PROJECT TRAFFIC ANALYSIS REPORT

Florida Department of Transportation

District 5

I-95 Interchange at Pioneer Trail

Project Development and Environment (PD&E) Study

Williamson Boulevard to Turnbull Bay Road

Volusia County, Florida

Financial Management Number: 436292-1-22-01

ETDM Number: 14193

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

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EXECUTIVE SUMMARY

The Florida Department of Transportation is conducting a Project Development and Environment (PD&E) study to evaluate the proposed construction of a new interchange along Interstate 95 (I-95) at Pioneer Trail (County Road (CR) 4118) near milepost (MP) 19.032 in Volusia County. The proposed interchange is located between two existing interchanges along the Interstate: I-95 and State Road (SR) 44 (Lytle Avenue) and I-95 and SR 421 (Dunlawton Avenue). The original Interchange Access Request (IAR) for this project including the Determination of Engineering and Operational Acceptability was granted by FHWA in May 2017. The current PD&E phase of the project precipitated completion of this Project Traffic Analysis Report (PTAR) to update the previously approved I-95 at Pioneer Trail Interchange Justification Report (IJR). This PTAR has been prepared in accordance with guidance provided in the FDOT PD&E Manual, Part 2, Chapter 2.

The purpose of the proposed interchange at I-95 and Pioneer is to relieve traffic congestion at the two adjacent interchanges north and south of the project, I-95 at State Road 421/Dunlawton Avenue and I-95 at State Road 44/Lytle Avenue. The future planned developments in the vicinity of Pioneer Trail include large increases in density of both population and employment in this area of the corridor including three Developments of Regional Impact (Farmton, Restoration and Pavilion at Port Orange), thus the project also aims to support economic development associated with existing and approved developments. The new interchange will provide a more direct access to these developments and relieve the congestion at the adjacent existing interchanges.

The need for an interchange in this evolving and transitioning area of Volusia County was thoroughly evaluated through an economic impact analysis conducted in 2016. This study illustrated the significant short- and long-term benefits associated with construction of a major new roadway infrastructure project. Direct and indirect economic benefits expected to be derived from this interchange include increases in new commercial and residential development opportunities, construction-related and permanent employment, spending and wages and travel time savings resulting from efficient movement of people and goods.

In addition to the economic impacts, the need for improvement to the existing transportation network was evaluated in detail in the approved IJR for this project. The proposed interchange is consistent with local and regional transportation plans. The interchange has been identified as a Strategic Intermodal System (SIS) Cost Feasible Project in the 2040 Long Range Transportation Plan (LRTP) eligible for state and federal funding and on the list of priority projects by the River to Sea Transportation Planning Organization (TPO). Additionally, both the new interchange and the Pioneer Trail widening to four lanes are also on the LRTP's list of local projects by Volusia County.

This PTAR documents the analysis procedures and results of the engineering and operations analysis used to evaluate the proposed interchange's impacts on the surrounding study area, including the two adjacent interchanges. The study builds upon the previously approved IJR and has developed two alternative design concepts for the proposed interchange in addition to the no build alternative. The two configurations evaluated in this report include a traditional diamond interchange and a partial cloverleaf interchange with a loop ramp in the southwest quadrant. Both of these concepts allow for full movements for access to and from the I-95 freeway facility.

Based on the findings in this report, the overall interchange traffic volume demand and vehicle delays at the existing SR 421 and SR 44 interchanges are expected to decrease with the construction of the new Pioneer Trail interchange. Under No Build conditions, for design year 2045 all freeway segments are anticipated to operate at LOS D or better during the AM and PM peak hours and all of the entrance and exit ramps are anticipated to operate at LOS C or better. However, several if the intersections along the three project corridors of SR 421, SR 44 and Pioneer Trail are projected to operate below the target LOS under future No Build conditions in design year 2045.

The I-95 and SR 421 Southbound ramp and is anticipated to operate under oversaturated conditions and below the target LOS for future design year 2045 No Build conditions. Additionally, the SR 421 and Williamson Boulevard intersection is also projected to operate under oversaturated conditions for both opening year 2025 and design year

2045 No Build conditions. The proximity of the Southbound ramp to the Williamson Boulevard intersection and right of way constraints limits the number of treatment options that could be reasonably implemented for this area. Additionally, the recent expansion plans of the I-95 six-lane reconstruction project already included widening the bridges over SR 421.

Under the Build scenario in design year 2045, all freeway segments and all of the entrance and exit ramps are anticipated to operate at LOS C or better during both AM and PM peak hours in design year 2045. Additionally, all of the study intersections are projected to operate at LOS D or better except for the SR 421 and Williamson Boulevard.

The new interchange at Pioneer Trail is projected to reduce traffic demands at the adjacent interchanges while providing additional benefits of reduced delays, emergency vehicle access, additional evacuation routes and improved connectivity for the region. Based on a review of the 2045 peak hour intersection operational analysis, the Pioneer Trail Partial Cloverleaf Interchange alternative (loop ramp in southwest quadrant) provides slightly improved operations over the Diamond Interchange alternative. Other factors such as environmental impacts, right of way and constructions costs should be evaluated in determining the preferred alternative

1.0 INTRODUCTION

The Florida Department of Transportation is conducting a Project Development and Environment (PD&E) study to evaluate the proposed construction of a new interchange along Interstate 95 (I-95) at Pioneer Trail (County Road (CR) 4118) near milepost (MP) 19.032 in Volusia County. The proposed interchange is located between two existing interchanges along the Interstate: I-95 and State Road (SR) 44 (Lytle Avenue) located near MP 16.287, approximately 2.74 miles to the south and I-95 and SR 421 (Dunlawton Avenue) located near MP 23.300, approximately 4.26 miles to the north. A project location map is provided in **Figure 1**.

1.1 Project Background

The proposed I-95 at Pioneer Trail interchange has been identified as a Strategic Intermodal System (SIS) priority project by the River to Sea Transportation Planning Organization (R2CTPO) and supported by the cities of Port Orange and New Smyrna Beach, as well as Volusia County. The current PD&E phase of the project conforms to the National Environmental Policy Act (NEPA) approval process and is part of an extensive transportation planning effort that includes the following previous studies:

- Interstate 95 and Pioneer Trail Interchange Justification Report (IJR) [May 2017]
- I-95 Systems Operational Analysis Report (SOAR) [November 2005, August 2016]
- I-95 Sketch Interstate Plan (SIP) [March 2010]
- SR 421/I-95 Interchange Analysis [January 2009]
- Final Pioneer Trail Feasibility Study [November 2005]

The interchange access request documenting engineering and operational acceptability, recommendation of the preferred alternative and opening year funding plan was submitted in the Interstate 95 and Pioneer Trail IJR and received FHWA approval in May 2017.

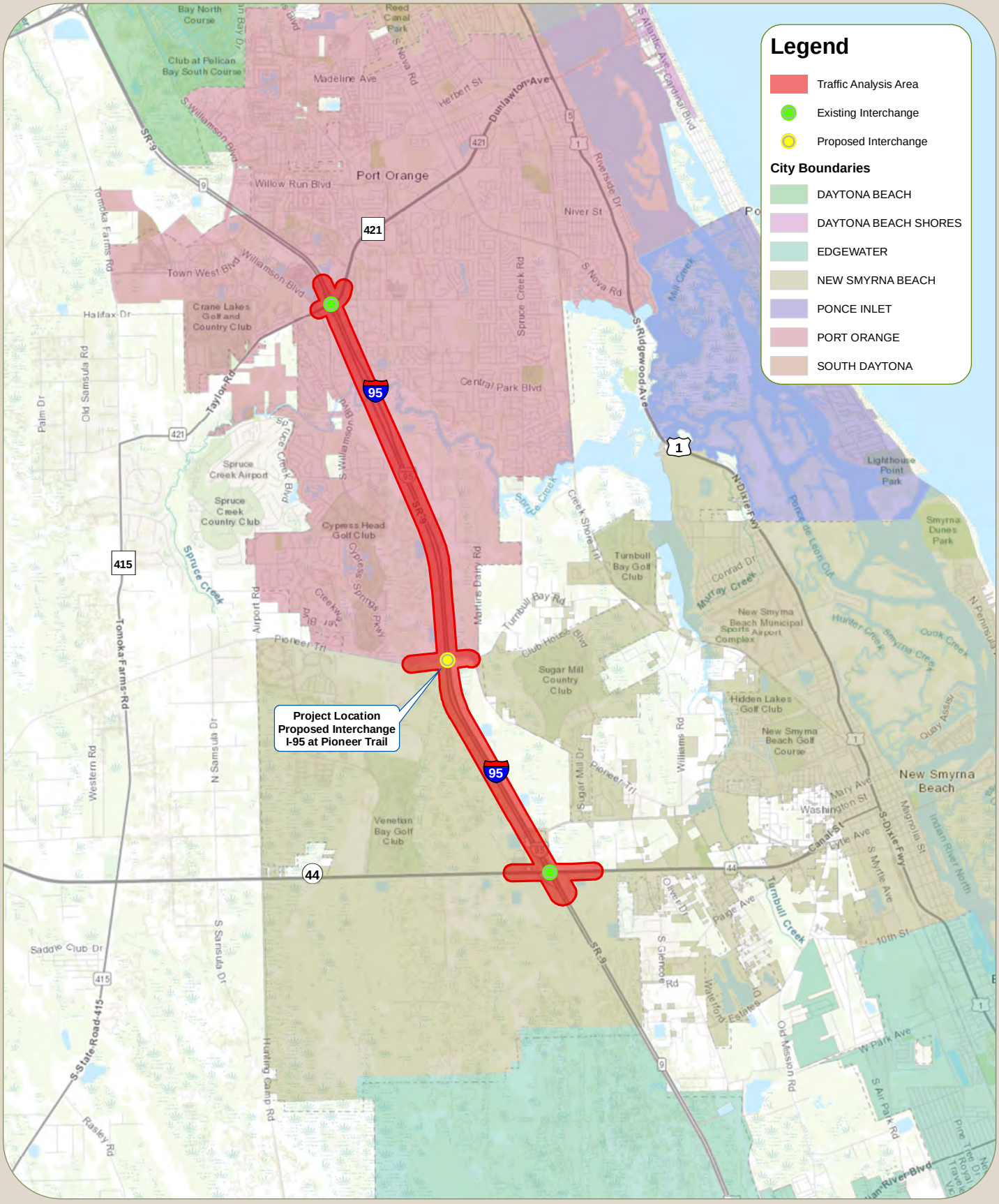
1.2 Project Description

The current PD&E study evaluates roadway and interchange alternatives associated with the proposed new interchange at Interstate 95 and Pioneer Trail. The project traffic analysis area as depicted in **Figure 2** includes the Area of Influence (AOI) identified along the I-95 mainline and the following interchange entry/exit ramp terminals and study intersections:

- SR 421 and Williamson Boulevard
- SR 421 and I-95 Southbound
- SR 421 and I-95 Northbound
- SR 421 and Taylor Branch Road
- Pioneer Trail and Williamson Boulevard
- I-95 and Pioneer Trail (proposed interchange)
- Pioneer Trail and Turnbull Bay Road
- SR 44 and Williamson Boulevard
- SR 44 and I-95 Southbound
- SR 44 and I-95 Northbound
- SR 44 and Sugar Mill Drive

1.3 Purpose and Need

The proposed I-95 at Pioneer Trail interchange is intended to reduce traffic congestion, enhance regional mobility, and provide a viable alternative for emergency evacuations for this area in southern Volusia County. Additionally, the new interchange is anticipated to enhance economic development opportunities throughout this area.



PROJECT LOCATION MAP

I-95 Interchange at Pioneer Trail PD&E Study

Williamson Boulevard to Turnbull Bay Road

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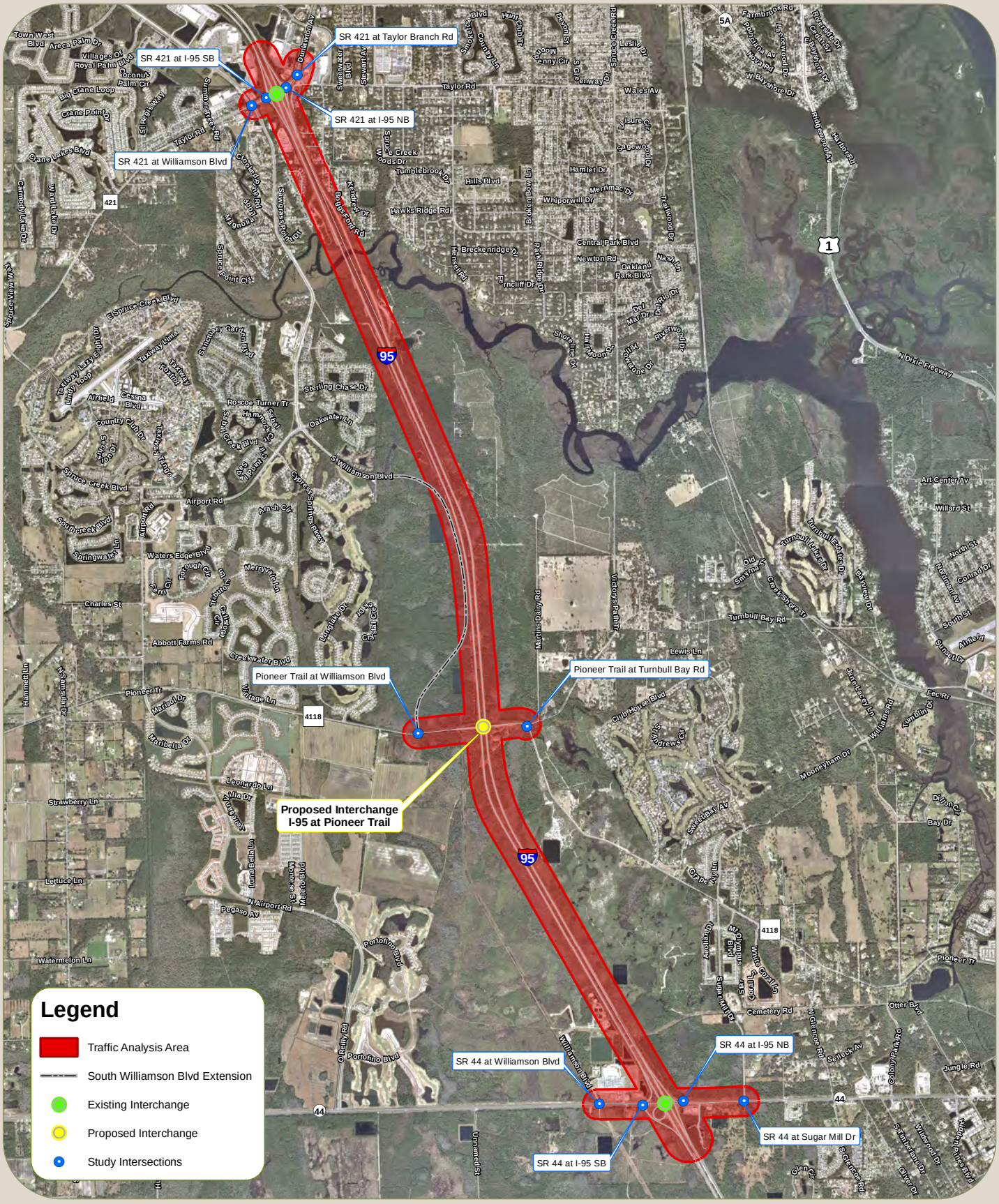


TRAFFIC ANAYLSIS AREA MAP

1.3.1 Traffic Congestion

Within Volusia County and the cities of Port Orange and New Smyrna Beach, a significant number of development plans have already been identified. This growth will place a burden on the regional roadway system including the adjacent interchanges of SR 421 and SR 44. SR 421 to the north is currently operating at or near capacity with extended queues during the peak hours and is constrained in terms of possible improvements to the existing configuration. The SR 44 interchange to the south is identified as one of the highest crash locations in Volusia County. The new interchange at Pioneer Trail is an ideal location to provide relief to the existing operation conditions at the SR 421 interchange and serve as an alternative to the SR 44 interchange in the future.

1.3.2 Regional Transportation Need

The I-95 at Pioneer Trail interchange has a long history of being identified as a regional transportation need. It was included in the 2025 Cost Feasible Roadway projects and the 2035 Needs Plan of the Volusia County Long Range Transportation Plan (LRTP). The proposed interchange was also identified in the 2040 River-to-Sea LRTP SIS Needs Plan.

Several previously conducted studies demonstrated the importance and need for the Pioneer Trail interchange.

- The “Pioneer Trail Feasibility Study” conducted in 2005 concluded that the proposed interchange at Pioneer Trail would serve the regional trips and would not have adverse impacts on mainline operations. The new interchange would alleviate traffic on the adjacent interchanges.
- The “SR 421/I-95 Interchange Analysis” study conducted by the City of Port Orange in 2009 studied the Pioneer Trail interchange as part of an alternate corridor evaluation and concluded that the Pioneer Trail interchange would provide relief to the critical SR 421 interchange.
- The April 2017 “I-95 at Pioneer Trail Interchange Justification Report” determined that not only would the interchange reduce congestion through the SR 421 interchange area, it would also support the economic vitality and approved future development of the area.

1.3.3 Emergency Evacuation

Pioneer Trail contributes to the regional network and provides direct and indirect connections to all of the major arterials in the surrounding area. This includes SR 421 to the north, US 1 to the east, SR 44 to the south, Tomoka Farms Road to the west, and I-4 using SR 44 to the west. An interchange at Pioneer Trail would provide easily accessible interchange termini and improved evacuation capacity to the area. This additional access has the potential to save valuable time for evacuating residents by providing additional access to the interstate system.

1.3.4 Economic Development

The County’s long-term planning and commitment for development on the west side of the City of Port Orange is evident with the socioeconomic data identified in the 2040 LRTP and development projects in the City of Port Orange and New Smyrna Beach future land use plans. The increased access provided by a proposed Pioneer Trail interchange would greatly improve the economic development potential of the entire Pioneer Trail corridor.

2.0 ANALYSIS METHODOLOGY

This Project Traffic Analysis Report (PTAR) was prepared in accordance with Part 2, Chapter 2 of the FDOT PD&E Manual pursuant to 23 United States Code (U.S.C.) 327 and documents the assumptions, methodology, traffic forecasts, design traffic, and traffic operational and safety analyses of the proposed project alternatives.

The required traffic data for this study was obtained from the FDOT 2017 Florida Traffic Information database and supplemented by field data collection conducted in April 2018. Consistent with approved methodologies, this PTAR was conducted using guidelines in the FDOT *Traffic Analysis Handbook (2014)* and FDOT *Project Traffic Forecasting Handbook (2014)*. Traffic operations were evaluated for the following analysis years:

- Existing year 2018
- Opening year 2025
- Design year 2045

The future years analyses were conducted for no-build conditions as well as for the preferred build alternatives that were identified in the previously approved *Interstate 95 and Pioneer Trail Interchange Justification Report (May 2017)*. The traffic analysis tools for evaluating freeway, ramps, and intersections are based on the Highway Capacity Manual and utilizing the following software:

- Highway Capacity Software Version 7
- Synchro Version 10.1

Performance Measures of Effectiveness (MOEs) such as delay, Level of Service (LOS), v/c ratio, speed, density, and queue length obtained from SYNCHRO and Highway Capacity Software (HCS) were used to assess operations. LOS criteria for State Highway System (SHS) projects is based on FDOT LOS policy (FDOT procedure No. 000-525-006-c) and the adopted LOS in the Volusia County Comprehensive Plan as shown in **Table 1**.

Table 1: Adopted Level of Service (LOS) Criteria

Location	Mainline/Roadway	Ramps/Intersections
I-95	D	D
SR 421	D	D
SR 44	D	D
Pioneer Trail	E	E

3.0 EXISTING CONDITIONS

3.1 Data Collection

Field reviews, traffic counts, database and document research and desktop analyses were completed as part of the data collection process. Data collection included identifying existing roadway, interchange and intersection configurations and vehicular traffic volumes throughout the I-95 and Pioneer Trail PD&E study area.

3.1.1 Existing Roadway Network

The I-95 Interchange at Pioneer Trail PD&E study area is designated by FDOT as within the Urban Boundary of Volusia County. The traffic analysis area, previously shown in **Figure 2**, extends for approximately seven miles along the I-95 corridor from south of SR 44 to north of SR 421. The crossroads along the interstate include SR 44 from Williamson Boulevard to Sugar Mill Drive, Pioneer Trail from Williamson Boulevard to Turnbull Bay Road and SR 421 from Williamson Boulevard to Taylor Branch Road.

Interstate 95 (I-95)

I-95 is an SIS corridor and functionally classified as an urban principal arterial-interstate. Within the study area, I-95 is a six-lane limited access facility that has three 12-foot travel lanes with paved inside and outside shoulders in each direction separated by a varying width vegetative median. I-95 has a southeast to northwest alignment and a posted speed limit of 70 miles per hour (mph) in the project study area.

State Road 44 (SR 44)

SR 44 is functionally classified as an urban principal arterial-other. Within the study area, SR 44 is a four-lane roadway that has two 12-foot travel lanes with 2- to 4-foot paved inside and outside shoulders in each direction separated by a 40-foot vegetative median. SR 44 has an east/west alignment and a posted speed limit of 55 mph in the project study area; west of Williamson Boulevard, the speed limit increases to 65 mph.

State Road 421 (SR 421)

SR 421 is functionally classified as an urban principal arterial-other. Within the study area, SR 421 has a five-lane cross-section with three 12-foot eastbound lanes and two 12-foot westbound lanes with a concrete traffic separator west of I-95 and a vegetative median east of I-95. SR 421 follows a southwest to northeast alignment and has a posted speed limit of 45 mph in the project study area.

Pioneer Trail (County Road 4118)

Pioneer Trail is a county-maintained roadway that is functionally classified as an urban major collector. Within the study area, Pioneer Trail is a two-lane undivided roadway that has an east/west alignment and posted speed limit of 45 mph west of Turnbull Bay Road. At the junction of Turnbull Bay Road, Pioneer Trail turns the bend and follows a northwest to southeast alignment with a decreased speed limit of 40 mph. Turnbull Bay Road continues to the east of the junction with a posted speed limit of 30 mph; it is considered an urban major collector in this vicinity.

Williamson Boulevard (County Road 4009)

Williamson Boulevard is a county-maintained roadway that is functionally classified as an urban principal arterial-other. Within the study area, Williamson Boulevard is a four-lane divided roadway that generally follows a north/south alignment that parallels the west side of I-95. The posted speed limit is 35 mph near SR 421 and increases to 45 mph south of Airport Road. The road is discontinuous in the project study area, extending from north of SR 421 and terminating at Pioneer Trail. Near the south end of the study area, Williamson Boulevard extends from approximately one-half mile north of SR 44 to just south of SR 44, providing access to recently developed commercial properties.

I-95 and SR 44 Interchange

The I-95 and SR 44 interchange is a diamond interchange with a loop ramp in the southwest quadrant. The southbound exit ramp to SR 44 westbound is STOP-controlled while the southbound loop exit ramp to SR 44 eastbound is under YIELD control. The I-95 northbound ramp terminal is under signal control. All connections to the interstate are through single-lane entry/exit ramps.

I-95 and SR 421 Interchange

The I-95 and SR 421 interchange is a diamond interchange with single-lane entry/exit ramps providing access to and from the interstate. Both northbound and southbound ramp terminals are signalized.

3.1.2 Existing Traffic Volumes

The existing traffic volumes are utilized to conduct existing traffic operational analysis and in development of design traffic for future years. Existing volumes were available from historical data published by FDOT Traffic Online (2017) and additional traffic counts conducted at key study area roadways and intersections in April 2018. The FDOT data and field data collection sheets are included in Appendix A-1; 2018 field count locations are as follows.

72-hour bi-directional vehicular volume counts were collected along the study roadways at the following locations:

- Williamson Boulevard, North of Taylor Road
- Taylor Road, West of Williamson Boulevard
- Williamson Boulevard, South of Dunlawton Avenue
- Taylor Road, between Williamson Boulevard and I-95
- Dunlawton Avenue, between I-95 Northbound Ramps and Southbound Ramps
- Dunlawton Avenue, East of I-95 Northbound Ramps
- I-95 Southbound Off-Ramp to Taylor Branch Road
- I-95 Southbound On-Ramp, South of Dunlawton Avenue
- I-95 Northbound On-Ramp, North of Dunlawton Avenue
- I-95 Northbound Off-Ramp to Dunlawton Avenue
- Taylor Branch Road, South of Dunlawton Avenue
- Williamson Boulevard, North of Pioneer Trail
- Pioneer Trail, West of Williamson Boulevard
- Turnbull Bay Road, North of Pioneer Trail
- Pioneer Trail, South of Turnbull Bay
- Williamson Boulevard, N, of SR 44
- SR 44, East of Williamson Boulevard
- SR 44, between Northbound and Southbound Ramps
- SR 44, West of Sugar Mill Drive
- SR 44, East of Sugar Mill Drive
- I-95 Southbound Off-Ramp to SR 44
- I-95 Southbound On-Ramp, South of SR 44
- I-95 Northbound On-Ramp, North of SR 44
- I-95 Northbound Off-Ramp to SR 44
- Sugar Mill Drive, North of SR 44
- Racetrac Gas Station Entrance/Exit, South of SR 44
- I-95 Southbound Off-Ramp to SR 44 EB

72-hour bi-directional vehicle classification counts were collected along the following study roadways:

- Dunlawton Avenue, East of Taylor Branch Road
- Pioneer Trail, East of I-95 overpass
- SR 44, West of Williamson Boulevard

Four-hour vehicle turning movement counts were collected between the hours of 7:00-9:00 AM and 4:00-6:00 PM at the following study intersections:

- SR 44 and Williamson Boulevard/Ocean Gate Boulevard
- SR 44 and I-95 Southbound Ramps
- SR 44 and I-95 Northbound Ramps
- SR 44 and Sugar Mill Drive
- Pioneer Trail and Williamson Boulevard
- Pioneer Trail and Turnbull Bay Road
- SR 421 (Dunlawton Avenue/Taylor Road) and Williamson Boulevard
- SR 421 and I-95 Southbound Ramps
- SR 421 and I-95 Northbound Ramps
- SR 421 and Taylor Branch Road

The 72-hour volume and classification counts were converted to Annual Average Daily Traffic (AADT) volumes using FDOT 2017 seasonal and axle factors for Volusia County provided in Appendix A-2. The resulting existing daily traffic volumes are summarized in **Table 2** and depicted in **Figure 3**. The selected AADT used for the 2018 existing analysis are from the 2018 data collection for all roadways except for I-95, which utilized the FDOT 2017 Florida Traffic Online data.

Existing peak hour directional volumes along the I-95 mainline were developed using hourly volume counts and adjusting them for ramp entry and exit volumes to obtain a balanced flow along the mainline. Similarly, the peak hour volumes along the east/west roadways of SR 44, Pioneer Trail and SR 421 were developed using the intersection turning movement counts adjusted to obtain balanced traffic flow between the study intersections. The resulting existing peak hour roadway traffic volumes are depicted in **Figure 4** and the intersection turning movement volumes are depicted in **Figure 5A** and **Figure 5B**.

3.1.3 Design Traffic Factors

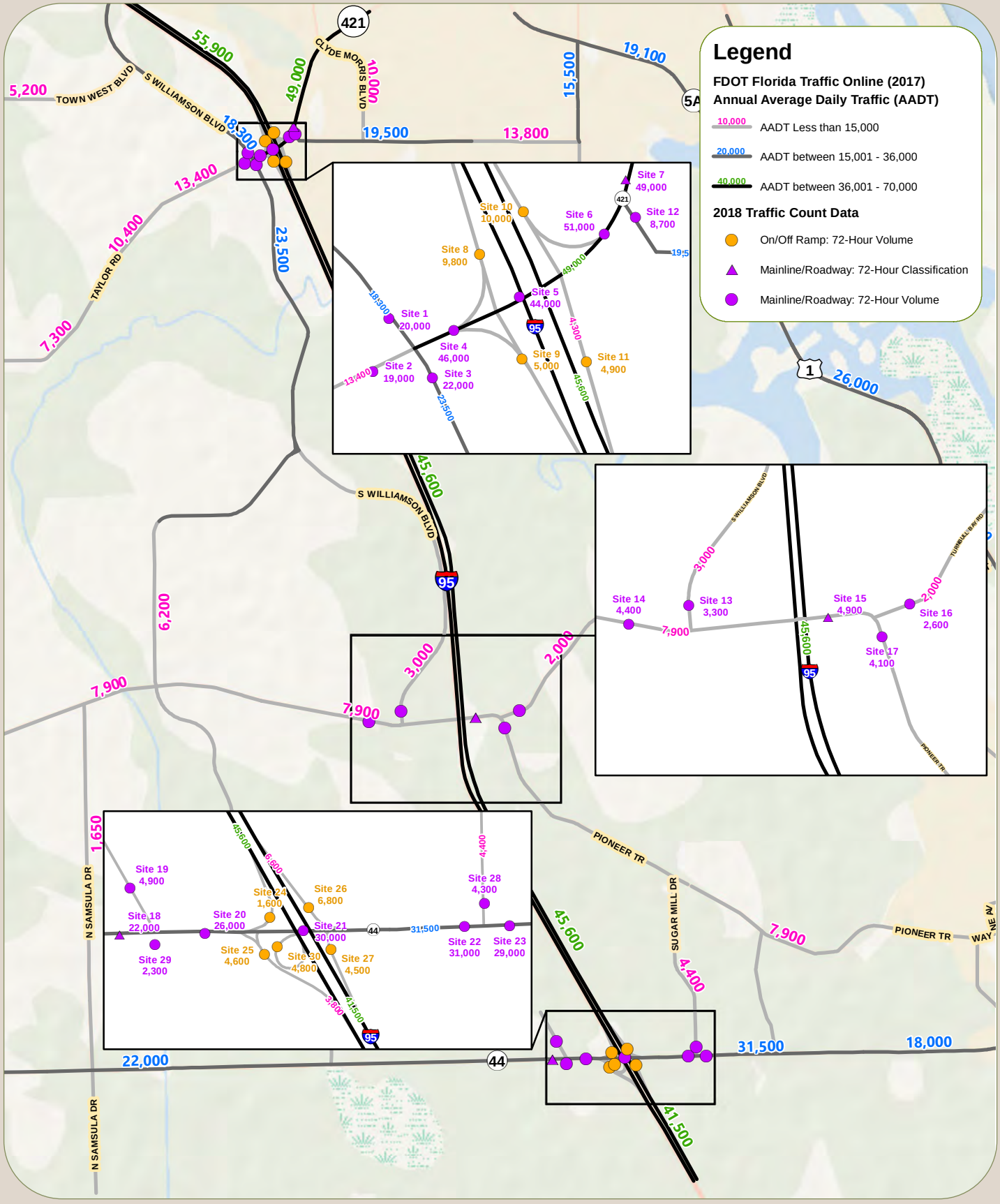
Design traffic factors K, D and T are used to determine design hour traffic volumes along the project study area roadways. The design hour factor, K, is the ratio of the AADT that occurs during the design hour for the design year. The Directional Distribution factor, D, is the percentage of the total, two-way design hour traffic traveling in the peak direction. The daily truck volume is determined by the T factor, the percentage of trucks using a roadway in one day.

Traffic factors for the I-95 Interchange at Pioneer Trail PD&E study area were developed utilizing historical traffic data and current field data collection. The Standard K factor of 9.0 for freeways, arterials and highways in urbanized areas was used per the FDOT 2014 Project Traffic Forecasting Handbook (PTF). The directional distribution factors (D) and truck factors (T) were computed using data from the FDOT Florida Traffic Information (2017) database for I-95, SR 421 and SR 44. The D and T factors for Pioneer Trail were computed based on traffic counts conducted in 2018. The D values listed in the table are within the acceptable range of demand D values as recommended in the PTF.

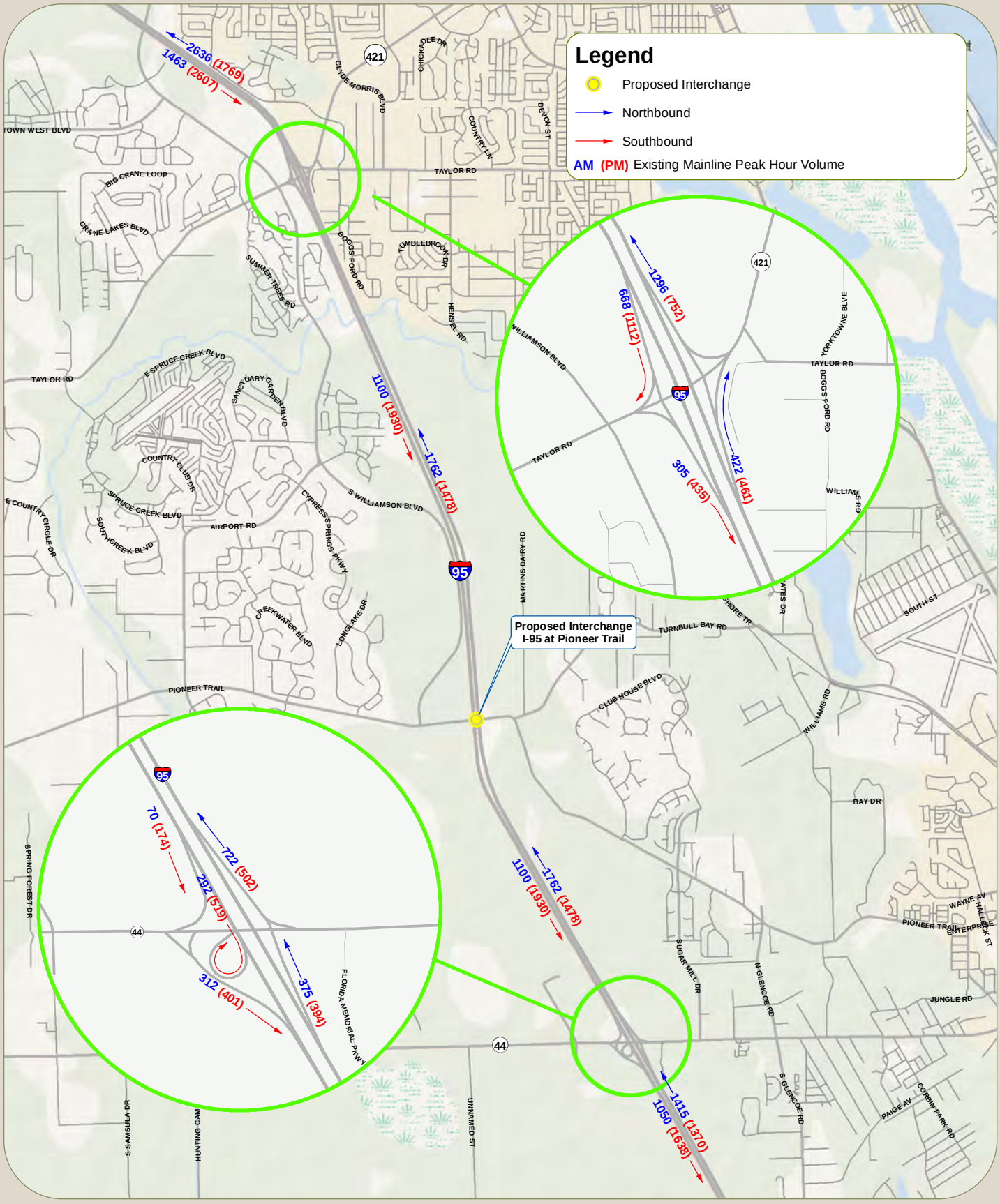
The T factor (daily truck %) used for I-95 for the existing conditions operational analysis was based on the 2017 T value of 10.10%. Although the PTF Handbook suggests that the truck percentage is usually assumed to be constant over time, the T% for 2017 was not deemed to be reflective of the historical T for this segment of I-95. A review of the historical 10-year traffic data for this project area showed that T was 13.5% or greater

Table 2: Existing Traffic Count Data Summary

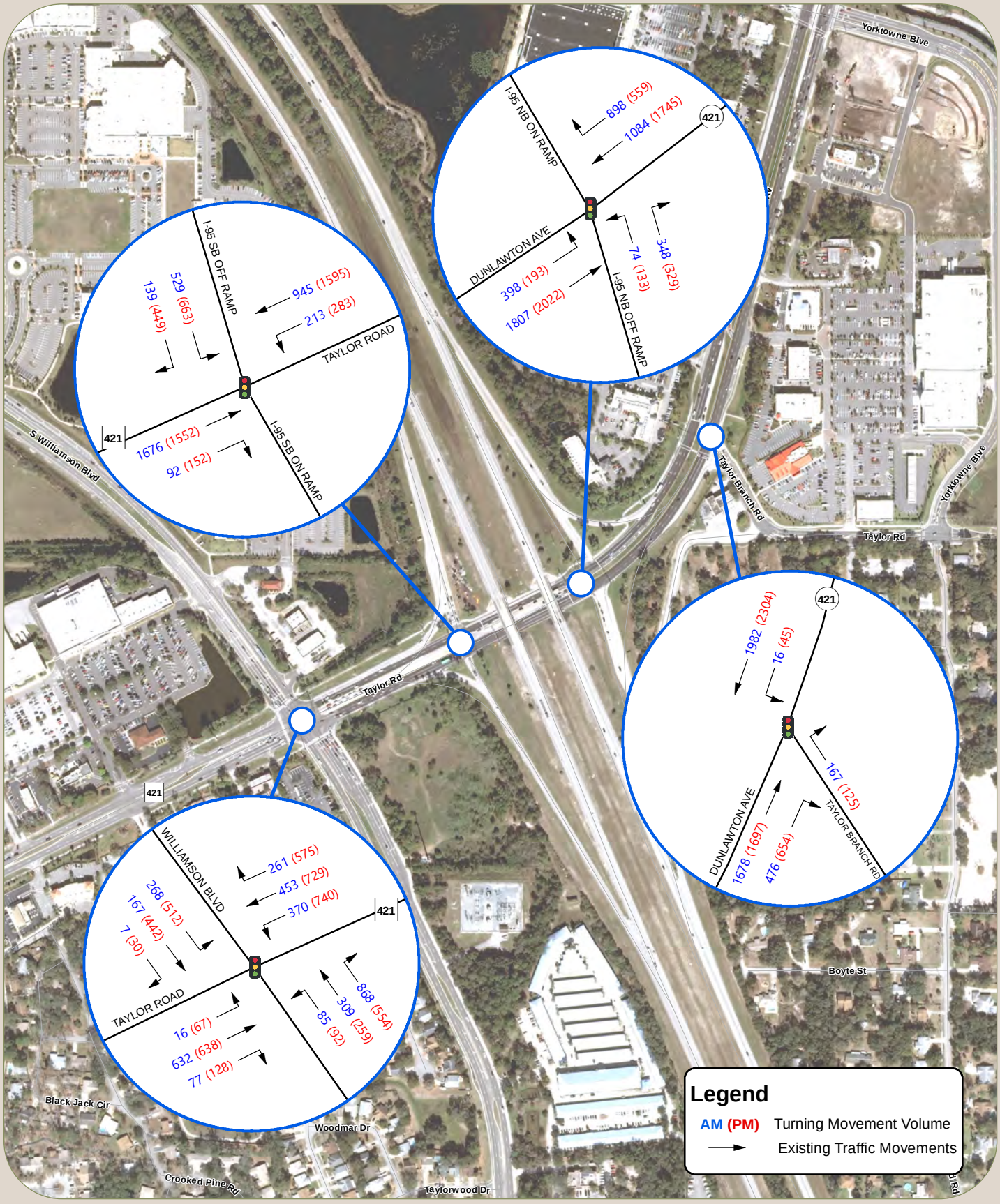
Site Number	Location Description	Type of Count	Count Begin Date	Average Daily Traffic	Seasonal Factor Adjustment	Weekly Axle Factor Adjustment	AADT	T Factor (%)
Site #1	Williamson Blvd, N. of Taylor Road	72-Hour Volume	04/24/18	20,271	0.98	0.99	20,000	-
Site #2	Taylor Road, W. of Williamson Blvd	72-Hour Volume	04/24/18	19,440	0.98	0.98	19,000	-
Site #3	Williamson Blvd, S. of Dunlawton Avenue	72-Hour Volume	04/10/18	22,569	0.97	0.99	22,000	-
Site #4	Taylor Road, between Williamson Blvd and I-95	72-Hour Volume	04/10/18	47,877	0.97	0.98	46,000	-
Site #5	Dunlawton Avenue, between I-95 NB Ramps and SB Ramps	72-Hour Volume	04/17/18	46,747	0.97	0.98	44,000	-
Site #6	Dunlawton Avenue, E. of I-95 NB Ramps	72-Hour Volume	04/10/18	53,271	0.97	0.98	51,000	-
Site #7	Dunlawton Avenue, E. of Taylor Branch Road	72-Hour Classification	04/24/18	49,965	0.98	-	49,000	4.7
Site #8	I-95 SB Off-Ramp to Taylor Branch Road	72-Hour Volume	04/10/18	10,255	0.97	0.99	9,800	-
Site #9	I-95 SB On-Ramp, S. of Dunlawton Avenue	72-Hour Volume	04/17/18	5,226	0.97	0.99	5,000	-
Site #10	I-95 NB On-Ramp, N. of Dunlawton Avenue	72-Hour Volume	04/10/18	10,918	0.97	0.99	10,000	-
Site #11	I-95 NB Off-Ramp to Dunlawton Avenue	72-Hour Volume	04/10/18	5,152	0.97	0.99	4,900	-
Site #12	Taylor Branch Road, S. of Dunlawton Avenue	72-Hour Volume	04/10/18	9,023	0.97	0.99	8,700	-
Site #13	Williamson Blvd, N. of Pioneer Trail	72-Hour Volume	04/17/18	3,453	0.97	0.99	3,300	-
Site #14	Pioneer Trail, W. of Williamson Blvd	72-Hour Volume	04/24/18	4,564	0.98	0.99	4,400	-
Site #15	Pioneer Trail, E. of I-95 overpass	72-Hour Classification	04/10/18	5,064	0.97	-	4,900	3.9
Site #16	Turnbull Bay Road, N. of Pioneer Trail	72-Hour Volume	04/24/18	2,686	0.98	0.99	2,600	-
Site #17	Pioneer Trail, S. of Turnbull Bay	72-Hour Volume	04/10/18	4,240	0.97	0.99	4,100	-
Site #18	State Road 44, W. of Williamson Blvd	72-Hour Classification	04/17/18	23,177	0.97	-	22,000	5.5
Site #19	Williamson Blvd, N, of State Road 44	72-Hour Volume	04/10/18	5,096	0.97	0.99	4,900	-
Site #20	State Road 44, E. of Williamson Blvd	72-Hour Volume	04/10/18	28,161	0.97	0.95	26,000	-
Site #21	State Road 44, between NB & SB Ramps	72-Hour Volume	04/17/18	30,789	0.97	0.99	30,000	-
Site #22	State Road 44, W. of Sugar Mill Drive	72-Hour Volume	04/10/18	32,814	0.97	0.98	31,000	-
Site #23	State Road 44, E. of Sugar Mill Drive	72-Hour Volume	04/10/18	30,700	0.97	0.98	29,000	-
Site #24	I-95 SB Off-Ramp to State Road 44	72-Hour Volume	04/10/18	1,653	0.97	0.99	1,600	-
Site #25	I-95 SB On-Ramp, S. of State Road 44	72-Hour Volume	04/10/18	4,792	0.97	0.99	4,600	-
Site #26	I-95 NB On-Ramp, N. of State Road 44	72-Hour Volume	04/10/18	7,105	0.97	0.99	6,800	-
Site #27	I-95 NB Off-Ramp to State Road 44	72-Hour Volume	04/10/18	4,699	0.97	0.99	4,500	-
Site #28	Sugar Mill Drive, N. of State Road 44	72-Hour Volume	04/10/18	4,507	0.97	0.99	4,300	-
Site #29	Racetrac Gas Station Entrance/Exit, S. of State Road 44	72-Hour Volume	04/10/18	2,365	0.97	0.99	2,300	-
Site #30	I-95 SB Off-Ramp to State Road 44 EB	72-Hour Volume	04/10/18	4,951	0.97	0.99	4,800	-



EXISTING ANNUAL AVERAGE DAILY TRAFFIC MAP



EXISTING AM & PM PEAK HOUR MAINLINE VOLUMES



EXISTING AM & PM PEAK HOUR TURNING MOVEMENT VOLUMES
SR 421

I-95 Interchange at Pioneer Trail PD&E Study

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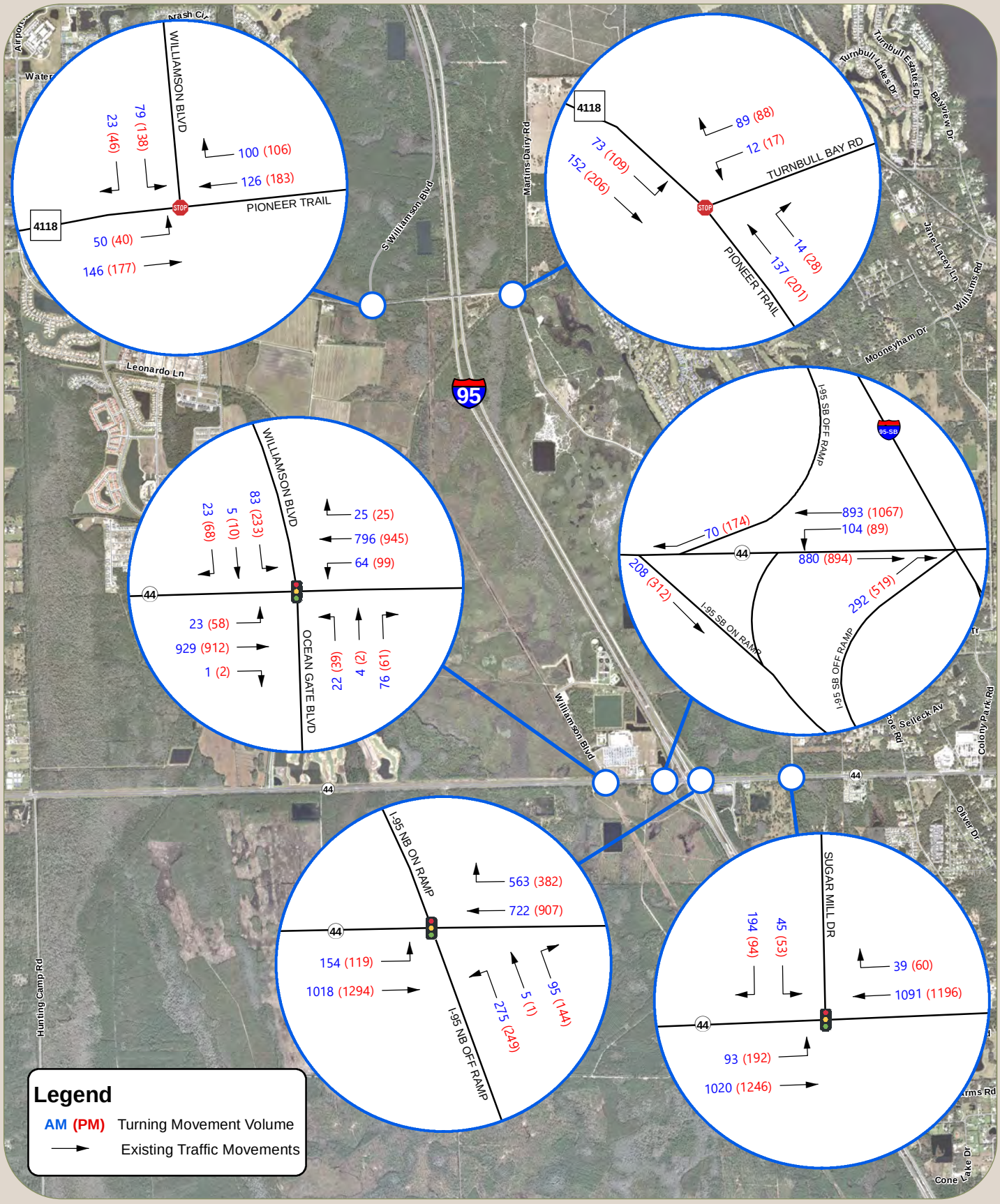


EXISTING AM & PM PEAK HOUR TURNING MOVEMENT VOLUMES
PIONEER TRAIL & SR 44

for all years preceding 2017, except for 2015-2016 which had a sharp decline (T=6.3% in 2016). This decrease may have been attributable to the I-95 four-to-six lane reconstruction/ widening project that began in late 2015 and continued through Fall 2017. Therefore, a T factor of 13.02%, calculated using the 10-year average from 2008-2017, was used for the future years operational analysis. The higher T% for future years analysis is consistent with the historical T values prior to the I-95 reconstruction.

For traffic analysis of the peak hour, the T_f factor, which is the percentage of truck traffic during the peak hour, is used. T_f values were computed by dividing T by two to derive the truck percentage during the peak hour. T_f values used for the I-95 freeway peak hour operations analysis were: 5.1% for existing year (2018) and 6.5% for future year (2025 and 2045) no-build and build scenarios. The data from the FDOT 2017 Historical AADT Report and corresponding D and T computations are provided in Appendix A-2. **Table 3** provides the design traffic factors approved by FDOT for this project.

Table 3: Design Traffic Factors

Roadway	K	D	T	T_f
I-95	9.0	55.00%	13.00%	6.50%
SR 421	9.0	61.00%	3.70%	1.90%
SR 44	9.0	61.00%	7.40%	3.70%
Pioneer Trail	9.0	55.80%	3.90%	2.00%
Source: FDOT 2017 Historical AADT Report & Existing Traffic Counts				

3.2 Existing Traffic Operational Analysis

The existing AM and PM peak hour balanced traffic volumes were utilized to conduct existing traffic operational analysis. Level of service (LOS) for intersections and arterials was computed using SYNCHRO, Version 10.1 software. The signalized and unsignalized intersection methodologies from the Highway Capacity Manual, 6th Edition were used to determine Level of Service (LOS) and delay for the study intersections. Traffic signal timing plans were provided by Volusia County Traffic Engineering and are included in Appendix A-3.

LOS for a signalized intersection is determined by the weighted average control delay for the entire intersection with LOS A (≤10 sec/veh) representing free flow conditions and LOS F (>80 sec/veh) representing congestion and failing operations. Similarly, unsignalized intersection LOS for all-way stops is based on the weighted average control delay of the overall intersection or of each approach. For two-way stop-control, the HCM methodology reports average control delay of the major street left turns and each minor street movement. A delay in excess of 50 sec/veh signifies LOS F for unsignalized intersections.

Arterial LOS was determined using Synchro estimates of arterial speed which is a function of the travel time and signal spacing distance along the corridor.

LOS for freeway segments and ramp merge/diverge areas was computed using HCS. The key input parameters used in the existing conditions analyses are as follows:

- Peak Hour Factor (PHF): HCM urban default value 0.94 (I-95 mainline); field collected (intersections)
- Level terrain
- Base free flow speed: 75 mph

Based on the existing operational analysis, the majority of the freeway segments within the study area limits operate at LOS A during both peak hours. The I-95 northbound segment north of SR 421 operates at LOS B during the AM peak hour and the I-95 southbound segment north of SR 421 operates at LOS B during the PM peak hour. **Table 4** provides a summary of the existing operational analysis; Appendix B-1 contains the HCS

outputs. The existing analysis of the I-95 ramp merge and diverge areas within the study area limits shows that the majority of the ramp segments operate at LOS A during both peak hours, with a few ramps operating at LOS B. **Table 5** provides a summary of the existing operational analysis; Appendix B-1 contains the HCS outputs.

Table 4: Existing Peak Hour Freeway Level of Service Analysis

Freeway Segment	AM Peak Hour			PM Peak Hour		
	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS
I-95 Northbound						
South of SR 44	1,415	7.4	A	1,370	7.2	A
North of SR 44	1,762	8.9	A	1,478	7.5	A
North of SR 421	2,636	14.8	B	1,769	10.0	A
I-95 Southbound						
South of SR 44	1,050	5.6	A	1,638	8.8	A
North of SR 44	1,100	5.7	A	1,930	10.0	A
North of SR 421	1,463	8.2	A	2,607	14.7	B

Table 5: Existing Peak Hour Ramp Merge/Diverge Analysis

Ramp Segment		AM Peak Hour			PM Peak Hour		
	Ramp Type	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS
I-95 and SR 44 Interchange							
I-95 NB off ramp to SR 44	Diverge	375	10.6	B	394	10.3	B
I-95 NB on ramp from SR 44	Merge	722	9.7	A	502	7.6	A
I-95 SB off ramp to SR 44	Diverge	70	6.3	A	174	11.8	B
I-95 SB off ramp to SR 44 (loop ramp)	Diverge	292	3.1	A	519	8.3	A
I-95 SB on ramp from SR 44	Merge	312	3.6	A	401	6.9	A
I-95 and SR 421 Interchange							
I-95 NB off ramp to SR 421	Diverge	422	6.0	A	461	4.3	A
I-95 NB on ramp from SR 421	Merge	1,296	15.4	B	752	9.4	A
I-95 SB off ramp to SR 421	Diverge	668	5.2	A	1,112	13.2	B
I-95 SB on ramp from SR 421	Merge	305	4.7	A	435	9.4	A

All of the signalized intersections operate at LOS C or better during both peak hours except for the SR 421 and Williamson Boulevard intersection which operates at LOS E and LOS D during the AM and PM peak hours, respectively. The critical turning movements at the two unsignalized intersections on Pioneer Trail operate at LOS B during both peak hours**. Table 6** provides a summary of the existing operational analysis; Appendix B-2 contains the Synchro outputs.

Table 6: Existing Peak Hour Intersection Level of Service

Signalized Intersection	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
SR 421 and Williamson Boulevard	55.8	E	48.4	D
SR 421 and I-95 Southbound	20.1	C	30.7	C
SR 421 and I-95 Northbound	16.1	B	12.3	B
SR 421 and Taylor Branch Road	10.1	B	10.6	B
SR 44 and Williamson Boulevard	22.6	C	25.5	C
SR 44 and I-95 Northbound	22.4	C	17.3	B
SR 44 and Sugar Mill Drive	14.7	B	8.9	A
Unsignalized Intersection*	**Delay (sec/veh)**	**LOS**	**Delay (sec/veh)**	**LOS**
SR 44 and I-95 Southbound**	12.4	B	16.4	C
Pioneer Trail and Williamson Boulevard	12.3	B	14.5	B
Pioneer Trail and Turnbull Bay Road	12.7	B	14.5	B

*Unsignalized intersection delay/LOS reported for worst case movement (minor street left turn)

**Unsignalized intersection delay/LOS reported for southbound right; there is no left turn movement from off ramp

3.3 Historical Crash Analysis

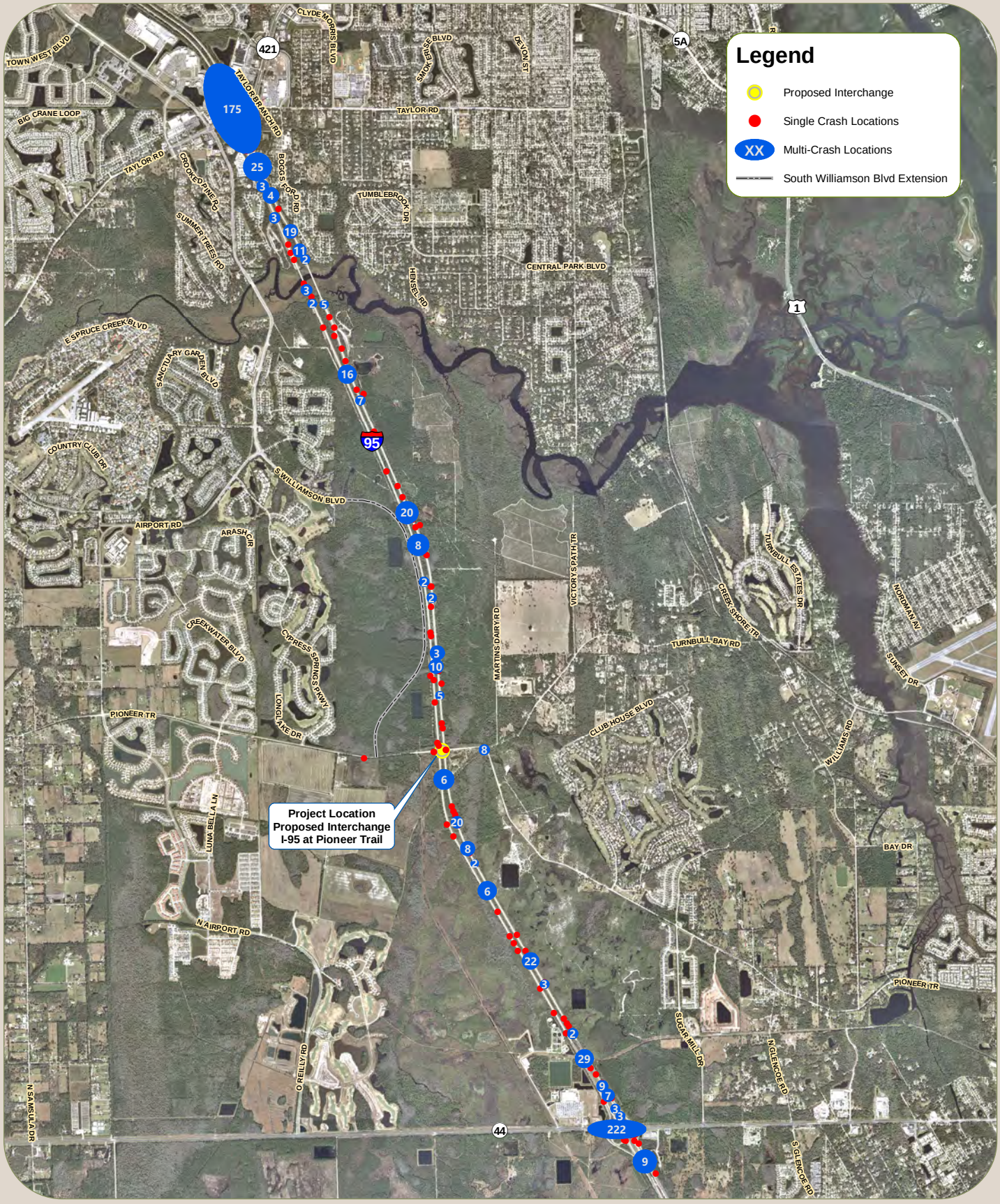
The crash data for the five-year period from January 2013 through December 2017 was downloaded from Signal Four Analytics for the Pioneer Trail corridor from west of Williamson Boulevard to Turnbull Bay Road and for the I-95 mainline from SR 44 to SR 421. The crash data includes collisions occurring at the two interchanges, ramps, and the crossroad segment within the interchanges. **Figure 6** depicts the locations of crashes within the project study area; the following sections provide detailed analysis of the crash data.

3.3.1 I-95 Mainline & Ramps Crash Data

During the most recent five-year period from 2013-2017, there was a total of 739 collisions along the I-95 mainline and existing interchanges within the study area, as shown in **Table 7.** As illustrated in **Figure 7**, the majority of the collision types were rear-end (238 crashes, 32%) and off-road (179 crashes, 24%). Sideswipes (87 crashes) and rollovers (82 crashes) accounted for 12% and 11% of total collisions, respectively.

Table 7: Existing Collision Type Summary (I-95 Mainline)

Crash Event Type	2013	2014	2015	2016	2017	Total
Angle		2		1		**3**
Animal		1	2	2		**5**
Head On	2		2	1		**5**
Left Turn	6	7	2	5	10	**30**
Off Road	32	32	45	33	37	**179**
Other	14	21	15	23	16	**89**
Pedestrian				1		**1**
Rear End	37	50	45	54	52	**238**
Right Turn		1		1	1	**3**
Rollover	17	23	23	16	3	**82**
Sideswipe	9	11	22	20	25	**87**
Unknown	2	4	4	3	4	**17**
Total	**119**	**152**	**160**	**160**	**148**	**739**



CRASH DATA MAP (2013 - 2017)

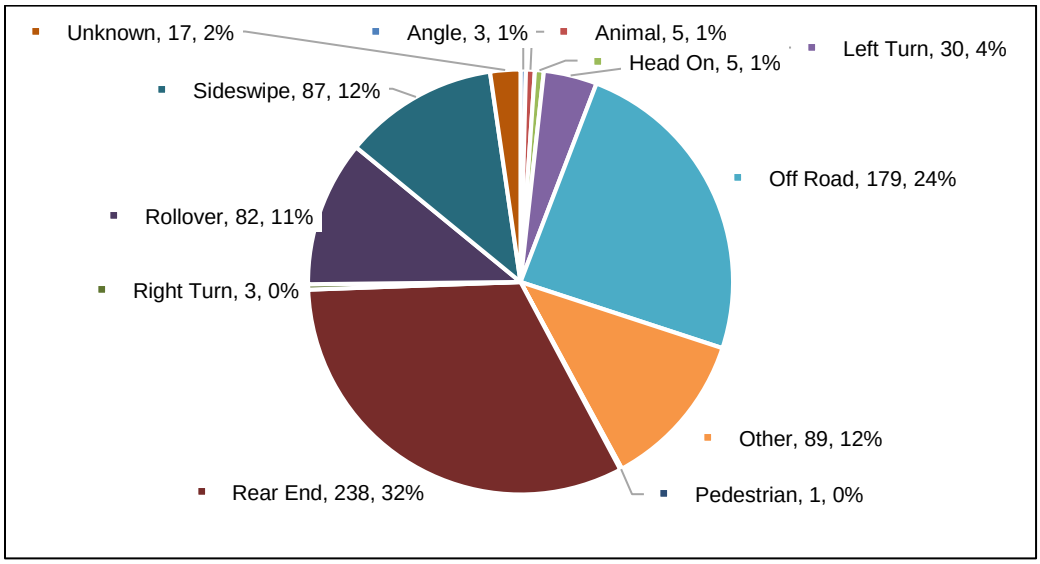


Figure 7: Existing Crash Type Distribution (I-95 Mainline)

Of the 739 collisions occurring along I-95 during the five-year period there were 471 property damage only collisions, 256 injury collisions with 379 injuries and 12 fatal collisions with 14 fatalities. Of the 12 fatal collisions, the majority (nine crashes) occurred between the SR 44 interchange and Pioneer Trail while three crashes occurred near the SR 421 interchange. Five of the fatal crashes involved vehicles running off-road, three were alcohol-related and the majority (6 crashes) occurred under daylight lighting conditions. **Table 8** provides a summary of the collisions by severity along I-95.

Table 8: Existing Collisions by Severity (I-95 Mainline)

Crash Severity	2013	2014	2015	2016	2017	Total
Fatal	2	1	3	3	3	12
Injury	38	70	46	52	50	256
Property Damage Only	79	81	111	105	95	471
Total	**119**	**152**	**160**	**160**	**148**	**739**

3.3.2 High Crash Roadway Segments

The FDOT high crash roadway segments list for the most recent five-year period (2011-2015) for which data has been compiled was reviewed. FDOT provided crash data for the cumulative 5-year period as well as individual years.

The I-95 segment within one-half mile in each direction of the existing I-95 and SR 421 (MP 23.300) interchange appears on the list for three of the five years with the actual crash rate nearly three to four times the average statewide crash rate for an urban interstate facility type. The I-95 and SR 44 (MP 16.287) interchange appears on the high crash segment list in 2015 with an actual crash rate of 3.702, approximately four times the average statewide crash rate of 0.906 for that year.

Along the crossroads in the study area, the SR 421 segment from west of Williamson Boulevard to the I-95 northbound off ramp appears on the high crash segment list for 2012 with a crash rate of 4.067, slightly double the average statewide crash rate for a suburban 6+ lane, 2-way divided facility. The SR 44 segment

between Williamson Boulevard and Sugar Mill Drive appears on the list for each year from 2012-2015 with crash rates two to three times the average statewide crash rate for a suburban 4-5 lane, 2-way divided facility. **Table 9** provides a summary of the historical high crash segment locations by year and compares the segment's average crash rate to the *statewide* average crash rate for each facility type within the project study area. **Table 10** provides a summary of the historical high crash segment locations for the cumulative 5-year period and compares the segment's average crash rate to the *districtwide* average crash rate for each facility type within the project study area.

Table 9: High Crash Roadway Segments by Year

Year	Begin Milepost	End Milepost	Total Number of Crashes	ADT	Crash Rate	Average Statewide Crash Rate
I-95 Mainline (Urban Interstate)						
2011	22.202	22.502	9	36,598	2.246	0.472
2012	22.202	22.602	8	36,921	1.484	0.519
	23.402	23.702	8	42,499	1.719	
2013	22.202	22.602	13	36,601	2.433	0.723
	23.602	23.802	9	45,000	2.740	
2014	22.302	22.602	10	37,724	2.41	0.854
	24.302	24.402	9	46,500	5.303	
2015	16.402	16.702	15	37,005	3.702	0.906
	23.302	23.702	21	46,372	3.102	
SR 421 (Suburban 6+ Lane, 2-way divided)						
2012	0.00	0.28	16	38,496	4.067	1.942
SR 44 (Suburban 4-5 Lane, 2-way divided)						
2012	25.094	25.394	11	27,149	3.700	1.287
2013	24.694	25.394	27	23,177	4.559	1.566
2014	25.094	25.294	10	27,096	5.056	1.544
	25.494	25.794	10	27,499	3.321	
2015	25.094	25.294	8	28,128	3.896	1.651

Table 10: High Crash Roadway Segments (5-Year)

Year	Begin Milepost	End Milepost	Total Number of Crashes	ADT	Crash Rate	Average Districtwide Crash Rate
I-95 Mainline (Urban Interstate)						
	16.402	16.502	12	36,970	1.778	0.704
2011 - 2015	16.802	16.902	13	36,970	1.926	
	17.302	17.402	17	36,970	2.519	
	18.302	18.402	18	36,970	2.667	
	22.202	22.602	46	36,970	1.704	
	23.302	23.802	74	44,492	1.822	
SR 44 (Suburban 4-5 Lane, 2-way divided)						
2011 - 2015	24.694	24.994	22	17,099	2.349	1.442
	24.994	25.394	62	24,838	3.419	

3.3.3 Pioneer Trail Crash Data

During the most recent five-year period from 2013-2017, there was a total of 11 collisions along Pioneer Trail between Williamson Boulevard and Turnbull Bay Road, as shown in **Table 11**. As illustrated in **Figure 8**, the majority of collision types were off-road (4 crashes, 37%).

Table 11: Existing Collision Type Summary (Pioneer Trail)

Crash Event Type	2013	2014	2015	2016	2017	Total
Angle			1			**1**
Off Road	1	1	1		1	**4**
Other				2	1	**3**
Pedestrian				1		**1**
Rollover			1			**1**
Sideswipe				1		**1**
Total	**1**	**1**	**3**	**4**	**2**	**11**

Of the 11 collisions occurring along Pioneer Trail during the five-year period there were five injury collisions with six injuries, no fatalities and six property damage only collisions resulting in an estimated $55,400 in damages. The majority of the collisions (7 crashes) occurred under dark-not lighted conditions and clear weather conditions (8 crashes). **Table 12** provides a summary of the collisions by severity along Pioneer Trail.

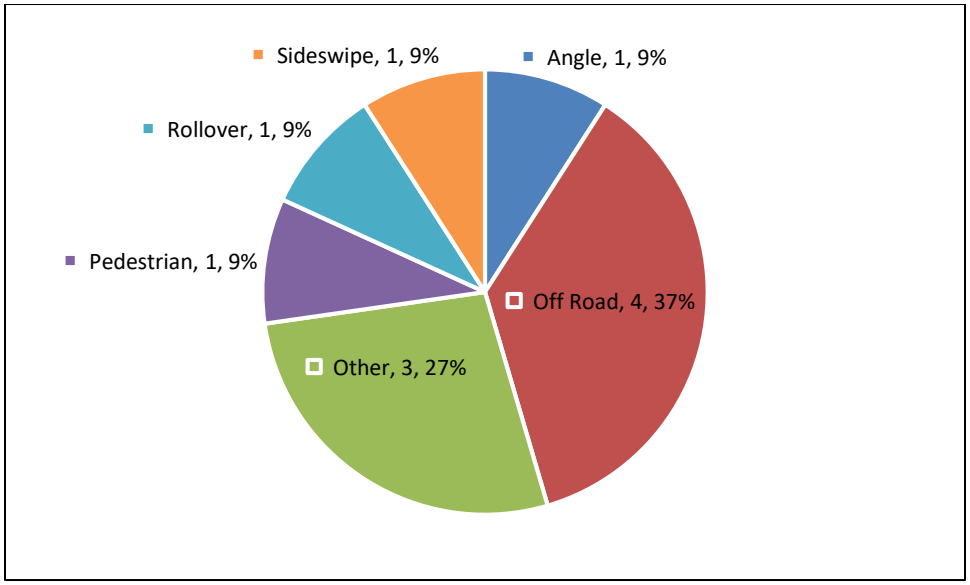


Figure 8: Existing Crash Type Distribution (Pioneer Trail)

Table 12: Existing Collisions by Severity (Pioneer Trail)

Crash Severity	2013	2014	2015	2016	2017	Total
Injury	1	1	1	1	1	5
Property Damage Only			2	3	1	6
Total	**1**	**1**	**3**	**4**	**2**	**11**

4.0 FUTURE CONDITIONS AND ALTERNATIVE ANALYSIS

4.1 Future Year Traffic Forecast

The development of future traffic was based on procedures identified in the FDOT 2014 Project Traffic Forecasting Handbook. The Central Florida Regional Planning Model (CFRPM) is the travel demand model utilized in Volusia County. Refinements to the socioeconomic data were made based on planned and committed improvement projects in the study area that were not previously reflected in the travel demand model. The model-derived traffic volume outputs were then converted to AADTs and used to develop Design Hourly Volumes (DHVs) by applying design traffic parameters. Design traffic parameters (K, D, and T) approved by FDOT for use in this project were computed based on measured data and compared to standard values to determine if they are within acceptable ranges. Both AADT and DHVs were used as inputs in the Turns5-V2014 program, an iterative procedure for intersection balancing used to estimate future year peak hour turning movement volumes for the project study area intersections. Manual adjustments were made as necessary to achieve reasonable results that reflected the projected growth over the analysis years. Design traffic projections were developed for Opening Year (2025) and Design Year (2045).

4.1.1 Travel Demand Model

The travel demand forecasting for Florida is standardized in the Florida Standard Urban Transportation Model Structure (FSUTMS). The Central Florida Regional Planning Model (CFRPM V5.1) travel demand model was used to forecast volumes for this project which is located in Volusia County. In consultation with FDOT District 5, it was determined that the CFRPM V5.1 would be used for this project in order to maintain consistency with the approved IJR. The CFRPM has been calibrated and validated for a base year of 2015 with a future year of 2045.

A sub-area model validation for the project study area was completed for year 2015. Population and employment data from the 2015 American Community Survey Census data was used to update the CFRPM year 2015 socioeconomic data for various traffic analysis zones (TAZs) within the project area. Additionally, the model validation procedures compare year 2015 model runs against observed ground counts from 2015-2018 to ensure that the model is reasonably replicating the existing conditions. For the future year, the socioeconomic data for the TAZs throughout the study area was reviewed and modified to reflect population and employment growth due to future planned/proposed developments as identified in the River to Sea Long Range Transportation Plan. The validation procedure including any refinements to the model TAZs, model roadway network and/or model parameters and the validation statistics are detailed in a travel demand modeling memo included in Appendix C of this report.

4.1.2 Growth Trends Analysis

To determine whether the model is suitable for performing the future conditions analysis, the model output data is compared to growth trend projections for reasonableness. Trends analysis was completed using historical traffic counts, population estimates, and base/future year model volumes as growth indicators for the project.

4.1.2.1 Historic Traffic Growth Trend

Historical traffic data was obtained from the FDOT 2017 Traffic Online database to evaluate historical growth rates for the area roadways. Linear regression analyses were performed using AADT data for the most recent five-year period from Year 2013 to Year 2017 for traffic count stations located within the project area. An average trend growth rate of 3.90% for the study area was determined using data with an R^2 value greater than or equal to 75%; the historic and trendline growth rates are summarized in **Table 13**. The trends worksheets are included in Appendix C.

Table 13: Traffic Growth Trend Analysis

PTMS	Location	2013 AADT	2017 AADT	2045 AADT	Trend R^2	TGR-AH	TGR-2017-DY
79-0133*	I-95 -- 2.7 MI N OF SR44, @CR44 O/P, VOLUSIA CO.	36,900	40,700	62,600	56.60%	2.21%	2.03%
79-0423	SR 44 -- 1.39 MI. E OF SR-415 (RVL)	18,300	22,000	49,400	80.85%	5.75%	4.67%
79-0492	I-95 -- ON I-95, 0.512 MI. S OF I-4 (UVL)	45,000	51,500	96,000	98.46%	3.57%	3.13%
79-0503	I-95 -- ON I-95, 0.41 MI. S OF SR-44 (RV)	32,500	41,500	126,800	68.36%	9.10%	6.67%
79-0515	SR 44 -- 0.408 MI. E OF I-95 (UCLP)	30,000	31,500	62,000	31.96%	3.70%	3.22%
79-0517	SR 421 -- 0.394 MI. NE OF I-95 (UVL)	45,500	49,000	66,700	50.90%	1.42%	1.34%
79-7074	TAYLOR RD -- 0.39 MI W OF S WILLIAMSON BLVD, (HPMS)	13,800	13,700	19,000	1.37%	0.82%	0.75%
79-7075	TAYLOR RD -- 0.17 MI W OF S WILLIAMSON BLVD, (HPMS)	16,900	13,400	-1,200	40.58%	-3.29%	-3.87%
				Average (for $R^2 \geq 75\%$):		**4.66%**	**3.90%**

PTMS: Portable Traffic Monitoring Site
TGR- AH: Trend Growth Rate Annual Historic
TGR- 2017-DY: Trend Growth Rate 2017 to Design Year
*Historical AADT for years 2012 through 2016 was used for Station 79-0133 as 2017 data was incomplete.

The historical traffic growth rate at the count stations in the project study area vary from -6.0% to over 9% for the last five years of traffic data. In this area, Interstate 95 has been under reconstruction since Spring 2015. That construction project involves widening 14 miles of I-95 from four to six lanes between SR 44 and north of US 92, and reconstruction of the I-95 interchanges with I-4 and US 92. The current estimate for completion of full reconstruction of the I-95 project is early 2019.

4.1.2.2 Population Growth

The population estimates and projections for the study area were also reviewed to determine growth trends. According to the University of Florida Bureau of Economic and Business Research (BEBR) Florida Population Studies, Volume 51, Bulletin 180 (January 2018), the low, medium and high population projections for Volusia County in year 2045 are 557,300, 642,400, and 759,400, respectively. These projections result in an average of 0.23%, 0.81%, and 1.61% linear growth per year, respectively. The existing population estimate along with projected growth is illustrated in **Figure 9**. A comparison was made to historical population data compiled by the U.S. Census Bureau which showed Volusia County's population increasing from 443,343 in 2000 to 494,593 in 2010, an increase of approximately 12% over a ten-year period, or an average of 1.2% in linear growth per year. The average of the BEBR medium and high population growth rates are comparable to the historical census growth rate.

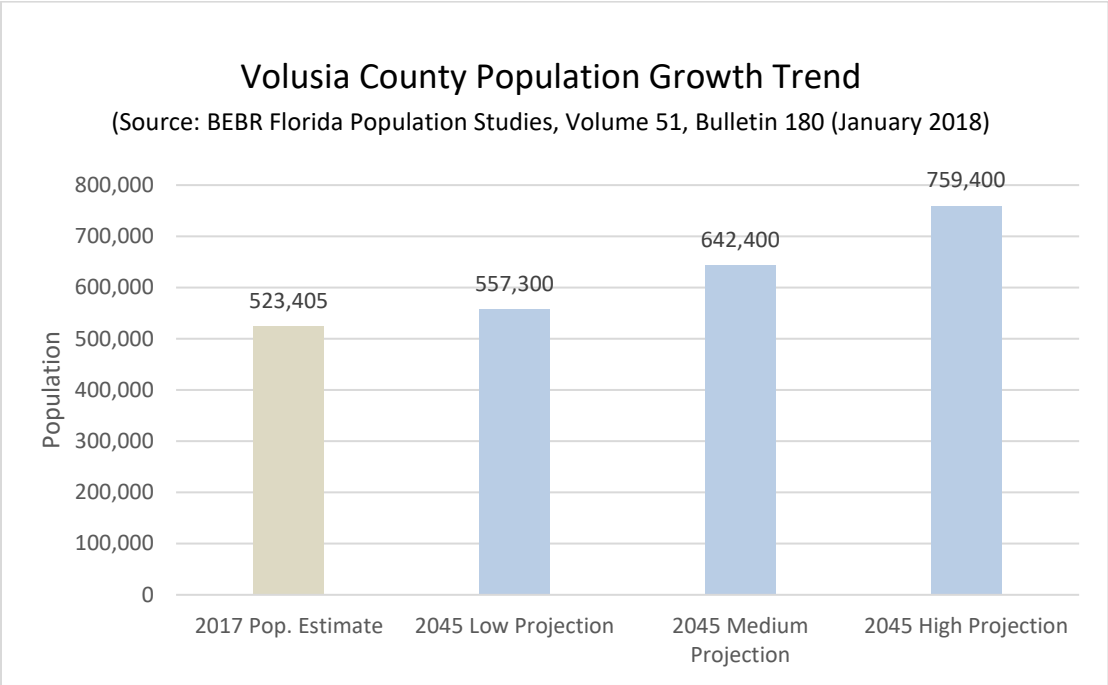


Figure 9: Volusia County Population Growth Trend

4.1.2.3 Travel Demand Model Growth

CFRPM model runs were completed for a 2015 existing year and 2045 future year. Model growth rates were computed for the study area roadway segments by comparing 2015 No-Build volumes to 2045 No-Build and Build volumes. The model output volumes represent peak season weekday average daily traffic (PSWADT); therefore, a model output conversion factor of 0.86 for I-95 and 0.96 for all other Volusia County roadways was used to convert from PSWADT to AADT. The resulting areawide average growth rates were 4.6%-4.7% for future model year to base model year and 5.2% for model year to existing for No-Build and Build scenarios. Based on the various methods of computing growth for the project study area, the trend growth rates are as follows: 3.9% using historical traffic data, 1.6% using high population projections and 4.6% to 5.2% for No-Build and Build scenarios using the travel demand model. The projected growth rates used for each roadway segment are summarized in **Table 14** and **Table 15** for No Build and Build scenarios, respectively. The CFRPM model plots are included in the travel demand forecasting memo provided in Appendix C.

4.1.3 Future Year Traffic Volumes

The growth rates and AADT volumes developed in in **Table 14** and **Table 15** for the individual roadway segments along the study corridor were used as a basis to estimate future year No Build and Build AADT volumes in the study area. Some manual adjustments were made to account for inconsistent growth projections due to variations between the existing volumes and model base year volumes. Additionally, select link analyses were completed to determine specific trip patterns from the traffic analysis zones that would impact volumes at the new and adjacent interchanges under Build conditions. Consistent with the approved IJR and the results of the select link analyses, the build alternative ramp volumes were adjusted at the adjacent interchanges to reflect the trips diverted to the new interchange. Further refinements were made to produce balanced traffic volumes along the Interstate and study corridors. The resulting projected daily volumes with adjustments are shown in **Figure 10A** and **Figure 10B**.

Table 14: CFRPM Growth Rates – No Build Alternative

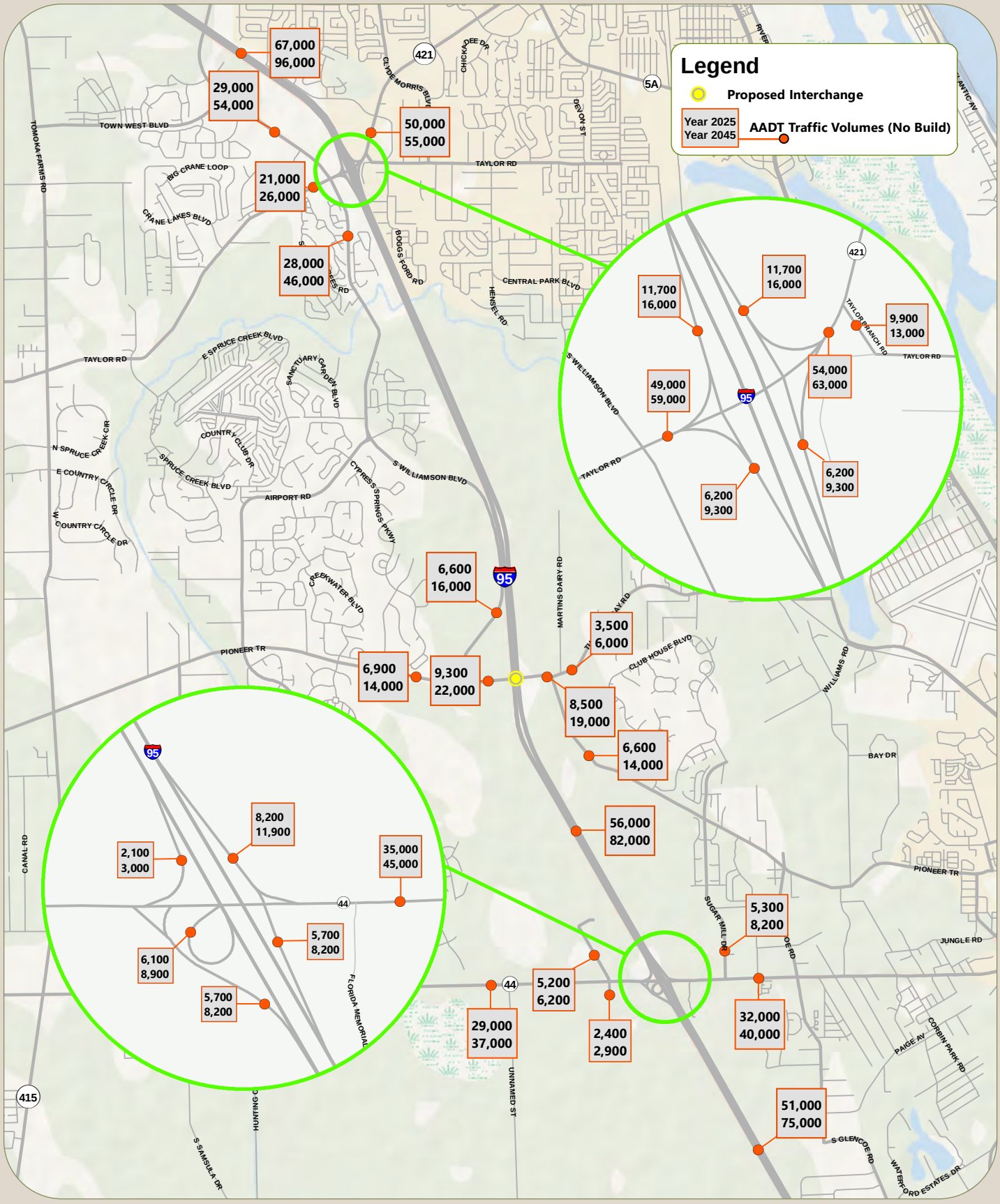
Roadway	From	To	2017/2018 Existing AADT	2015 Base Year Model AADT	2045 Future Year Model AADT	Growth Rate	2045 Projected No-Build AADT
I-95	SR 442	SR 44	42,000	48,000	90,000	2.9%	75,000
	SR 44	Pioneer Trail	46,000	51,000	95,000	2.9%	82,000
	Pioneer Trail	SR 421 (Taylor Rd.)	46,000	51,000	95,000	2.9%	82,000
	SR 421 (Taylor Rd.)	I-4	56,000	53,000	89,000	2.3%	92,000
SR 421	CR 415 (Tomoka Farms Rd.)	CR 4009 (Williamson Blvd.)	19,000	18,000	26,000	1.5%	26,000
	CR 4009 (Williamson Blvd.)	I-95	46,000	49,000	65,000	1.1%	59,000
	I-95	Taylor Rd.	51,000	53,000	67,000	0.9%	63,000
	Taylor Rd.	Yorktowne Blvd.	49,000	59,000	69,000	0.6%	55,000
Pioneer Trail	Airport Road	CR 4009 (Williamson Blvd.)	4,400	5,200	14,000	8.1%	14,000
	CR 4009 (Williamson Blvd.)	I-95	4,900	8,000	22,000	12.9%	22,000
	I-95	Turnbull Bay Rd.	4,900	7,600	19,000	10.7%	19,000
	Turnbull Bay Rd.	Sugar Mill Drive	4,100	6,200	14,000	8.9%	14,000
SR 44	Airport Road	I-95	24,000	23,000	37,000	2.0%	37,000
	I-95	Sugar Mill Drive	31,000	29,000	45,000	1.7%	45,000
	Sugar Mill Drive	East of Sugar Mill Dr.	29,000	26,000	37,000	1.4%	40,000
Williamson Blvd.	South of SR 44	SR 44	2,300	-	-	1.0%	2,900
	Pioneer Trail	Airport Rd.	3,300	3,800	20,000	14.2%	16,000
	Airport Rd.	SR 421 (Taylor Rd.)	22,000	24,000	54,000	4.2%	46,000
	SR 421 (Taylor Rd.)	North of SR 421 (Taylor Rd.)	20,000	27,000	54,000	6.5%	54,000
Sugar Mill Dr.	SR 44	Pioneer Trail	4,300	6,000	12,000	3.3%	8,200
Taylor Rd.	South of SR 421	SR 421 (Taylor Rd.)	8,700	1,800	19,000	2.0%	13,000
Turnbull Bay Rd.	Pioneer Trail	North of Pioneer Trail	2,600	3,100	6,000	4.8%	6,000

Future Model Year to Base Model Year Growth Rate
Future Model Year to Existing Growth Rate
BEBR High Population Growth Rate

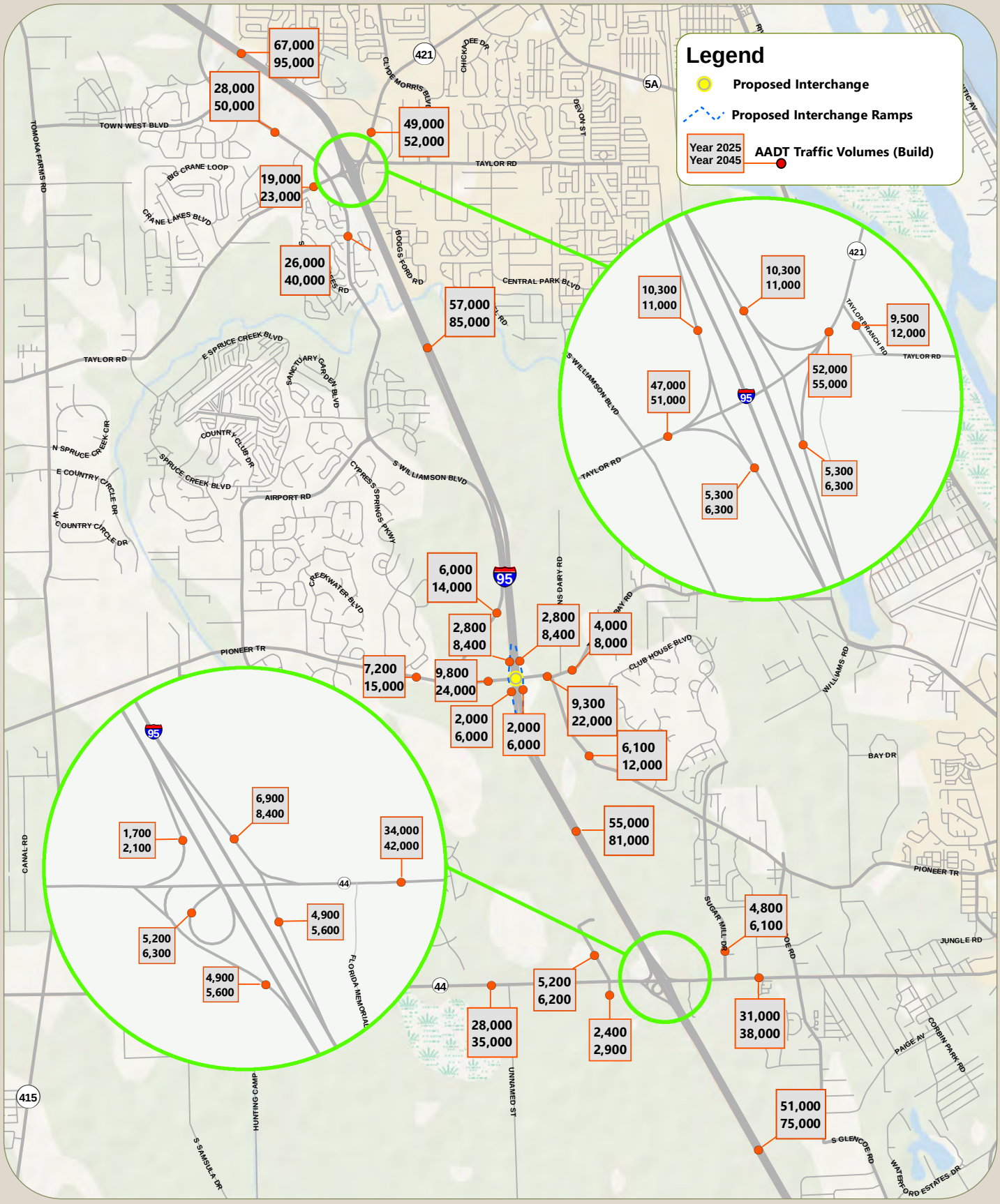
Table 15: CFRPM Growth Rates – Build Alternative

Roadway	From	To	2017/2018 Existing AADT	2015 Base Year Model AADT	2045 Future Year Model AADT	Growth Rate	2045 Projected Build AADT
I-95	SR 442	SR 44	42,000	48,000	90,000	2.9%	75,000
	SR 44	Pioneer Trail	46,000	51,000	95,000	2.9%	82,000
	Pioneer Trail	SR 421 (Taylor Rd.)	46,000	51,000	100,000	3.2%	86,000
	SR 421 (Taylor Rd.)	I-4	56,000	53,000	93,000	2.5%	95,000
SR 421	CR 415 (Tomoka Farms Rd.)	CR 4009 (Williamson Blvd.)	19,000	18,000	24,000	1.1%	24,000
	CR 4009 (Williamson Blvd.)	I-95	46,000	49,000	65,000	1.1%	59,000
	I-95	Taylor Rd.	51,000	53,000	67,000	0.9%	63,000
	Taylor Rd.	Yorktowne Blvd.	49,000	59,000	70,000	0.6%	56,000
Pioneer Trail	Airport Road	CR 4009 (Williamson Blvd.)	4,400	5,200	15,000	8.9%	15,000
	CR 4009 (Williamson Blvd.)	I-95	4,900	8,000	24,000	14.4%	24,000
	I-95	Turnbull Bay Rd.	4,900	7,600	22,000	12.9%	22,000
	Turnbull Bay Rd.	Sugar Mill Drive	4,100	6,200	12,000	7.1%	12,000
SR 44	Airport Road	I-95	24,000	23,000	38,000	2.0%	38,000
	I-95	Sugar Mill Drive	31,000	29,000	42,000	1.3%	42,000
	Sugar Mill Drive	East of Sugar Mill Dr.	29,000	26,000	37,000	1.4%	40,000
Williamson Blvd.	South of SR 44	SR 44	2,300	-	-	1.00%	2,900
	Pioneer Trail	Airport Rd.	3,300	3,800	17,000	11.6%	14,000
	Airport Rd.	SR 421 (Taylor Rd.)	22,000	24,000	51,000	3.8%	44,000
	SR 421 (Taylor Rd.)	North of SR 421 (Taylor Rd.)	20,000	27,000	54,000	6.5%	54,000
Sugar Mill Dr.	SR 44	Pioneer Trail	4,300	6,000	8,800	1.6%	6,100
Taylor Rd.	South of SR 421	SR 421 (Taylor Rd.)	8,700	1,800	18,000	2.0%	13,000
Turnbull Bay Rd.	Pioneer Trail	North of Pioneer Trail	2,600	3,100	8,000	7.7%	8,000

Future Model Year to Base Model Year Growth Rate
Future Model Year to Existing Growth Rate
BEBR High Population Growth Rate



2025 & 2045 NO BUILD AADT TRAFFIC VOLUMES



2025 & 2045 BUILD AADT TRAFFIC VOLUMES

4.1.1 Future Year Design Hour Volumes

Directional design hour volumes (DDHVs) for No Build and Build alternatives were developed based on the procedures in the FDOT 2014 Project Traffic Forecasting Handbook (PTF). The model developed AADTs along with the design traffic factors (K and D) were used as a basis to develop future peak hour volumes along the I-95 mainline. Furthermore, AADT, K and D data was used as inputs in the FDOT Turns5 spreadsheet tool to develop peak hour intersection turning movement volumes. The outputs from Turns5 were evaluated for reasonableness. In some cases, the Turns5 volumes did not reflect growth between design hour turning movement estimates for 2018 and the future design years. These intersection volumes were manually adjusted; additionally, they were further refined to produce balanced traffic flows along I-95 mainline and the arterial crossroads. The resulting balanced traffic volumes along the I-95 mainline and ramps and intersection turning movement volumes for the AM and PM peak hours for opening and design year No Build and Build alternatives are shown in **Figure 11** through **Figure 18**. The Turns5 worksheets are included in Appendix D.

4.2 Future Year No Build Alternative Operational Analysis

Analysis of the future year no build traffic operations was completed for opening and design years. The methodologies specified in the Highway Capacity Manual (HCM, 6th Edition) were used to evaluate the freeway segments, ramps and intersections. The No Build scenario reflects future growth in traffic as determined in the preceding section of the report and roadway geometry, traffic control and signal timings consistent with the existing conditions; no changes in roadway configurations are assumed for the No Build condition. The future No Build geometry and traffic control are illustrated in **Figure 19A** and **Figure 19B**. Additionally, the following input parameters were used for the No Build operational/capacity analysis:

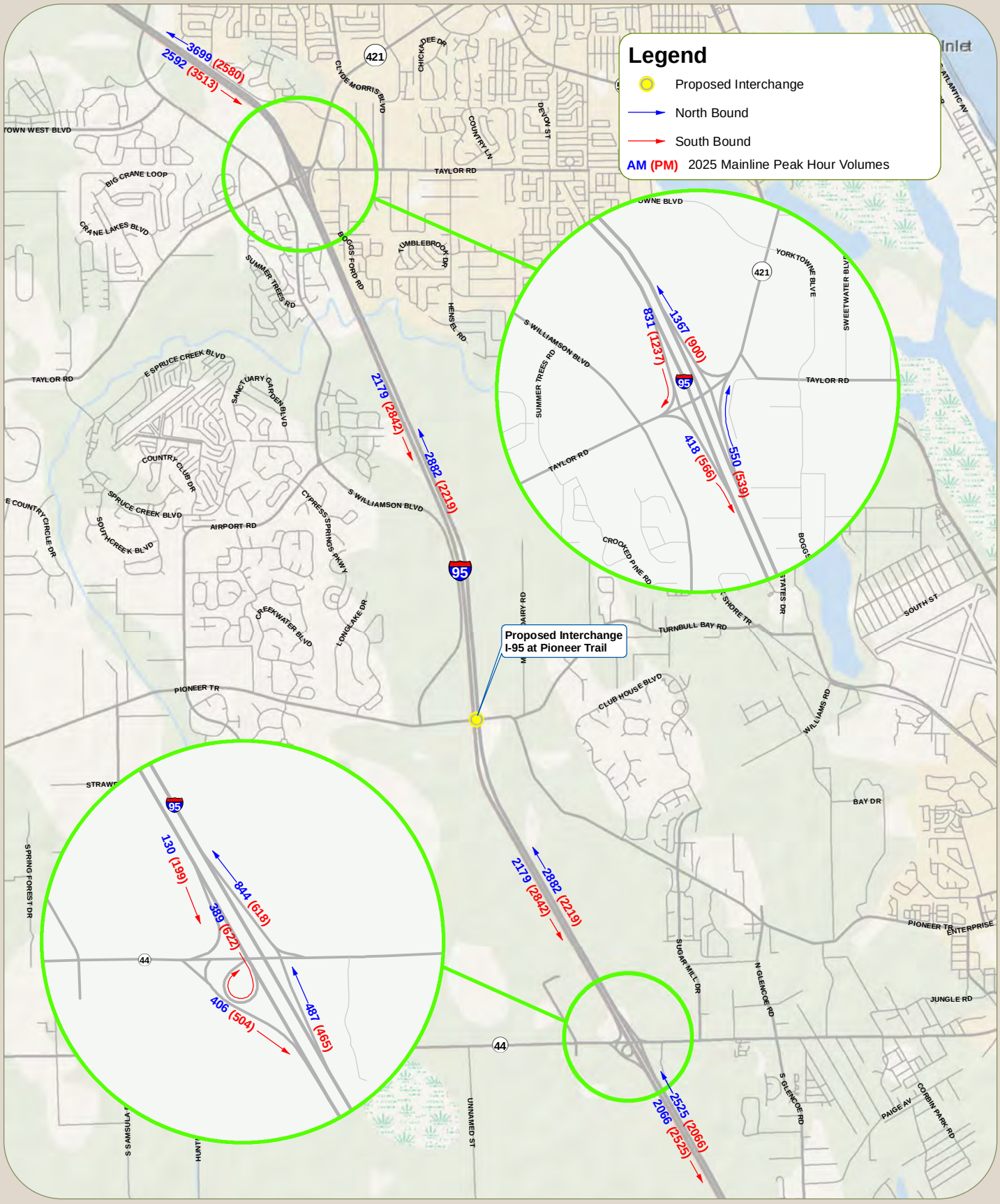
- Peak Hour Factor (PHF): 0.95 (I-95 mainline and intersections)
- Level terrain
- I-95 Base free flow speed: 75 mph

4.2.1 No Build Alternative Freeway & Ramp Junctions Operational LOS Analysis

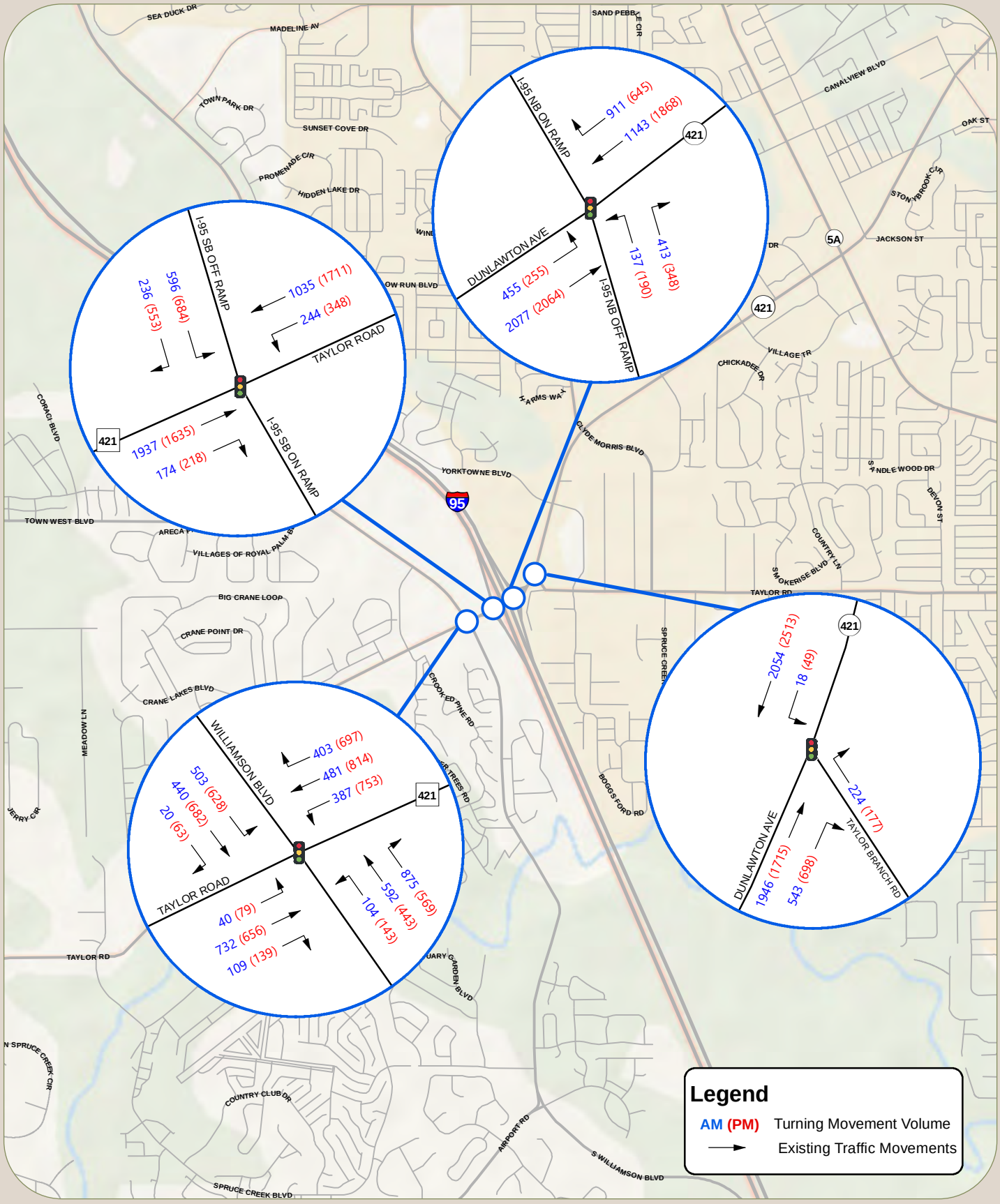
Level of service for the I-95 freeway and ramps in the project corridor were computed using the basic freeway segment and ramp merge/diverge modules of the Highway Capacity Software (HCS7). The future projected No Build freeway demand volumes and performance measures including density and LOS during the AM and PM peak hours are summarized in **Table 16** and **Table 17** for opening year 2025 and in **Table 18 and Table 19** for design year 2045. The future year operational analysis worksheets are included in Appendix E.

The results of the peak hour operational analyses indicate that for opening year 2025 all freeway segments are expected to operate at LOS B or better, except the segment north of SR 421 which is anticipated to operate at LOS C in the northbound direction during the AM peak hour and in the southbound direction during the PM peak hour. All of the entrance and exit ramps are anticipated to operate at LOS B or better except the northbound on ramp from SR 421 which is expected to operate at LOS C during the AM peak hour.

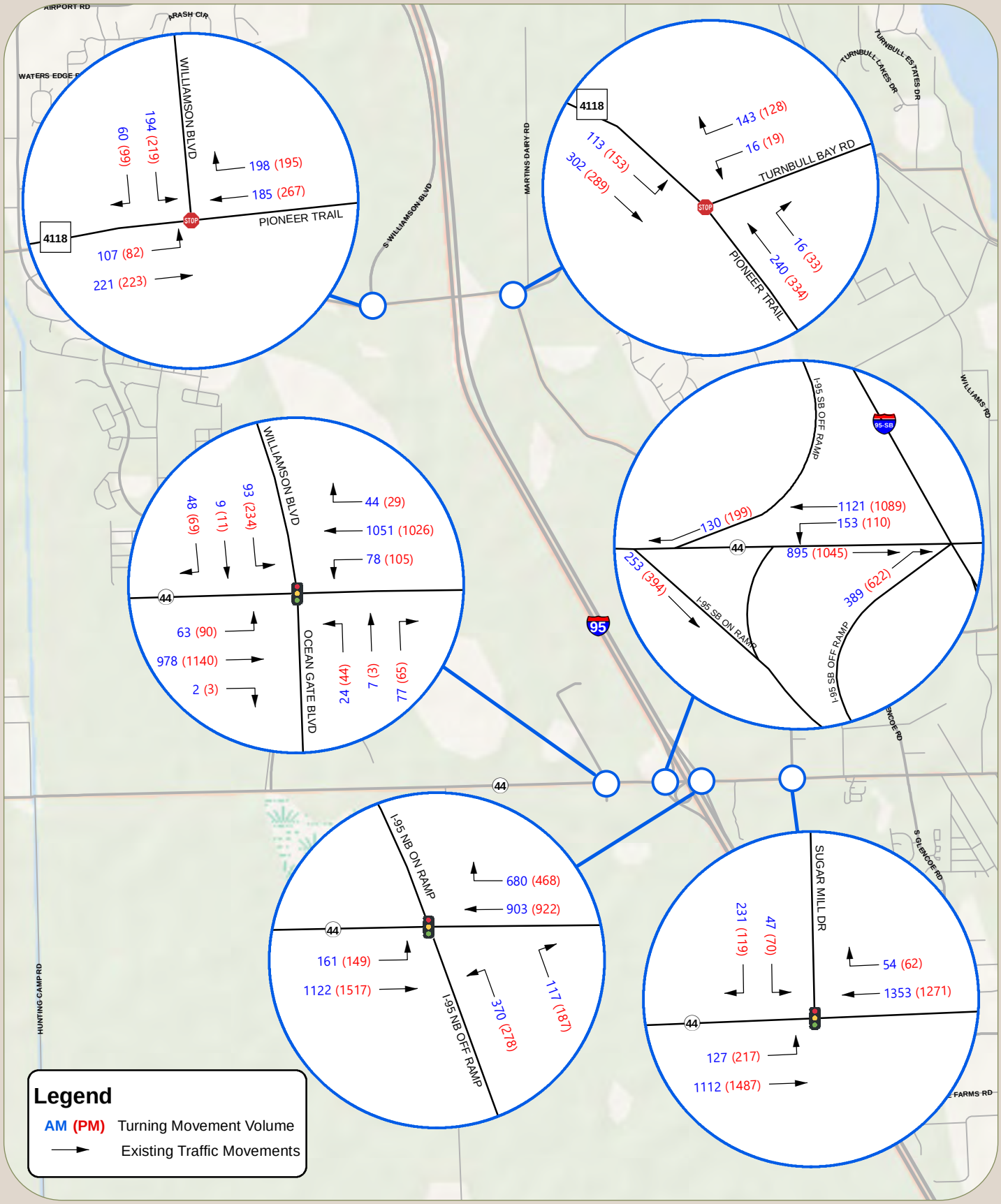
For design year 2045, all freeway segments are anticipated to operate at LOS C or better except the segment north of SR 421 which is anticipated to operate at LOS D in the northbound direction during the AM peak hour and in the southbound direction during the PM peak hour. All of the entrance and exit ramps are anticipated to operate at LOS C or better under no build conditions in design year 2045.



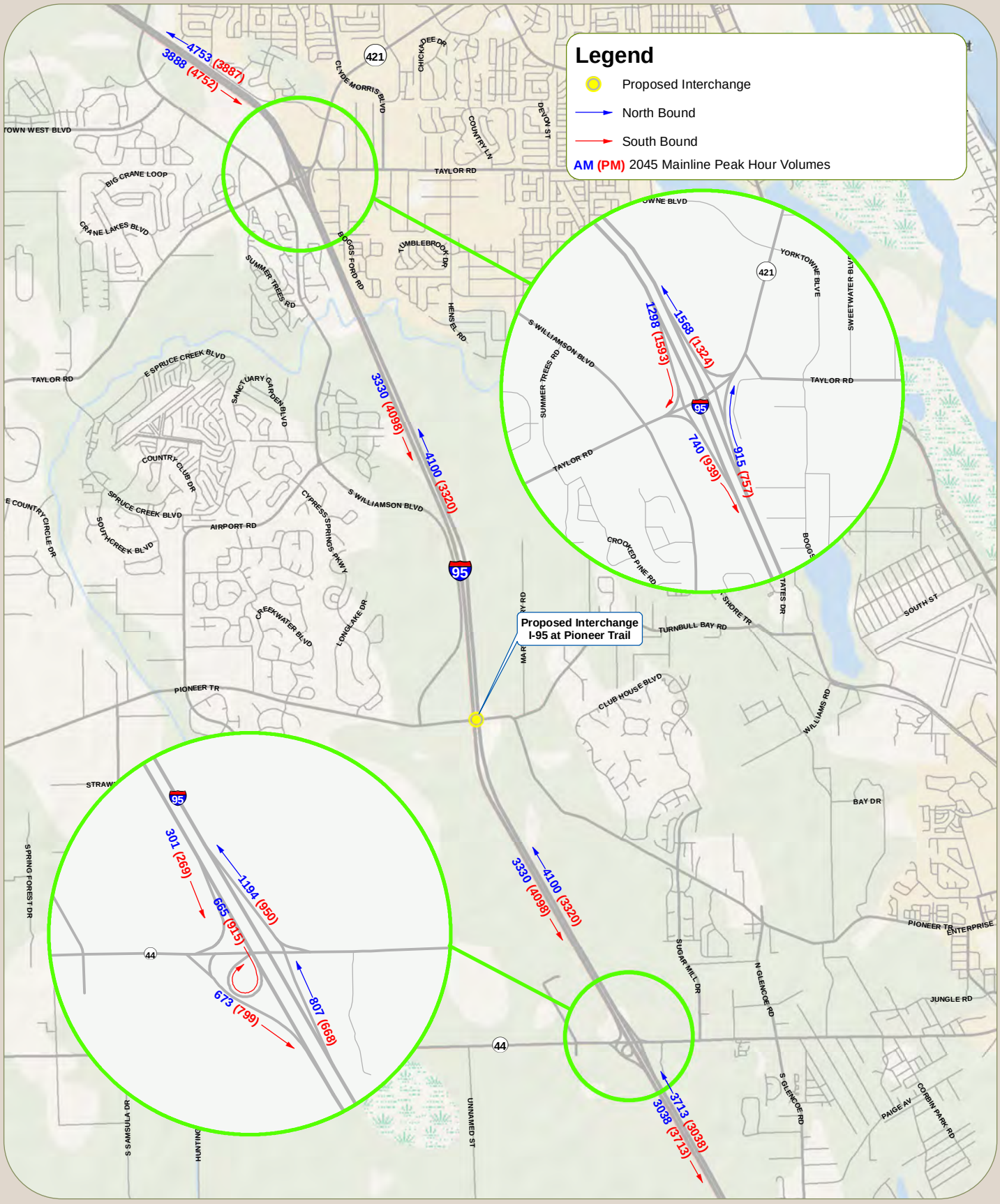
YEAR 2025 AM & PM PEAK HOUR MAINLINE VOLUMES (NO BUILD)



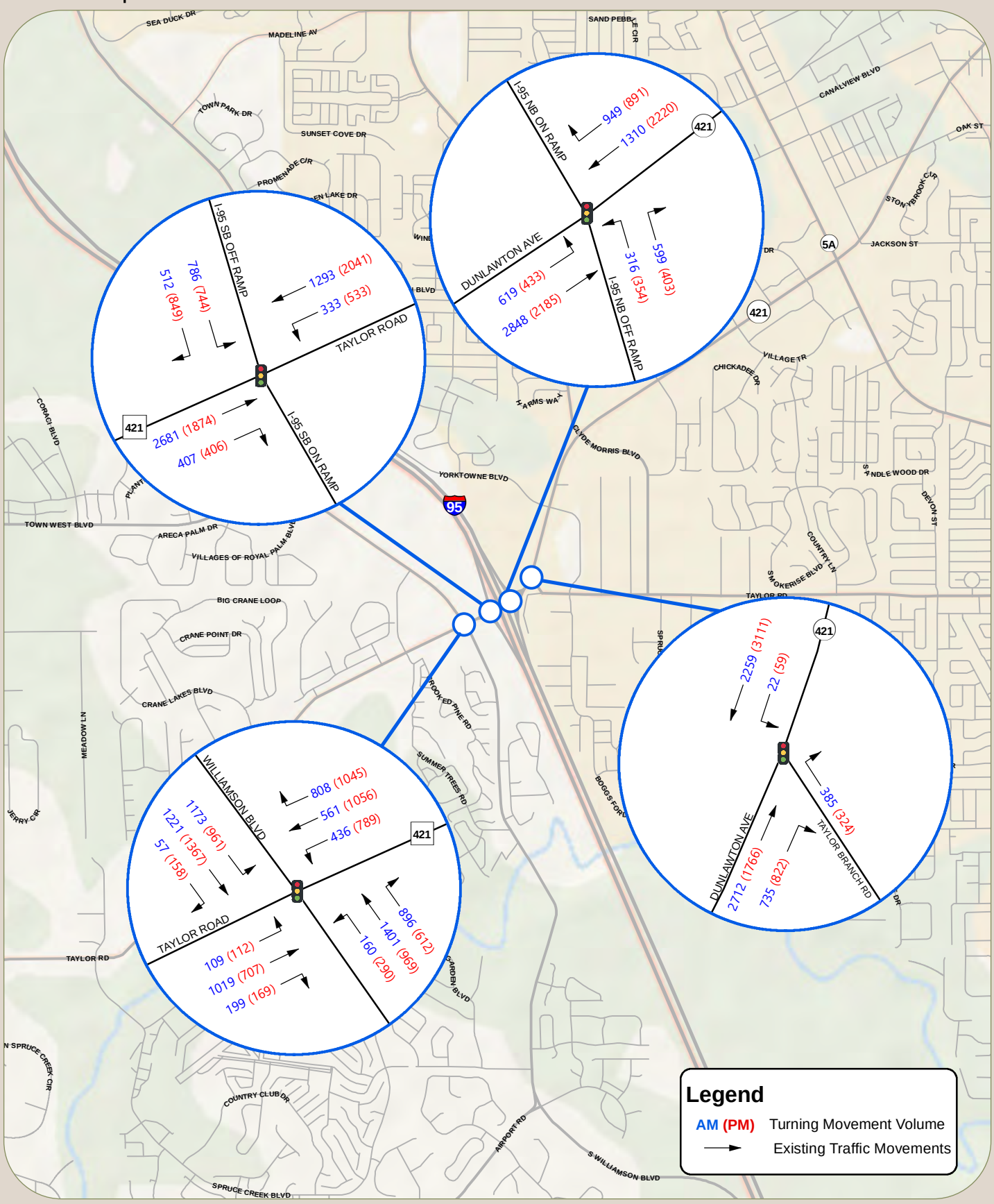
2025 AM & PM PEAK HOUR TURNING MOVEMENT VOLUMES (NO BUILD)
SR 421



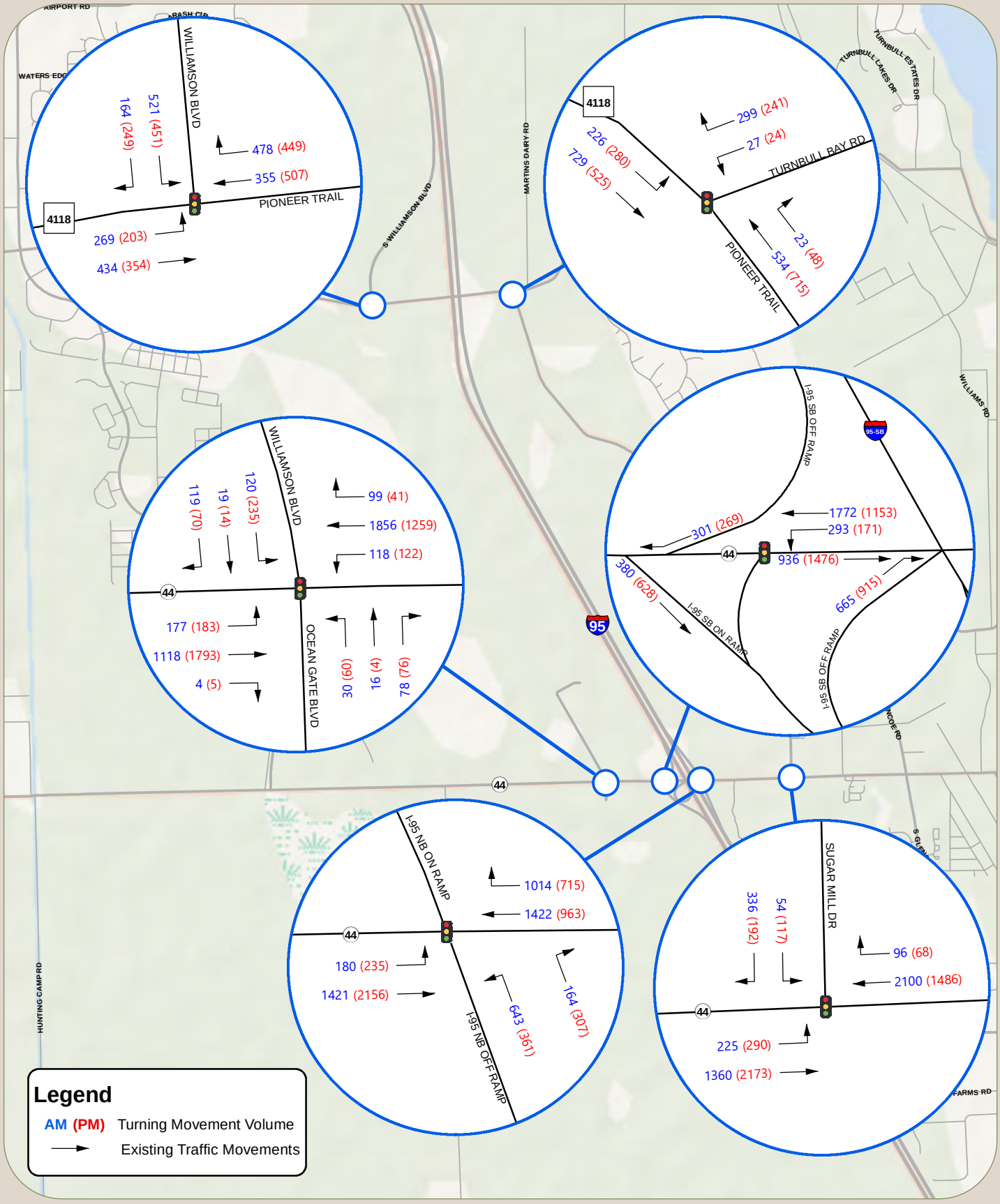
2025 AM & PM PEAK HOUR TURNING MOVEMENT VOLUMES (NO BUILD)
PIONEER TRAIL & SR 44



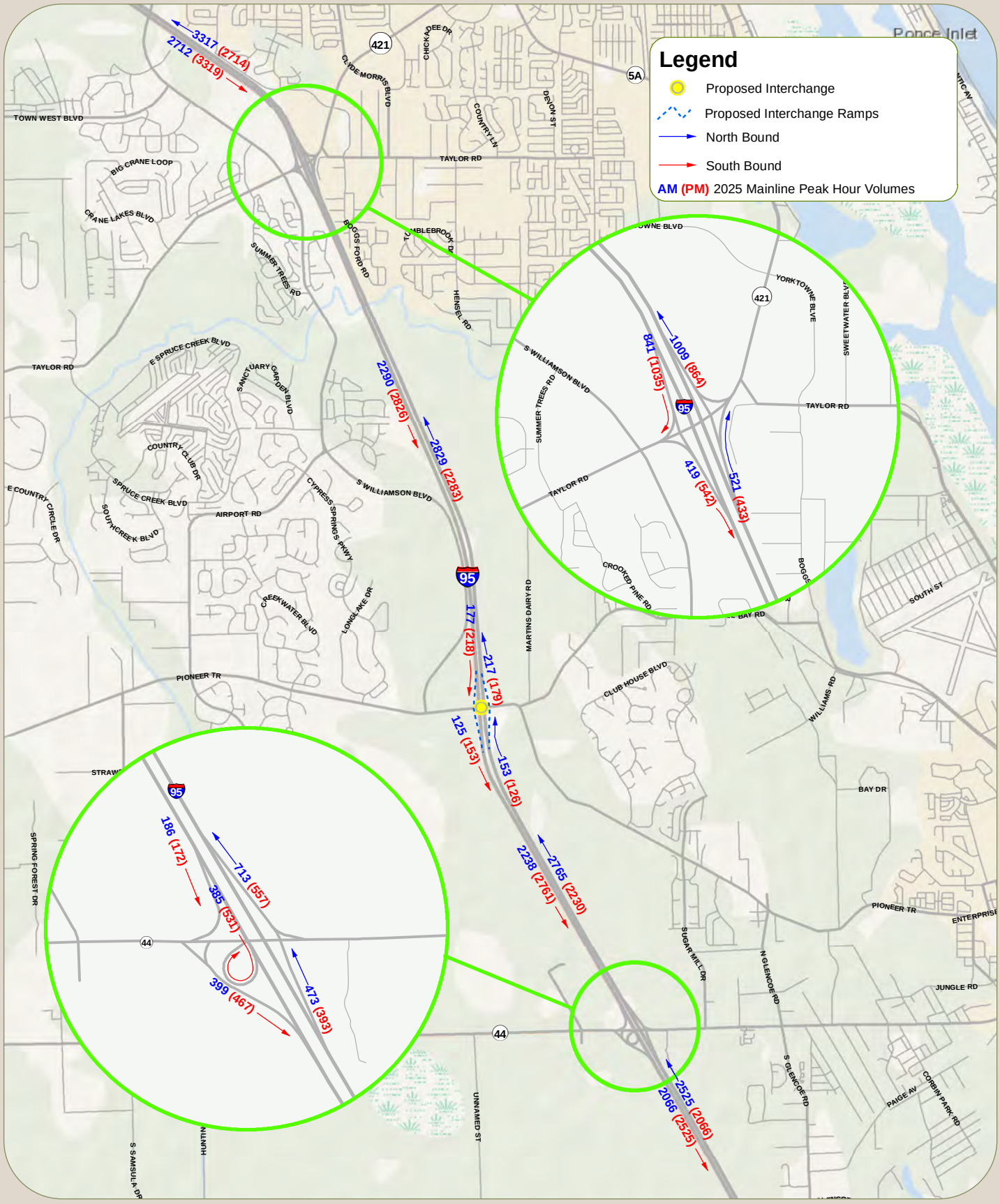
YEAR 2045 AM & PM PEAK HOUR MAINLINE VOLUMES (NO BUILD)



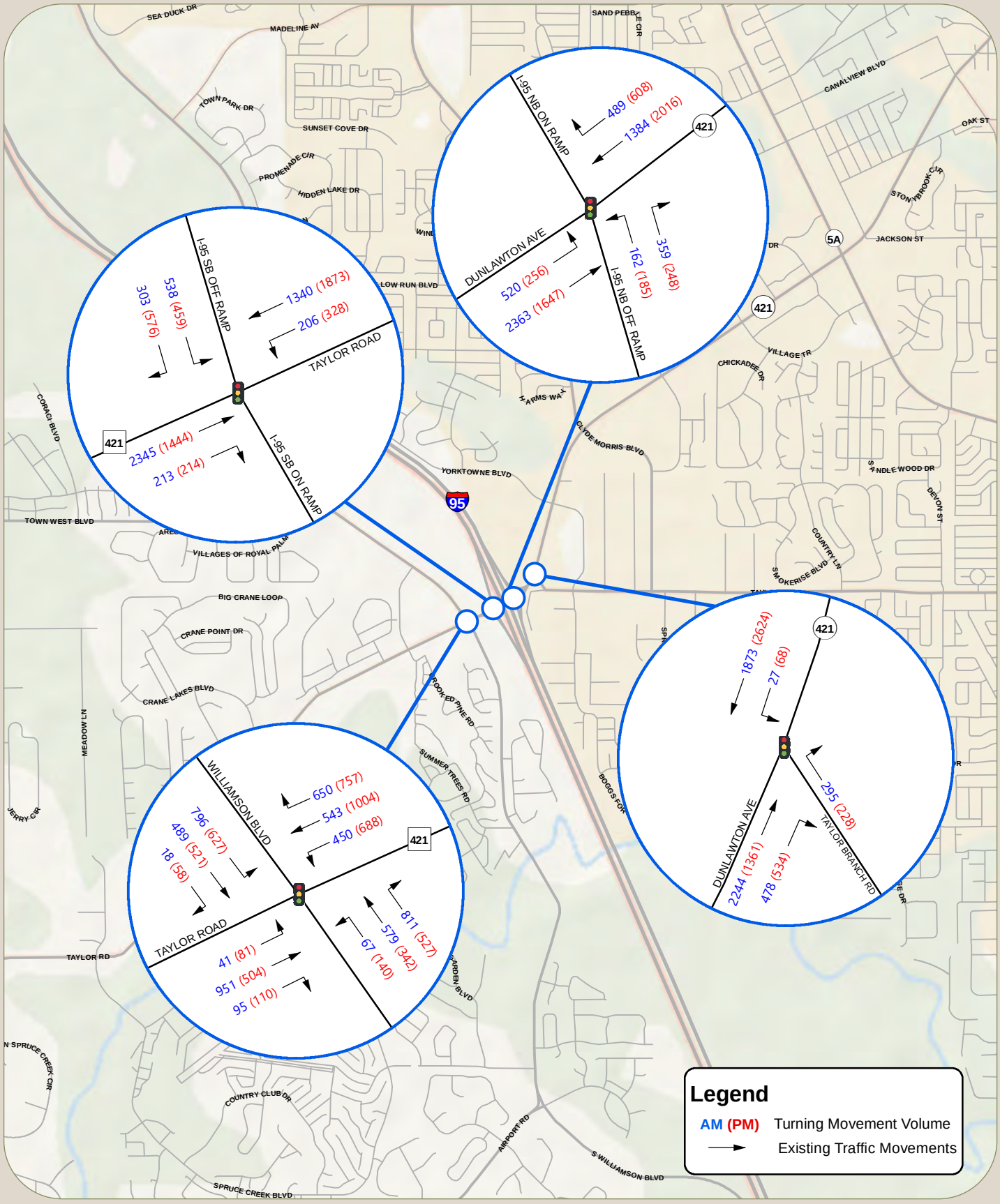
2045 AM & PM PEAK HOUR TURNING MOVEMENT VOLUMES (NO BUILD)
SR 421



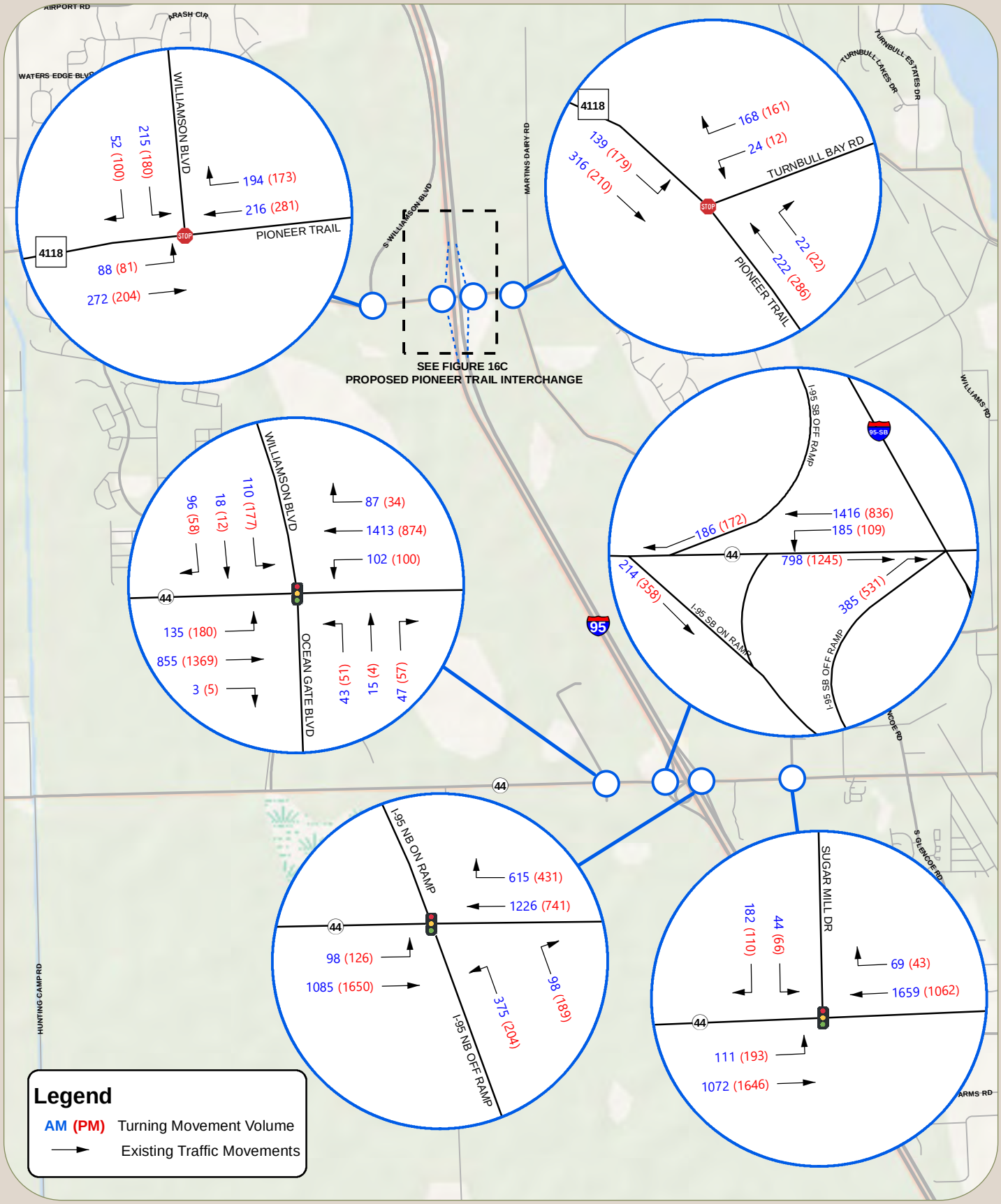
2045 AM & PM PEAK HOUR TURNING MOVEMENT VOLUMES (NO BUILD)
PIONEER TRAIL & SR 44



YEAR 2025 AM & PM PEAK HOUR MAINLINE VOLUMES (BUILD)



2025 AM & PM PEAK HOUR TURNING MOVEMENT VOLUMES (BUILD)
SR 421

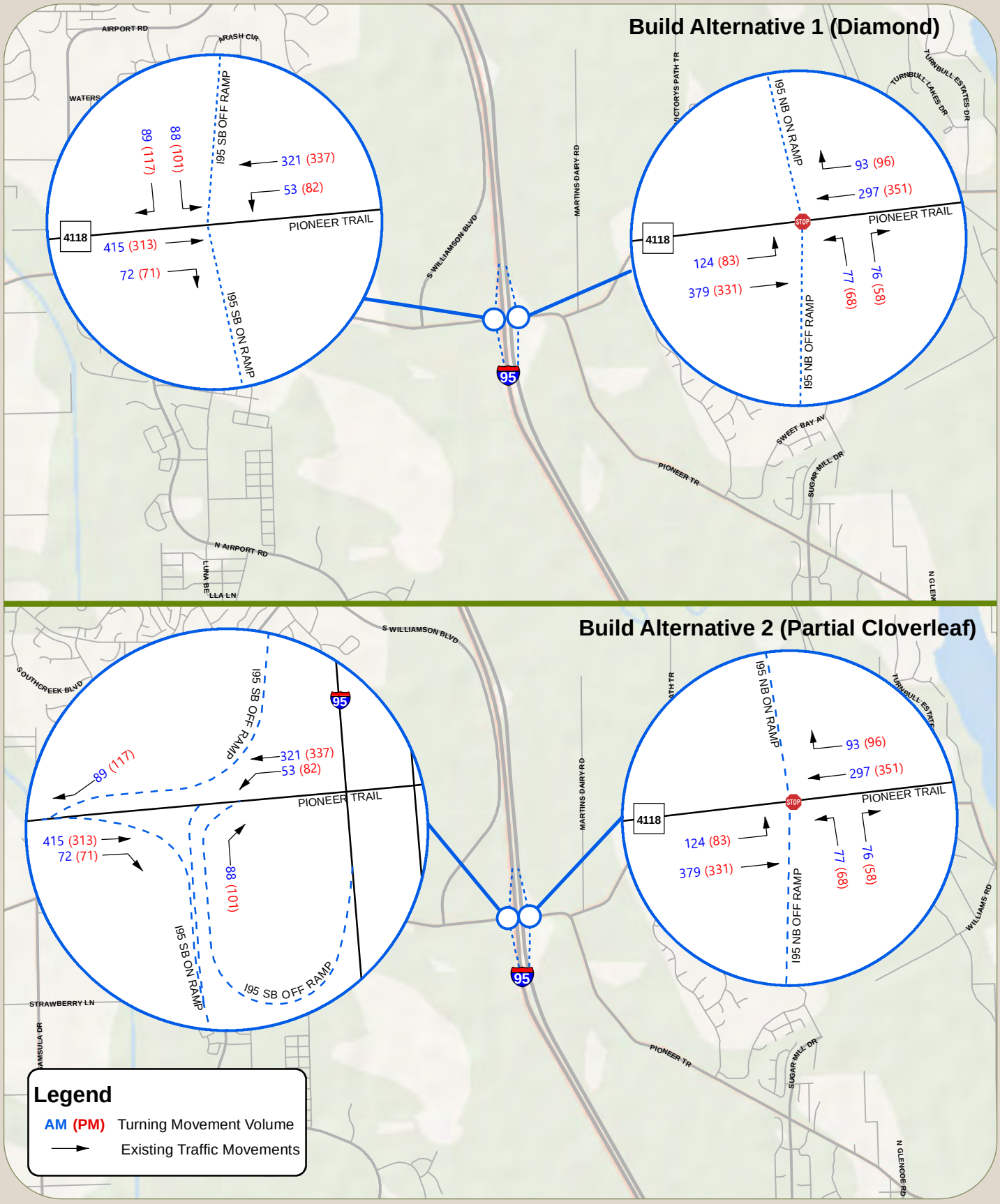


2025 AM & PM PEAK HOUR TURNING MOVEMENT VOLUMES (BUILD)
PIONEER TRAIL & SR 44

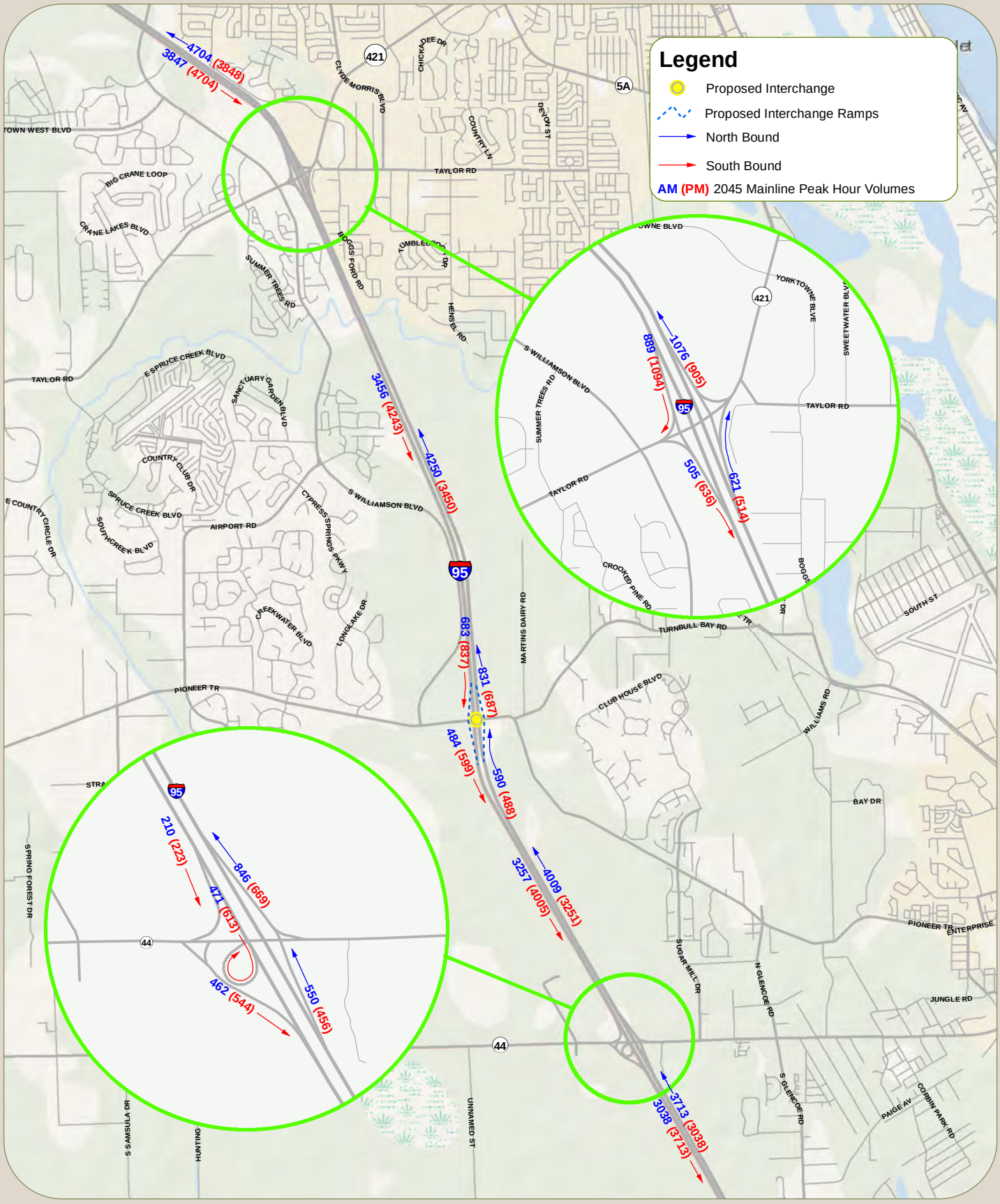
I-95 Interchange at Pioneer Trail PD&E Study

Williamson Boulevard to Turnbull Bay Road

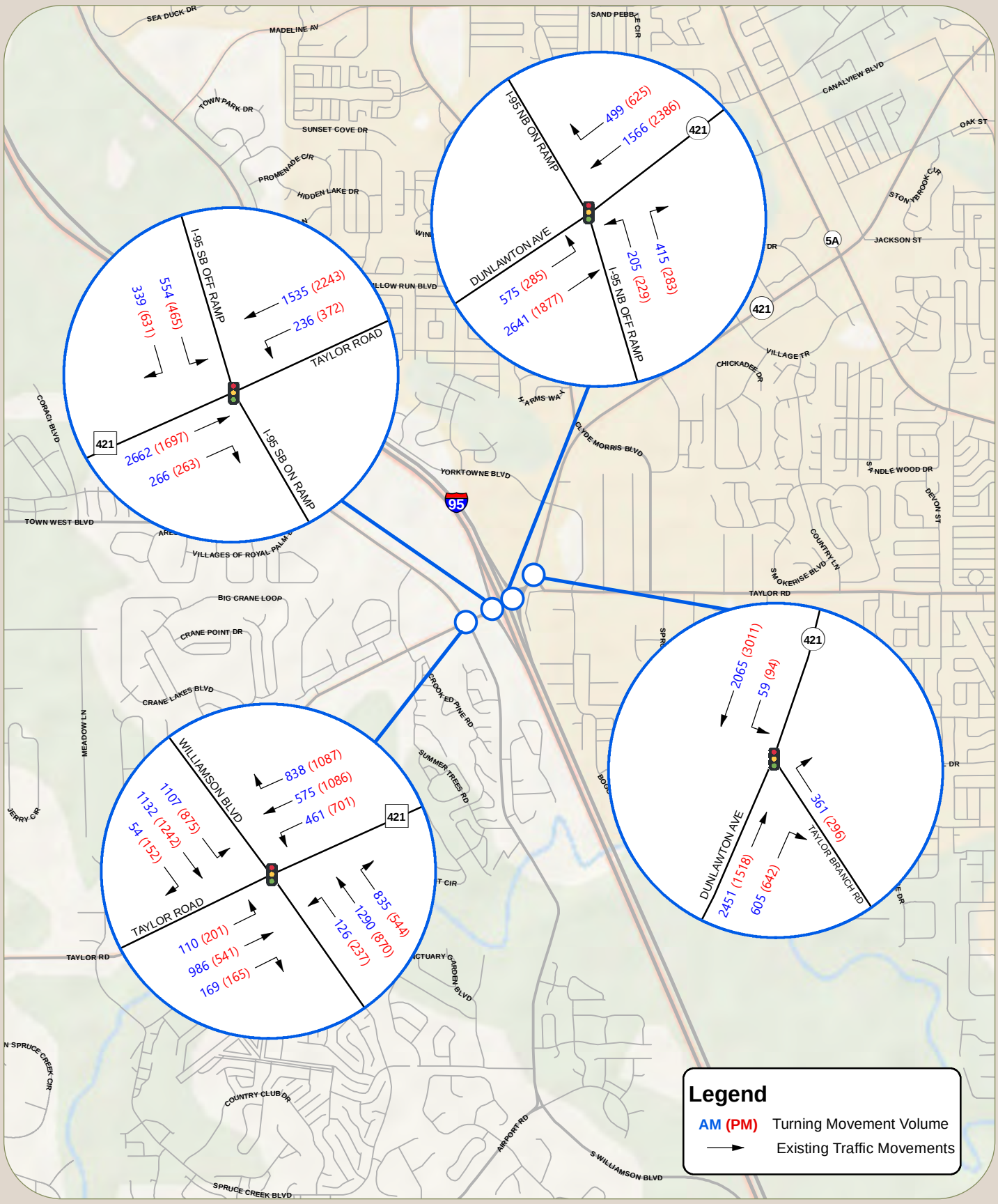
FPID No. 436292-1-22-01 | ETDM No. 14193



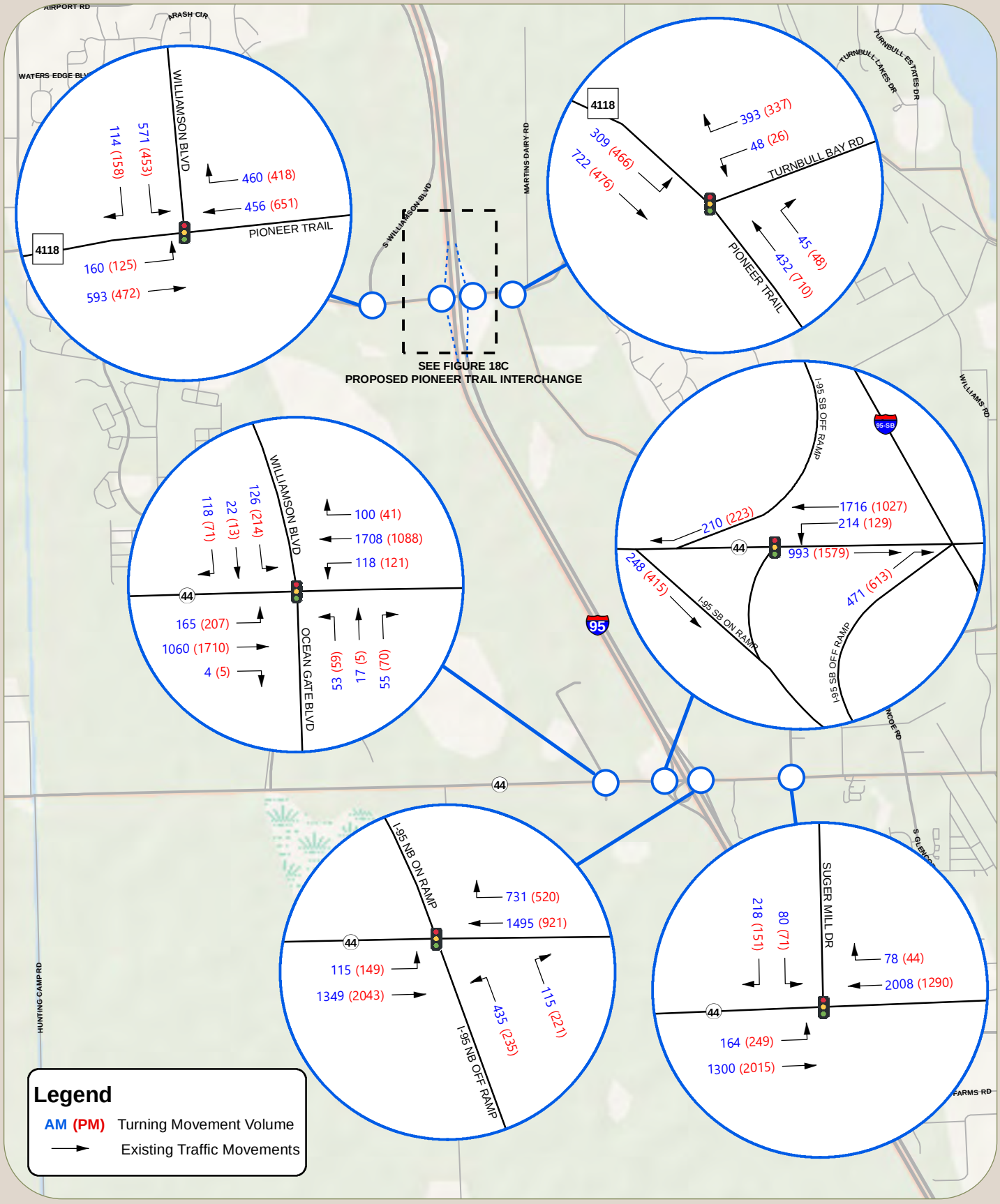
2025 AM & PM PEAK HOUR TURNING MOVEMENT VOLUMES (BUILD)
PROPOSED PIONEER TRAIL INTERCHANGE



YEAR 2045 AM & PM PEAK HOUR MAINLINE VOLUMES (BUILD)



2045 AM & PM PEAK HOUR TURNING MOVEMENT VOLUMES (BUILD)
SR 421



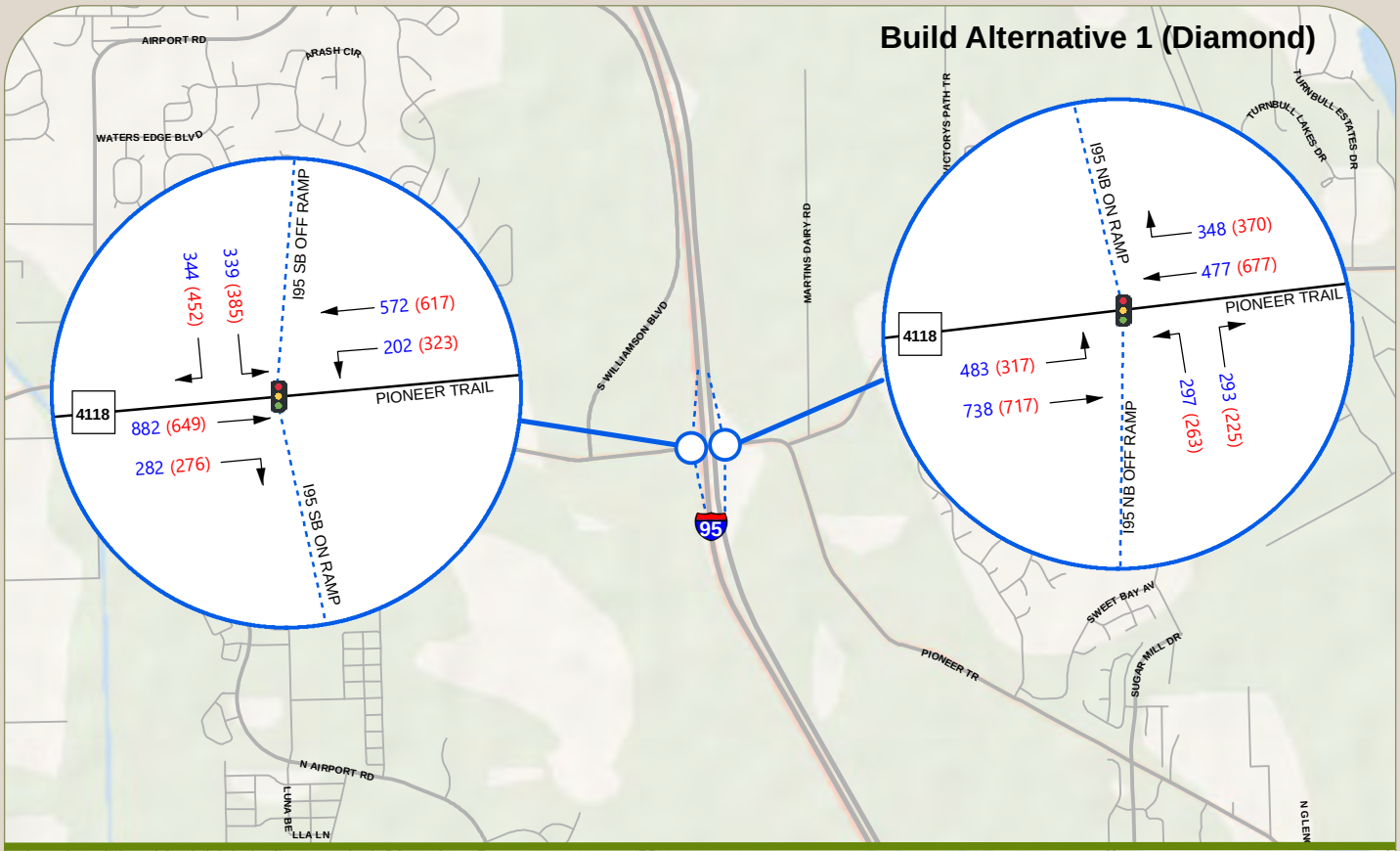
2045 AM & PM PEAK HOUR TURNING MOVEMENT VOLUMES (BUILD)
PIONEER TRAIL & SR 44

FDOT

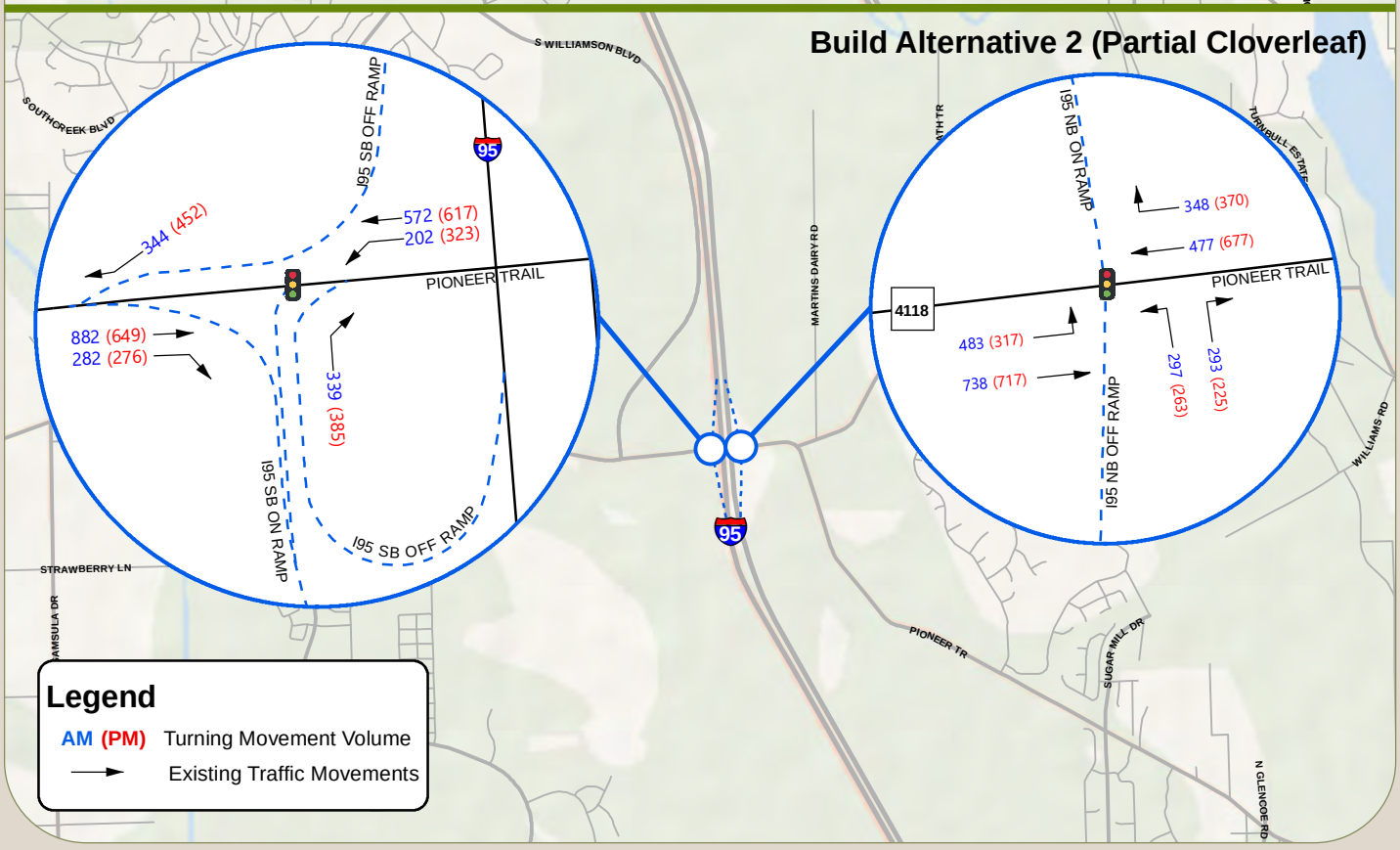
N

0 1,750 3,500 7,000 Feet
1 inch = 3,500 feet

Build Alternative 1 (Diamond)



Build Alternative 2 (Partial Cloverleaf)

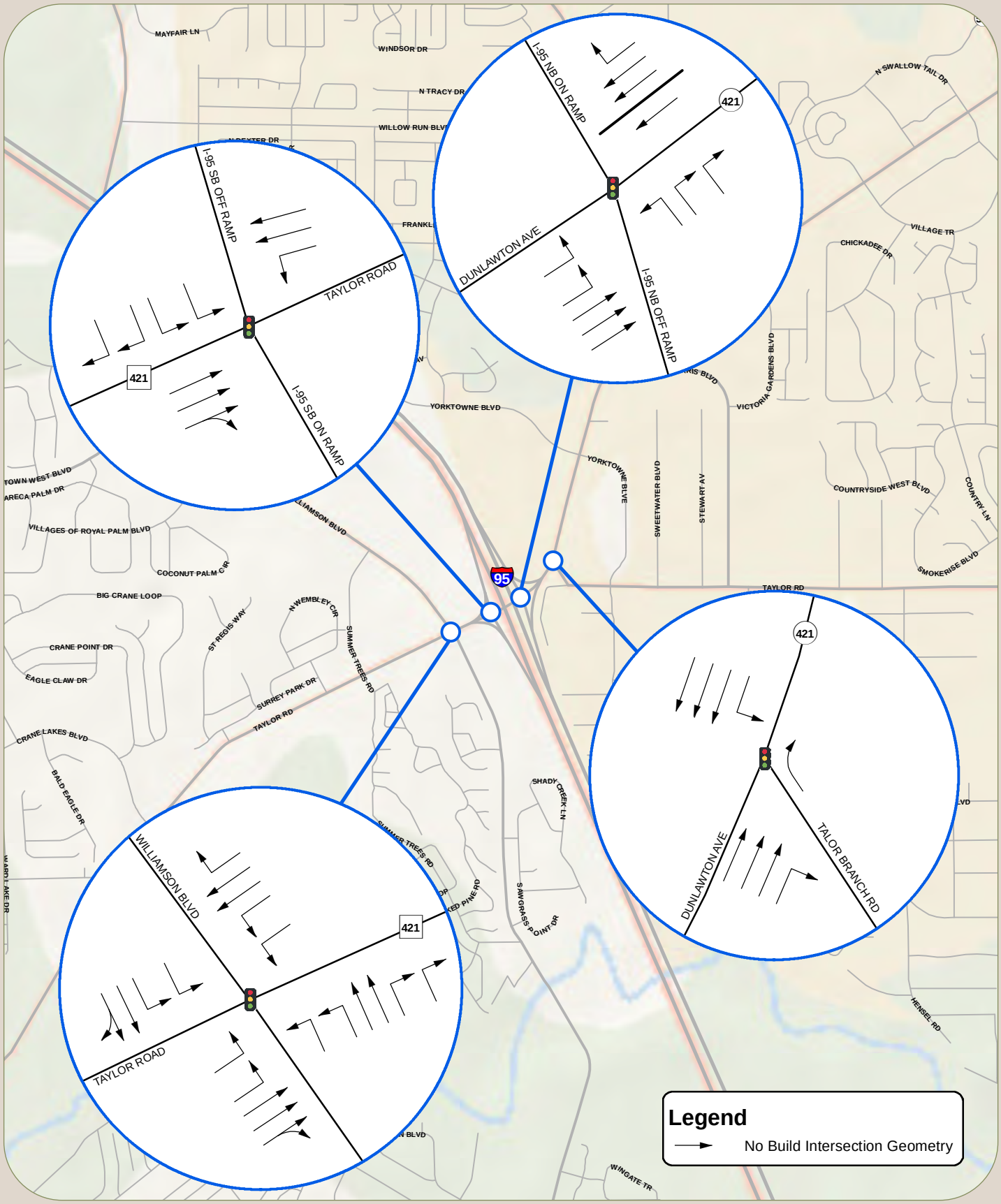


Legend

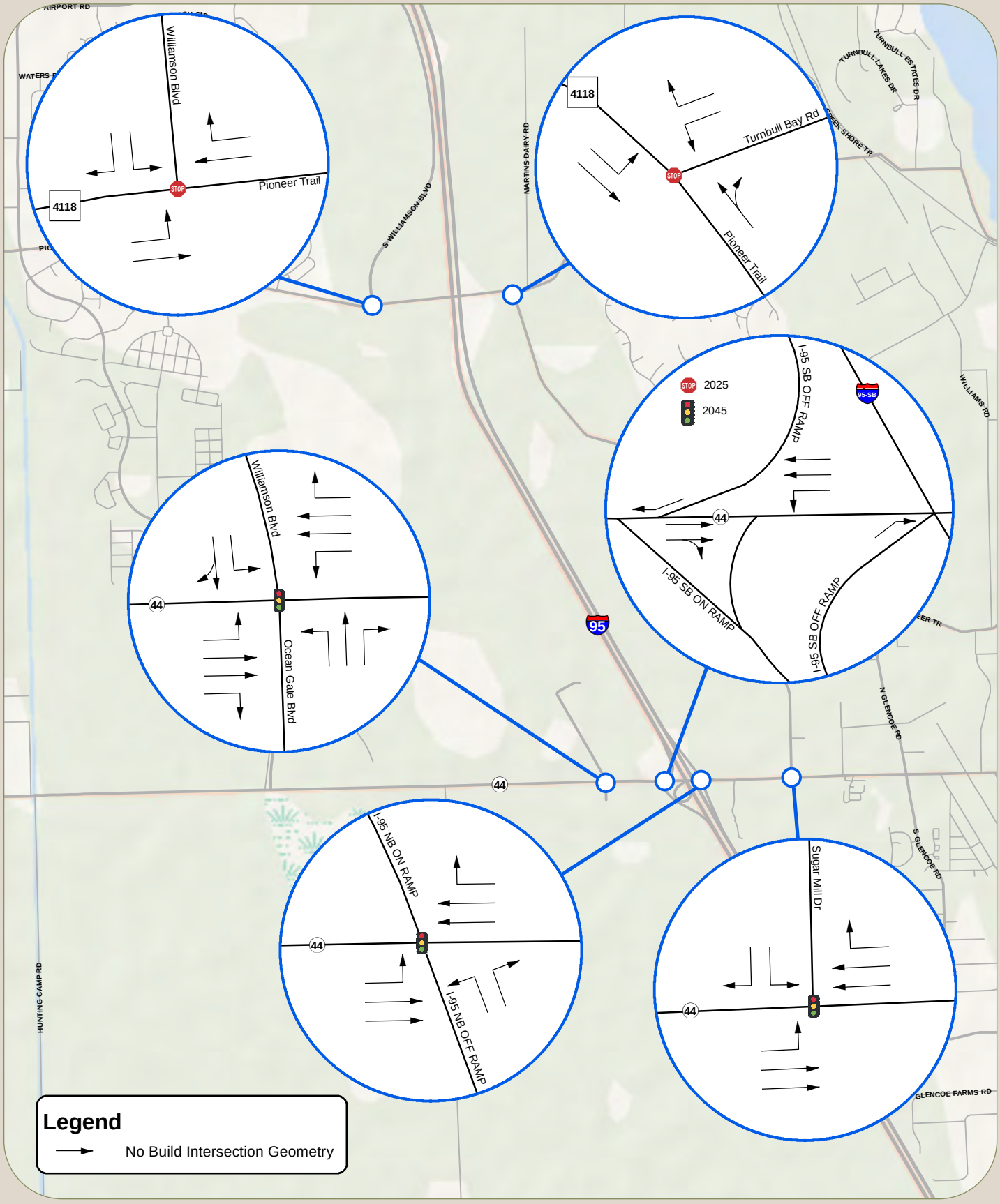
AM (PM) Turning Movement Volume

Existing Traffic Movements

2045 AM & PM PEAK HOUR TURNING MOVEMENT VOLUMES (BUILD)
PROPOSED PIONEER TRAIL INTERCHANGE



NO BUILD INTERSECTION GEOMETRY
SR 421



NO BUILD INTERSECTION GEOMETRY
PIONEER TRAIL AND SR 44

Table 16: Year 2025 No Build Peak Hour Freeway Level of Service Analysis

Freeway Segment	AM Peak Hour			PM Peak Hour		
	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS
I-95 Northbound						
South of SR 44	2,525	12.8	B	2,066	10.5	A
North of SR 44	2,882	14.6	B	2,219	11.3	B
North of SR 421	3,699	19.1	C	2,580	13.1	B
I-95 Southbound						
South of SR 44	2,066	10.5	A	2,525	12.8	B
North of SR 44	2,179	11.1	B	2,842	14.4	B
North of SR 421	2,592	13.2	B	3,513	18.0	B

Table 17: Year 2025 No Build Peak Hour Ramp Merge/Diverge Analysis

Ramp Segment			AM Peak Hour			PM Peak Hour	
	Ramp Type	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS
I-95 and SR 421 Interchange							
I-95 NB off ramp to SR 421	Diverge	550	13.0	B	539	9.1	A
I-95 NB on ramp from SR 421	Merge	1,367	21.7	C	900	14.4	B
I-95 SB off ramp to SR 421	Diverge	831	12.5	B	1237	18.6	B
I-95 SB on ramp from SR 421	Merge	418	10.9	B	566	14.8	B
I-95 and SR 44 Interchange							
I-95 NB off ramp to SR 44	Diverge	487	17.7	B	465	14.9	B
I-95 NB on ramp from SR 44	Merge	844	16.2	B	618	12.0	B
I-95 SB off ramp to SR 44	Diverge	130	13.3	B	199	17.4	B
I-95 SB off ramp to SR 44 (loop ramp)	Diverge	389	9.9	A	622	14.0	B
I-95 SB on ramp from SR 44	Merge	406	9.4	A	504	12.1	B

Table 18: Year 2045 No Build Peak Hour Freeway Level of Service Analysis

Freeway Segment	AM Peak Hour			PM Peak Hour		
	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS
I-95 Northbound						
South of SR 44	3,713	19.2	C	3,038	15.4	B
North of SR 44	4,100	21.5	C	3,320	17.0	B
North of SR 421	4,753	26.2	D	3,887	20.2	C
I-95 Southbound						
South of SR 44	3,038	15.4	B	3,713	19.2	C
North of SR 44	3,330	17.0	B	4,098	21.5	C

Table 18: Year 2045 No Build Peak Hour Freeway Level of Service Analysis

Freeway Segment	AM Peak Hour			PM Peak Hour		
	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS
North of SR 421	3,888	20.2	C	4,752	26.2	D

Table 19: Year 2045 No Build Peak Hour Ramp Merge/Diverge Analysis

Ramp Segment			AM Peak Hour			PM Peak Hour	
	Ramp Type	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS
I-95 and SR 421 Interchange							
I-95 NB off ramp to SR 421	Diverge	915	20.3	C	757	15.9	B
I-95 NB on ramp from SR 421	Merge	1,568	27.9	C	1,324	22.6	C
I-95 SB off ramp to SR 421	Diverge	1,298	20.6	C	1,593	25.5	C
I-95 SB on ramp from SR 421	Merge	740	18.0	B	939	22.6	C
I-95 and SR 44 Interchange							
I-95 NB off ramp to SR 44	Diverge	807	25.0	C	668	21.0	C
I-95 NB on ramp from SR 44	Merge	1,194	23.7	C	950	18.9	B
I-95 SB off ramp to SR 44	Diverge	301	20.3	C	269	24.3	C
I-95 SB off ramp to SR 44 (loop ramp)	Diverge	665	16.3	B	915	21.1	C
I-95 SB on ramp from SR 44	Merge	673	15.3	B	799	19.3	B

4.2.2 No Build Alternative Intersection LOS Analysis

Intersection operational analyses were completed for No Build peak hour conditions using Synchro software. A peak hour factor of 0.95 for all intersections was used along with the existing geometry and traffic control data. For future year 2045, the SR 44 and I-95 Southbound ramp terminal is assumed to be signalized as recommended in the long-term improvements identified in the *SR 44 Corridor Management Plan (August 2013)*. The future projected No Build LOSs are summarized in **Table 20** and **Table 21** for opening year 2025 and design year 2045, respectively. The results of the operational analyses show that all intersections are anticipated to operate at LOS D or better during both peak hours for opening year 2025 except for the SR 421 and Williamson Boulevard intersection which is projected to operate a LOS E and LOS F for future years 2025 and 2045, respectively. The future year operational analysis worksheets are included in Appendix E.

Table 20: Year 2025 No Build Peak Hour Intersection Level of Service

Signalized Intersection	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
SR 421 and Williamson Boulevard	65.6	E	79.5	E
SR 421 and I-95 Southbound	20.4	C	26.9	C
SR 421 and I-95 Northbound	18.2	B	14.1	B
SR 421 and Taylor Branch Road	12.5	B	13.2	B
SR 44 and Williamson Boulevard	25.6	C	28.0	C

Table 20: Year 2025 No Build Peak Hour Intersection Level of Service

SR 44 and I-95 Northbound	34.1	C	18.2	B
SR 44 and Sugar Mill Drive	19.1	B	10.8	B
Unsignalized Intersection*	**Delay (sec/veh)**	**LOS**	**Delay (sec/veh)**	**LOS**
SR 44 and I-95 Southbound**	16.4	C	18.9	B
Pioneer Trail and Williamson Boulevard	24.1	C	27.9	D
Pioneer Trail and Turnbull Bay Road	17.2	C	21.7	C
*Unsignalized intersection delay/LOS reported for worst case movement (minor street left turn) ** Unsignalized intersection delay/LOS reported for southbound right; there is no left turn movement from off ramp				

Table 21: Year 2045 No Build Peak Hour Intersection Level of Service

Signalized Intersection	**AM Peak Hour**		**PM Peak Hour**	
	Delay (sec/veh)	**LOS**	**Delay (sec/veh)**	**LOS**
SR 421 and Williamson Boulevard	285.0	F	315.5	F
SR 421 and I-95 Southbound	78.9	E	57.6	E
SR 421 and I-95 Northbound	42.8	D	26.2	C
SR 421 and Taylor Branch Road	28.3	C	24.6	C
SR 44 and Williamson Boulevard	50.6	D	62.8	E
SR 44 and I-95 Southbound	1.7	A	0.3	A
SR 44 and I-95 Northbound	97.8	F	26.1	C
SR 44 and Sugar Mill Drive	71.1	E	20.3	C
Unsignalized Intersection*	**Delay (sec/veh)**	**LOS**	**Delay (sec/veh)**	**LOS**
Pioneer Trail and Williamson Boulevard	>300s	F	>300s	F
Pioneer Trail and Turnbull Bay Road	100.1	F	144.1	F
*Unsignalized intersection delay/LOS reported for worst case movement (minor street left turn)				

The results of the operational analyses show that during design year 2045, the following intersections are projected to operate below the target LOS under future No Build conditions:

- SR 421 and Williamson Boulevard
- SR 421 and I-95 Southbound
- SR 44 and Williamson Boulevard
- SR 44 and I-95 Northbound
- SR 44 and Sugar Mill Drive
- Pioneer Trail and Williamson Boulevard
- Pioneer Trail and Turnbull Bay Road

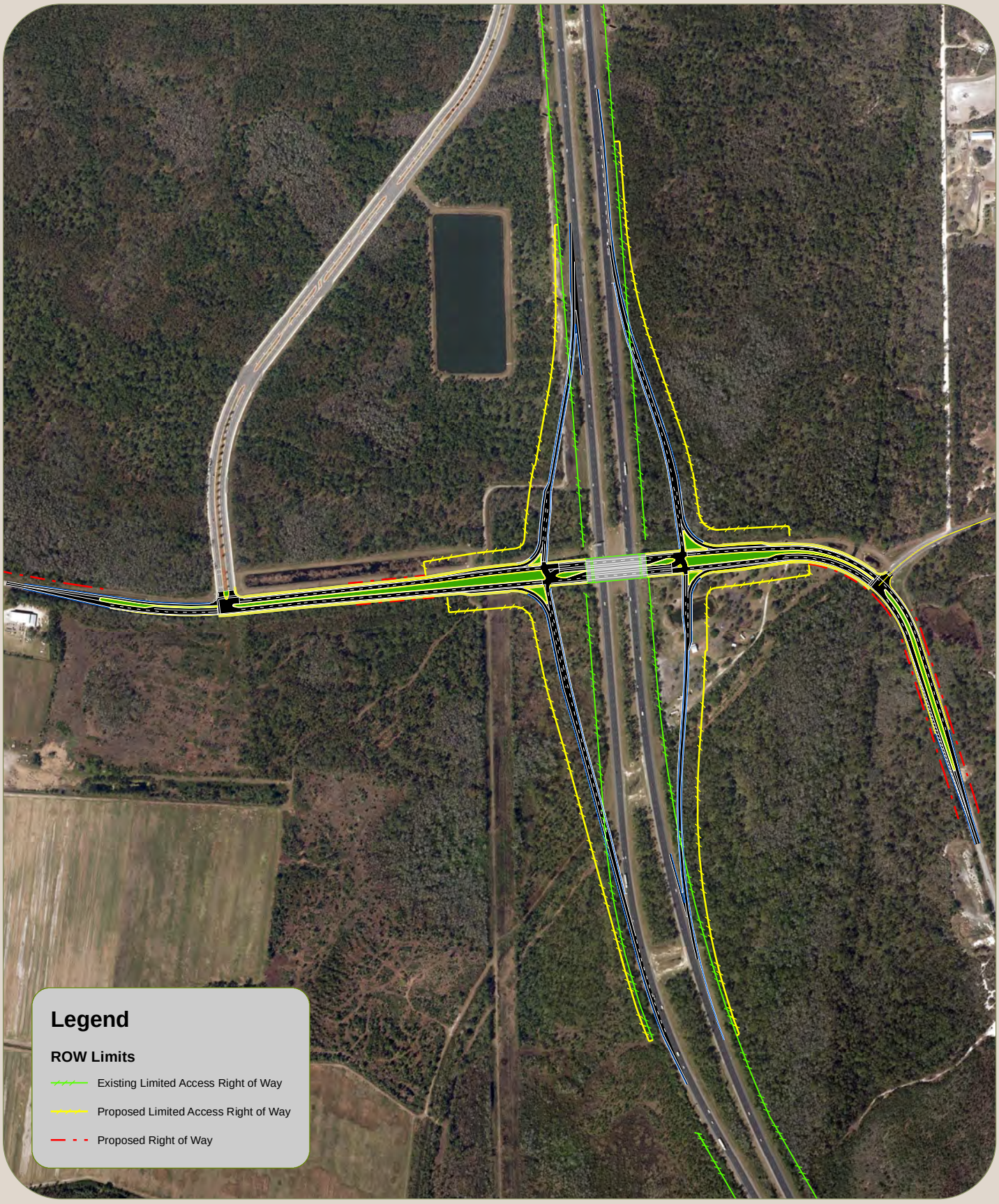
4.3 Future Year Build Alternative Operational Analysis

Analysis of traffic operations for the future year Build conditions was completed for opening year 2025 and design year 2045. The Build scenario reflects future growth in traffic as determined in the preceding section of the report and assumes construction of a new interchange at I-95 and Pioneer Trail, along with widening of Pioneer Trail from two to four lanes within the project study limits. Two preliminary design concepts were developed for the I-95 at Pioneer Trail interchange: a tight diamond and a partial cloverleaf as shown in **Figure 20A** and **Figure 20B**. Both interchange design concepts provide single lane entry and exit ramps for access to and from I-95. The

N

0 250 500 750 1,500 Feet

1 inch = 750 feet



PIONEER TRAIL BUILD ALTERNATIVE
(DIAMOND INTERCHANGE CONCEPT)

N

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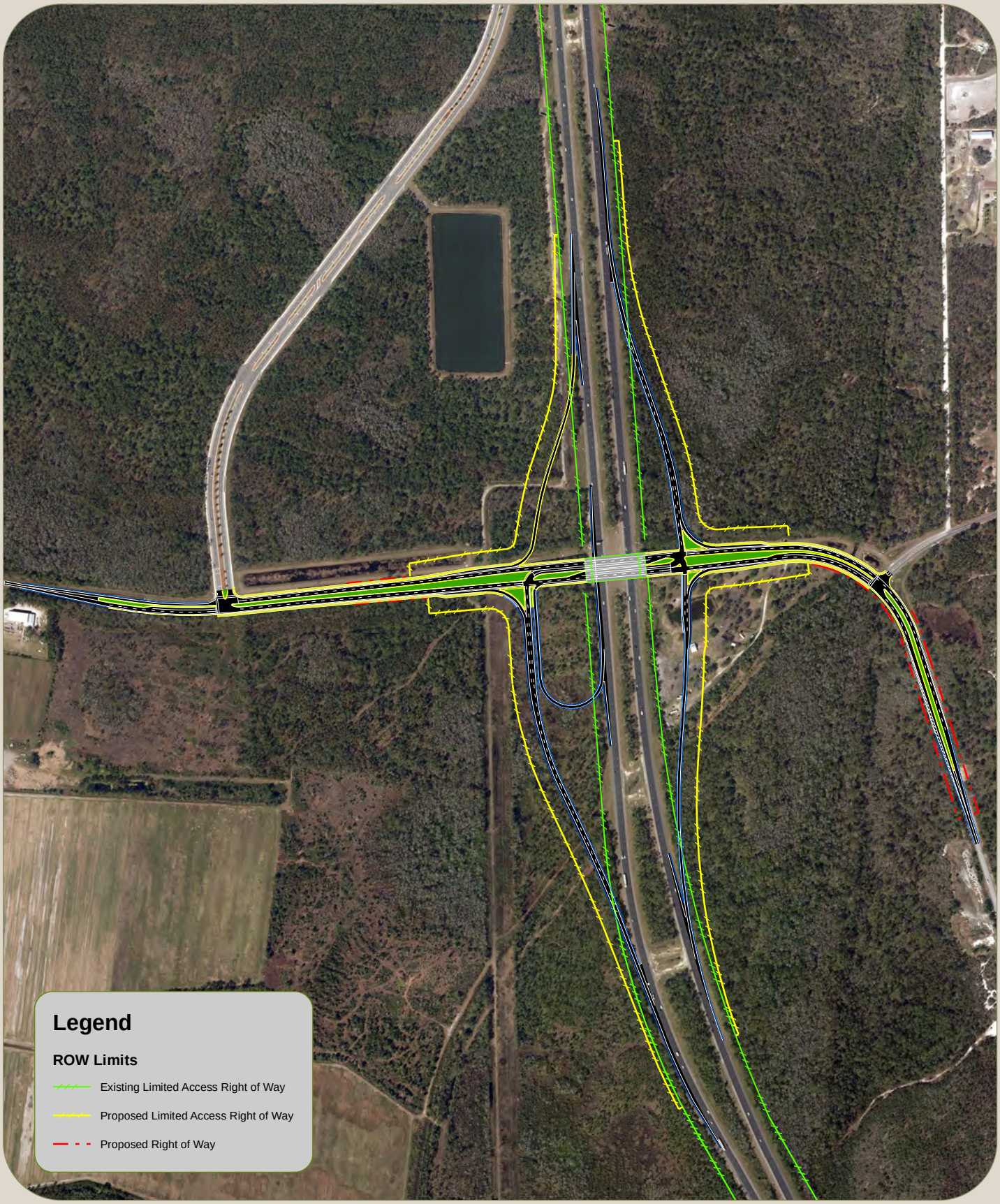
1 inch = 750 feet



PIONEER TRAIL BUILD ALTERNATIVE
(PARTIAL CLOVERLEAF INTERCHANGE CONCEPT)

partial cloverleaf design concept incorporates a loop ramp in the southwest quadrant of the interchange for I-95 southbound to Pioneer Trail eastbound movements, thus eliminating the need for a left turn movement from the northwest quadrant exit ramp.

For freeway and ramp analyses, the roadway geometry is consistent with the existing and No Build conditions; no changes in lane configurations are assumed for the Build condition except for the new intersections formed by the Pioneer Trail interchange and the widening of Pioneer Trail. Additionally, the following input parameters were used for the capacity analysis:

- Peak Hour Factor (PHF): 0.95 (I-95 mainline and intersections)
- Level terrain
- I-95 Base free flow speed: 75 mph

4.3.1 Build Alternative Freeway & Ramp Junctions Operational LOS Analysis

Level of service for the I-95 freeway and ramps in the project corridor was computed using the basic freeway segment and ramp merge/diverge modules of the Highway Capacity Software (HCS7). The total future projected Build demand volumes and performance measures including density and LOS are summarized in **Table 22** and **Table 23** for opening year 2025 and in **Table 24** and **Table 25** for design year 2045. The future year operational analysis worksheets are included in Appendix E.

The results of the Build operational analyses indicate that for opening year 2025 all freeway segments are expected to operate at LOS B or better during both AM and PM peak hours. Additionally, all of the entrance and exit ramps are anticipated to operate at LOS B or better during both AM and PM peak hours.

For design year 2045, all freeway segments are anticipated to operate at LOS C or better during both AM and PM peak hours. Additionally, all of the entrance and exit ramps are anticipated to operate at LOS C or better during both AM and PM peak hours under build conditions in design year 2045.

Table 22: Year 2025 Build Peak Hour Freeway Level of Service Analysis

Freeway Segment	AM Peak Hour			PM Peak Hour		
	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS
I-95 Northbound						
South of SR 44	2,525	12.8	B	2,066	10.5	A
North of SR 44	2,765	14.0	B	2,230	11.3	B
North of Pioneer Trail	2,829	14.4	B	2,283	11.6	B
North of SR 421	3,317	16.9	B	2,714	13.8	B
I-95 Southbound						
South of SR 44	2,066	10.5	A	2,525	12.8	B
North of SR 44	2,238	11.4	B	2,761	14.0	B
North of Pioneer Trail	2,290	11.6	B	2,826	14.3	B
North of SR 421	2,712	13.8	B	3,319	16.9	B

Table 23: Year 2025 Build Peak Hour Ramp Merge/Diverge Analysis

Ramp Segment		AM Peak Hour			PM Peak Hour		
	Ramp Type	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS
I-95 and SR 421 Interchange							
I-95 NB off ramp to SR 421	Diverge	521	12.7	B	433	9.3	A
I-95 NB on ramp from SR 421	Merge	1009	18.7	B	864	15.0	B
I-95 SB off ramp to SR 421	Diverge	841	13.2	B	1035	17.0	B
I-95 SB on ramp from SR 421	Merge	419	11.5	B	542	14.7	B
I-95 and SR 44 Interchange							
I-95 NB off ramp to SR 44	Diverge	473	17.7	B	393	14.8	B
I-95 NB on ramp from SR 44	Merge	713	15.2	B	557	11.9	B
I-95 SB off ramp to SR 44	Diverge	186	13.8	B	172	16.9	B
I-95 SB off ramp to SR 44 (loop ramp)	Diverge	385	9.9	A	531	13.5	B
I-95 SB on ramp from SR 44	Merge	399	9.3	A	467	12.0	B
I-95 and Pioneer Trail Interchange (Diamond Interchange Alternative)							
I-95 NB off ramp to Pioneer Trail	Diverge	153	18.7	B	126	15.4	B
I-95 NB on ramp from Pioneer Trail	Merge	217	12.1	B	179	9.0	A
I-95 SB off ramp to Pioneer Trail	Diverge	177	15.9	B	218	19.1	B
I-95 SB on ramp from Pioneer Trail	Merge	125	8.6	A	153	11.5	B
I-95 and Pioneer Trail Interchange (Partial Cloverleaf Interchange Alternative)							
I-95 NB off ramp to Pioneer Trail	Diverge	153	18.7	B	126	15.4	B
I-95 NB on ramp from Pioneer Trail	Merge	217	12.1	B	179	9.0	A
I-95 SB off ramp to Pioneer Trail	Diverge	89	15.2	B	114	18.8	B
I-95 SB off ramp to Pioneer Trail (SW quadrant loop ramp)	Diverge	88	14.6	B	101	18.2	B
I-95 SB on ramp from Pioneer Trail	Merge	125	8.6	A	153	11.5	B

Table 24: Year 2045 Build Peak Hour Freeway Level of Service Analysis

Freeway Segment	AM Peak Hour			PM Peak Hour		
	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS
I-95 Northbound						
South of SR 44	3,713	19.2	C	3,038	15.4	B
North of SR 44	4,009	21.0	C	3,251	16.6	B
North of Pioneer Trail	4,250	22.6	C	3,450	17.7	B
North of SR 421	4,704	25.8	C	3,848	20.0	C

Table 24: Year 2045 Build Peak Hour Freeway Level of Service Analysis

Freeway Segment	AM Peak Hour			PM Peak Hour		
	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS
I-95 Southbound						
South of SR 44	3,038	15.4	B	3,713	19.2	C
North of SR 44	3,257	16.6	B	4,005	21.0	C
North of Pioneer Trail	3,456	17.7	B	4,243	22.5	C
North of SR 421	3,847	20.0	C	4,704	25.8	C

Table 25: Year 2045 Build Peak Hour Ramp Merge/Diverge Analysis

Ramp Segment			AM Peak Hour			PM Peak Hour	
	Ramp Type	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS
I-95 and SR 421 Interchange							
I-95 NB off ramp to SR 421	Diverge	621	20.4	C	514	16.1	B
I-95 NB on ramp from SR 421	Merge	1,076	26.3	C	905	21.2	C
I-95 SB off ramp to SR 421	Diverge	889	19.4	B	1,094	24.0	C
I-95 SB on ramp from SR 421	Merge	505	18.0	B	636	22.5	C
I-95 and SR 44 Interchange							
I-95 NB off ramp to SR 44	Diverge	550	24.4	C	456	20.6	C
I-95 NB on ramp from SR 44	Merge	846	22.2	C	669	17.7	B
I-95 SB off ramp to SR 44	Diverge	210	19.8	B	223	23.7	C
I-95 SB off ramp to SR 44 (loop ramp)	Diverge	471	15.9	B	613	20.2	C
I-95 SB on ramp from SR 44	Merge	462	14.7	B	544	18.6	B
I-95 and Pioneer Trail Interchange (Diamond Interchange Alternative)							
I-95 NB off ramp to Pioneer Trail	Diverge	590	26.2	C	488	22.1	C
I-95 NB on ramp from Pioneer Trail	Merge	831	21.5	C	687	16.8	B
I-95 SB off ramp to Pioneer Trail	Diverge	683	23.6	C	837	27.9	C
I-95 SB on ramp from Pioneer Trail	Merge	484	15.2	B	599	19.5	B
I-95 and Pioneer Trail Interchange (Partial Cloverleaf Interchange Alternative)							
I-95 NB off ramp to Pioneer Trail	Diverge	590	26.2	C	488	22.1	C
I-95 NB on ramp from Pioneer Trail	Merge	831	21.5	C	687	16.8	B
I-95 SB off ramp to Pioneer Trail	Diverge	344	22.9	C	452	27.1	C
I-95 SB off ramp to Pioneer Trail (SW quadrant loop ramp)	Diverge	339	21.0	C	385	24.7	C
I-95 SB on ramp from Pioneer Trail	Merge	484	15.2	B	599	19.5	B

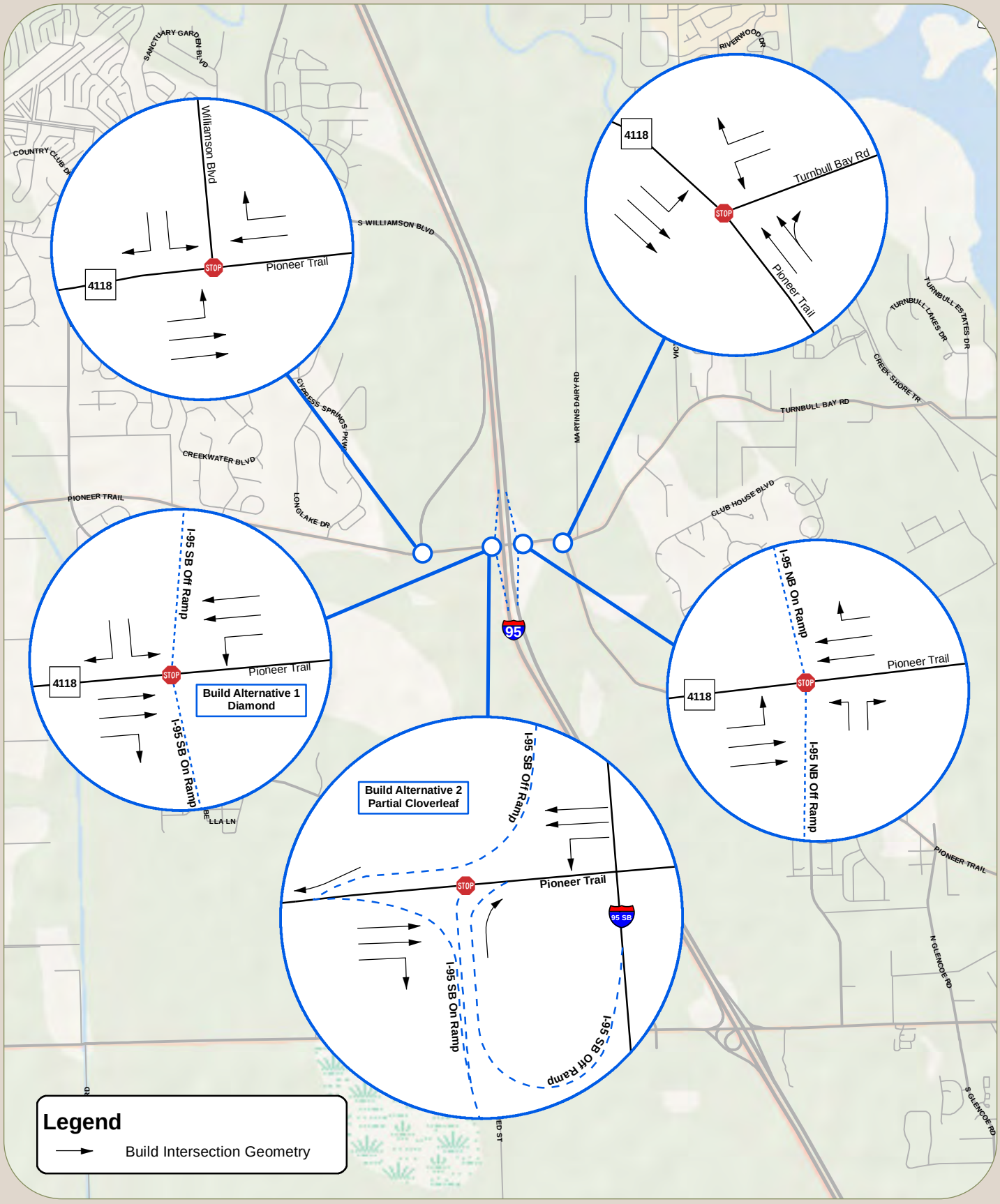
4.3.2 Build Alternative Intersection LOS Analysis

Intersection operational analyses were completed for Build peak hour conditions using Synchro software. A peak hour factor of 0.95 for all intersections was used. The Build geometry and traffic control assumed for opening year 2025 was consistent with the No Build conditions for SR 421 and SR 44 intersections. Along Pioneer Trail the opening year 2025 Build geometry, as shown in **Figure 21A,** assumes Pioneer Trail to be widened to four lanes, stop-control on the minor streets and single exclusive left or right turn lanes at the four study intersections. In the Design year 2045, the Build geometry as shown in **Figure 21B**, shows the recommended lane configurations and traffic control necessary to accommodate future traffic volumes and produce LOS at or above the acceptable target LOS. It should be noted that although the Pioneer Trail intersections are not projected to meet the need for dual left turn lanes in the opening year 2025, it is assumed that the interchange, bridge and intersections will be constructed to the ultimate width to accommodate the lane configurations depicted in **Figure 21B**. In the interim, the additional turn lanes should be striped/hatched out until the installation of dual left turn lanes and/or traffic signals are warranted by future traffic studies. The future year operational analysis worksheets are included in Appendix E.

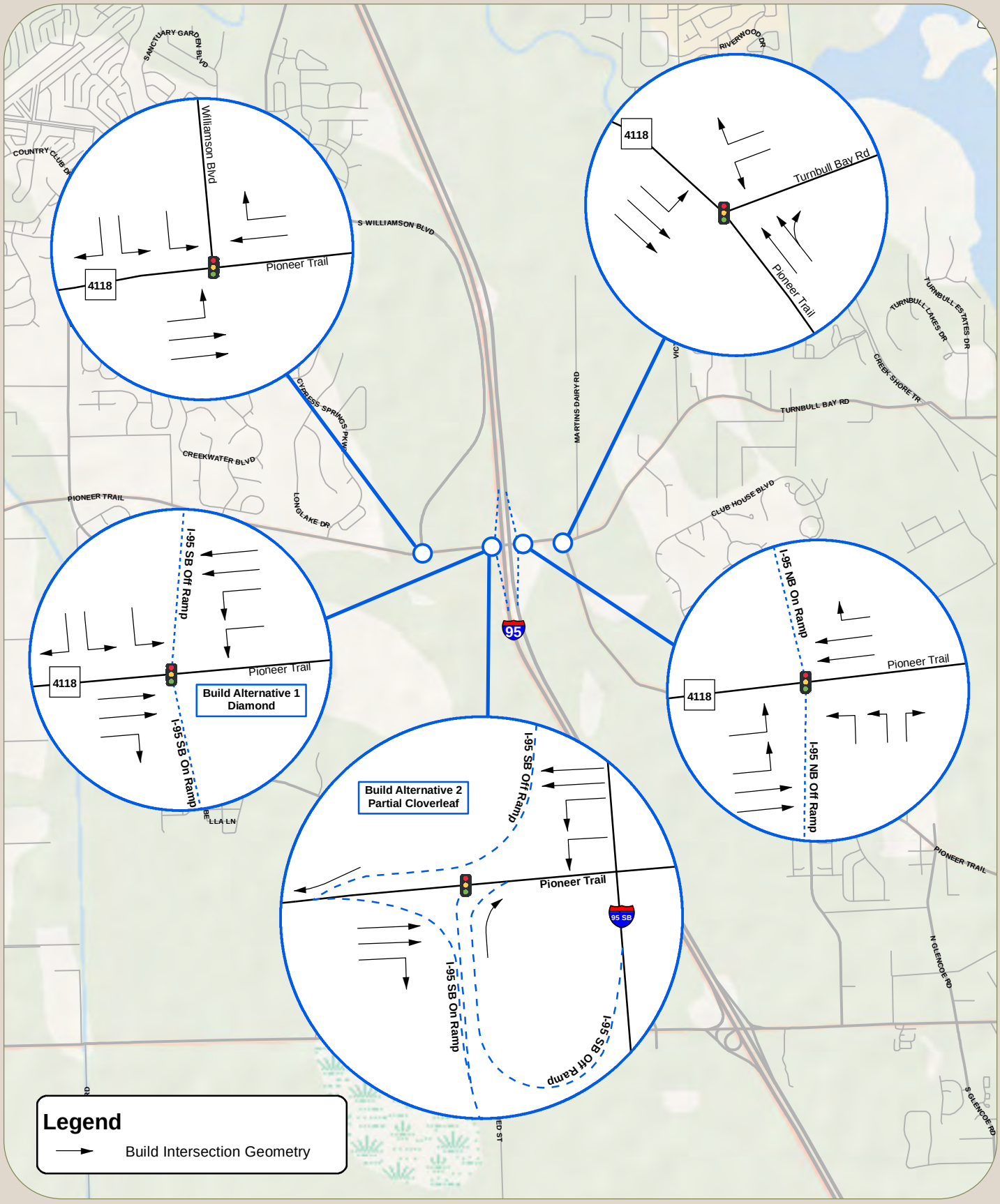
The future projected Build LOSs are summarized in **Table 26** and **Table 27** for opening year 2025 and design year 2045, respectively. The results of the Build operational analyses show that all intersections are anticipated to operate at LOS D or better during both peak hours for opening year 2025 and design year 2045 except for the SR 421 and Williamson Boulevard intersection which is projected to operate at LOS E during the AM peak hour in 2025 and LOS F during both peak hours in 2045. Although this intersection is anticipated to operate below the target LOS for the projected future demand, provision of a new access connection at Pioneer Trail would provide needed relief and benefits by reducing overall traffic demand, with anticipated decrease in intersection delay by approximately 42% during the AM peak and 56% during the PM peak in design year 2045 under the Build alternative when compared to No Build.

The SR 421 and Williamson Boulevard intersection is located within 700 feet and to the west of the SR 421 and I-95 interchange. Three of the four quadrants of the intersection are fully developed with commercial land uses, while the southeast quadrant remains vacant. Dual left turn lanes are provided on all four approaches and U-turns are restricted in the southbound and westbound direction. The signal currently operates with a right turn overlap phase for the northbound dual right turn lane movement. The intersection has been operationally enhanced with geometric configurations to maximize the available right of way and recent signal retiming efforts to improve traffic progression along the SR 421 corridor and through the adjacent interchange. Additionally, the I-95 bridges over SR 421 were recently demolished and reconstructed to accommodate the widening of I-95 to three lanes in each direction; this I-95 capacity enhancement project was completed in the Spring of 2017.

The SR 421 and Williamson Boulevard intersection was thoroughly evaluated in detail in previous studies completed for this corridor. Numerous alternatives ranging from additional lanes, movement restrictions and various interchange configurations such as Diverging Diamond and Single Point Urban Interchange were evaluated for the I-95 and SR 421 interchange and nearby intersections along the SR 421 corridor. All evaluated alternatives in the previous studies resulted in failing LOS at the SR 421 and Williamson Boulevard for the future projected demand. With the widening of I-95 to provide additional capacity and improved mobility in the area, the ability to provide adequate access connections that meet the needs of the region is critical. As previously determined in the approved IJR, a new access connection at Pioneer Trail would produce benefits through decreased delays resulting from reduced vehicle demands in the vicinity of the I-95 interchange including the SR 421 and Williamson Boulevard intersection. **Table 28** and **Table 29** shows the projected decrease in traffic demand and reduced delays with the Pioneer Trail Build alternative.



BUILD INTERSECTION GEOMETRY
PIONEER TRAIL (OPENING YEAR 2025)



BUILD INTERSECTION GEOMETRY
PIONEER TRAIL (DESIGN YEAR 2045)

Table 26: Year 2025 Build Peak Hour Intersection Level of Service

Signalized Intersection	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/ve	LOS
SR 421 and Williamson Boulevard	66.5	E	48.9	D
SR 421 and I-95 Southbound	18.6	B	20.0	B
SR 421 and I-95 Northbound	14.1	B	12.7	B
SR 421 and Taylor Branch Road	15.1	B	15.4	B
SR 44 and Williamson Boulevard	33.0	C	29.4	C
SR 44 and I-95 Northbound	30.6	C	12.9	B
SR 44 and Sugar Mill Drive	20.5	C	8.9	A
Unsignalized Intersection*	Delay	LOS	Delay	LOS
SR 44 and I-95 Southbound**	26.8	D	14.3	B
Pioneer Trail and Williamson Boulevard	21.9	C	23.1	C
Pioneer Trail and Turnbull Bay Road	16.9	C	19.7	C
Pioneer Trail and I-95 Southbound (Diamond Alt.)	17.9	C	19.5	C
Pioneer Trail and I-95 Northbound	22.9	C	18.1	C
Pioneer Trail and I-95 Southbound (Partial Cloverleaf Alt.)**	10.2	B	10.0	B

*Unsignalized intersection delay/LOS reported for worst case movement (minor street left turn)
**Unsignalized intersection delay/LOS reported for right turn; there is no left turn movement from off ramp

Table 27: Year 2045 Build Peak Hour Intersection Level of Service

Signalized Intersection	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
SR 421 and Williamson Boulevard	165.1	F	139.8	F
SR 421 and I-95 Southbound	19.9	B	21.9	C
SR 421 and I-95 Northbound	14.5	B	12.6	B
SR 421 and Taylor Branch Road	19.1	B	19.7	B
SR 44 and Williamson Boulevard	41.6	D	35.4	D
SR 44 and I-95 Southbound	1.5	A	0.3	A
SR 44 and I-95 Northbound	37.0	D	11.6	B
SR 44 and Sugar Mill Drive	31.9	C	11.7	B
Pioneer Trail and Williamson Boulevard	19.3	B	20.6	C
Pioneer Trail and Turnbull Bay Road	16.6	B	19.2	B
Pioneer Trail and I-95 Southbound (Diamond Alt.)	15.0	B	28.5	C
Pioneer Trail and I-95 Northbound (Diamond Alt.)	28.9	C	21.0	C
Pioneer Trail and I-95 Southbound (Partial Cloverleaf Alt.)	5.9	A	8.0	A
Pioneer Trail and I-95 Northbound (Partial Cloverleaf Alt.)	26.9	C	21.9	C

Table 28: Year 2045 No Build vs. Build Peak Hour Demand Volumes

Intersection	Total Volume Entering Intersection				% Decrease in Total Entering Volume	
	2045 No Build		2045 Build			
	AM	PM	AM	PM	AM	PM
SR 421 and Williamson Boulevard	8,040	8,235	7,683	7,701	-4%	-6%
SR 421 and I-95 Southbound	6,012	6,447	5,592	5,671	-7%	-12%
SR 421 and I-95 Northbound	6,641	6,486	5,901	5,685	-11%	-12%
SR 421 and Taylor Branch Road	6,113	6,082	5,541	5,561	-9%	-9%
SR 44 and Williamson Boulevard	3,754	3,862	3,546	3,604	-6%	-7%
SR 44 and I-95 Southbound	4,347	4,612	3,852	3,986	-11%	-14%
SR 44 and I-95 Northbound	4,844	4,737	4,240	4,089	-12%	-14%
SR 44 and Sugar Mill Drive	4,171	4,326	3,848	3,820	-8%	-12%

Table 29: Year 2045 No Build vs. Build Peak Hour Intersection Delay

Intersection	Total Intersection Delay (sec/veh)				% Decrease in Total Intersection Delay	
	2045 No Build		2045 Build			
	AM	PM	AM	PM	AM	PM
SR 421 and Williamson Boulevard	285	315.5	165.1	139.8	-42%	-56%
SR 421 and I-95 Southbound	78.9	57.6	19.9	21.9	-75%	-62%
SR 421 and I-95 Northbound	42.8	26.2	14.5	12.6	-66%	-52%
SR 421 and Taylor Branch Road	28.3	24.6	19.1	19.7	-33%	-20%
SR 44 and Williamson Boulevard	50.6	62.8	41.6	35.4	-18%	-44%
SR 44 and I-95 Southbound	1.7	0.3	1.5	0.3	-12%	0%
SR 44 and I-95 Northbound	97.8	26.1	37	11.6	-62%	-56%
SR 44 and Sugar Mill Drive	71.1	20.3	31.9	11.7	-55%	-42%

4.3.3 Future No-Build and Build Alternatives SimTraffic Analysis

The results of the preceding Synchro traffic operational analysis for the future design year Build conditions may not adequately account for over-saturated conditions in the roadway network; therefore, they are supplemented by analysis using the SimTraffic microsimulation tool. SimTraffic allows for further detailed analysis of congested conditions including queues and spillbacks. As recommended in the FDOT Traffic Analysis Handbook (March 2014), multiple simulation runs were performed, and the results were combined to produce Measures of Effectiveness (MOEs). The Synchro input parameters such as lane assignments, demand volumes and PHFs were reviewed along with the default calibration parameters utilized in completing ten simulation runs, each with a 10-minute seeding time and 60-minute recording time.

4.3.3.1 Queuing Analysis

Analysis of traffic operations for the future design year Build conditions includes calculating the queue lengths for critical movements throughout the study area roadway network. Both Synchro and SimTraffic analysis results are presented for the study intersections under 2045 No Build and Build conditions. The 95th percentile queue length represents a 5-percent probability of the length being exceeded during the analysis time-period. The SimTraffic maximum queue length is the maximum observed distance from the stop bar to the back of queue recorded every two minutes during the simulation. The queue lengths are used to determine the required queue length that would decrease the likelihood of spillback of traffic

upstream from the intersection. The resulting queuing analyses including recommended queue lengths are shown in **Table 30** and **Table 31**; calculations are provided in Appendix E.

Table 30: Year 2045 Peak Hour Queuing Analysis

Intersection	95th Percentile Queue Length xx = Synchro Queue, (xx) = SimTraffic Queue				
	2045 No Build AM Peak	2045 No Build PM Peak	2045 Build AM Peak	2045 Build PM Peak	Existing Turn Lane Length (feet)*
SR 421 and Williamson Blvd.					
Eastbound Left	97 (297)	105 (161)	98 (329)	#217 (282)	250
Westbound Left	m#324 (264)	m#553 (363)	#486 (551)	m#649 (513)	450
Westbound Right	m431 (396)	m#1369 (272)	#1172 (353)	m#1666 (365)	285
Northbound Left	#150 (315)	#334 (355)	#128 (307)	#272 (321)	210
Northbound Right	535 (711)	331 (856)	484 (690)	276 (764)	575
Southbound Left	#1248 (729)	#960 (844)	#1050 (733)	#790 (810)	680
SR 421 and I-95 Southbound					
Westbound Left	m#526 (565)	m#1103 (509)	#475 (578)	m#596 (443)	350
Southbound Left	#687 (516)	#522 (586)	#454 (651)	316 (609)	450
Southbound Right	#444 (1240)	#784 (1175)	269 (1492)	#544 (1429)	340
SR 421 and I-95 Northbound					
Eastbound Left	m276 (276)	m269 (217)	m285 (274)	m197 (179)	340
Westbound Right	571 (392)	m0 (214)	418 (191)	185 (395)	1,350
Northbound Left	#619 (319)	#744 (305)	302 (361)	357 (336)	280
Northbound Right	#548 (1320)	285 (1081)	263 (1419)	176 (635)	600
SR 421 and Taylor Branch Road					
Eastbound Right	m207 (233)	223 (133)	99 (132)	148 (88)	250
Westbound Left	54 (125)	121 (322)	118 (300)	173 (402)	275
Northbound Right	457 (399)	389 (351)	452 (399)	343 (351)	full length of roadway approach
SR 44 and Williamson Blvd.					
Eastbound Left	253 (256)	#324 (637)	240 (258)	305 (474)	465
Westbound Left	184 (286)	m193 (183)	184 (458)	m193 (180)	500
Westbound Right	16 (359)	m0 (150)	15 (434)	m0 (76)	350
Northbound Left	56 (63)	89 (104)	90 (109)	100 (109)	175
Southbound Left	167 (185)	301 (323)	#210 (202)	#360 (626)	175
SR 44 and I-95 Southbound					
Westbound Left	308 (261)	m#244 (228)	141 (286)	m#177 (175)	310
Southbound Right	293 (398)	#323 (811)	195 (279)	154 (854)	1,100

Table 30: Year 2045 Peak Hour Queuing Analysis

Intersection	95th Percentile Queue Length xx = Synchro Queue, (xx) = SimTraffic Queue				
	2045 No Build AM Peak	2045 No Build PM Peak	2045 Build AM Peak	2045 Build PM Peak	Existing Turn Lane Length (feet)*
SR 44 and I-95 Northbound					
Eastbound Left	#217 (216)	m68 (229)	#137 (175)	m36 (142)	500
Westbound Right	m#1072 (375)	879 (307)	m#817 (369)	150 (203)	275
Northbound Left	#1091 (1048)	#594 (1211)	#612 (1191)	344 (423)	200
Northbound Right	121 (315)	365 (283)	62 (309)	242 (279)	180
SR 44 and Sugar Mill Drive					
Eastbound Left	#313 (216)	m#260 (298)	#211 (179)	m189 (232)	625
Westbound Right	42 (345)	25 (221)	25 (292)	24 (140)	240
Southbound Right	#331 (231)	91 (208)	#201 (223)	72 (142)	150

Notes:
Queue shown is maximum after two cycles.
- 95th percentile volume exceeds capacity, queue may be longer
m - Volume for 95th percentile queue is metered by upstream signal
*The existing turn lane length provided is exclusive of taper.
= Synchro queue length; (##) = SimTraffic queue length
(##) – denotes that the computed queue length exceeds the existing available queue length

Table 31: Year 2045 Peak Hour Queuing Analysis (Pioneer Trail)

Intersection	Synchro 95th Percentile Queue Length		SimTraffic 95th Percentile Queue Length		Minimum Recommended Queue Length (feet)*
	2045 AM Peak Hour	2045 PM Peak Hour	2045 AM Peak Hour	2045 PM Peak Hour	
Build Alternative - Diamond Interchange					
Pioneer Trail and Turnbull Bay Road					
Eastbound Left	55	223	177	405	425
Southbound Left	70	57	126	138	150
Southbound Right	248	276	240	378	400
Pioneer Trail and Williamson Boulevard					
Eastbound Left	110	80	165	157	175
Westbound Right	33	1	94	81	100
Southbound Left	317	301	320	289	325
Southbound Right	49	65	64	112	125
Pioneer Trail and I-95 Southbound					
Westbound Left	151	231	149	238	250
Southbound Left	196	238	231	285	300

Table 31: Year 2045 Peak Hour Queuing Analysis (Pioneer Trail)

Intersection	Synchro 95th Percentile Queue Length		SimTraffic 95th Percentile Queue Length		Minimum Recommended Queue Length (feet)*
	2045 AM Peak Hour	2045 PM Peak Hour	2045 AM Peak Hour	2045 PM Peak Hour	
Pioneer Trail and I-95 Northbound					
Eastbound Left	313	240	289	202	300
Northbound Left	186	192	202	207	225
Build Alternative - Southwest Quadrant Partial Cloverleaf Interchange					
Pioneer Trail and Turnbull Bay Road					
Eastbound Left	66	437	165	345	450
Southbound Left	70	57	138	146	150
Southbound Right	248	276	230	398	400
Pioneer Trail and Williamson Boulevard					
Eastbound Left	110	80	166	179	200
Westbound Right	33	0	109	79	125
Southbound Left	317	301	309	286	325
Southbound Right	49	65	57	108	125
Pioneer Trail and I-95 Southbound					
Westbound Left	120	181	159	234	250
Pioneer Trail and I-95 Northbound					
Eastbound Left	206	208	286	223	300
Northbound Left	186	192	204	211	225

Notes:
Queue shown is maximum after two cycles.
- 95th percentile volume exceeds capacity, queue may be longer
m - Volume for 95th percentile queue is metered by upstream signal
*The minimum recommended queue length is exclusive of deceleration and taper; additional length should be provided per FDOT Design Standard Index 301.

4.3.3.2 I-95 Southbound & SR 44 Eastbound Loop Ramp Analysis

The I-95 Southbound to SR 44 Eastbound movement from the loop ramp in the southwest quadrant of the interchange was reviewed by completing simulation runs using SimTraffic as specified in the preceding section. The merge gore point for this movement is located about 350 feet west of the I-95 Northbound and SR 44 ramp terminal. The queuing and blocking reports for the I-95 Northbound and SR 44 ramp intersection were reviewed to evaluate the length of the eastbound through movement queues at the adjacent ramp terminal located to the east of the loop ramp. The SimTraffic queue results show that there is potential for the SR 44 eastbound through lane queues to extend back approximately 400 feet during both peak hours under both No Build and Build conditions. The maximum queue length for the Southbound loop off ramp was estimated to be 1039 feet. The existing loop ramp provides approximately 1,300 feet from the freeway diverge ramp gore area to the merge location on SR 44; therefore, this movement is not expected to back up onto the freeway mainline.

4.3.4 Intersection Control Evaluation (ICE) Analysis

The FDOT Intersection Control Evaluation (ICE) procedure was used to further analyze the ramp terminal intersections for the proposed I-95 at Pioneer Trail interchange. The ICE analysis included completing Stage 1 screening using the Capacity Analysis for Planning of Junctions (CAP-X) operational analysis tool and the Safety Performance of Intersection Control Evaluations (SPICE) tool. The AM and PM peak hour volumes for design year 2045 were used in the analyses for the northbound and southbound ramp terminals. The CAP-X analysis provides a ranking of the intersection treatments based on overall v/c ratios. For the I-95 Northbound ramp and the I-95 Southbound ramp intersections, both a traffic signal treatment and a 2x2 roundabout provided good results with v/c ratios below 1.0. To further evaluate treatment options, the Stage 1 SPICE analysis was completed utilizing the AADT volumes developed for this project. For the ramp terminal intersections, a traffic signal ranked higher than a two-lane (2X2) roundabout. Based on evaluation of the combined results of both Stage 1 CAP-X and SPICE analyses, the traffic signal treatment at both ramp terminals ranks overall higher than a roundabout. The Stage 1 ICE analysis worksheets for the ramp terminal intersections are included in Appendix F. The Stage 2 analysis requires development of conceptual design plans and cost estimates for design construction and right of way for the intersection treatment alternatives that are selected for advancement from Stage 1.

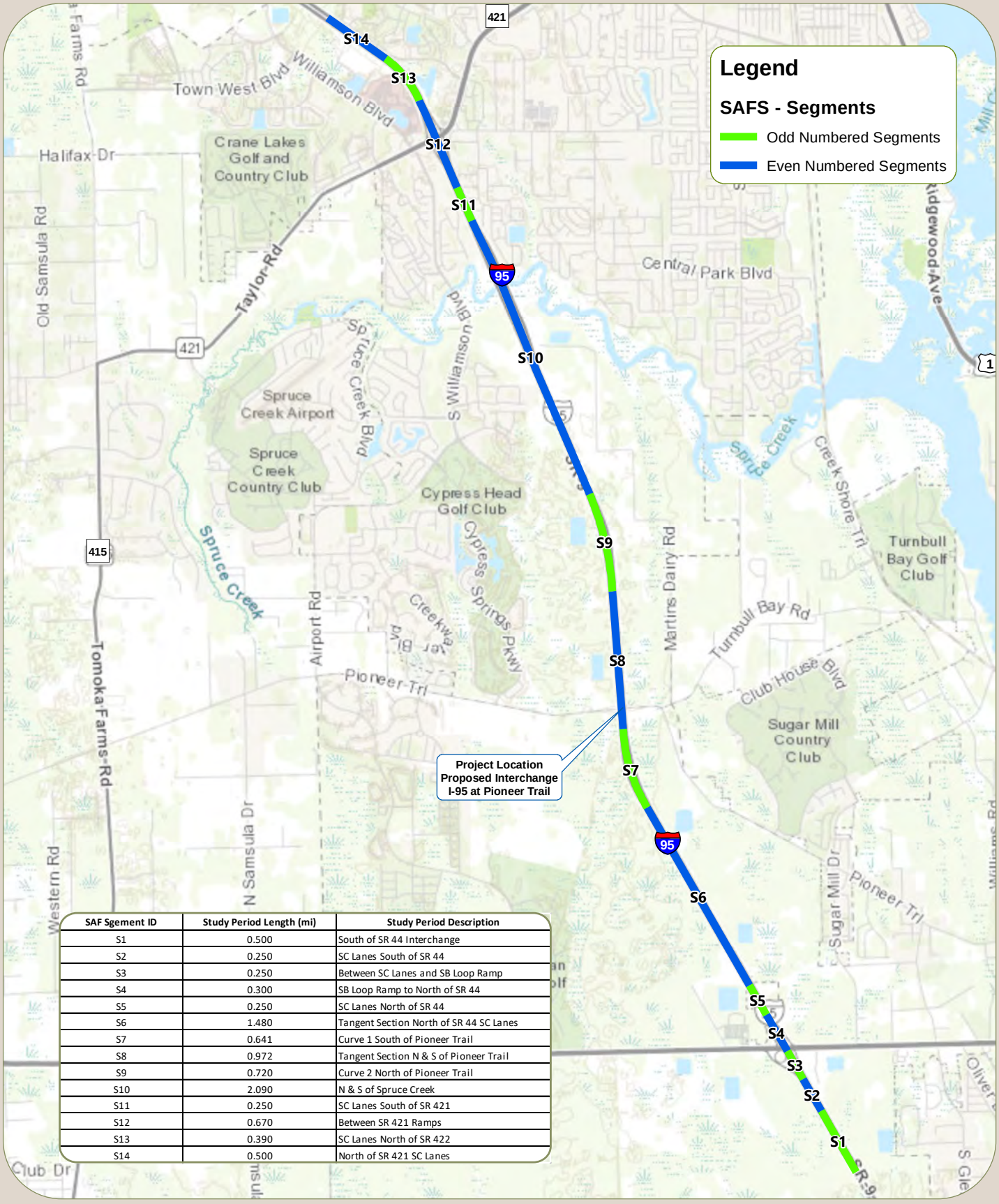
5.0 SAFETY ANALYSIS

A quantitative safety analysis of future conditions was conducted using the methods specified in the Highway Safety Manual (HSM). The anticipated change in crash frequency and severity due to changes in geometric features and traffic conditions resulting from the proposed project was determined based on the safety prediction methodologies in Part C of the HSM.

The Enhanced Interchange Safety Analysis Tool (ISATe), a spreadsheet-based program developed by the American Association of State Highway and Transportation Officials (AASHTO) and approved for use by FDOT, was used to evaluate freeway and interchange safety for the proposed I-95 and Pioneer Trail project. The ISATe tool implements the predictive methods in Part C of the HSM to develop Safety Performance Functions (SPFs) that predict crash frequency for a given set of site conditions. The predictive method utilizes traffic volumes and roadway characteristics such as horizontal alignment, cross section elements, roadside data and ramp access data as inputs to evaluate safety performance.

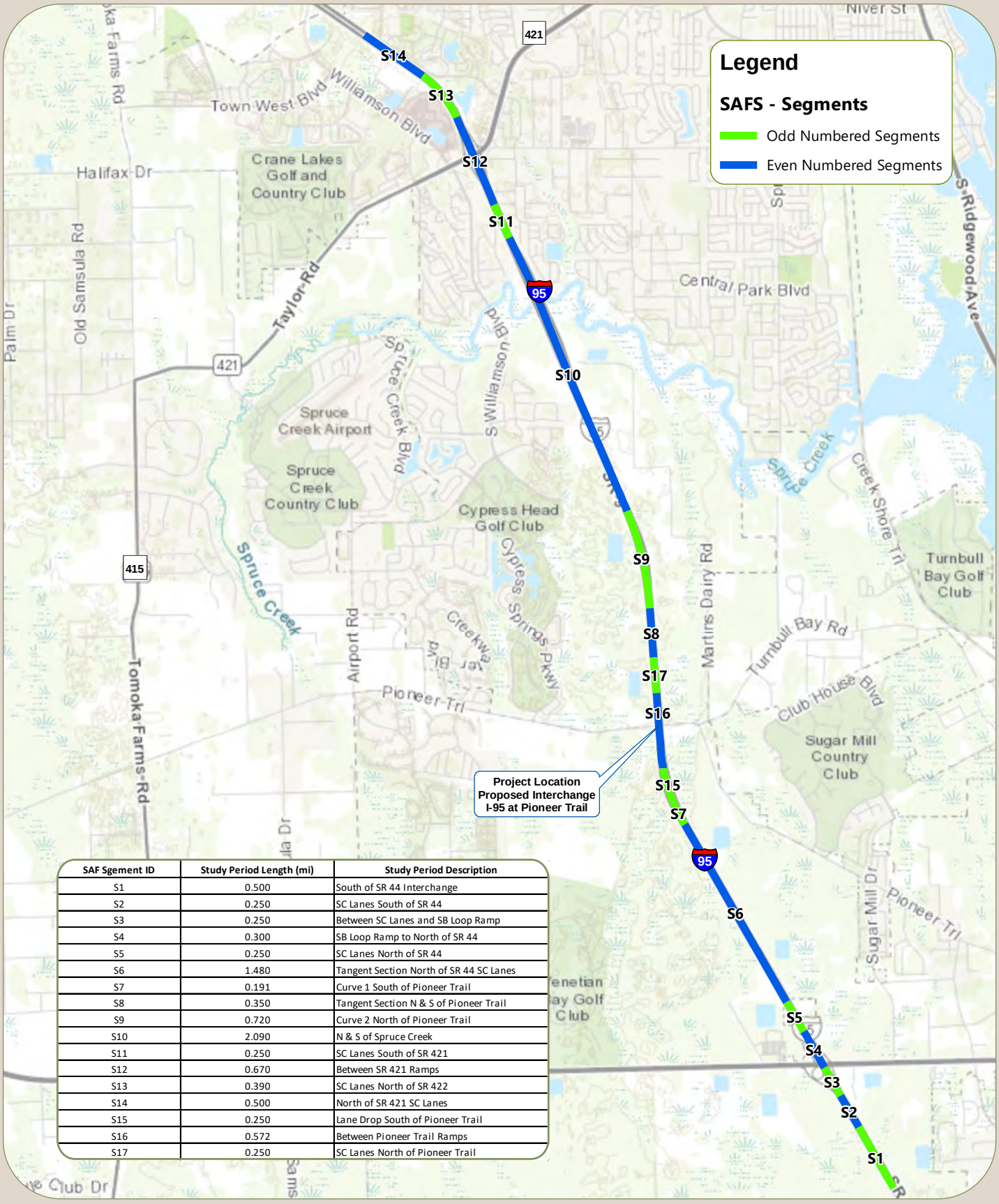
The predictive model may be used with observed crash data by using the empirical Bayes (EB) Method to provide a more reliable estimate of the expected average crash frequency. Based on the established criteria, the EB Method is not applicable to this project since the I-95 cross section was recently modified to widen it from a four-lane to six-lane freeway. The historical crash data that was available for the project was from 2013-2017, prior to the widening. Since the widening is a major geometric improvement that added through lanes to the interstate, the observed crash data from the historical time period would not necessarily be indicative of the crash experience that is likely to occur after the widening. Therefore, the study period for the predictive model will include only future analysis years.

The ISATe tool provides a safety performance evaluation based on the predicted number of total crashes by facility type and by severity. Different severity levels are defined as follows: K- fatal, A- incapacitating injury, B- non-incapacitating injury, C- possible injury and PDO- property damage only. The No Build and Build alternatives were analyzed for the entire I-95 project corridor using the future year AADTs developed in this study as inputs into ISATe. Geometric data for the freeway segments were available from the I-95 widening construction plans and from desktop analysis. For the No Build condition, the entire corridor was divided into 14 freeway segments with 14 ramp segments and 4 ramp terminals. For the Build condition, the Pioneer Trail diamond interchange configuration was added, and the corridor was divided into 17 freeway segments with 20 ramp segments and 6 ramp terminals. The I-95 freeway segmentation used in the analyses is shown in **Figure 22A** and **Figure 22B**. Based on the input data, ISATe calculations were performed to determine the predicted number of crashes for future year conditions. The resulting estimated crash statistics for future year No Build and Build alternatives are summarized in **Table 32** and **Table 33** for the individual study years and for the entire study period, respectively. The ISATe calculations are provided in Appendix G. The predictive analysis shows that for the overall facility, which includes freeway segments, ramp segments and ramp terminals, the total number of crashes is expected to increase for the Build condition compared to the No Build condition. This is attributable to the introduction of new ramp terminal intersections along the arterial crossroad and not the freeway itself. However, there is a decrease in the number of crashes for the freeway and ramp segment components of the facility.



SAF Sgement ID	Study Period Length (mi)	Study Period Description
S1	0.500	South of SR 44 Interchange
S2	0.250	SC Lanes South of SR 44
S3	0.250	Between SC Lanes and SB Loop Ramp
S4	0.300	SB Loop Ramp to North of SR 44
S5	0.250	SC Lanes North of SR 44
S6	1.480	Tangent Section North of SR 44 SC Lanes
S7	0.641	Curve 1 South of Pioneer Trail
S8	0.972	Tangent Section N & S of Pioneer Trail
S9	0.720	Curve 2 North of Pioneer Trail
S10	2.090	N & S of Spruce Creek
S11	0.250	SC Lanes South of SR 421
S12	0.670	Between SR 421 Ramps
S13	0.390	SC Lanes North of SR 422
S14	0.500	North of SR 421 SC Lanes

SAFETY ANALYSIS FREEWAY SEGMENTATION MAP (NO BUILD)



SAF Sgement ID	Study Period Length (mi)	Study Period Description
S1	0.500	South of SR 44 Interchange
S2	0.250	SC Lanes South of SR 44
S3	0.250	Between SC Lanes and SB Loop Ramp
S4	0.300	SB Loop Ramp to North of SR 44
S5	0.250	SC Lanes North of SR 44
S6	1.480	Tangent Section North of SR 44 SC Lanes
S7	0.191	Curve 1 South of Pioneer Trail
S8	0.350	Tangent Section N & S of Pioneer Trail
S9	0.720	Curve 2 North of Pioneer Trail
S10	2.090	N & S of Spruce Creek
S11	0.250	SC Lanes South of SR 421
S12	0.670	Between SR 421 Ramps
S13	0.390	SC Lanes North of SR 422
S14	0.500	North of SR 421 SC Lanes
S15	0.250	Lane Drop South of Pioneer Trail
S16	0.572	Between Pioneer Trail Ramps
S17	0.250	SC Lanes North of Pioneer Trail

SAFETY ANALYSIS FREEWAY SEGMENTATION MAP (BUILD)

Table 32: Predictive Crash Statistics by Study Year

	K	A	B	C	PDO	KABC	Total
No Build Alternative							
Opening Year 2025	0.9	3.0	15.9	37.5	89.8	57.3	147.1
Design Year 2045	1.3	4.1	22.1	49.7	131.9	77.2	209.1
Build Alternative							
Opening Year 2025	0.9	2.8	15.3	36.3	85.3	55.3	140.6
Design Year 2045	1.3	4.3	23.1	54.1	140.7	82.7	223.4

Notes:
K- fatal, A- incapacitating injury, B- non-incapacitating injury, C- possible injury
KABC- fatal & injury
PDO- property damage only

Table 33: Predictive Crash Statistics by Facility Component

Study Period Years: 2025 - 2045	K	A	B	C	PDO	KABC	Total
No Build Alternative							
Freeway Segments	19.8	50.7	265.7	402.1	1636.7	738.4	2375.1
Ramp Segments	2.7	8.3	39.2	51.1	122.7	101.3	224.0
Ramp Terminals	0.9	14.8	93.0	459.0	549.8	567.6	1117.4
						Total	3716.5
Build Alternative							
Freeway Segments	19.5	49.9	262.0	396.5	1620.9	727.9	2348.8
Ramp Segments	2.5	7.7	36.1	47.0	110.8	93.3	204.1
Ramp Terminals	0.9	16.8	104.3	504.1	634.7	626.1	1260.8
						Total	3813.7

Notes:
K- fatal, A- incapacitating injury, B- non-incapacitating injury, C- possible injury
KABC- fatal & injury
PDO- property damage only

6.0 SUMMARY OF ANALYSIS AND RECOMMENDATIONS

This Project Traffic Analysis Report was completed as part of the Pioneer Trail PD&E Study which proposes construction of a new interchange along I-95 in Volusia County. The analysis encompassed evaluating existing and future development plans for the area, travel demand forecasting to project future year traffic volumes, changes in the roadway network for future years and impacts of a new interchange. As determined in the preceding analysis, the overall interchange traffic volume demand and vehicle delays at the existing SR 421 and SR 44 interchanges are expected to decrease with the construction of the new Pioneer Trail interchange.

Under No Build conditions, for design year 2045 all freeway segments are anticipated to operate at LOS D or better during the AM and PM peak hours. All of the entrance and exit ramps are anticipated to operate at LOS C or better under no build conditions in design year 2045. Additionally, the following intersections are projected to operate below the target LOS under future No Build conditions in design year 2045:

- SR 421 and Williamson Boulevard (AM/PM)
- SR 421 and I-95 Southbound (AM/PM)
- SR 44 and Williamson Boulevard (PM)
- SR 44 and I-95 Northbound (AM)
- SR 44 and Sugar Mill Drive (AM)
- Pioneer Trail and Williamson Boulevard (AM/PM)
- Pioneer Trail and Turnbull Bay Road (AM/PM)

The future planned developments in the vicinity of Pioneer Trail include large increases in density of both population and employment in this area of the corridor. The new interchange will provide a more direct access to these developments and relieve the congestion at the adjacent existing interchanges. The SR 421 Southbound ramp and is anticipated to operate under oversaturated conditions and below the target LOS for future design year 2045 No Build conditions. Additionally, the SR 421 and Williamson Boulevard intersection is also projected to operate under oversaturated conditions for both opening year 2025 and design year 2045 No Build conditions. The proximity of the Southbound ramp to the Williamson Boulevard intersection and right of way constraints limits the number of treatment options that could be reasonably implemented for this area. Additionally, the recent expansion plans of the I-95 six-lane reconstruction project already included widening the bridges over SR 421.

Under the Build scenario in design year 2045, all freeway segments and all of the entrance and exit ramps are anticipated to operate at LOS C or better during both AM and PM peak hours in design year 2045. Additionally, all of the study intersections are projected to operate at LOS D or better except for the SR 421 and Williamson Boulevard.

The new interchange at Pioneer Trail is projected to reduce traffic demands at the adjacent interchanges while providing additional benefits of reduced delays, emergency vehicle access, additional evacuation routes and improved connectivity for the region. Based on a review of the 2045 peak hour intersection operational analysis, the Pioneer Trail Partial Cloverleaf Interchange alternative (loop ramp in southwest quadrant) provides improved traffic operations over the Diamond Interchange alternative. Other factors such as environmental impacts, right of way and constructions costs should be evaluated in determining the preferred alternative.

APPENDICES

Appendix A

Traffic Data Collection

A-1: Traffic Counts

A-2: FDOT 2017 Traffic Factors

A-3: Signal Timing Plans

Appendix B

Existing Operational Analysis/ Level of Service (LOS) Calculations

B-1: HCS Worksheets

B-2: Synchro Worksheets

Appendix C

Travel Demand Modeling & Growth Rates

C-1: CFRPM Sub-Area validation

C-2: TRENDS Analysis Worksheets

C-3: BEBR Population Estimates

Appendix D

Traffic Volume Development

TURNS 5 WORKSHEETS

Appendix E

Future Operational Analysis/ Level of Service (LOS) Calculations

E-1: HCS Worksheets

E-2: Synchro Worksheets

Appendix F

Intersection Control Evaluation

Stage 1 CAP-X and SPICE Worksheets

Appendix G

Enhanced Interchange Safety Analysis Tool (ISATe)

Future No Build and Build Worksheets