeds
    - Facility types
    - Network connectivity
- Volume over Count on I-95 and Turnpike (base year – 2010)
- Projected preliminary volume growth between 2010 and 2045
- Input trips and time of day factors on the external links
- Truck volumes on I-95 and in and around Port of Fort Pierce will be reviewed by utilizing available counts and Central Office's FreightSIM model and if found missing, they will be treated as special generators to correct the volumes in TCRPM.

5.4 Design Traffic Development Process

Once the travel demand model runs are complete, the study team will develop the design traffic to be used for analysis of alternatives. The following steps will be taken to develop the one set of design traffic for the I-95 mainline and study interchanges and adjacent intersections.

1. Gather and analyze the most recent available traffic data (counts, turning movements and classification counts) from various sources to establish existing year traffic conditions (per Section 4.2).
2. Develop traffic growth factors for the future year design traffic from TCRPM.
3. Perform TCRPM forecasts reasonableness checks using the following data sources:
    a. Historical traffic trends (ten years from 2007 to 2016, or as available on study roadway links) using data available from the Florida Traffic Information (FTI) DVD
    b. Growth in zonal population, households, employment and trips at the external stations
    c. Design hour factor (K) and directional distribution factor (D) obtained from the data collected by the study team
    d. Guidelines in the Florida Project Traffic Forecasting Handbook
    e. Existing 2040 traffic projections from the 2040 adopted LRTP model.
4. Coordinate with the FDOT's modeling coordinator to develop/finalize the traffic growth rates, K, D and T factors.
5. Develop the 2045 future year design traffic based on the existing traffic counts and approved growth rates and K, D and T factors. Standard K factors will be utilized.
    a. 2045 AADTs will be developed for I-95 mainline segments and cross streets included in the scope of work based on the existing traffic counts and approved growth rates. Segment specific and area-wide historical growth rates will be computed and the most appropriate growth rates and method will be recommended and applied. Growth rates will be determined after reviewing growth rates from 1) TCRPM, 2) historical trends, and 3) land use projections.
    b. AADTs for the interim year (TBD) will be interpolated between the existing traffic counts and 2045 AADTs.

c. Directional design hour volumes (DDHVs) will be developed by applying the approved K and D factors to the forecasted AADTs. These DDHVs will be approved by FDOT before performing the operational analysis.

d. Future intersection turning movement volumes will be developed using TMTOOL, after consultation with FDOT's modeling coordinator.

6.0 TRAFFIC OPERATIONS ANALYSIS

The flow chart in Figure 6-1 illustrates the procedure for performing operations analyses for the I-95 Multimodal Master Plan. The procedure involves the following:

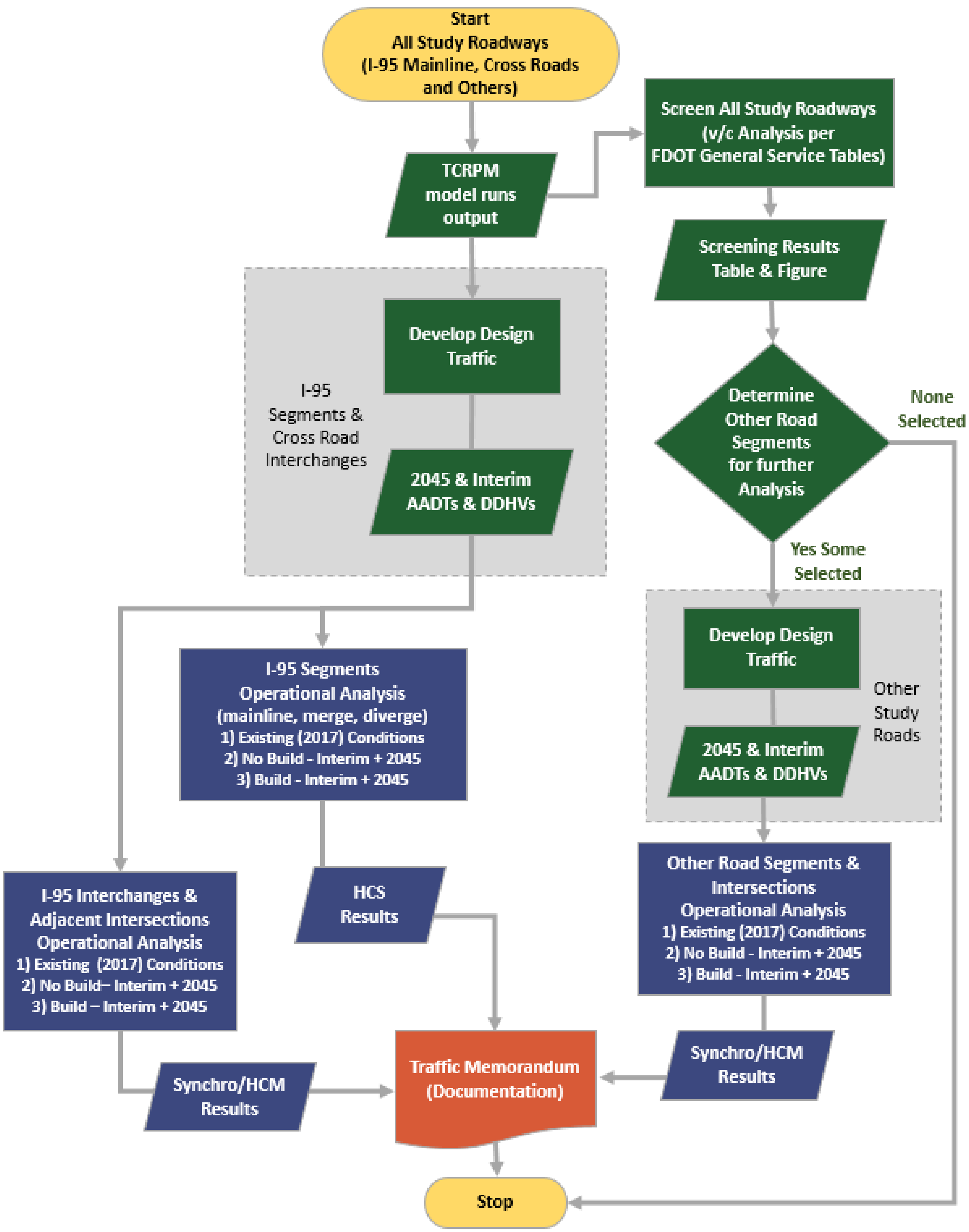
6.1 Field Reviews

Field reviews will be conducted during typical weekday AM and PM peak periods to identify and document typical traffic operating conditions, freeway operations, signal operations, queues and delays at study intersections, potential traffic safety concerns and other relevant traffic characteristics that may impact the project. The reviews will be conducted at the I-95 interchanges and intersections within the area of influence, identified in Table 4-1 and Figure 4-2.

6.2 Initial Screening of Study Roadways

A high level initial screen of all study roadways will be performed to identify road segments that are expected to be overcapacity and to determine the need for long term capacity improvements. The analysis will be performed using the travel demand model outputs from the 2045 No Build Alternative. The daily volume-to-capacity (V/C) ratios will be used as the primary performance measure to identify overcapacity segments on the study roadways. The 2013 FDOT Quality/Level of Service Handbook will be utilized as the benchmark for capacity thresholds. The handbook provides service volume thresholds based on area type, facility type and other roadway characteristics. Based on consultations with FDOT, adjustments to the forecasted volumes may be performed for those links that truck percentage that differ substantially from the assumed percentages in the LOS Handbook. For Urban area segments, LOS D threshold will be used, while for rural and transitioning areas LOS C threshold will be used in the V/C

Figure 6-1: I-95 Multimodal Master Plan Traffic Operations Analysis Process



computation. Definition of the link area type will be consistent with the definitions used for the 2045 SIS Needs Plan assessment.

After a review of the initial screening results, the I-95 freeway operational analysis and I-95 interchange operational analysis may begin. A decision point following the screening analysis is also built into the overall process to determine if other study roadways should be evaluated further through operational analysis, using Synchro and Highway Capacity Manual methodologies, and if so, what roadways should be evaluated. Other roadway operational analysis will require approval by the Department to use optional services for this effort.

6.3 Operations Analyses for I-95 Freeway Segments

Detailed operations analyses will be conducted for I-95 freeway segments – mainline, ramps, merge, diverge and weaving segments. Analyses will be performed for the following scenarios:

- Existing (2017) conditions
- No Build and Build Conditions for design year 2045 and interim year (TBD).

The operations analyses will be based on methodology from the Highway Capacity Manual, 6th Edition. Calculations will be performed using the Highway Capacity Software (HCS7). Results of the analyses will include level of service (LOS) for freeway segments and related performance measures (density, speed and volume/capacity ratio).

Effects of transit ridership in the study area on travel demand will be incorporated into the forecasted traffic volumes. Existing and future truck volumes will be estimated for the I-95 corridor and interchanges, and used in the analysis to calculate LOS.

6.4 Operations Analyses for I-95 Cross Roads and Intersections

Detailed operations analyses will be performed for the I-95 cross roads and intersections within the interchange area of influence. This will include the 14 existing interchanges and one interchange that is currently under design, each of which are anticipated to be open in the analysis years.

Analyses will be performed for the following scenarios:

- Existing (2017) conditions
- No Build and Build Conditions for design year 2045 and interim year (TBD)

Operations analyses will be based on methodology from the Highway Capacity Manual, 6th Edition. Calculations will be performed using Synchro 9 models. Results of the analyses will include the following performance measures:

- Arterials: LOS, speeds
- Intersections: LOS, delays, queue lengths.

6.5 Failure Year Analyses

Analyses will be performed to estimate the anticipated failure year for the I-95 mainline segments and the I-95 Cross Roads that are within the study limits. The analyses will be conducted for No Build Conditions. Planned and committed projects for the surrounding roadway network from the LRTPs and Turnpike and FDOT SIS Plans will be assumed to be in place when determining failure year of I-95 segments. The failure year will be estimated based on comparison of the estimated daily traffic volume on the road segments (per linear interpolation for year 2045 and 2017) vs. estimated roadway capacity (per FDOT Generalized Service Volume Tables). Failure will be assumed for a volume/capacity ration greater than 1.0. Anticipated failure year for road segments will be categorized as follows:

- Year 2017 – 2025
- Year 2025 – 2030
- Year 2030 – 2040
- Year 2040 – 2045
- Beyond 2045

7.0 DOCUMENTATION

The foregoing traffic analyses will be documented in the *Traffic Memorandum.* The documentation will include details of the analytical procedures and results of the travel demand forecasts and operations analyses. It will include tables and figures summarizing traffic forecasts (AADT, AM and PM peak hour volumes, intersection turning movements) and results of the operations analyses (LOS, delays, queue lengths and other measures of effectiveness).

The Traffic Memorandum document shall include an Executive Summary and a Comparative Evaluation of Alternatives.