SR 16 PD&E Study
From International Golf Parkway to I-95

PROJECT TRAFFIC ANALYSIS REPORT (PTAR)

Financial Project Identification Number: 210447-5-32-01

St. John's County, Florida

ETDM Number: 14535

Prepared for

Florida Department of Transportation
District Two

March 2025

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

PROFESSIONAL ENGINEER CERTIFICATION

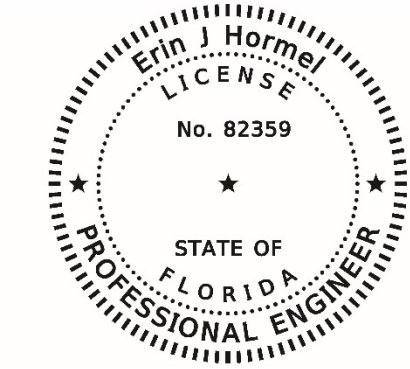
PROJECT TRAFFIC ANALYSIS REPORT

Project: SR 16 PD&E Study from International Golf Parkway to I-95

Financial Project ID: 210447-5-32-01

This project traffic analysis report contains engineering information pertaining to the SR 16 PD&E Study from International Golf Parkway to I-95 in St. Johns County, Florida. I acknowledge that the procedures and references used to develop the results contained in this report are standard to the professional practice of transportation engineering as applied through professional judgment and experience.

I hereby certify that I am a registered professional engineer in the State of Florida practicing with RS&H, Inc., and that I have prepared or approved the evaluation, findings, opinions, conclusions or technical advice for this project.



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Erin J Hormel

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10748 DEERWOOD PARK BLVD SOUTH
JACKSONVILLE, FL 32256
CERTIFICATE OF AUTHORIZATION NO. 5620
ERIN J. HORMEL, P.E., NO. 82359

Executive Summary

The purpose of this Project Traffic Analysis Report (PTAR) is to provide the Florida Department of Transportation (FDOT) District Two with the traffic information necessary to assist in evaluating alternatives to improve SR 16 from International Golf Parkway to I-95 in St. Johns County. Two future year alternatives were analyzed, which included a No-Action (No-Build) Alternative and a Four-Lane Build Alternative. The Build Alternative proposes changes in access management as well as intersection improvements.

Within the study limits, SR 16 is functionally classified as an urban principal arterial between International Golf Parkway and Francis Road and a rural principal arterial between Francis Road and I-95. Between International Golf Parkway and the St. Augustine Outlet Mall, SR 16 is a two-lane undivided roadway. From the St. Augustine Outlet Mall to I-95, SR 16 is a four-lane divided roadway. Existing Year 2023 Annual Average Daily Traffic (AADT) along SR 16 within the study area ranges from 19,600 vehicles per day to 24,700 vehicles per day. Existing field observations indicate congestion within the study area throughout the AM and PM peak periods, particularly at the intersection of SR 16 and International Golf Parkway/Pacetti Road, which experiences significant recurring congestion on the eastbound, westbound, and northbound approaches. The Existing Conditions Synchro intersection analysis indicates that many of the existing intersections operate below the level of service (LOS) target of D during one or both peak hours.

An analysis of crashes along SR 16 within the project limits was conducted for the years 2018 through 2022. During the five-year analysis period, a total of 735 crashes occurred in the study area; this includes 176 injury crashes and 3 fatal crashes. The predominant crash types were rear-end, left-turn, and sideswipe crashes. The analysis included calculations of actual crash rates along SR 16 within the study area for comparison with statewide average crash rates for similar facilities. These results indicated that 10 out of the 13 study area intersections are high crash locations. The SR 16 segment between the West Outlet Mall Access and Toms Road is also a high crash location. The high percentage of rear-end crashes throughout the study area indicates that congestion is likely a contributing factor to many crashes.

The Northeast Regional Planning Model (NERPM) was used to determine the forecast growth rates for the future year analysis alternatives. Growth rates derived from the model indicated that SR 16 would experience 3% annual growth on segments east of the planned CR 2209 intersection and 2% annual growth on segments west of the planned CR 2209 intersection. The selected annual growth rates for the various arterials, connectors and side streets ranged from 1% to 3%. These rates were used to develop the Opening Year 2030 and Design Year 2050 AADTs and directional design hour volumes (DDHVs), which were used in the future year analysis.

The results of the future year analysis indicate that without providing capacity and operational improvements along SR 16, the existing congested conditions would continue to deteriorate

resulting in severe congestion throughout the study area. In the Design Year 2050, 10 out of the 15 study intersections are expected to operate at LOS E or F in one or both peak hours. In addition, the highway segment analysis shows that the current two-lane capacity of SR 16 between CR 2209 and Elevation Parkway/West Outlet Mall Access is expected to reach LOS E by Opening Year and LOS F by Design Year.

The Build alternative provides operational benefits over the No-Build alternative by providing a four-lane divided facility from CR 2209 to Elevation Parkway/West Outlet Mall Access, in addition to incorporating signal control at several of the study area intersections, providing significantly improved operations for traffic entering and exiting the affected residential neighborhoods. In addition, the proposed access management will better meet Roadway Access Class 3 requirements, which should improve both safety and operations. The four-lane capacity provided in the Build alternative along SR 16 between CR 2209 and Elevation Parkway/West Outlet Mall Access is expected to operate at LOS C or better through the Design Year.

The Build alternative provides intersection improvements at several study area intersections, which include both alternative control strategies and conventional traffic signals. At Francis Road and Toms Road, alternative control strategies are proposed, which incorporate a hybrid Median U-turn (MUT)/thru-cut that restricts the SR 16 left turns and the cross-street through movements. The intersection of Turnbull Creek Road is proposed to be converted from conventional two-way stop-control (TWSC) to a signalized thru-cut intersection. In addition, the intersections of SR 16 at Windward Ranch Boulevard, Downs Corner Roads, and Whisper Ridge Drive are proposed to be converted from TWSC to signalized operations. While these T-intersections include similar raised channelizing islands used for thru-cut intersections, they will operate in the same manner as standard signals as the cross-street approaches do not have a through movement. These changes in intersection control provide significant delay reductions for vehicles entering SR 16 from the side streets.

A predictive safety analysis was completed to determine the safety benefits of the Build alternatives over the No-Build. The Highway Safety Manual (HSM) Chapter 12 spreadsheets were used to determine the predicted number of crashes for SR 16 and the study intersections with and without the proposed improvements. The predictive safety analysis results indicate that the Build alternative is expected to reduce crashes throughout the study area by approximately 29%.

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1.0 INTRODUCTION

1.1 Background

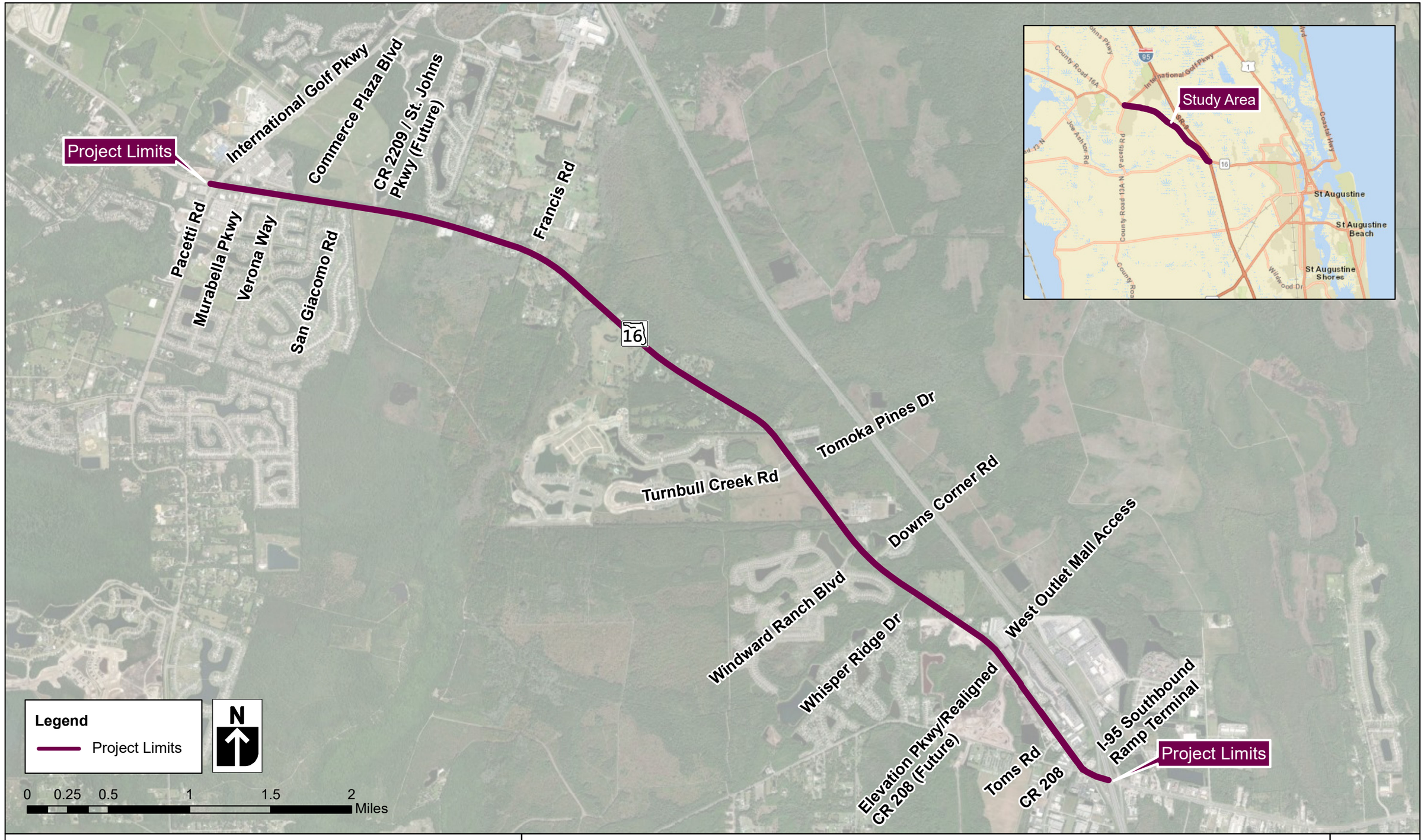
The Florida Department of Transportation (FDOT) is evaluating alternatives to improve the safety and operations of SR 16 from International Golf Parkway to I-95, a distance of approximately six miles. The project is located in Saint (St.) Johns County, Florida.

1.2 Purpose and Need

SR 16 is a primarily east/west facility that connects the cities of Raiford and St. Augustine while also passing through the towns of Green Cove Springs, Penney Farms, and Starke. The purpose of this Project Traffic Analysis Report (PTAR) is to provide FDOT District Two with the traffic information necessary to assist in evaluating alternatives to address capacity, safety, and operational issues on SR 16 from International Golf Parkway to I-95 in St. Johns County. The results of the traffic analysis will be incorporated into the SR 16 Project Development and Environment (PD&E) Study. Portions of the corridor currently experience congestion throughout the peak periods, which is expected to worsen in the future. Therefore, this project will assess the traffic operations and safety of various changes in access management, intersection improvements, and widening along SR 16.

1.3 Project Location

The study area for the SR 16 PD&E Study spans from International Golf Parkway to I-95, a distance of approximately six miles (**Figure 1-1**). Within the study limits, SR 16 is functionally classified as an urban principal arterial from International Golf Parkway to Francis Road and a rural principal arterial from Francis Road to I-95. Between International Golf Parkway and the St. Augustine Outlet Mall, approximately 5.1 miles, SR 16 is a two-lane undivided roadway. From the St. Augustine Outlet Mall to I-95, approximately 0.8 miles, SR 16 is a four-lane divided roadway. The existing land uses adjacent to SR 16 within the project study area include primarily commercial and residential land uses.



FDOT **SR 16 from International Golf Parkway to I-95 PD&E Study**	Project Location Map	Figure 1-1

2.0 TRAFFIC ANALYSIS ASSUMPTIONS AND METHODOLOGY

2.1 Overview

The following section summarizes the methodology used in the traffic analysis, including data collection, traffic forecasting, design hour traffic development, level of service (LOS) criteria, operational analysis, and safety analysis. Additional details are included in subsequent sections.

2.2 Analysis Years

The following study years are established for the analysis:

- Existing Year: 2023
- Opening Year: 2030
- Design Year: 2050

2.3 Area of Influence

The area of influence for this study includes SR 16 from west of International Golf Parkway to the southbound I-95 ramp terminal intersection. Three signalized intersections and eleven unsignalized intersections were analyzed along SR 16 as part of this study, including the following:

- International Golf Parkway / Pacetti Road (signalized)
- Murabella Parkway (unsignalized)
- Verona Way (unsignalized)
- Commerce Plaza Boulevard (unsignalized)
- San Giacomo Road (unsignalized)
- Francis Road (unsignalized)
- Turnbull Creek Road (unsignalized
- Windward Ranch Boulevard (unsignalized)
- Whisper Ridge Drive (unsignalized)
- Downs Corner Road (unsignalized)
- West Outlet Mall Access (unsignalized)
- Toms Road (signalized)
- CR 208 (unsignalized)
- I-95 Southbound Ramps (signalized)

2.4 Data Collection

The primary source of traffic data for this study is field traffic counts. The field-collected data were supplemented with traffic data and other transportation data as needed from existing available data sources. The data sources within the project study area include the following:

- Existing Year (2023) project traffic counts
- FDOT Transportation System Data
- Existing Plans, Programs and Project Lists from FDOT
- Northeast Regional Planning Model (NERPM) Travel Demand Model

2.5 Base Traffic Data and Traffic Factors

Numerous field traffic counts were conducted to obtain the existing traffic for the study area. Twelve-hour turning movement counts (TMCs) were performed for fourteen study intersections listed in **Section 2.3**. In addition, 72-hour bi-directional vehicle classification counts were collected at two locations along SR 16 and on Francis Road north of SR 16. 48-hour bi-directional vehicle counts were collected at three locations along SR 16. Most of the counts were conducted in September 2023 on a typical weekday (Tuesday, Wednesday, or Thursday). The 12-hour TMC's at the intersection of SR 16 and Downs Corner Road were collected on August 20th, 2024 (Tuesday). The count locations that were used for the study include the following:

12-Hour Turning Movement Counts

- SR 16 at International Golf Parkway / Pacetti Road
- SR 16 at Murabella Parkway
- SR 16 at Verona Way
- SR 16 at Commerce Plaza Boulevard
- SR 16 at San Giacomo Road
- SR 16 at Francis Road
- SR 16 at Turnbull Creek Road
- SR 16 at Windward Ranch Boulevard
- SR 16 at Downs Corner Road
- SR 16 at Whisper Ridge Drive
- SR 16 at West Outlet Mall Access
- SR 16 at Toms Road
- SR 16 at CR 208
- SR 16 at I-95 Southbound Ramps

72-Hour Bi-directional Classification Counts

- SR 16 west of Francis Road
- SR 16 between Whisper Ridge Drive and West Outlet Mall Access
- Francis Road north of SR 16

48-Hour Bi-directional Vehicle Counts

- SR 16 east of San Giacomo Road
- SR 16 east of Francis Road
- SR 16 east of West Outlet Mall Access

The 72-hour classification counts and 48-hour vehicle counts were converted to Annual Average Daily Traffic (AADT) by applying seasonal correction factors in accordance with FDOT standards. Historical information from Florida Traffic Online (FTO 2022), was used to check the reasonableness of the existing traffic counts.

The factors used for design traffic analysis include the K, D, and T_f factors, as well as the peak-hour factor (PHF). The project traffic counts were used to derive traffic factors specific to the study area, and the traffic factors are summarized in **Table 2-1**.

2.5.1 K Factor Development

The K factor, or peak to daily factor, is the proportion of the daily traffic that occurs during the peak hour of the day. The FDOT defines a set of Standard K factors based on area type and roadway characteristics in the FDOT Project Traffic Forecasting Handbook (2019). The Standard K of 9% is defined for urban arterials and highways and will be used for future traffic development for this study.

2.5.2 D Factor Development

The D factor, or directional factor, is the proportion of the peak-hour traffic traveling in the peak direction. D factors were calculated for this project based on the 72-hour classification counts and 48-hour vehicle counts. The D factors calculated from the tube counts along SR 16 ranged from 53.1% to 59.9%. An average value of 57% was identified for use in developing Directional Design Hour Volumes (DDHVs) on SR 16.

For the side streets, D factors were calculated based on the turning movement count data for the peak hours. Individual D factors for the side streets ranged from 50.6% to 71.8%. The recommended range of D factors for an urban arterial is between 50.8% and 67.1% (2019 FDOT Project Traffic Forecasting Handbook). An average D factor of 59% was used for the side streets.

2.5.3 Peak Hour Factor (PHF) and Truck Factor Development

The PHF is a measure of the variability of demand during the peak hour [PHF = peak hour volume/ (4 x peak 15-minute volume within the peak hour)]. Project traffic counts were used to derive the PHF by intersection for the existing AM and PM peaks. The project-calculated PHFs for the study intersections ranged from 0.95 to 0.99. A uniform PHF of 0.97 was selected for the future conditions analysis.

The peak-hour truck factors for the study area were calculated from the existing project traffic counts. The traffic count data showed that the peak hour truck percentages were generally consistent along SR 16 (eastbound and westbound approaches) within the study area. These ranged from 2% to 7% during the AM peak and from 1% to 2% during the PM peak. Therefore, an average value of 4% was selected on SR 16 for the AM peak, and an average value of 1% was selected for the PM peak. Due to the close proximity of residential and commercial land uses throughout the study area, the project traffic count data indicated much higher levels of variability in peak hour truck percentages for the side streets; these ranged from 0% to 20%. Therefore, the peak hour truck percentages for the side streets were selected individually based on the turning movement count data. **Table 2-1** summarizes the traffic factors used in the development of design hour traffic and the analysis of the study alternatives.

Table 2-1: Traffic Factor Summary

Facility	K (%)	D (%)	T_{24}[1] (%)	T_f[2] (%)	PHF
SR 16	9.0	57.0	3.8	4.0 (1.0)	0.97
Side Streets	9.0	59.0	varies	varies	0.97

[1]Daily Truck Factors represent the average of the two classification counts on SR 16
[2]AM (PM) Peak Hour Truck Factors are calculated from project traffic counts.

2.6 Travel Demand Forecasting

This study utilized the adopted Northeast Regional Planning Model Activity-Based version 2.1.1 (NERPMABv2.1.1), which is the regional travel demand model developed and maintained by FDOT District Two with a base year of 2015 and forecast year of 2045. The NERPM is the primary travel demand forecasting tool used to support the Long-Range Transportation Plan updates of the North Florida Transportation Planning Organization (TPO), which includes St. Johns County.

2.6.1 Forecast Model Review

As a part of the forecasting effort, a review of the 2045 Cost Feasible Network model was conducted to assess the reasonableness of future traffic projections in the study corridor. The study area model review checked for illogical speed and capacity calculations, illogical trip pathing, reasonableness of trip distribution and assignment, and the reasonableness of population and employment growth.

The NERPM 2045 Cost Feasible Network serves as the base network for the design year alternatives. The Cost Feasible Network was reviewed to ensure that the appropriate planned transportation improvements were included in the forecast year model network.

2.6.2 Review of Base Model Assignments

A review of the NERPM 2015 base year model was conducted to assess whether the model was replicating travel patterns in the SR 16 study corridor at a reasonable and acceptable level. The

results of this evaluation served as the basis for determining the necessity and scale of a study corridor validation. The primary measures used to assess the performance of the 2015 base model include the percent deviation between the counts and assigned volumes (V/C ratio) and the percent Root Mean Square Error (%RMSE) of these deviations.

An initial review of the 2015 NERPM suggested that moderate refinements to the model network could improve the distribution of trips in the study area and improve the model forecast accuracy by reducing the forecast errors.

2.6.3 Subarea Model Validation

For this study, FDOT standard measures of travel demand assignment validation were used to compare the assigned Peak Season Weekday Average Daily Traffic (PSWADT) model volumes to observed 24-hour peak season traffic counts along the SR 16 corridor.

Based on the results of the NERPM review, the following refinements were made to the model network:

- International Golf Parkway from SR 16 to Harkness Court was changed from facility type 46 to facility type 23 to accurately present the existing roadway conditions.
- International Golf Parkway from Harkness Court to US 1 was changed from facility type 46 to facility type 36 to match the posted speed and existing roadway conditions.
- Centroid connectors for the following Traffic Analysis Zones (TAZs) were adjusted to improve distribution of trips in the study area: 1259, 1199, 2356, 2355, 2352, 1258, 1363, 1252, 1261, 1213.

A review of the model revealed that overall model performance for all measures fell within the acceptable error ranges for V/C and %RMSE. The area-wide %RMSE error was reduced by 8%, and the subarea V/C ratio was 1.05. Therefore, no additional subarea model validation was required for this project.

2.7 Development of Design Traffic

Historical traffic data, population projections, and travel demand model projections were reviewed to determine the preferred growth rates for the project. Based on the review of the available data, the growth rates derived from the NERPM were determined to be the preferred growth rates for this study. **Section 4.0** summarizes the discussion of each growth strategy and the proposed growth rates for future traffic projections.

The selected growth rates were applied to the Existing Year AADTs to achieve the Design Year 2050 AADTs. The Design Year 2050 DDHVs were derived by applying the appropriate K and D factors to the 2050 AADTs. The existing peak-hour turning movement percentages were then applied to the DDHVs to produce the future year peak hour turning movement volumes. For side streets where Existing Year AADTs were not available, the 2050 peak hour turning movement

counts were developed by applying the selected growth rates to the turning movement counts. The Opening Year 2030 AADTs, DDHVs, and peak hour turning movement volumes were developed through interpolation of the Existing Year 2023 and Design Year 2050 AADTs and peak hour turning movement counts. Traffic volumes were balanced along SR 16 in areas where intermediate driveways and access points are not present, and care was taken to ensure that traffic differentials between intersections were maintained at realistic levels. At locations where alternative intersections and access management improvements were incorporated, turning movement volumes were derived by manually reassigning any restricted movements to the appropriate movements at downstream intersections.

2.8 Level of Service (LOS) Criteria

FDOT maintains minimum acceptable operating LOS targets for the State Highway System. LOS is defined with six ranges from "A" (best) to "F" (worst) used to identify roadway facility performance.

FDOT's policy no. 000-525-006 "Level of Service Targets for the State Highway System" defines the minimum LOS target for the State Highway System as LOS D within urbanized areas and LOS C outside urbanized areas. Since the project area is primarily within an FDOT designated urbanized area, the FDOT LOS target for the project area is "D".

2.9 Operational Analysis Procedures

The primary tool that was used to perform the traffic analysis for this study was Synchro 11 which was used to assess the existing and future intersection operations along SR 16. Highway Capacity Software (HCS) 2023 was also used to analyze the highway portion of the study area, which is between CR 2209 and the West Outlet Mall Access (approximately 4.4 miles).

2.9.1 Intersection Measures of Effectiveness (MOEs)

The capacity analysis using Synchro was conducted to evaluate the operational performance of the study area intersections. The primary MOEs used in assessing intersection operations are delay and LOS. For unsignalized intersections, the output for the stop-controlled movements is reported based on methodologies from the Highway Capacity Manual (HCM) 6th Edition. In addition to the intersection analysis, a highway segment analysis was conducted using Highway Capacity Software (HCS) 2023 to determine the expected LOS for the future conditions.

2.10 Safety Analysis Procedures

A safety analysis was performed in accordance with the FDOT PD&E Manual. Summary crash data was obtained from Signal 4 and SSOGis for the latest available five-year period (2018-2022). The critical analysis factors identified from the crash data include the following:

- Number and Type of Crashes
- Severity

- Lighting and Surface Conditions
- Crash Identification by Segment
- Crash Rates

Results of the analysis were used to determine the existence of any crash-related trends. Safety analysis for the future conditions included Highway Safety Manual predictive analysis to determine the predicted number of crashes of the future year alternatives along with the use of CMFs to estimate any potential crash reduction of the Build over the No-Build.

3.0 EXISTING CONDITIONS

The following section provides an evaluation of the existing conditions within the study area. The discussion items include transportation systems information, existing traffic data, and existing operating conditions.

3.1 Existing Transportation Network

3.1.1 Existing Roadway Network

The existing transportation network within the study area has Context Classifications of C2 (Rural), C3C (Suburban Commercial), and C3R (Suburban Residential). The existing roadways within the study area consist of a rural principal arterial, a rural minor collector, an urban principal arterial, urban major and minor collectors, as well as various urban and rural local roads. **Table 3-1** summarizes the features of the major roadways in the study area including number of lanes and roadway classifications. **Figure 3-1** shows the existing lane configuration for the study area.

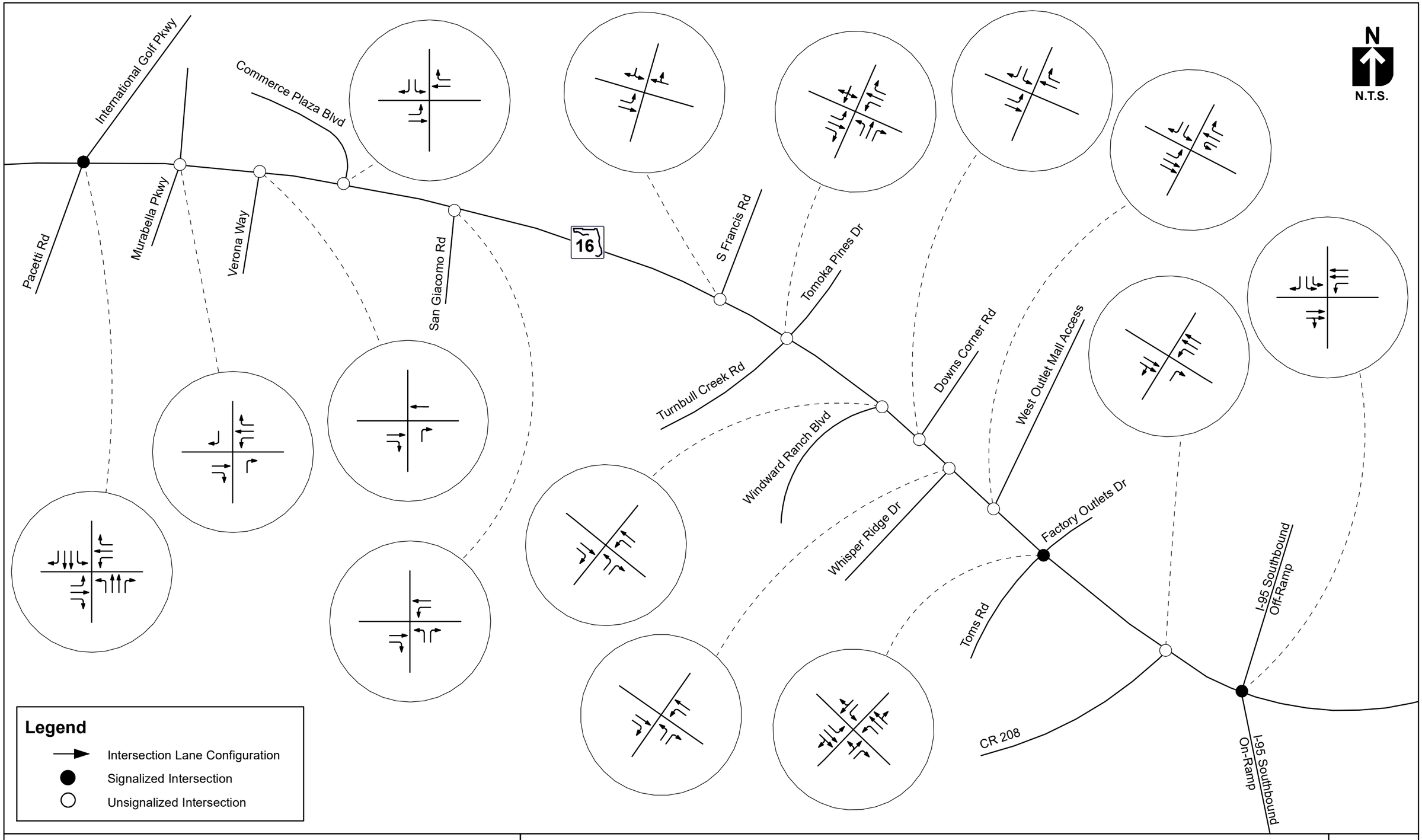
Table 3-1: Roadway Functional Classification

Roadway	Functional Classification	Number of Lanes
SR 16 (West of International Golf Parkway)	Urban Principal Arterial – Other	4
SR 16 (International Golf Parkway to Francis Road)	Urban Principal Arterial – Other	2
SR 16 (Francis Road to West Outlet Mall Access)	Rural Principal Arterial – Other	2
SR 16 (West Outlet Mall Access to East of I-95)	Rural Principal Arterial – Other	4
International Golf Parkway	Urban Major Collector	4
Pacetti Road	Urban Minor Collector	4
CR 208	Rural Minor Collector	2
I-95	Rural Principal Arterial - Interstate	6

West of International Golf Parkway, SR 16 is a four-lane arterial with a speed limit of 45 mph. It reduces to two-lanes east of International Golf Parkway and the speed limit transitions to 60 mph east of San Giacomo Road. These features are maintained until the West Outlet Mall Access, at

which the speed limit reduces to 45 mph, and SR 16 widens to four lanes through the rest of the study area. SR 16 serves as a primary east-west route and is oriented northwest-to-southeast through the study area. The adjacent areas consist of a mixture of commercial and residential land uses.

Pacetti Road and CR 208 are minor collectors that connect to Bakersville, which lies southwest of the study area. I-95 is an interstate that connects to Jacksonville to the north and St. Augustine and Palm Coast to the south. International Golf Parkway, which is located at the western end of the study area, is a major collector that connects with I-95 to the north. Francis Road is a local roadway that provides a connection between SR 16 and the commercial developments on World Commerce Parkway. Toms Road is a local roadway that provides an alternative connection between SR 16 and CR 208 to the south. The remaining local roadways in the study area serve primarily to move traffic to and from SR 16.



SR 16 from International Golf Parkway to I-95 PD&E Study	Existing Year 2023 Lane Configuration	Figure 3-1

3.2 Historical Crash Analysis

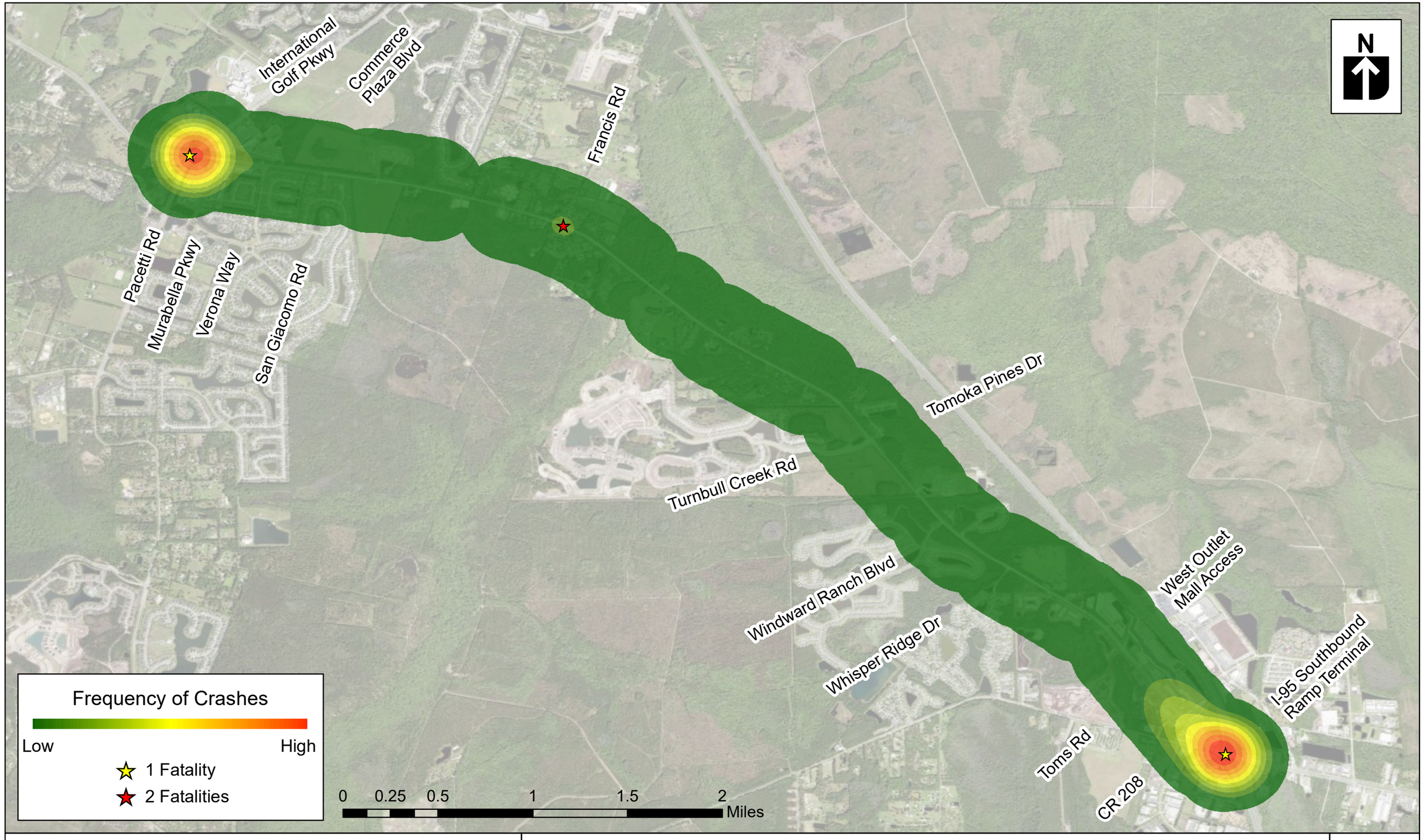
Historical crash data for the project study area was obtained from Florida's Signal Four Analytics and FDOT's State Safety Office Geographical Information System (SSOGis) tool. Crash data collected in the study area from 2018 to 2022 included the number of crashes for each year, number of vehicles involved, type of crashes, number of injuries and/or fatalities, contributing causes, and economic losses. The dataset from Signal Four Analytics was considered the primary dataset and unique crashes from the SSOGis tool were added. The crash dataset was cleaned to remove crashes that occurred in parking lots, occurred outside the project area, etc. Additionally, long form crash reports were read for all fatal crashes as well as injury crashes coded as "Other" in the "S4_CRASH_TYPE_SIMPLIFIED" attribute. A significant change to the dataset pulled from Signal Four Analytics is that crash number 87345941 was originally coded as a fatal crash; however, reviewing the long form revealed the crash to be a "No Injury" crash and was recoded in the final dataset. The "Other" crashes were recoded as "Left Turn", "Sideswipe", "Angle", "Rear End", "Off Road", "Other Non-Collision", or "Other Non-Fixed Object" based on the review of longform crash reports. The final crash dataset is provided in **Appendix A**.

The crash analysis results indicated that there was a total of 735 crashes within the study area (2018 to 2022). Rear-end crashes were the predominant crash type in the study area accounting for 384 (52.2%) of the total crashes followed by left-turn (13.9%) and sideswipe crashes (11.7%). There were 3 fatal crashes and 176 injury crashes within the study area. **Table 3-2** summarizes the number of crashes by crash type, crash severity, lighting conditions, and surface conditions for the analysis period.

Figure 3-2 illustrates the density of the historical crashes occurring within the study area. As shown in the figure, the areas surrounding the intersections of SR 16 at International Golf Parkway and the I-95 southbound off-ramp terminal have the highest frequency of crashes. More details about the crash type and severity at each intersection are discussed later in this section.

Table 3-2: Summary of SR 16 Project Crashes

SR 16 from IGP to I-95 SB Ramp Terminal		Number of Crashes					5 Year Total Crashes	Percent
		2018	2019	2020	2021	2022		
Crash Type	Rear End	80	72	62	90	80	384	52.2%
	Left Turn	19	18	18	22	25	102	13.9%
	Sideswipe	14	14	15	22	21	86	11.7%
	Other	5	9	6	14	10	44	6.0%
	Off Road	8	5	4	6	7	30	4.1%
	Right Turn	6	4	4	6	5	25	3.4%
	Angle	3	6	2	4	2	17	2.3%
	Head On	2	3	3	1	3	12	1.6%
	Animal	1	2	2	2	3	10	1.4%
	Other Non-Collision	2	1	2	2	1	8	1.1%
	Unknown	0	1	2	0	3	6	0.8%
	Bicycle	2	1	0	1	1	5	0.7%
	Rollover	0	1	2	2	0	5	0.7%
	Other Non-Fixed Object	0	1	0	0	0	1	0.1%
	Pedestrian	0	0	0	0	0	0	0.0%
	Total	**142**	**138**	**122**	**172**	**161**	**735**	**100.0%**
Crash Severity	No Injury	111	104	87	133	121	556	75.7%
	Possible Injury	23	20	16	20	25	104	14.1%
	Non-Incapacitating Injury	7	13	14	16	11	61	8.3%
	Incapacitating Injury	0	1	3	3	4	11	1.5%
	Fatal (within 30 days)	1	0	2	0	0	3	0.4%
Lighting Conditions	Daylight	104	105	93	136	122	560	76.1%
	Dusk	4	0	2	7	3	16	2.2%
	Dawn	5	2	6	2	6	21	2.9%
	Dark - Not Lighted	17	19	9	12	12	69	9.4%
	Dark - Lighted	12	12	12	14	18	68	9.3%
	Dark - Unknown Lighting	0	0	0	1	0	1	0.1%
Surface Conditions	Dry	116	120	102	143	144	625	85.0%
	Wet	26	18	20	29	17	110	15.0%



SR 16 from International Golf Parkway to I-95 PD&E Study	Historical Crash Data Heat Map (Years 2018-2022)	Figure 3-2

3.2.1 Crash Rate Analysis

The Average Crash Rate Method of crash analysis, based on identifying intersections and segments, average daily traffic, and number of crashes, was used for calculating the actual crash rate for the intersections and arterial segments within the project study area. The actual crash rates for the SR 16 intersections and segments were compared with the most recent 5-year statewide average crash rates available (2015-2019) for similar facilities to determine whether the intersection or segment was considered a high crash location during the analysis period.

The segmentation of the project area followed guidelines from the *FDOT Safety Crash Data Guidance*, April 2023. A minimum length of 0.1 miles, with the middle of the intersection at the center of this measurement, was applied to each intersection. The intersection influence area was extended on a per leg basis to the beginning of the longest turn lane taper as needed. All but one of the study area intersections were considered in the crash rate analysis as Commerce Plaza Boulevard was not open within the crash analysis period. The space between intersections was typically considered a segment. Exceptions included closely spaced intersections whose turn lanes were immediately adjacent to each other or segments with a length of less than 0.2 mi. The segment between Verona Way and San Giacomo Road, the segment between Downs Corner Road and Whisper Ridge Drive, as well as the segment between Toms Road and CR 208 are not included in the crash rate analysis due to being less than 0.2 miles measuring at 0.13 miles, 0.08 miles, and 0.05 miles, respectively.

The crash analysis results, as shown in **Table 3-3**, indicate that 10 out of the 13 intersections and one out of the six segments are high crash locations. The high crash locations are listed below.

- International Golf Parkway Intersection
- Murabella Parkway Intersection
- Verona Way Intersection
- San Giacomo Road Intersection
- Francis Road Intersection
- Turnbull Creek Road Intersection
- Whisper Ridge Drive Intersection
- Segment between West Outlet Mall Access and Toms Road
- Toms Road Intersection
- CR 208 Intersection
- I-95 Southbound Off Ramp Terminal Intersection

Table 3-3: Summary of Crash Rate Analysis

Location	Analysis Type	Total Crashes (5 Years)	Actual Crash Rate[1]	Statewide Average Crash Rate[2]	High Crash Location	Crash Ratio[3]
International Golf Parkway	Intersection	215	2.94	0.67	**Yes**	**4.41**
Murabella Parkway	Intersection	22	0.50	0.28	**Yes**	**1.82**
Verona Way	Intersection	16	0.41	0.20	**Yes**	**2.10**
Between Verona Way and San Giacomo Road	Segment[4]	6	-	-	-	-
San Giacomo Road	Intersection	16	0.43	0.20	**Yes**	**2.20**
Between San Giacomo Road and Francis Road	Segment	12	0.38	1.29	No	0.29
Francis Road	Intersection	24	0.63	0.20	**Yes**	**3.18**
Between Francis Road and Turnbull Creek Road	Segment	29	0.47	1.29	No	0.36
Turnbull Creek Road	Intersection	11	0.29	0.28	**Yes**	**1.03**
Between Turnbull Creek Road and Windward Ranch Boulevard	Segment	6	0.51	1.29	No	0.39
Windward Ranch Boulevard	Intersection	2	0.05	0.20	No	0.26
Downs Corner Road	Intersection	2	0.06	0.20	No	0.29
Between Downs Corner Road and Whisper Ridge Drive	Segment[4]	0	-	-	-	-
Whisper Ridge Drive	Intersection	8	0.23	0.20	**Yes**	**1.15**
Between Whisper Ridge Drive and West Outlet Mall Access	Segment	8	0.53	1.29	No	0.41
West Outlet Mall Access	Intersection	9	0.24	0.27	No	0.89
Between West Outlet Mall Access and Toms Road	Segment	20	2.01	1.75	**Yes**	**1.15**
Toms Road	Intersection	54	1.22	0.53	**Yes**	**2.31**
Between Toms Road and CR 208	Segment[4]	10	-	-	**-**	-
CR 208	Intersection	70	1.36	0.53	**Yes**	**2.59**
I-95 SB Off Ramp Terminal	Intersection	195	3.04	1.51	**Yes**	**2.02**

[1]Intersection crash rate unit is per million entering vehicles while segment crash rate unit is per million vehicle-miles.
[2]Statewide Average Crash Rate used represents the most recent 5-year average available (2015-2019).
[3]Ratio of Actual Crash Rate divided by the Statewide Average Crash Rate.
[4]Segment length of less than 0.2 miles and therefore not included in crash rate analysis.

3.2.2 High Crash Locations

3.2.2.1 International Golf Parkway Intersection

The intersection of SR 16 at International Golf Parkway is a high crash location with an actual crash rate of 2.94 crashes per million entering vehicles, while the statewide average for a similar facility is 0.67 crashes per million entering vehicles. The actual crash rate is 4.41 times the statewide average crash rate.

The crash analysis results indicated that there was a total of 215 crashes during the analysis period. Rear-end crashes were the predominant crash type, accounting for 134 (62.3%) of the total crashes, followed by sideswipe crashes (12.1%) and left-turn crashes (8.4%). There was 1 fatal crash and 36 injury crashes. The fatal crash occurred in April 2018 in dark, dry conditions and resulted in one fatality in the not at fault vehicle (passenger). It involved an eastbound vehicle failing to yield to oncoming westbound traffic while attempting to make a permissive eastbound left. The drivers of both vehicles were under the influence of drugs. **Table 3-4** summarizes the number of crashes by crash type and crash severity.

Table 3-4: International Golf Parkway Crash Frequency

International Golf Parkway		2018	2019	2020	2021	2022	5 Year Total Crashes	Percent
Crash Type	Rear End	29	26	26	28	25	134	62.3%
	Sideswipe	4	5	5	9	3	26	12.1%
	Left Turn	4	5	5	2	2	18	8.4%
	Other	2	1	3	3	1	10	4.7%
	Off Road	2	0	2	2	1	7	3.3%
	Right Turn	3	1	2	1	0	7	3.3%
	Angle	2	3	0	0	1	6	2.8%
	Head On	0	1	1	0	1	3	1.4%
	Other Non-Collision	1	0	0	1	0	2	0.9%
	Animal	0	1	0	0	0	1	0.5%
	Unknown	0	0	1	0	0	1	0.5%
	Bicycle	0	0	0	0	0	0	0.0%
	Rollover	0	0	0	0	0	0	0.0%
	Pedestrian	0	0	0	0	0	0	0.0%
	Other Non-Fixed Object	0	0	0	0	0	0	0.0%
Crash Severity	No Injury	37	38	35	39	29	178	82.8%
	Possible Injury	6	4	4	4	3	21	9.8%
	Non-Incapacitating Injury	3	0	5	3	0	11	5.1%
	Incapacitating Injury	0	1	1	0	2	4	1.9%
	Fatal (within 30 days)	1	0	0	0	0	**1**	0.5%
Total		**47**	**43**	**45**	**46**	**34**	**215**	

3.2.2.2 Murabella Parkway Intersection

The intersection of SR 16 at Murabella Parkway is a high crash location with an actual crash rate of 0.50 crashes per million entering vehicles, while the statewide average for a similar facility is 0.28 crashes per million entering vehicles. The actual crash rate is 1.82 times the statewide average crash rate.

The crash analysis results indicated that there was a total of 22 crashes during the analysis period. Rear-end crashes were the predominant crash type, accounting for 16 (72.7%) of the total crashes, followed by sideswipe crashes (9.1%) and angle crashes (9.1%). There were zero fatal crashes and five injury crashes. **Table 3-5** summarizes the number of crashes by crash type and crash severity.

Table 3-5: Murabella Parkway Crash Frequency

Murabella Parkway		2018	2019	2020	2021	2022	5 Year Total Crashes	Percent
Crash Type	Rear End	3	4	4	2	3	16	72.7%
	Sideswipe	0	0	0	1	1	2	9.1%
	Angle	0	2	0	0	0	2	9.1%
	Left Turn	0	0	0	0	1	1	4.5%
	Other	0	1	0	0	0	1	4.5%
	Off Road	0	0	0	0	0	0	0.0%
	Right Turn	0	0	0	0	0	0	0.0%
	Head On	0	0	0	0	0	0	0.0%
	Other Non-Collision	0	0	0	0	0	0	0.0%
	Animal	0	0	0	0	0	0	0.0%
	Unknown	0	0	0	0	0	0	0.0%
	Bicycle	0	0	0	0	0	0	0.0%
	Rollover	0	0	0	0	0	0	0.0%
	Pedestrian	0	0	0	0	0	0	0.0%
	Other Non-Fixed Object	0	0	0	0	0	0	0.0%
Crash Severity	No Injury	3	6	2	2	4	17	77.3%
	Possible Injury	0	1	1	0	1	3	13.6%
	Non-Incapacitating Injury	0	0	1	1	0	2	9.1%
	Incapacitating Injury	0	0	0	0	0	0	0.0%
	Fatal (within 30 days)	0	0	0	0	0	0	0.0%
Total		**3**	**7**	**4**	**3**	**5**	**22**	

3.2.2.3 Verona Way Intersection

The intersection of SR 16 at Verona Way is a high crash location with an actual crash rate of 0.41 crashes per million entering vehicles, while the statewide average for a similar facility is 0.20 crashes per million entering vehicles. The actual crash rate is 2.10 times the statewide average crash rate.

The crash analysis results indicated that there was a total of 16 crashes during the analysis period. Rear-end crashes were the predominant crash type, accounting for eight (50.0%) of the total crashes, followed by sideswipe crashes (18.8%) and head-on crashes (12.5%). There were zero fatal crashes and five injury crashes. **Table 3-6** summarizes the number of crashes by crash type and crash severity.

Table 3-6: Verona Way Crash Frequency

Verona Way		2018	2019	2020	2021	2022	5 Year Total Crashes	Percent
Crash Type	Rear End	0	0	1	3	4	8	50.0%
	Sideswipe	1	0	0	2	0	3	18.8%
	Head On	0	0	0	1	1	2	12.5%
	Left Turn	1	0	0	0	0	1	6.3%
	Other	0	0	0	1	0	1	6.3%
	Right Turn	0	1	0	0	0	1	6.3%
	Angle	0	0	0	0	0	0	0.0%
	Off Road	0	0	0	0	0	0	0.0%
	Other Non-Collision	0	0	0	0	0	0	0.0%
	Animal	0	0	0	0	0	0	0.0%
	Unknown	0	0	0	0	0	0	0.0%
	Bicycle	0	0	0	0	0	0	0.0%
	Rollover	0	0	0	0	0	0	0.0%
	Pedestrian	0	0	0	0	0	0	0.0%
	Other Non-Fixed Object	0	0	0	0	0	0	0.0%
Crash Severity	No Injury	2	1	1	4	3	11	68.8%
	Possible Injury	0	0	0	1	1	2	12.5%
	Non-Incapacitating Injury	0	0	0	1	1	2	12.5%
	Incapacitating Injury	0	0	0	1	0	1	6.3%
	Fatal (within 30 days)	0	0	0	0	0	0	0.0%
Total		2	1	1	7	5	16	

3.2.2.4 San Giacomo Road Intersection

The intersection of SR 16 at San Giacomo Road is a high crash location with an actual crash rate of 0.43 crashes per million entering vehicles, while the statewide average for a similar facility is 0.20 crashes per million entering vehicles. The actual crash rate is 2.20 times the statewide average crash rate.

The crash analysis results indicated that there was a total of 16 crashes during the analysis period. Rear-end crashes were the predominant crash type, accounting for seven (43.8%) of the total crashes, followed by left turn (37.5%). There were zero fatal crashes and five injury crashes. **Table 3-7** summarizes the number of crashes by crash type and crash severity.

Table 3-7: San Giacomo Road Crash Frequency

San Giacomo Road		2018	2019	2020	2021	2022	5 Year Total Crashes	Percent
Crash Type	Rear End	0	1	1	4	1	7	43.8%
	Left Turn	2	2	1	0	1	6	37.5%
	Animal	0	0	0	1	0	1	6.3%
	Off Road	0	1	0	0	0	1	6.3%
	Other	0	0	1	0	0	1	6.3%
	Sideswipe	0	0	0	0	0	0	0.0%
	Angle	0	0	0	0	0	0	0.0%
	Right Turn	0	0	0	0	0	0	0.0%
	Head On	0	0	0	0	0	0	0.0%
	Other Non-Collision	0	0	0	0	0	0	0.0%
	Unknown	0	0	0	0	0	0	0.0%
	Bicycle	0	0	0	0	0	0	0.0%
	Rollover	0	0	0	0	0	0	0.0%
	Pedestrian	0	0	0	0	0	0	0.0%
	Other Non-Fixed Object	0	0	0	0	0	0	0.0%
Crash Severity	No Injury	0	2	3	4	2	11	68.8%
	Possible Injury	1	1	0	1	0	3	18.8%
	Non-Incapacitating Injury	1	1	0	0	0	2	12.5%
	Incapacitating Injury	0	0	0	0	0	0	0.0%
	Fatal (within 30 days)	0	0	0	0	0	0	0.0%
Total		2	4	3	5	2	16	

3.2.2.5 Francis Road Intersection

The intersection of SR 16 at Francis Road is a high crash location with an actual crash rate of 0.63 crashes per million entering vehicles, while the statewide average for a similar facility is 0.20 crashes per million entering vehicles. The actual crash rate is 3.18 times the statewide average crash rate.

The crash analysis results indicated that there was a total of 24 crashes during the analysis period. Rear-end crashes were the predominant crash type, accounting for 10 (41.7%) of the total crashes, followed by left-turn crashes (29.2%) and off-road crashes (12.5%). There was 1 fatal crash and 10 injury crashes. The fatal crash occurred in October 2020 in dark, dry conditions and resulted in two fatalities in the not at fault vehicle. It involved a southbound vehicle failing to yield to westbound traffic while attempting to make a stop-controlled southbound left. The driver of the not at fault vehicle was under the influence of drugs while the at fault driver refused to be tested. **Table 3-8** summarizes the number of crashes by crash type and crash severity.

Table 3-8: Francis Road Crash Frequency

Francis Road		2018	2019	2020	2021	2022	5 Year Total Crashes	Percent
Crash Type	Rear End	0	3	2	3	2	10	41.7%
	Left Turn	1	3	1	2	0	7	29.2%
	Off Road	2	0	0	0	1	3	12.5%
	Other	0	1	0	1	0	2	8.3%
	Right Turn	0	0	0	1	0	1	4.2%
	Unknown	0	1	0	0	0	1	4.2%
	Sideswipe	0	0	0	0	0	0	0.0%
	Angle	0	0	0	0	0	0	0.0%
	Head On	0	0	0	0	0	0	0.0%
	Other Non-Collision	0	0	0	0	0	0	0.0%
	Animal	0	0	0	0	0	0	0.0%
	Bicycle	0	0	0	0	0	0	0.0%
	Rollover	0	0	0	0	0	0	0.0%
	Pedestrian	0	0	0	0	0	0	0.0%
	Other Non-Fixed Object	0	0	0	0	0	0	0.0%
Crash Severity	No Injury	2	5	0	4	2	13	54.2%
	Possible Injury	1	1	2	2	1	7	29.2%
	Non-Incapacitating Injury	0	2	0	1	0	3	12.5%
	Incapacitating Injury	0	0	0	0	0	0	0.0%
	Fatal (within 30 days)	0	0	1	0	0	**1**	4.2%
Total		3	8	3	7	3	24	

3.2.2.6 Turnbull Creek Road Intersection

The intersection of SR 16 at Turnbull Creek Road is a high crash location with an actual crash rate of 0.29 crashes per million entering vehicles, while the statewide average for a similar facility is 0.28 crashes per million entering vehicles. The actual crash rate is 1.03 times the statewide average crash rate.

The crash analysis results indicated that there was a total of 11 crashes during the analysis period. Rear-end crashes were the predominant crash type, accounting for four (36.4%) of the total crashes, followed by animal (18.2%). There were zero fatal crashes and five injury crashes. Additionally, there was one bicycle crash. **Table 3-9** summarizes the number of crashes by crash type and crash severity.

Table 3-9: Turnbull Creek Road Crash Frequency

Turnbull Creek Road		2018	2019	2020	2021	2022	5 Year Total Crashes	Percent
Crash Type	Rear End	1	0	1	1	1	4	36.4%
	Animal	0	1	1	0	0	2	18.2%
	Bicycle	0	0	0	1	0	1	9.1%
	Left Turn	0	0	0	0	1	1	9.1%
	Off Road	0	0	0	0	1	1	9.1%
	Other	0	0	0	1	0	1	9.1%
	Sideswipe	0	0	0	1	0	1	9.1%
	Angle	0	0	0	0	0	0	0.0%
	Right Turn	0	0	0	0	0	0	0.0%
	Head On	0	0	0	0	0	0	0.0%
	Other Non-Collision	0	0	0	0	0	0	0.0%
	Unknown	0	0	0	0	0	0	0.0%
	Rollover	0	0	0	0	0	0	0.0%
	Pedestrian	0	0	0	0	0	0	0.0%
	Other Non-Fixed Object	0	0	0	0	0	0	0.0%
Crash Severity	No Injury	0	1	2	3	0	6	54.5%
	Possible Injury	1	0	0	0	3	4	36.4%
	Non-Incapacitating Injury	0	0	0	1	0	1	9.1%
	Incapacitating Injury	0	0	0	0	0	0	0.0%
	Fatal (within 30 days)	0	0	0	0	0	0	0.0%
Total		1	1	2	4	3	11	

3.2.2.7 Whisper Ridge Drive Intersection

The intersection of SR 16 at Whisper Ridge Drive is a high crash location with an actual crash rate of 0.23 crashes per million entering vehicles, while the statewide average for a similar facility is 0.20 crashes per million entering vehicles. The actual crash rate is 1.15 times the statewide average crash rate.

The crash analysis results indicated that there was a total of eight crashes during the analysis period. Off-road crashes were the predominant crash type, accounting for four (50.0%) of the total crashes, followed by rear end, sideswipe, left turn, and animal with one (12.5%) crash each. There were zero fatal crashes and three injury crashes. **Table 3-10** summarizes the number of crashes by crash type and crash severity.

Table 3-10: Whisper Ridge Drive Crash Frequency

Whisper Ridge Drive		2018	2019	2020	2021	2022	5 Year Total Crashes	Percent
Crash Type	Off Road	0	2	1	0	1	4	50.0%
	Rear End	0	1	0	0	0	1	12.5%
	Sideswipe	0	0	0	1	0	1	12.5%
	Left Turn	0	0	1	0	0	1	12.5%
	Animal	1	0	0	0	0	1	12.5%
	Angle	0	0	0	0	0	0	0.0%
	Other	0	0	0	0	0	0	0.0%
	Right Turn	0	0	0	0	0	0	0.0%
	Head On	0	0	0	0	0	0	0.0%
	Other Non-Collision	0	0	0	0	0	0	0.0%
	Unknown	0	0	0	0	0	0	0.0%
	Bicycle	0	0	0	0	0	0	0.0%
	Rollover	0	0	0	0	0	0	0.0%
	Pedestrian	0	0	0	0	0	0	0.0%
	Other Non-Fixed Object	0	0	0	0	0	0	0.0%
Crash Severity	No Injury	1	2	1	0	1	5	62.5%
	Possible Injury	0	0	1	0	0	1	12.5%
	Non-Incapacitating Injury	0	1	0	1	0	2	25.0%
	Incapacitating Injury	0	0	0	0	0	0	0.0%
	Fatal (within 30 days)	0	0	0	0	0	0	0.0%
Total		1	3	2	1	1	8	

3.2.2.8 Segment between West Outlet Mall Access and Toms Road

The segment of SR 16 between West Outlet Mall Access and Toms Road is a high crash location with an actual crash rate of 2.01 crashes per million vehicle-miles, while the statewide average for a similar facility is 1.75 crashes per million vehicle-miles. The actual crash rate is 1.15 times the statewide average crash rate.

The crash analysis results indicated that there was a total of 20 crashes during the analysis period. Rear-end crashes were the predominant crash type, accounting for 14 (70.0%) of the total crashes, followed by left turn (10.0%). There were zero fatal crashes and four injury crashes. **Table 3-11** summarizes the number of crashes by crash type and crash severity.

Table 3-11: Segment between West Outlet Mall Access and Toms Road Crash Frequency

Segment between West Outlet Mall Access and Toms Road		2018	2019	2020	2021	2022	5 Year Total Crashes	Percent
Crash Type	Rear End	1	3	3	5	2	14	70.0%
	Left Turn	1	0	0	1	0	2	10.0%
	Off Road	0	1	0	0	0	1	5.0%
	Sideswipe	1	0	0	0	0	1	5.0%
	Other	0	0	0	0	1	1	5.0%
	Other Non-Fixed Object	0	1	0	0	0	1	5.0%
	Angle	0	0	0	0	0	0	0.0%
	Animal	0	0	0	0	0	0	0.0%
	Bicycle	0	0	0	0	0	0	0.0%
	Head On	0	0	0	0	0	0	0.0%
	Other Non-Collision	0	0	0	0	0	0	0.0%
	Pedestrian	0	0	0	0	0	0	0.0%
	Right Turn	0	0	0	0	0	0	0.0%
	Rollover	0	0	0	0	0	0	0.0%
	Unknown	0	0	0	0	0	0	0.0%
Crash Severity	No Injury	2	3	2	6	3	16	80.0%
	Possible Injury	0	1	1	0	0	2	10.0%
	Non-Incapacitating Injury	1	1	0	0	0	2	10.0%
	Incapacitating Injury	0	0	0	0	0	0	0.0%
	Fatal (within 30 days)	0	0	0	0	0	0	0.0%
Total		3	5	3	6	3	20	

3.2.2.9 Toms Road Intersection

The intersection of SR 16 at Toms Road is a high crash location with an actual crash rate of 1.22 crashes per million entering vehicles, while the statewide average for a similar facility is 0.53 crashes per million entering vehicles. The actual crash rate is 2.31 times the statewide average crash rate.

The crash analysis results indicated that there was a total of 54 crashes during the analysis period. Rear-end crashes were the predominant crash type, accounting for 28 (51.9%) of the total crashes, followed by left turn (16.7%) and sideswipe (9.3%). There were 0 fatal crashes and 18 injury crashes. Additionally, there was one bicycle crash. **Table 3-12** summarizes the number of crashes by crash type and crash severity.

Table 3-12: Toms Road Crash Frequency

Toms Road		2018	2019	2020	2021	2022	5 Year Total Crashes	Percent
Crash Type	Rear End	10	5	2	5	6	28	51.9%
	Left Turn	2	2	3	2	0	9	16.7%
	Sideswipe	1	1	1	0	2	5	9.3%
	Angle	0	0	1	2	0	3	5.6%
	Other	0	1	0	0	2	3	5.6%
	Off Road	1	0	0	1	0	2	3.7%
	Right Turn	0	0	0	1	1	2	3.7%
	Unknown	0	0	1	0	0	1	1.9%
	Bicycle	1	0	0	0	0	1	1.9%
	Head On	0	0	0	0	0	0	0.0%
	Other Non-Collision	0	0	0	0	0	0	0.0%
	Animal	0	0	0	0	0	0	0.0%
	Rollover	0	0	0	0	0	0	0.0%
	Pedestrian	0	0	0	0	0	0	0.0%
	Other Non-Fixed Object	0	0	0	0	0	0	0.0%
Crash Severity	No Injury	9	7	4	7	9	36	66.7%
	Possible Injury	5	2	2	3	0	12	22.2%
	Non-Incapacitating Injury	1	0	1	0	1	3	5.6%
	Incapacitating Injury	0	0	1	1	1	3	5.6%
	Fatal (within 30 days)	0	0	0	0	0	0	0.0%
Total		15	9	8	11	11	54	

3.2.2.10 CR 208 Intersection

The intersection of SR 16 at CR 208 is a high crash location with an actual crash rate of 1.36 crashes per million entering vehicles, while the statewide average for a similar facility is 0.53 crashes per million entering vehicles. The actual crash rate is 2.59 times the statewide average crash rate.

The crash analysis results indicated that there was a total of 70 crashes during the analysis period. Rear-end crashes were the predominant crash type, accounting for 21 (30.0%) of the total crashes, followed by other (18.6%) and sideswipe and right turn which both had 8 crashes each (11.4%). There were 0 fatal crashes and 15 injury crashes. Additionally, there were two bicycle crashes. **Table 3-13** summarizes the number of crashes by crash type and crash severity.

Table 3-13: CR 208 Crash Frequency

CR 208		2018	2019	2020	2021	2022	5 Year Total Crashes	Percent
Crash Type	Rear End	10	3	1	4	3	21	30.0%
	Other	1	4	1	4	3	13	18.6%
	Sideswipe	0	1	1	1	5	8	11.4%
	Right Turn	3	1	1	1	2	8	11.4%
	Left Turn	3	2	1	0	0	6	8.6%
	Off Road	0	0	0	1	2	3	4.3%
	Head On	1	2	0	0	0	3	4.3%
	Unknown	0	0	0	0	3	3	4.3%
	Angle	1	0	0	0	1	2	2.9%
	Bicycle	1	0	0	0	1	2	2.9%
	Rollover	0	0	0	1	0	1	1.4%
	Other Non-Collision	0	0	0	0	0	0	0.0%
	Animal	0	0	0	0	0	0	0.0%
	Pedestrian	0	0	0	0	0	0	0.0%
	Other Non-Fixed Object	0	0	0	0	0	0	0.0%
Crash Severity	No Injury	17	10	3	8	17	55	78.6%
	Possible Injury	3	3	2	1	1	10	14.3%
	Non-Incapacitating Injury	0	0	0	2	2	4	5.7%
	Incapacitating Injury	0	0	0	1	0	1	1.4%
	Fatal (within 30 days)	0	0	0	0	0	0	0.0%
Total		20	13	5	12	20	70	

3.2.2.11 I-95 Southbound Off Ramp Terminal Intersection

The intersection of SR 16 at the I-95 southbound off-ramp terminal is a high crash location with an actual crash rate of 3.04 crashes per million entering vehicles, while the statewide average for a similar facility is 1.51 crashes per million entering vehicles. The actual crash rate is 2.02 times the statewide average crash rate.

The crash analysis results indicated that there was a total of 195 crashes during the analysis period. Rear-end crashes were the predominant crash type accounting for 104 (53.3%) of the total crashes, followed by sideswipe crashes (20.5%) and left-turn crashes (13.8%). There was 1 fatal crash and 41 injury crashes. The fatal crash occurred in March 2020 in dark, dry conditions and resulted in one fatality in the at-fault vehicle (passenger). It involved a westbound vehicle, a motorcycle, running a red light and colliding with a vehicle attempting to make a protected southbound left. The driver of the not at fault vehicle was under the influence of drugs while the at-fault driver was not tested. **Table 3-14** summarizes the number of crashes by crash type and crash severity.

Table 3-14: I-95 Southbound Off Ramp Terminal Crash Frequency

I-95 Southbound Off Ramp Terminal		2018	2019	2020	2021	2022	5 Year Total Crashes	Percent
Crash Type	Rear End	19	17	15	27	26	104	53.3%
	Left Turn	4	3	6	11	16	40	20.5%
	Sideswipe	6	3	6	4	8	27	13.8%
	Other	1	1	1	3	3	9	4.6%
	Right Turn	0	1	0	1	1	3	1.5%
	Head On	1	0	1	0	1	3	1.5%
	Angle	0	0	0	2	0	2	1.0%
	Off Road	0	1	0	1	0	2	1.0%
	Rollover	0	0	1	1	0	2	1.0%
	Other Non-Collision	0	0	0	0	1	1	0.5%
	Animal	0	0	0	0	1	1	0.5%
	Bicycle	0	1	0	0	0	1	0.5%
	Unknown	0	0	0	0	0	0	0.0%
	Pedestrian	0	0	0	0	0	0	0.0%
	Other Non-Fixed Object	0	0	0	0	0	0	0.0%
Crash Severity	No Injury	27	21	24	42	39	153	78.5%
	Possible Injury	3	3	3	4	12	25	12.8%
	Non-Incapacitating Injury	1	3	2	4	5	15	7.7%
	Incapacitating Injury	0	0	0	0	1	1	0.5%
	Fatal (within 30 days)	0	0	1	0	0	**1**	0.5%
Total		31	27	30	50	57	195	

3.3 Existing Traffic Volumes

3.3.1 Existing Traffic Data

Traffic data collection was conducted during September 2023. Twelve-hour TMCs were collected at the thirteen study area intersections. In addition, 72-hour bi-directional vehicle classification counts were collected at two locations along SR 16 and on Francis Road north of SR 16, and 48-hour bi-directional vehicle counts were collected at three locations along SR 16. **Appendix B** contains the raw traffic counts.

3.3.2 Daily Traffic

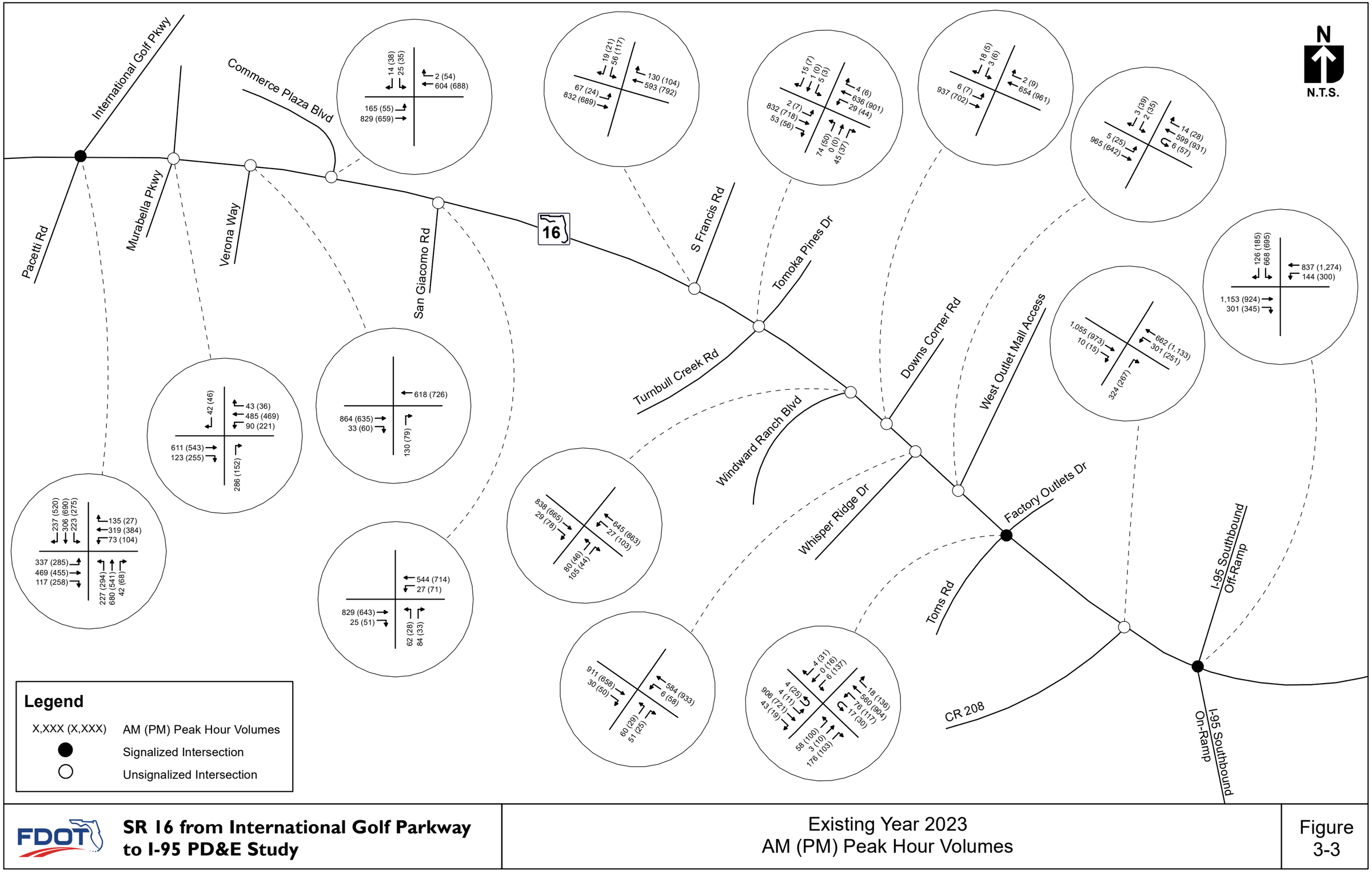
Existing Year 2023 AADTs were developed using the 48- and 72-hour bi-directional counts. The daily traffic counts were averaged, and the appropriate seasonal and axle correction factors were applied to convert the existing count to an AADT. Existing count data was supplemented with data from FTO 2022 where necessary. The Existing Year 2023 AADTs are summarized in **Table 3-15**.

Table 3-15: Existing Year 2023 AADTs

Location	AADT
SR 16 West of International Golf Parkway	23,000
SR 16 Between San Giacomo Road and Francis Road	19,600
SR 16 Between Francis Road and Turnbull Creek Road	21,500
SR 16 Between Whisper Ridge Drive and West Outlet Mall Access	20,600
SR 16 Between West Outlet Mall Access and Toms Road	21,800
SR 16 Between Toms Road and CR 208	24,700
International Golf Parkway North of SR 16	29,600
Pacetti Road South of SR 16	18,000
Francis Road North of SR 16	3,200
CR 208 South of SR 16	4,800
I-95 Southbound Off-Ramp	10,800
I-95 Southbound On-Ramp	6,900

3.3.3 Peak Hour Traffic

Study area peak hours were determined by analyzing the turning movement count data and tube count data to find the most frequent peak hour across the study intersections and segments. The AM peak hour was identified as 7:30 AM – 8:30 AM, while the PM peak hour was from 4:30 PM - 5:30 PM. **Figure 3-3** shows the study intersection peak hour volumes. Since turning movement count data at the intersection of SR 16 and Downs Corner Road were not included in the initial data collection, the turning movement volumes at that intersection were based on the corresponding turning movements at Tomoka Pines Drive, which is another residential neighborhood 0.65 miles west of Downs Corner Road with approximately the same number of houses.



SR 16 from International Golf Parkway to I-95 PD&E Study

Existing Year 2023
AM (PM) Peak Hour Volumes

Figure 3-3

3.4 Existing Operational Performance

The Existing Year 2023 operational conditions within the project study area were assessed with Synchro 11, as discussed in the following sections.

3.4.1 Existing Conditions Synchro Analysis

Synchro 11 was used to analyze the Existing Year 2023 study intersections. Of the 14 primary study intersections, 3 are signalized and 11 are unsignalized under existing conditions. Existing signal timings were obtained from St. Johns County and were incorporated into the Existing conditions Synchro models to replicate the existing field signal timings. Intersection delay (seconds per vehicle) and LOS are reported in **Table 3-16** in terms of the individual turning movements and the overall intersections. For the unsignalized intersections, the overall intersection delay is equivalent to the turning movement with the highest delay. The results indicate that the intersection of SR 16 and International Golf Parkway/Pacetti Road operates at LOS E during the PM peak, while the two other signalized intersections operate at LOS D or better during both peaks. It should be noted that based on field visits, congestion was observed during the AM and PM peak hours for the eastbound, westbound, and northbound approaches at the International Golf Parkway intersection. Seven of the unsignalized intersections include stop-controlled approaches that operate at LOS E or F during the AM peak. During the PM peak, eight of the unsignalized intersections include stop-controlled approaches that operate at LOS E or F. The high levels of delay are primarily due to the heavy eastbound and westbound traffic flow along SR 16 which provides few acceptable gaps and little opportunity for stop-controlled vehicles on the side streets to enter the traffic stream. Backup documentation for the Existing Conditions Synchro analysis is provided in **Appendix C**.

Table 3-16: Existing Year 2023 Synchro Intersection Analysis

Intersection	Intersection Approach				Overall Intersection	
	Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
			AM (PM)	AM (PM)	AM (PM)	AM (PM)
International Golf Parkway / Pacetti Road	Eastbound	Left	41.8 (46.3)	D (D)	52.1 (55.7)	D **(E)**
		Through	51.2 (52.7)	D (D)		
		Right	2.4 (7.9)	A (A)		
	Westbound	Left	29.6 (29.4)	C (C)		
		Through	65.8 (64.4)	E (E)		
		Right	1.4 (0.2)	A (A)		
	Northbound	Left	80.7 (89.7)	F (F)		
		Through	64.5 (59.7)	E (E)		
		Right	0.3 (0.6)	A (A)		
	Southbound	Left	98.9 (81.5)	F (F)		
		Through	55.3 (73.6)	E (E)		
		Right	8.7 (35.7)	A (D)		
Murabella Parkway*	Westbound	Left	9.8 (11.2)	A (B)	23.4 (14.7)	C (B)
	Northbound	Right	23.4 (14.7)	C (B)		
	Southbound	Right	12.0 (11.7)	B (B)		
Verona Way*	Northbound	Right	13.4 (11.1)	B (B)	13.4 (11.1)	B (B)
Commerce Plaza Boulevard*	Eastbound	Left	9.6 (9.5)	A (A)	82.2 (44.7)	**F (E)**
	Southbound	Left	82.2 (44.7)	F (E)		
		Right	12.6 (14.1)	B (B)		
San Giacomo Road*	Westbound	Left	9.9 (9.4)	A (A)	53.0 (45.6)	**F (E)**
	Northbound	Left	53.0 (45.6)	F (E)		
		Right	18.1 (13.4)	C (B)		
Francis Road*	Eastbound	Left	9.6 (10.0)	A (B)	81.8 (201.8)	**F (F)**
	Southbound	Left / Right	81.8 (201.8)	F (F)		
Turnbull Creek Road / Tomoka Pines Drive*	Eastbound	Left	8.9 (9.9)	A (A)	174.2 (188.9)	**F (F)**
	Westbound	Left	10.1 (9.6)	B (A)		
	Northbound	Left	174.2 (188.9)	F (F)		
		Right	16.7 (14.5)	C (B)		
	Southbound	Left / Thru / Right	27.3 (36.1)	D (E)		
Windward Ranch Boulevard*	Westbound	Left	10.0 (9.8)	A (A)	91.6 (103.5)	**F (F)**
	Northbound	Left	91.6 (103.5)	F (F)		
		Right	19.6 (13.9)	C (B)		
Downs Corner Road*	Eastbound	Left	9.0 (10.2)	A (B)	39.6 (45.1)	**E (E)**
	Southbound	Left	39.6 (45.1)	E (E)		
		Right	13.2 (17.3)	B (C)		
Whisper Ridge Drive*	Westbound	Left	10.2 (9.4)	B (A)	60.0 (66.7)	**F (F)**
	Northbound	Left	60.0 (66.7)	F (F)		
		Right	18.4 (13.4)	C (B)		
West Outlet Mall Access*	Eastbound	Left	8.9 (10.3)	A (B)	16.6 (21.8)	C (C)
	Westbound	U-Turn	19.7 (14.8)	C (B)		
	Southbound	Left	16.6 (21.8)	C (C)		
		Right	13.1 (18.1)	B (C)		

Intersection	Intersection Approach				Overall Intersection	
	Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
			AM (PM)	AM (PM)	AM (PM)	AM (PM)
Toms Road / Factory Outlets Drive	Eastbound	Left	5.5 (14.6)	A (B)	11.2 (21.6)	B (C)
		Through / Right	11.1 (26.2)	B (C)		
	Westbound	Left	5.3 (9.1)	A (A)		
		Through / Right	4.9 (15.0)	A (B)		
	Northbound	Through / Left	72.2 (74.0)	E (E)		
		Right	13.5 (2.0)	B (A)		
	Southbound	Left	45.3 (37.8)	D (D)		
		Through / Right	0.0 (14.3)	A (B)		
CR 208*	Westbound	Left	16.3 (13.3)	C (B)	29.0 (20.4)	D (C)
	Northbound	Right	29.0 (20.4)	D (C)		
I-95 Southbound Ramp Terminal	Eastbound	Through	30.1 (55.3)	C (E)	31.1 (40.1)	C (D)
	Westbound	Left	46.0 (58.3)	D (E)		
		Through	10.8 (14.4)	B (B)		
	Southbound	Left	59.8 (56.2)	E (E)		
		Right	7.7 (23.4)	A (C)		

* Indicates an unsignalized intersection reporting the highest movement delay (LOS) for the overall intersection.
- Intersection LOS in **red** exceeds target LOS D.

4.0 DEVELOPMENT OF DESIGN TRAFFIC

Several strategies were considered for the development of the proposed growth rate(s) for the study area. Historical traffic data from FDOT was reviewed to determine trends in traffic growth. Available population data and population projections for St. Johns County from the latest Florida Statistical Abstract from the University of Florida's Bureau of Economic and Business Research (BEBR) were reviewed to determine population growth rates. Finally, the region's travel demand forecasting model was used to develop traffic projections for the study area.

4.1 Historical Traffic

Historical growth trends in the study area were analyzed to identify potential growth rates for the study area. Historical AADTs were obtained from the 2022 FTO for the count sites within the study area. In general, 10 years of historical AADTs were used; data was available from 2012 to 2022 for all FTO count stations in the study area. Historical trends within the study area indicate linear growth rates between 1.71% and 6.42%. Based on guidance from the FDOT Project Traffic Forecasting Handbook, growth rates with a trend R^2 value of 75% or greater can be considered a viable source for future growth rates. As shown in **Table 4-1**, all locations along SR 16 had trend R^2 values greater than 75%, in addition to the location on Pacetti Road south of SR 16. Backup documentation of the historical trends analysis is provided in **Appendix D**.

Table 4-1: Historical Traffic Growth

Count Site	Location	Historical Growth	Trend R^2
780042	SR 16 East of Toms Road	2.88%	80.39%
780043	SR 16 West of Outlet Mall	5.00%	89.93%
785050	SR 16 West of International Golf Parkway	4.47%	85.76%
784019	I-95 Southbound Off-Ramp	3.13%	67.21%
784020	I-95 Southbound On-Ramp	2.00%	40.53%
789123	CR 208 West of SR 16	1.71%	64.18%
789134	Pacetti Road South of SR 16	6.42%	90.01%
780295	International Golf Parkway North of SR 16	5.68%	73.53%

4.2 St. Johns County Population Projections

The BEBR has been publishing population projections for each county in the state of Florida since the 1970s. To account for uncertainty in the population projections, three series of projections are published for each county: a low estimate, a medium estimate, and a high estimate. The St. Johns County population growth estimates, which are based on the most recent BEBR publication, produce average annual growth rates ranging from 1% to 4% (**Table 4-2**). The BEBR population projections are provided in **Appendix D**.

Table 4-2: BEBR Population Projections, St. Johns County

2022 Population	Projection	2050 Population	Annual Growth Rate (2022 - 2050)
296,919	Low	356,700	1%
	Medium	488,600	2%
	High	620,500	4%

4.3 Travel Demand Model

The NERPM is the regional travel demand model developed and maintained by FDOT District Two, which has a base year of 2015 and forecast year of 2045. The NERPM is the primary travel demand forecasting tool used to support the Long Range Transportation Plan updates of the North Florida TPO. As a part of the forecasting effort, the regional model was reviewed for accuracy and reasonableness. The study area model was checked for illogical speed and capacity calculations, illogical trip pathing, reasonableness of trip distribution and assignment, and the reasonableness of population and employment growth. In addition, the model was reviewed to ensure that the appropriate planned transportation improvements are included in the forecast year model network.

After the subarea model validation was completed for the base year, the NERPM was used to produce volume projections for the Design Year 2050. Initial annual traffic growth rates were calculated using the 2015 Validated and updated 2045 Cost Feasible NERPM runs. The results of this comparison are summarized in **Table 4-3**.

Table 4-3: NERPM Traffic Growth Rates

Roadway Segment	2015 AADT	2045 AADT	Linear Growth 2015-2045
SR 16			
SR 16 West of International Golf Parkway	15,400	21,600	1.3%
SR 16 between International Golf Parkway and CR 2209 (Future)	14,100	18,900	1.1%
SR between CR 2209 (Future) and Francis Road	13,900	29,500	3.7%
SR 16 between Francis Road and Whisper Ridge Drive	12,000	23,000	3.0%
SR 16 between Whisper Ridge Drive and West Outlet Mall Access	16,700	29,700	2.6%
SR 16 between West Outlet Mall Access and CR 208	19,400	33,600	2.4%
SR 16 East of I-95 Southbound Ramp Terminal	30,900	55,800	2.7%
Side Streets			
International Golf Parkway North of SR 16	15,100	26,900	2.6%
Pacetti Road South of SR 16	14,600	28,200	3.1%
CR 2209 North of SR 16 (Future)	---	16,800	---
CR 208 West of SR 16	5,000	11,800	4.5%
I-95 Southbound Off-Ramp	12,100	21,600	2.6%
I-95 Southbound On-Ramp	3,400	4,600	1.2%

Based on the review of the historical traffic data, population projections, and travel demand model projections, it was determined that the growth rates derived from the NERPM would be the most appropriate basis for the growth rates used for this study.

Average growth rates were used to assist in developing a consistent set of daily and peak hour traffic volumes along SR 16. A 3% growth rate was used for the SR 16 segments east of the planned SR 16 at CR 2209 intersection. Because the NERPM projections show a significant difference in growth rates west of CR 2209, a 2% growth rate was used for the SR 16 segments west of CR 2209. A 3% growth rate was used for International Golf Parkway, Pacetti Road, Francis Road, and CR 208. A 2% growth rate was used for the I-95 southbound ramps. A minimum growth rate of 1% was used for the additional side streets that aren't included in the NERPM. These growth rates were applied to the Existing Year 2023 AADTs to produce Opening Year 2030 and Design Year 2050 AADTs, which are provided in **Table 4-4**. Future year DDHVs were developed through the application of K and D factors as described in **Section 2.7**.

For Elevation Parkway (which is planned to intersect with the existing intersection at the West Outlet Mall Access) traffic development and trip generation provided by St. Johns County was used as a source for the development of the DDHVs.

Table 4-4: Future Year AADTs

Location	2030 AADT	2050 AADT
SR 16 West of International Golf Parkway	26,200	35,400
SR 16 between San Giacomo Road and CR 2209	22,300	30,200
SR 16 between CR 2209 and Francis Road	23,700	35,500
SR 16 between Francis Road and Turnbull Creek Road	26,000	38,900
SR 16 between Whisper Ridge Drive and West Outlet Mall Access	24,900	37,300
SR 16 between West Outlet Mall Access and Toms Road	26,400	39,500
SR 16 between Toms Road and CR 208	29,900	44,700
International Golf Parkway North of SR 16	35,800	53,600
Pacetti Road South of SR 16	21,800	32,600
CR 2209 North of SR 16	12,100	19,300
Francis Road North of SR 16	3,900	5,800
CR 208 South of SR 16	5,800	8,700
I-95 Southbound Off-Ramp	12,300	16,600
I-95 Southbound On-Ramp	7,900	10,600

5.0 ALTERNATIVES

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

- No-Build Alternative
- Build Alternative

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

5.1 No-Build

The No-Build alternative provides a baseline for comparison to the Build alternative. It represents the existing roadway network within the area of influence, in addition to any planned improvements. Four planned improvements exist within the study area, and the project details have been provided by St. Johns County and FDOT. A summary of these improvements includes the following:

SR 16 between International Golf Parkway and CR 2209 Extension

This project is currently under design by St. Johns County. The planned improvements will include widening SR 16 to a four-lane facility from International Golf Parkway to the CR 2209 extension, as well as intersection improvements for SR 16 at International Golf Parkway and Commerce Plaza Boulevard. At the intersection of SR 16 and International Golf Parkway, dual left-turn lanes and dual eastbound/westbound through lanes will be provided. It should be noted that the AM and PM cycle lengths at this intersection were maintained from existing conditions, but the splits were re-optimized to account for these capacity improvements. At SR 16 and Commerce Plaza Boulevard, a partial MUT configuration is proposed with an eastbound U-turn intersection on SR 16 east of Commerce Plaza Boulevard.

CR 2209 Extension

This project is currently under design. The planned improvements include an extension of CR 2209 to SR 16 by the Opening Year. The planned intersection of SR 16 and CR 2209 is a partial MUT configuration with an eastbound U-turn intersection on SR 16 east of CR 2209.

Elevation Parkway and Realigned CR 208

To serve a new commercial development (Elevation Pointe) currently under construction, a southern leg will be added to the existing intersection at the West Outlet Mall Access, which will coincide with the realigned CR 208. It is assumed that signal control will be incorporated at this intersection by the Opening Year 2030 in addition to dual-lane westbound left-turn lanes to accommodate the additional traffic demand.

SR 16 at I-95 Interchange Improvements

This project is currently under construction. The existing interchange at SR 16 and I-95 will be converted to an MUT interchange.

The Opening Year 2030 and Design Year 2050 No-Build network lane configuration is shown in **Figures 5-1** and **5-2**, respectively.

5.2 Build

The Build alternative for this PTAR includes several elements, which include widening SR 16, incorporating access management along SR 16, and providing intersection improvements primarily at two locations. The most significant project improvement is the widening of SR 16 to four lanes throughout the study area. The widening of SR 16 to a four-lane facility from east of International Golf Parkway to CR 2209 (No-Build) will continue from CR 2209 to the West Outlet Mall Access (and future Elevation Parkway), covering a distance of approximately 4.4 miles, and will have a design speed of 55 mph. In addition to the widening of SR 16, the Build alternative includes access management improvements between International Golf Parkway and I-95. The proposed access management will better meet Roadway Access Class 3 requirements, which should improve both safety and operations. The project will include shared-use paths on both sides of SR 16 from International Golf Parkway to the St. Augustine Outlet Mall.

Intersection improvements are also proposed at several study intersections as part of the Build alternative. Intersection Control Evaluation (ICE) Stage 1 analyses were completed for all intersections with control strategy changes and are located in **Appendix E**. The Opening Year 2030 and Design Year 2050 Build network lane configuration is shown in **Figures 5-3** and **5-4**, respectively.

The intersection of SR 16 at Francis Road will be changed from a conventional TWSC intersection to a hybrid MUT/thru-cut that restricts the SR 16 left turns and Francis Road through movements. The eastbound left-turn movement from SR 16 will travel through the existing intersection and perform a U-turn approximately 720 feet downstream. The eastbound U-turn will initially be unsignalized but will be signalized by Design Year 2050. The movements from Francis Road and the eastbound/westbound through movements of SR 16 will be controlled by a traffic signal for both analysis horizons.

The intersection of SR 16 at Turnbull Creek Road will be changed from a conventional TWSC intersection to a signalized thru-cut, which will redistribute the low-volume northbound and southbound through movements to perform U-turns at unsignalized median openings east and west of the intersection.

The intersections at Windward Ranch Boulevard, Downs Corner Road, and Whisper Ridge Drive will be converted from conventional TWSC intersections to signalized intersections. While these T-intersections include similar raised channelizing islands used for thru-cut intersections, they will

operate in the same manner as standard signals as the cross-street approaches do not have a through movement.

The intersection of SR 16 at Toms Road will be changed from a conventional signalized intersection to a hybrid MUT/thru-cut that restricts the SR 16 left turns and the Toms Road/Factory Outlet Drive through movements. The eastbound and westbound left turns from SR 16 will travel through the existing intersection and perform a U-turn approximately 540 feet downstream for the eastbound U-turn and 360 feet for the westbound U-turn. In addition, the through traffic from Toms Road and Factory Outlet Drive will use the U-turn intersection on SR 16. For Opening Year 2030, the main intersection with Toms Road and the westbound U-turn will be signalized; the eastbound U-turn will be signalized by Design Year 2050. The Build alternative design concept is provided in **Appendix F**.

N

N.T.S.

International Golf Pkwy

Pacetti Rd

Murabella Pkwy

Verona Way

Commerce Plaza Blvd

16

San Giacomo Rd

CR 2209

Matchline A

Page 2

Legend

- Intersection Lane Configuration
- Signalized Intersection
- Unsignalized Intersection

SR 16 from International Golf Parkway to I-95 PD&E Study	No-Build Opening Year 2030 Lane Configuration	Page 1 of 2	Figure 5-1

Matchline A

Page 1

S Francis Rd

Tomoka Pines Dr

Turnbull Creek Rd

Windward Ranch Blvd

Downs Corner Rd

West Outlet Mall Access

Whisper Ridge Dr

Elevation Pkwy

16

Factory Outlets Dr

Toms Rd

CR 208

I-95 Southbound Off-Ramp

I-95 Southbound On-Ramp

N

N.T.S.

Legend

- Intersection Lane Configuration
- Signalized Intersection
- Unsignalized Intersection

SR 16 from International Golf Parkway to I-95 PD&E Study	No-Build Opening Year 2030 Lane Configuration	Page 2 of 2	Figure 5-1

N

N.T.S.

International Golf Pkwy

Pacetti Rd

Murabella Pkwy

Verona Way

Commerce Plaza Blvd

16

San Giacomo Rd

CR 2209

Matchline A

Page 2

Legend

- Intersection Lane Configuration
- Signalized Intersection
- Unsignalized Intersection

SR 16 from International Golf Parkway to I-95 PD&E Study	No-Build Design Year 2050 Lane Configuration	Page 1 of 2	Figure 5-2

Matchline A

Page 1

S Francis Rd

Tomoka Pines Dr

Turnbull Creek Rd

Downs Corner Rd

West Outlet Mall Access

Windward Ranch Blvd

Whisper Ridge Dr

Elevation Pkwy

16

Factory Outlets Dr

Toms Rd

CR 208

I-95 Southbound Off-Ramp

I-95 Southbound On-Ramp

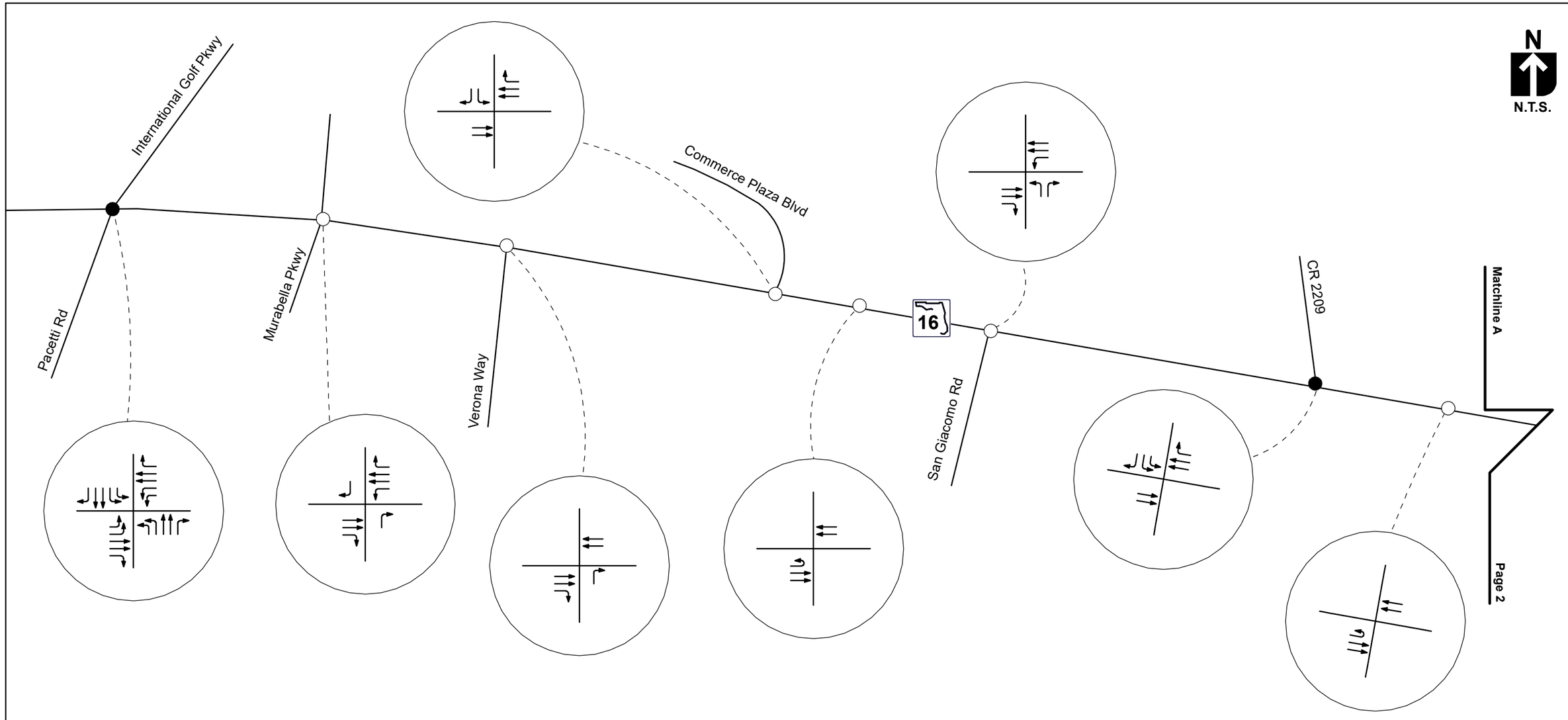
N

N.T.S.

Legend

- Intersection Lane Configuration
- Signalized Intersection
- Unsignalized Intersection

SR 16 from International Golf Parkway to I-95 PD&E Study	No-Build Design Year 2050 Lane Configuration	Page 2 of 2	Figure 5-2



Legend

- Intersection Lane Configuration
- Signalized Intersection
- Unsignalized Intersection

SR 16 from International Golf Parkway to I-95 PD&E Study	Build Opening Year 2030 Lane Configuration	Page 1 of 2	Figure 5-3

Matchline A

Page 1

S Francis Rd

Tomoka Pines Dr

Turnbull Creek Rd

Windward Ranch Blvd

Downs Corner Rd

West Outlet Mall Access

Whisper Ridge Dr

Elevation Pkwy

16

Factory Outlets Dr

Toms Rd

CR 208

I-95 Southbound Off-Ramp

I-95 Southbound On-Ramp

N

N.T.S.

Legend

- Intersection Lane Configuration
- Signalized Intersection
- Unsignalized Intersection

SR 16 from International Golf Parkway to I-95 PD&E Study	Build Opening Year 2030 Lane Configuration	Page 2 of 2	Figure 5-3

N

N.T.S.

International Golf Pkwy

Pacetti Rd

Murabella Pkwy

Verona Way

Commerce Plaza Blvd

16

San Giacomo Rd

CR 2209

Matchline A

Page 2

Legend

- Intersection Lane Configuration
- Signalized Intersection
- Unsignalized Intersection

SR 16 from International Golf Parkway to I-95 PD&E Study	Build Design Year 2050 Lane Configuration	Page 1 of 2	Figure 5-4

Matchline A

Page 1

S Francis Rd

Tomoka Pines Dr

Turnbull Creek Rd

Windward Ranch Blvd

Downs Corner Rd

West Outlet Mall Access

Whisper Ridge Dr

Elevation Pkwy

16

Factory Outlets Dr

Toms Rd

CR 208

I-95 Southbound Off-Ramp

I-95 Southbound On-Ramp

N

N.T.S.

Legend

- Intersection Lane Configuration
- Signalized Intersection
- Unsignalized Intersection

SR 16 from International Golf Parkway to I-95 PD&E Study	Build Design Year 2050 Lane Configuration	Page 2 of 2	Figure 5-4

6.0 EVALUATION OF ALTERNATIVES

This section summarizes the operational characteristics of the analysis alternatives considered as part of this study. The alternatives were evaluated under Design Year 2050 and Opening Year 2030 conditions to determine their ability to accommodate future year traffic demand and to assess whether the future year traffic operations under each of the different geometric and operational scenarios met the LOS target of "D". The future year analysis included AM and PM peak hour intersection capacity analysis using Synchro 11, as well as highway segment analysis using HCS 2023.

The intersection capacity analysis was completed using Synchro 11 for both the signalized and unsignalized intersections within the study area. Intersection delay (seconds per vehicle) and LOS was reported for each study area intersection. For the unsignalized intersections, the overall intersection delay is equivalent to the turning movement with the highest level of delay based on HCM 6th Edition methodologies. In addition to the intersection analysis, a highway segment analysis was conducted using HCS 2023 to determine the expected LOS for future conditions. Backup documentation for the Opening Year 2030 and Design Year 2050 Synchro and HCS analysis is provided in **Appendix G**.

6.1 2030 Opening Year No-Build Analysis

6.1.1 2030 No-Build Intersection Analysis

Synchro 11 was used to analyze study intersections under the Opening Year 2030 No-Build conditions. The 2030 No-Build roadway network is based on the Existing Conditions model and includes the planned improvements discussed in **Section 5.1**. These include the SR 16 at International Golf Parkway intersection improvements, the CR 2209 extension to SR 16, the signalized intersection at SR 16 and Elevation Parkway/West Outlet Mall Access, and the SR 16 at I-95 interchange improvements. **Figure 6-1** shows the 2030 No-Build peak hour volumes.

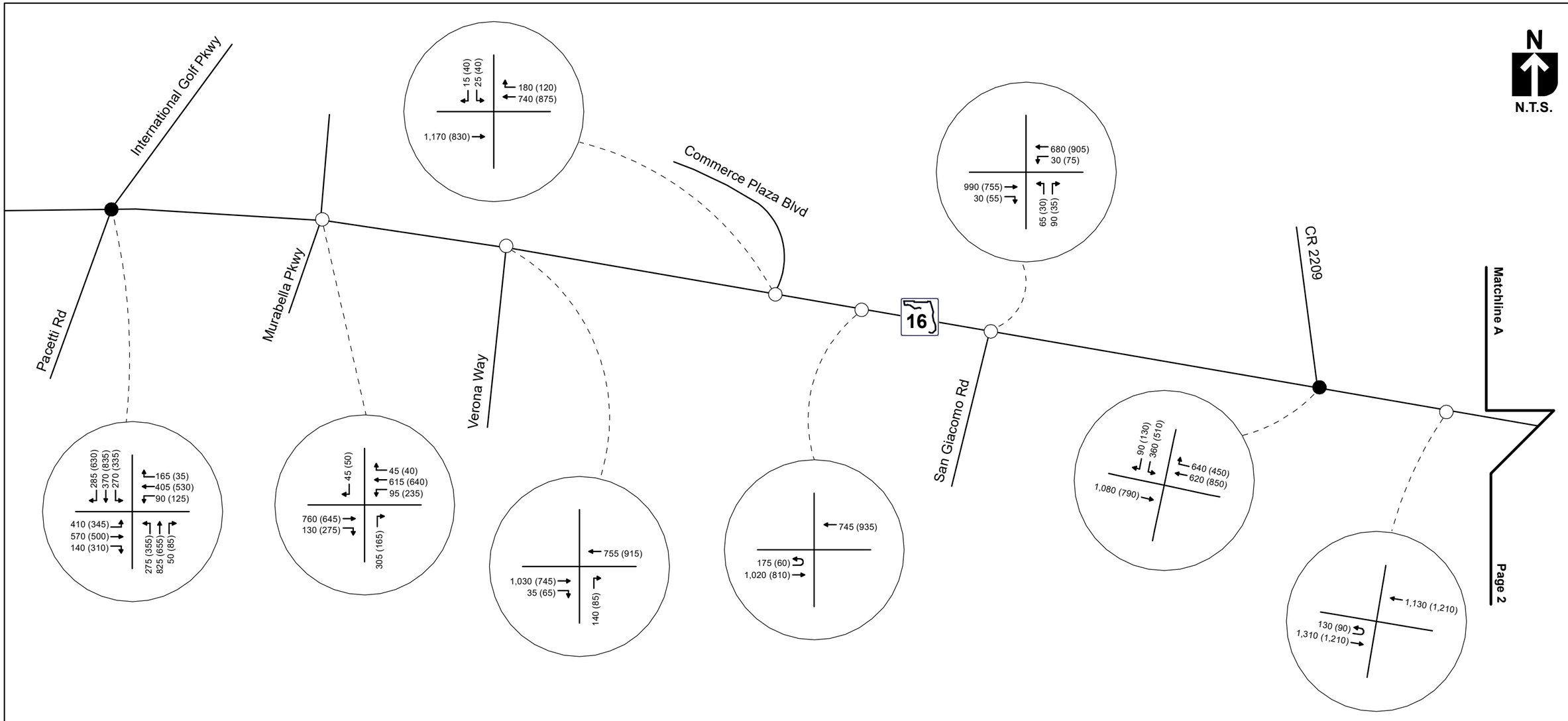
Table 6-1 summarizes the delay and LOS for intersections within the study area. The results of the analysis indicate that the unsignalized SR 16 intersections at Francis Road, Turnbull Creek Road, Windward Ranch Boulevard, Downs Corner Road, and Whisper Ridge Drive are expected to operate at LOS F during both the AM and PM peaks. The high levels of delay are primarily due to the heavy eastbound and westbound traffic flow along SR 16 which provides few acceptable gaps and little opportunity for stop-controlled vehicles on the side streets to enter the traffic stream. The remaining intersections are expected to operate at LOS D or better during both peaks.

Table 6-1: Opening Year 2030 No-Build Synchro Intersection Analysis

Intersection		Intersection Approach				Overall Intersection	
		Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
				AM (PM)	AM (PM)	AM (PM)	AM (PM)
International Golf Parkway / Pacetti Road		Eastbound	Left	76.1 (76.9)	E (E)	52.3 (52.6)	D (D)
			Through	41.4 (44.3)	D (D)		
			Right	6.3 (7.6)	A (A)		
		Westbound	Left	81.2 (73.3)	F (E)		
			Through	53.0 (52.9)	D (D)		
			Right	8.6 (0.3)	A (A)		
		Northbound	Left	77.2 (69.0)	E (E)		
			Through	62.4 (49.0)	E (D)		
			Right	0.2 (6.6)	A (A)		
		Southbound	Left	77.3 (70.6)	E (E)		
			Through	46.9 (60.5)	D (E)		
			Right	17.2 (47.1)	B (D)		
Murabella Parkway*		Westbound	Left	10.7 (12.4)	B (B)	17.0 (12.3)	C (B)
		Northbound	Right	17.0 (12.3)	C (B)		
		Southbound	Right	10.9 (10.8)	B (B)		
Verona Way*		Northbound	Right	17.8 (13.2)	C (B)	17.8 (13.2)	C (B)
Commerce Plaza Boulevard*	Eastbound/ Westbound Main	Southbound	Left	19.4 (20.9)	C (C)	19.4 (20.9)	C (C)
			Right	10.9 (12.0)	B (B)		
	Eastbound U-turn	Eastbound	U-turn	17.3 (17.4)	C (C)	17.3 (17.4)	C (C)
San Giacomo Road*		Westbound	Left	10.9 (10.0)	B (A)	26.2 (21.1)	D (C)
		Northbound	Left	26.2 (21.1)	D (C)		
			Right	13.6 (11.2)	B (B)		
CR 2209	Eastbound/ Westbound Main	Eastbound	Through	10.0 (10.4)	B (B)	10.1 (12.0)	B (B)
		Westbound	Through	8.0 (10.9)	A (B)		
		Southbound	Left	26.7 (24.9)	C (C)		
			Right	7.4 (9.8)	A (A)		
	Eastbound U-turn*	Eastbound	U-turn	33.8 (30.5)	D (D)	33.8 (30.5)	D (D)
		Westbound	Through	--- (---)	--- (---)		
Francis Road*		Eastbound	Left	11.8 (11.6)	B (B)	1,027.2 (1,353.4)	**F (F)**
		Southbound	Left / Right	1,027.2 (1,353.4)	F (F)		
Turnbull Creek Road / Tomoka Pines Drive*		Eastbound	Left	9.8 (11.3)	A (B)	1,274.9 (1,261.3)	**F (F)**
		Westbound	Left	11.8 (10.8)	B (B)		
		Northbound	Left	1,274.9 (1,261.3)	F (F)		
			Through	90.8 (124.9)	F (F)		
			Right	24.4 (18.5)	C (C)		
		Southbound	Left / Through / Right	138.9 (167.0)	F (F)		
Windward Ranch Boulevard*		Westbound	Left	11.5 (10.8)	B (B)	458.4 (381.0)	**F (F)**
		Northbound	Left	458.4 (381.0)	F (F)		
			Right	33.4 (16.5)	D (C)		

Intersection	Intersection Approach				Overall Intersection	
	Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
			AM (PM)	AM (PM)	AM (PM)	AM (PM)
Downs Corner Rd*	Eastbound	Left	9.8 (11.5)	A (B)	83.4 (90.6)	**F (F)**
	Southbound	Left	83.4 (90.6)	F (F)		
		Right	16.1 (22.6)	C (C)		
Whisper Ridge Drive*	Westbound	Left	11.5 (10.1)	B (B)	235.0 (146.9)	**F (F)**
	Northbound	Left	235.0 (146.9)	F (F)		
		Right	25.7 (15.5)	D (C)		
West Outlet Mall Access / Elevation Parkway	Eastbound	Left	4.5 (9.0)	A (A)	19.9 (29.9)	B (C)
		Through	14.6 (22.2)	B (C)		
		Right	0.0 (0.0)	A (A)		
	Westbound	Left	80.7 (76.1)	F (E)		
		Through	6.4 (11.2)	A (B)		
		Right	0.0 (0.0)	A (A)		
	Northbound	Through / Left	78.4 (89.6)	E (F)		
		Right	19.5 (11.5)	B (B)		
	Southbound	Through / Left	63.7 (66.3)	E (E)		
		Right	0.2 (0.8)	A (A)		
Tom's Road / Factory Outlets Dr	Eastbound	Left / U-turn	5.5 (15.4)	A (B)	13.2 (27.8)	B (C)
		Through / Right	14.0 (26.6)	B (C)		
	Westbound	Left / U-turn	7.5 (16.1)	A (B)		
		Through / Right	6.7 (27.6)	A (C)		
	Northbound	Through / Left	74.3 (73.6)	E (E)		
		Right	16.2 (2.0)	B (A)		
	Southbound	Left	46.4 (40.2)	D (D)		
		Through / Right	33.5 (15.3)	C (B)		
CR 208	Eastbound	Through / Right	15.3 (11.7)	B (B)	14.7 (11.0)	B (B)
	Westbound	Left	25.9 (30.6)	C (C)		
		Through	0.2 (0.3)	A (A)		
	Northbound	Right	36.2 (36.5)	D (D)		
I-95 Southbound Ramp Terminal	Eastbound	Through	24.2 (28.7)	C (C)	29.9 (33.1)	C (C)
		Right	14.0 (18.8)	B (B)		
	Westbound	U-turn	62.6 (63.8)	E (E)		
		Through	14.8 (19.3)	B (B)		
	Southbound	Left	67.8 (66.6)	E (E)		
		Right	24.5 (33.6)	C (C)		

* Indicates an unsignalized intersection reporting the highest movement delay (LOS) for the overall intersection.
- Intersection LOS in **red** exceeds target LOS D.



Legend

X,XXX (X,XXX)	AM (PM) Peak Hour Volumes
●	Signalized Intersection
○	Unsignalized Intersection

SR 16 from International Golf Parkway to I-95 PD&E Study	No-Build Opening Year 2030 AM (PM) Peak Hour Volumes	Page 1 of 2	Figure 6-1

Matchline A

Page 1

S Francis Rd

Tomoka Pines Dr

Turnbull Creek Rd

Downs Corner Rd

West Outlet Mall Access

Windward Ranch Blvd

Whisper Ridge Dr

Elevation Pkwy

Factory Outlets Dr

Toms Rd

CR 208

I-95 Southbound Off-Ramp

I-95 Southbound On-Ramp

16

N

N.T.S.

20 (10)
5 (5)
10 (5)
5 (10)
1,110 (930)
65 (65)
5 (5)
860 (1,160)
35 (55)
90 (60)
5 (5)
55 (45)

20 (10)
5 (10)
10 (10)
1,220 (865)
5 (10)
855 (1,200)

25 (40)
90 (140)
150 (125)
955 (1,055)
75 (30)
1,085 (1,035)

5 (35)
5 (20)
10 (145)
5 (30)
5 (15)
1,230 (915)
45 (20)
20 (145)
790 (1,210)
80 (125)
20 (35)
60 (105)
5 (15)
190 (110)

1,115 (830)
30 (85)
845 (1,100)
30 (110)
85 (50)
115 (45)

5 (40)
5 (5)
5 (40)
10 (30)
1,095 (770)
25 (25)
15 (30)
735 (1,000)
190 (410)
10 (70)
70 (125)
5 (10)
270 (205)

1,150 (795)
35 (55)
780 (1,135)
10 (60)
65 (30)
55 (30)

1,340 (1,190)
15 (20)
905 (1,410)
365 (305)
390 (325)

145 (210)
760 (790)
1,290 (1,920)

165 (340)
760 (790)
1,460 (1,150)
345 (395)

Legend

X,XXX (X,XXX)	AM (PM) Peak Hour Volumes
●	Signalized Intersection
○	Unsignalized Intersection

SR 16 from International Golf Parkway to I-95 PD&E Study	No-Build Opening Year 2030 AM (PM) Peak Hour Volumes	Page 2 of 2	Figure 6-1

6.1.2 2030 No-Build Highway Analysis

Highway Capacity Software (HCS) 2023 was used to analyze the highway portion of the study area, which is between CR 2209 and the West Outlet Mall Access and covers approximately 4.4 miles of roadway. The analysis was conducted on two segments, which are west and east of Francis Road. Several performance measures are available for two-lane highways, which include average speed, percent followers, and follower density. The LOS criteria for two-way highways is based on follower density (followers/mile/lane). **Table 6-2** provides the analysis results for the two highway segments. The 2030 No-Build alternative is expected to operate at LOS D or LOS E for both AM and PM peaks.

Table 6-2: Opening Year 2030 No-Build HCS Highway Segment Analysis

Highway Segment	Direction	Average Speed (mi/hr)	Percent Followers	Follower Density (LOS)
2030 AM Peak				
SR 16 West of Francis Road	Eastbound	62.3	77.3	**15.6 (E)**
	Westbound	62.8	69.5	10.5 (D)
SR 16 East of Francis Road	Eastbound	63.0	79.4	**17.3 (E)**
	Westbound	63.6	71.8	11.8 (D)
2030 PM Peak				
SR 16 West of Francis Road	Eastbound	62.9	69.5	10.5 (D)
	Westbound	62.4	77.3	**15.6 (E)**
SR 16 East of Francis Road	Eastbound	63.6	71.9	11.8 (D)
	Westbound	63.2	79.4	**17.2 (E)**

6.2 Design Year 2050 No-Build Analysis

6.2.1 2050 No-Build Intersection Analysis

Synchro 11 was used to analyze study intersections under the Design Year 2050 No-Build conditions. The 2050 No-Build roadway network is the same as the 2030 No-Build network. **Figure 6-2** shows the 2030 No-Build peak hour volumes.

Table 6-3 summarizes the delay and LOS for intersections within the study area. The results of the analysis indicate that the signalized intersection at International Golf Parkway/Pacetti Road is expected to operate at LOS F during both the AM and PM peak hours. The signalized intersection at Toms Road is also expected to operate at LOS E during the PM peak hour due to heavy demand along eastbound and westbound SR 16 in addition to increased northbound demand. During the AM peak, eight of the nine unsignalized intersections are expected to operate at LOS E or F. During the PM peak, seven of the unsignalized intersections are expected to operate at LOS E or F. It should be noted that the results marked as 'error' indicate levels of delay exceed the limitations

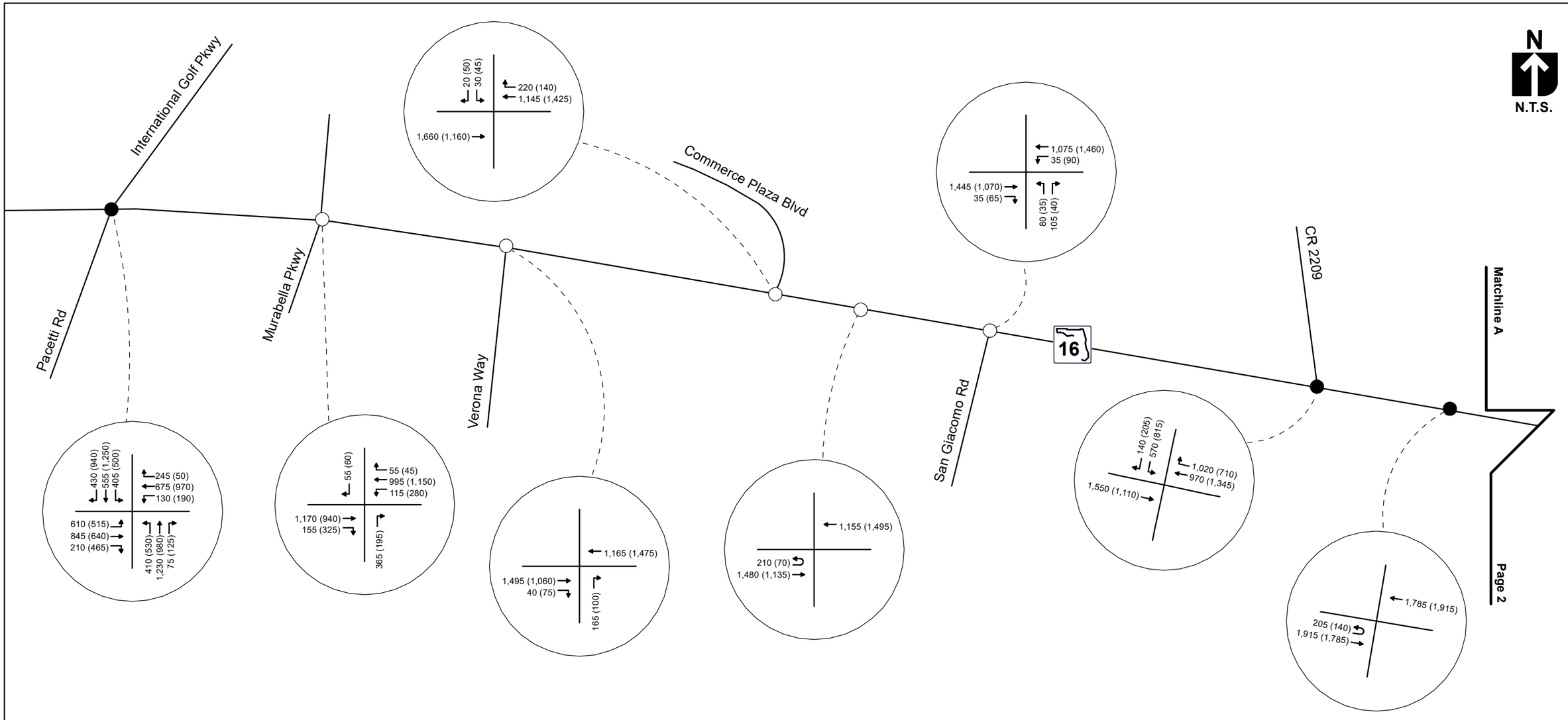
of HCM 6th edition capacity analysis methodologies. The high levels of delay at the unsignalized intersections are primarily due to the heavy eastbound and westbound traffic flow along SR 16 which provides few acceptable gaps and little opportunity for stop-controlled vehicles on the side streets to enter the traffic stream. The remaining intersections are expected to operate at LOS D or better.

Table 6-3: Design Year 2050 No-Build Synchro Intersection Analysis

Intersection		Intersection Approach				Overall Intersection	
		Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
				AM (PM)	AM (PM)	AM (PM)	AM (PM)
International Golf Parkway / Pacetti Road		Eastbound	Left	115.1 (187.7)	F (F)	87.0 (121.5)	**F (F)**
			Through	48.7 (44.3)	D (D)		
			Right	7.8 (23.1)	A (C)		
		Westbound	Left	103.0 (78.8)	F (E)		
			Through	74.4 (74.8)	E (E)		
			Right	17.4 (0.3)	B (A)		
		Northbound	Left	87.0 (204.2)	F (F)		
			Through	174.5 (78.8)	F (E)		
			Right	1.3 (12.1)	A (B)		
		Southbound	Left	85.9 (156.0)	F (F)		
			Through	52.6 (165.5)	D (F)		
			Right	26.0 (185.6)	C (F)		
Murabella Parkway*		Westbound	Left	14.7 (19.5)	B (C)	43.8 (19.5)	**E** (C)
		Northbound	Right	43.8 (15.9)	E (C)		
		Southbound	Right	13.4 (14.2)	B (B)		
Verona Way*		Northbound	Right	25.2 (14.4)	D (B)	25.2 (14.4)	D (B)
Commerce Plaza Boulevard*	Eastbound / Westbound Main	Southbound	Left	32.4 (43.8)	D (E)	32.4 (43.8)	D **(E)**
			Left	13.3 (16.5)	B (C)		
	Eastbound U-turn	Eastbound	Right	68.4 (49.5)	F (E)	68.4 (49.5)	**F (E)**
San Giacomo Road*		Westbound	Left	14.3 (12.1)	B (B)	70.5 (36.2)	**F (E)**
		Northbound	Left	70.5 (36.2)	F (E)		
			Right	19.2 (13.1)	C (B)		
CR 2209	Eastbound / Westbound Main	Eastbound	Through	17.4 (15.3)	B (B)	14.8 (15.8)	B (B)
		Westbound	Through	9.1 (14.3)	A (B)		
		Southbound	Left	37.0 (31.1)	D (C)		
			Right	11.8 (19.6)	B (B)		
	Eastbound U-turn	Eastbound	U-turn	28.0 (31.3)	C (C)	11.6 (6.9)	B (A)
		Westbound	Through	21.7 (11.2)	C (B)		
Francis Road*		Eastbound	Left	23.1 (20.5)	C (C)	26,855.4 (24,720.4)	**F (F)**
		Southbound	Left / Right	26,855.4 (24,720.4)	F (F)		
Turnbull Creek Road / Tomoka Pines Drive*		Eastbound	Left	13.8 (17.7)	B (C)	1,695.3 (2,343.3)	**F (F)**
		Westbound	Left	21.5 (17.2)	C (C)		
		Northbound	Left	error (error)	error (error)		
			Through	1,695.3 (2,343.3)	F (F)		
			Right	207.1 (57.5)	F (F)		
		Southbound	Left / Thru / Right	error (error)	error (error)		
Windward Ranch Boulevard*		Westbound	Left	19.7 (15.8)	C (C)	8,476.3 (5,377.4)	**F (F)**
		Northbound	Left	8,476.3 (5,377.4)	F (F)		
			Right	488.8 (32.8)	F (D)		
Downs Corner Road*		Eastbound	Left	13.3 (17.7)	B (C)	1,466.6 (1,145.7)	**F (F)**
		Southbound	Left	1,466.6 (1,145.7)	F (F)		
			Right	32.2 (59.6)	D (F)		

Intersection	Intersection Approach				Overall Intersection	
	Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
			AM (PM)	AM (PM)	AM (PM)	AM (PM)
Whisper Ridge Drive*	Westbound	Left	17.6 (12.7)	C (B)	3,763.0 (1,915.7)	**F (F)**
	Northbound	Left	3,763.0 (1,915.7)	F (F)		
		Right	122.2 (24.4)	F (C)		
West Outlet Mall Access / Elevation Parkway	Eastbound	Left	7.1 (12.7)	A (B)	27.4 (33.5)	C (C)
		Through	28.1 (33.6)	C (C)		
		Right	0.1 (0.1)	A (A)		
	Westbound	Left	78.0 (73.3)	E (E)		
		Through	11.1 (16.2)	B (B)		
		Right	0.1 (0.1)	A (A)		
	Northbound	Through / Left	72.1 (89.6)	E (F)		
		Right	42.0 (10.2)	D (B)		
	Southbound	Through / Left	57.9 (64.5)	E (E)		
		Right	0.3 (0.8)	A (A)		
Toms Road / Factory Outlets Drive	Eastbound	Left	7.8 (27.8)	A (C)	27.6 (74.5)	C **(E)**
		Through / Right	35.0 (56.9)	C (E)		
	Westbound	Left	44.0 (53.6)	D (D)		
		Through / Right	15.2 (100.1)	B (F)		
	Northbound	Through / Left	80.5 (77.4)	F (E)		
		Right	15.4 (3.4)	B (A)		
	Southbound	Left	42.8 (42.4)	D (D)		
		Through / Right	27.4 (15.2)	C (B)		
CR 208	Eastbound	Through / Right	59.4 (22.3)	E (C)	36.8 (15.6)	D (B)
	Westbound	Left	38.1 (33.0)	D (C)		
		Through	0.3 (1.0)	A (A)		
	Northbound	Right	50.7 (39.8)	D (D)		
I-95 Southbound Ramp Terminal	Eastbound	Through	47.0 (40.7)	D (D)	45.2 (54.4)	D (D)
		Right	18.8 (29.2)	B (C)		
	Westbound	U-turn	58.9 (56.9)	E (E)		
		Through	25.6 (50.6)	C (D)		
	Southbound	Left	93.7 (103.1)	F (F)		
		Right	30.2 (39.7)	C (D)		

* Indicates an unsignalized intersection reporting the highest movement delay (LOS) for the overall intersection.
- Intersection LOS in **red** exceeds target LOS D.



Legend

X,XXX (X,XXX)	AM (PM) Peak Hour Volumes
●	Signalized Intersection
○	Unsignalized Intersection

SR 16 from International Golf Parkway to I-95 PD&E Study

No-Build Design Year 2050
AM (PM) Peak Hour Volumes

Page 1 of 2

Figure 6-2

Matchline A

Page 1

S Francis Rd

Tomoka Pines Dr

Turnbull Creek Rd

Downs Corner Rd

West Outlet Mall Access

Windward Ranch Blvd

Whisper Ridge Dr

Elevation Pkwy

Factory Outlets Dr

Toms Rd

CR 208

I-95 Southbound Off-Ramp

I-95 Southbound On-Ramp

16

N

N.T.S.

25 (15)
5 (5)
15 (10)
10 (15)
1,895 (1,545)
95 (100)
10 (10)
1,500 (1,895)
50 (80)
135 (90)
5 (5)
80 (65)

25 (15)
10 (15)
15 (15)
2,030 (1,350)
10 (15)
1,420 (1,890)

40 (100)
180 (210)
210 (180)
1,660 (1,815)
100 (40)
1,815 (1,660)

10 (40)
10 (25)
15 (175)
10 (45)
10 (20)
1,935 (1,475)
60 (30)
30 (180)
1,440 (1,865)
100 (155)
30 (35)
75 (125)
10 (20)
225 (130)

1,910 (1,310)
35 (100)
1,410 (1,775)
35 (130)
100 (60)
135 (55)

1,830 (1,180)
40 (65)
1,340 (1,705)
15 (75)
75 (35)
65 (35)

10 (50)
10 (10)
10 (45)
15 (35)
1,685 (1,135)
35 (30)
20 (35)
1,270 (1,405)
225 (485)
15 (105)
85 (150)
10 (115)
320 (245)

2,145 (1,805)
20 (25)
1,590 (2,200)
545 (455)
585 (485)

195 (285)
1,030 (1,070)
2,160 (2,905)

220 (460)
1,030 (1,070)
2,340 (1,790)
465 (530)

Legend

X,XXX (X,XXX)	AM (PM) Peak Hour Volumes
●	Signalized Intersection
○	Unsignalized Intersection

FDOT

SR 16 from International Golf Parkway to I-95 PD&E Study

No-Build Design Year 2050
AM (PM) Peak Hour Volumes

Page 2 of 2

Figure 6-2

6.2.2 2050 No-Build Highway Analysis

Highway Capacity Software (HCS) 2023 was used to analyze the highway portion of the study area, which is between CR 2209 and the West Outlet Mall Access and covers approximately 4.4 miles of roadway. The analysis was conducted on two segments, which are west and east of Francis Road. Several performance measures are available for two-lane highways, which include average speed, percent followers, and follower density. The LOS criteria for two-way highways is based on follower density (followers/mile/lane). It should be noted that LOS F occurs when demand exceeds capacity. Since the Design Year 2050 peak direction hourly volumes exceed the capacity of the existing two-lane highway, detailed performance measures are not available. **Table 6-4** provides the analysis results for the two highway segments. The 2050 No-Build alternative is expected to operate at LOS E or LOS F for both AM and PM peaks.

Table 6-4: Opening Year 2050 No-Build HCS Highway Segment Analysis

Highway Segment	Direction	Average Speed (mi/hr)	Percent Followers	Follower Density (LOS)
2050 AM Peak				
SR 16 West of Francis Road	Eastbound	---	---	**--- (F)**
	Westbound	62.0	79.8	**18.2 (E)**
SR 16 East of Francis Road	Eastbound	---	---	**--- (F)**
	Westbound	62.7	81.7	**20.3 (E)**
2050 PM Peak				
SR 16 West of Francis Road	Eastbound	62.1	79.8	**18.2 (E)**
	Westbound	---	---	**--- (F)**
SR 16 East of Francis Road	Eastbound	62.7	81.7	**20.3 (E)**
	Westbound	---	---	**--- (F)**

Note: "---" Value not available when demand exceeds capacity

6.3 Opening Year 2030 Build Analysis

6.3.1 2030 Build Intersection Analysis

Synchro 11 was used to analyze study intersections under the Opening Year 2030 Build conditions. The 2030 Build roadway network includes widening SR 16 to a full four-lane facility throughout the study area, in addition to the proposed access management and intersection improvements discussed in **Section 5.2**. **Figure 6-3** shows the 2030 Build peak hour volumes.

Table 6-5 summarizes the delay and LOS for intersections within the study area. The results indicate that all study area intersections are expected to operate at LOS D or better.

The proposed intersection improvements at Francis Road are expected to operate at LOS C or better during both peaks; it should be noted that the unsignalized intersection at Francis Road was shown to operate at LOS F during both peaks under No-Build conditions. The proposed intersection improvements at Turnbull Creek Road, Windward Ranch Boulevard, Downs Corner

Road, and Whisper Ridge Drive, which are converted from TWSC to signalized, are also shown to operate at LOS B or better. These intersections were shown to operate at LOS F under No-Build conditions.

Similarly, the proposed intersection improvements at Toms Road are also expected to operate at LOS A, which represents an improvement over the No-Build alternative which was shown to operate at LOS B during the AM peak and at LOS C during the PM peak.

Table 6-5: Opening Year 2030 Build Synchro Intersection Analysis

Intersection		Intersection Approach				Overall Intersection	
		Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
				AM (PM)	AM (PM)	AM (PM)	AM (PM)
International Golf Parkway / Pacetti Road		Eastbound	Left	77.0 (76.9)	E (E)	51.9 (52.5)	D (D)
			Through	43.5 (44.6)	D (D)		
			Right	5.1 (6.4)	A (A)		
		Westbound	Left	77.8 (72.5)	E (E)		
			Through	53.4 (52.9)	D (D)		
			Right	4.0 (0.3)	A (A)		
		Northbound	Left	77.0 (69.0)	E (E)		
			Through	60.6 (49.0)	E (D)		
			Right	0.2 (6.2)	A (A)		
		Southbound	Left	77.5 (70.6)	E (E)		
			Through	46.1 (60.5)	D (E)		
			Right	15.2 (47.1)	B (D)		
Murabella Parkway		Westbound	Left	10.7 (12.4)	B (B)	17.0 (12.4)	C (B)
		Northbound	Right	17.0 (12.3)	C (B)		
		Southbound	Right	10.9 (10.8)	B (B)		
Verona Way		Northbound	Right	15.2 (11.8)	C (B)	15.2 (11.8)	C (B)
Commerce Plaza Boulevard	Eastbound/ Westbound Main	Southbound	Left	19.4 (20.9)	C (C)	19.4 (20.9)	C (C)
			Right	10.9 (12.0)	B (B)		
	Eastbound U-turn	Eastbound	Left	17.3 (17.4)	C (C)	17.3 (17.4)	C (C)
San Giacomo Road		Westbound	Left	10.9 (10.0)	B (A)	26.2 (21.1)	D (C)
		Northbound	Left	26.2 (21.1)	D (C)		
			Right	13.6 (11.2)	B (B)		
CR 2209	Eastbound/ Westbound Main	Eastbound	Through	9.3 (9.6)	A (A)	9.0 (11.0)	A (B)
		Westbound	Through	7.4 (9.9)	A (A)		
		Southbound	Left	25.8 (24.5)	C (C)		
			Right	7.1 (9.1)	A (A)		
	Eastbound U-turn	Eastbound	U-turn / Left	33.8 (30.5)	D (D)	33.8 (30.5)	D (D)
		Westbound	Through	--- (---)	--- (---)		
Francis Road	Eastbound/ Westbound Main	Eastbound	Through	6.4 (7.4)	A (A)	7.7 (8.2)	A (A)
		Westbound	Through	6.1 (4.0)	A (A)		
			Right	2.1 (0.5)	A (A)		
		Southbound	Left / Right	43.3 (44.1)	D (D)		
	Eastbound U-turn	Eastbound	U-turn	24.1 (22.0)	C (C)	24.1 (22.0)	C (C)
		Westbound	Through	--- (---)	--- (---)		
Turnbull Creek Road / Tomoka Pines Drive		Eastbound	Left	45.4 (34.5)	D (C)	6.6 (9.7)	A (A)
			Through	6.4 (10.4)	A (B)		
			Right	0.2 (1.7)	A (A)		
		Westbound	Left	39.0 (37.9)	D (D)		
			Through	2.7 (6.9)	A (A)		
			Right	0.0 (0.0)	A (A)		
		Northbound	Left	39.7 (39.3)	D (D)		
			Right	1.8 (1.5)	A (A)		
		Southbound	Left	37.0 (37.4)	D (D)		
			Right	0.6 (0.3)	A (A)		

Intersection		Intersection Approach				Overall Intersection	
		Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
				AM (PM)	AM (PM)	AM (PM)	AM (PM)
Windward Ranch Boulevard		Eastbound	Through	14.5 (9.3)	B (A)	11.7 (10.5)	B (B)
			Right	5.4 (4.6)	A (A)		
		Westbound	Left	44.4 (36.8)	D (D)		
			Through	3.7 (7.7)	A (A)		
		Northbound	Left	43.7 (41.3)	D (D)		
			Right	11.7 (14.3)	B (B)		
Downs Corner Rd		Eastbound	Left	62.9 (38.2)	E (D)	2.4 (6.5)	A (A)
			Through	0.6 (3.8)	A (A)		
		Westbound	Through	3.7 (7.8)	A (A)		
			Right	3.0 (7.0)	A (A)		
		Southbound	Left	38.0 (38.7)	D (D)		
			Right	18.1 (21.5)	B (C)		
Whisper Ridge Dr		Eastbound	Through	9.7 (11.9)	A (B)	8.7 (8.4)	A (A)
			Right	7.0 (9.2)	A (A)		
		Westbound	Left	39.8 (42.4)	D (D)		
			Through	3.7 (3.1)	A (A)		
		Northbound	Left	42.1 (40.3)	D (D)		
			Right	13.3 (16.0)	B (B)		
West Outlet Mall Access / Elevation Parkway		Eastbound	Left	4.5 (8.9)	A (A)	19.7 (31.7)	B (C)
			Through	14.6 (22.5)	B (C)		
			Right	0.0 (0.0)	A (A)		
		Westbound	Left	74.4 (83.7)	E (F)		
			Through	9.3 (13.2)	A (B)		
			Right	0.0 (0.3)	A (A)		
		Northbound	Through / Left	77.3 (84.9)	E (F)		
			Right	14.3 (11.0)	B (B)		
		Southbound	Through / Left	62.9 (63.7)	E (E)		
			Right	0.2 (0.7)	A (A)		
Tom's Road / Factory Outlets Dr	Westbound U-turn	Eastbound	Through	9.0 (8.4)	A (A)	7.2 (6.3)	A (A)
			Right	4.2 (1.5)	A (A)		
		Westbound	Left / U-turn	44.4 (41.9)	D (D)		
		Northbound	Right	0.3 (0.1)	A (A)		
	Eastbound/ Westbound Main	Eastbound	Through / Right	6.7 (5.2)	A (A)	8.8 (7.0)	A (A)
		Westbound	Through	6.1 (3.0)	A (A)		
			Right	3.1 (0.3)	A (A)		
		Northbound	Left	30.5 (35.0)	C (D)		
			Right	30.4 (9.1)	C (A)		
		Southbound	Left / Right	1.6 (34.9)	A (C)		
	Eastbound U-turn	Eastbound	U-turn	32.9 (42.7)	C (D)	1.1 (3.2)	A (A)
		Westbound	Through	1.9 (4.0)	A (A)		

Intersection	Intersection Approach				Overall Intersection	
	Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
			AM (PM)	AM (PM)	AM (PM)	AM (PM)
CR 208	Eastbound	Through / Right	15.2 (8.9)	B (A)	14.7 (9.9)	B (A)
	Westbound	Left	25.9 (30.5)	C (C)		
	Northbound	Right	36.2 (36.5)	D (D)		
I-95 Southbound Ramp Terminal	Eastbound	Through	23.9 (27.6)	C (C)	29.8 (32.7)	C (C)
		Right	13.7 (17.9)	B (B)		
	Westbound	U-turn	62.6 (63.8)	E (E)		
		Through	14.8 (19.3)	B (B)		
	Southbound	Left	67.8 (66.6)	E (E)		
		Right	24.5 (33.6)	C (C)		

* Indicates an unsignalized intersection reporting the highest movement delay (LOS) for the overall intersection.
- Intersection LOS in **red** exceeds target LOS D.

The experienced travel time (ETT) was calculated to compare the No-Build and Build intersection operations that include alternative intersections, specifically the proposed hybrid MUT/thru-cut intersections, except for Turnbull Creek Road since the thru-cut has minimal side-street through traffic. For most turning movements, the ETT is consistent with the control delay, as documented in the previous section. For turning movements that are displaced, such as those channelized through an additional U-turn, the ETT is determined by adding the extra distance travel time (EDTT) between intersections to the control delay incurred at each turning movement. In addition, the overall intersection ETT is developed by weighing each movement ETT by its respective demand volume. This approach allows for a better understanding of the change in operations for the intersection as a whole.

The detailed ETT analysis for Francis Road is shown in **Table 6-6**. Under No-Build conditions, this intersection is a three-leg unsignalized intersection. The Build alternative proposes a hybrid MUT/thru-cut in which the eastbound left-turn movement is channeled through a U-turn intersection approximately 720 feet east on SR 16. For the northbound and southbound approaches, the through movements must perform a right turn onto SR 16, use the U-turn intersection, and then perform a right turn to complete their desired turning movement. Under No-Build conditions, the southbound turning movements from Francis Road experience very high levels of delay, corresponding with LOS F during the PM peak. This is due to the high volumes on eastbound and westbound SR 16, which limit the acceptable gaps for the two-stage southbound left-turn. The hybrid MUT/thru-cut configuration in the Build alternative resolves this issue by providing signal control at the main intersection and channeling the eastbound left-turn movement through a downstream U-turn; this configuration allows two-phase signal operation and a shorter cycle length. It should be noted that the Opening Year 2030 analysis assumes that the eastbound U-turn intersection remains unsignalized for this horizon since the intersection operates at LOS E or better, as shown in the previous section. In terms of the overall intersection, the Build alternative provides worse (but acceptable) operations during the AM peak and very

similar operations during the PM peak in comparison to the No-Build alternative. Because of the significant reduction in terms of travel time and delay for the southbound approach during the PM peak, the Build is still shown to provide a substantial operational benefit.

Table 6-6: Opening Year 2030 Francis Road ETT Analysis

Approach / Movement		Volume (vph)	No-Build		Build	
			Movement ETT (s/veh)	Overall ETT (s/veh)	Movement ETT (s/veh)	Overall ETT (s/veh)
2030 AM PEAK						
SR 16 Eastbound	Left	75	11.8	50.0	51.0	10.1
	Through	1,085	0.0		7.4	
SR 16 Westbound	Through	955	0.0		7.0	
	Right	150	0.0		3.0	
Francis Road Southbound	Left	90	1,027.2		43.3	
	Right	25	1,027.2		43.3	
2030 PM PEAK						
SR 16 Eastbound	Left	30	11.6	**100.6**	48.0	7.4
	Through	1,035	0.0		4.0	
SR 16 Westbound	Through	1,055	0.0		4.0	
	Right	125	0.0		1.0	
Francis Road Southbound	Left	140	1,353.4		44.1	
	Right	40	1,353.4		44.1	

- Intersection delay in **red** exceeds target LOS D.

The detailed ETT analysis for Toms Road is shown in **Table 6-7**. Under No-Build conditions, the SR 16 intersection at Toms Road is a four-leg signalized intersection. The Build alternative proposes a hybrid MUT/thru-cut in which the eastbound left-turn movement is channeled through a U-turn intersection approximately 540 feet east on SR 16, and the westbound left-turn movement is channelized through a U-turn intersection approximately 360 feet west on SR 16. For the northbound and southbound approaches, the through movements must perform a right turn onto SR 16, use the U-turn intersection, and then perform a right turn to complete their desired turning movement. During the 2030 Opening Year, both alternatives provide acceptable delay in terms of the individual turning movements and overall intersection performance.

Table 6-7: Opening Year 2030 Toms Road ETT Analysis

Approach / Movement		Volume (vph)	No-Build		Build	
			Movement ETT (s/veh)	Overall ETT (s/veh)	Movement ETT (s/veh)	Overall ETT (s/veh)
2030 AM PEAK						
SR 16 Eastbound	U-turn	5	5.5	13.2	71.0	17.4
	Left	5	5.5		68.0	
	Through	1,230	14.0		16.0	
	Right	45	14.0		16.0	
SR 16 Westbound	U-turn	20	7.5		70.0	
	Left	80	7.5		70.0	
	Through	790	6.7		8.0	
	Right	20	6.7		5.0	
Toms Rd Northbound	Left	60	74.3		30.5	
	Through	5	74.3		83.0	
	Right	190	16.2		30.4	
Factory Outlets Drive Southbound	Left	10	46.4		1.6	
	Through	5	33.5		64.0	
	Right	5	33.5		1.6	
2030 PM PEAK						
SR 16 Eastbound	U-turn	30	15.4	27.8	76.0	17.0
	Left	15	15.4		73.0	
	Through	915	26.6		14.0	
	Right	20	26.6		14.0	
SR 16 Westbound	U-turn	35	16.1		65.0	
	Left	125	16.1		65.0	
	Through	1,210	27.6		7.0	
	Right	145	27.6		4.0	
Toms Rd Northbound	Left	105	73.6		35.0	
	Through	15	73.6		68.0	
	Right	110	2.0		9.1	
Factory Outlets Drive Southbound	Left	145	40.2		34.9	
	Through	20	15.3		93.0	
	Right	35	15.3		34.9	

Table 6-8 compares the Build and No-Build Opening Year 2030 intersection analysis in terms of overall intersection delay for the 14 study area intersections. At intersections with conventional intersection control, the overall intersection performance is based on intersection delay. At intersections where the Build alternative includes conversion from a TWSC or signalized intersection to an alternative intersection, the overall intersection performance for the Build alternative is based on the ETT methodology described in the preceding sections. At Francis Road and Toms Road, alternative intersections are proposed as part of the Build alternative with hybrid MUT/thru-cuts that restrict the SR 16 approaches and cross-street through movements. It should be noted that the Build alternative experiences a slight increase in overall delay at Francis Road and Toms Road due to the additional travel time incurred for several of the low-volume turning movements. At the remaining intersections, the Build alternative experiences overall intersection performance that is very similar to or better than the No-Build. The most significant delay reductions are observed at the unsignalized intersections between CR 2209 and the West Outlet Mall Access, where the conversion from TWSC to signalized operations provides much better conditions for vehicles entering SR 16 from the side streets.

Table 6-8: Opening Year 2030 Intersection Analysis Results Summary

Intersection	AM Peak Delay (sec/veh)		PM Peak Delay (sec/veh)	
	No-Build	Build	No-Build	Build
International Golf Parkway / Pacetti Road	52.3	51.9	52.6	52.5
Murabella Parkway	17.0	17.0	12.3	12.4
Verona Way	17.8	15.2	13.2	11.8
Commerce Plaza Boulevard	19.4	19.4	20.9	20.9
San Giacomo Boulevard	26.2	26.2	21.1	21.1
CR 2209	10.1	9.0	12.0	11.0
Francis Road*	50.0	10.1	**100.6**	7.4
Turnbull Creek Road / Tomoka Pines Drive	**1,274.9**	6.6	**1,261.3**	9.7
Windward Ranch Boulevard	**458.4**	11.7	**381.0**	10.5
Downs Corner Road	**88.6**	3.0	**81.7**	6.4
Whisper Ridge Drive	**235.0**	8.8	**146.9**	8.5
West Outlet Mall Access / Elevation Parkway	19.9	19.7	29.9	31.7
Toms Road / Factory Outlets Drive*	13.2	17.4	27.8	17.0
CR 208	14.7	14.7	11.0	9.9
I-95 Southbound Ramps	29.9	29.8	33.1	32.7

*Overall intersection performance is based on total ETT for the Build alternative
- Intersection delay in **red** exceeds target LOS D.

N

N.T.S.

International Golf Pkwy

Pacetti Rd

Murabella Pkwy

Verona Way

Commerce Plaza Blvd

San Giacomo Rd

16

CR 2209

Matchline A

Page 2

15 (40)
25 (40)
180 (120)
740 (875)
1,170 (830)

680 (905)
30 (75)
990 (755)
30 (55)
65 (30)
90 (35)

285 (630)
370 (835)
270 (335)
165 (35)
405 (530)
90 (125)
410 (345)
570 (500)
140 (310)
275 (355)
825 (655)
50 (85)

45 (50)
45 (40)
615 (640)
95 (235)
760 (645)
130 (275)
305 (165)

755 (915)
1,030 (745)
35 (65)
140 (85)

745 (935)
175 (60)
1,020 (810)

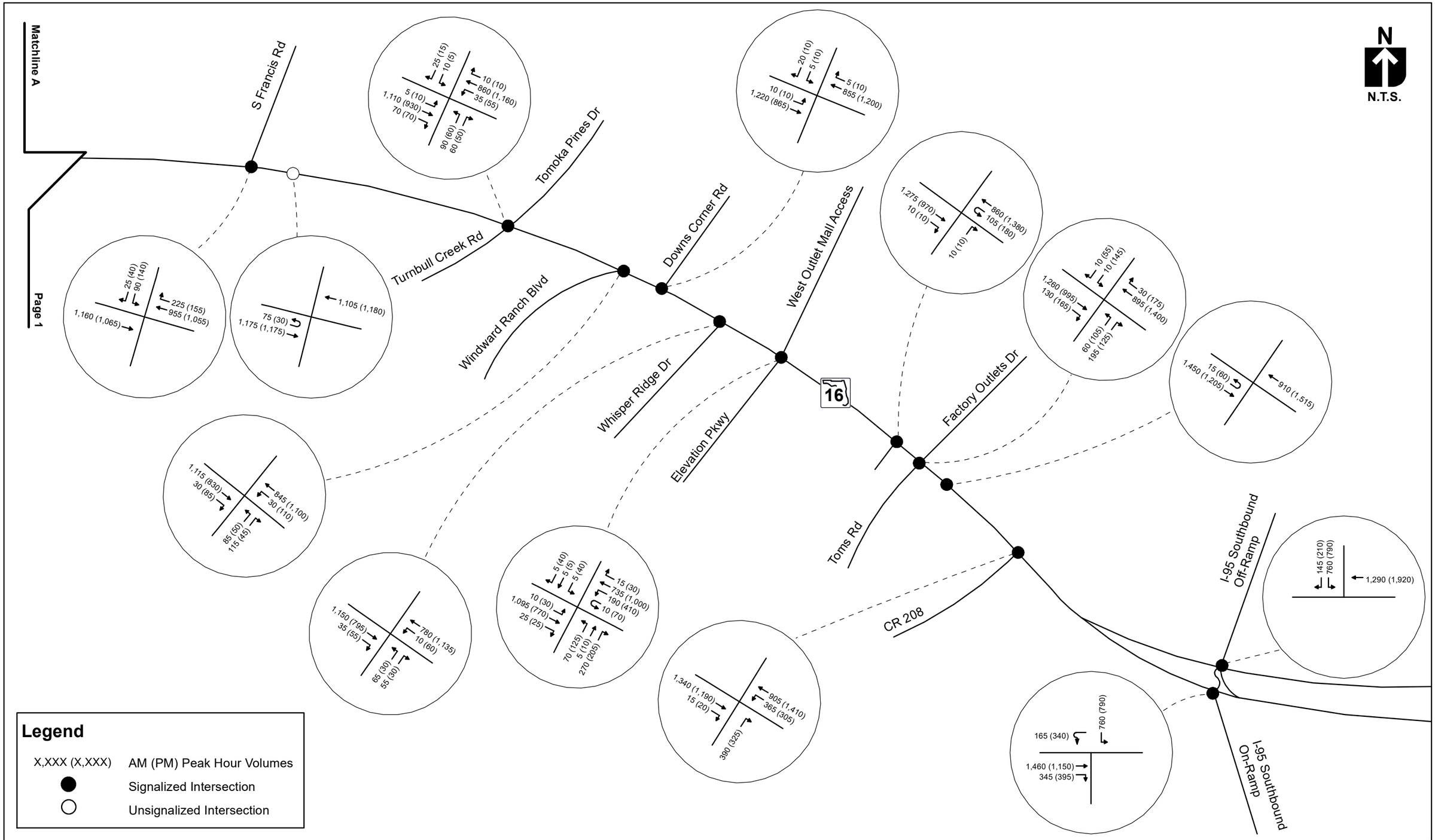
90 (130)
360 (510)
640 (450)
620 (850)
1,080 (790)

1,130 (1,210)
130 (90)
1,310 (1,210)

Legend

X,XXX (X,XXX)	AM (PM) Peak Hour Volumes
●	Signalized Intersection
○	Unsignalized Intersection

SR 16 from International Golf Parkway to I-95 PD&E Study	Build Opening Year 2030 AM (PM) Peak Hour Volumes	Page 1 of 2	Figure 6-3



SR 16 from International Golf Parkway to I-95 PD&E Study	Build Opening Year 2030 AM (PM) Peak Hour Volumes	Page 2 of 2	Figure 6-3

6.3.2 2030 Build Highway Analysis

Highway Capacity Software (HCS) 2023 was used to analyze the highway portion of the study area, which is between CR 2209 and the West Outlet Mall Access and covers approximately 4.4 miles of roadway. The analysis was conducted on two segments, which are west and east of Francis Road. The Build alternative is considered a multilane highway, and several performance measures are available, which include average speed and density. The LOS criteria for a multilane highway is based on density (passenger cars/mile/lane). **Table 6-9** provides the analysis results for the two highway segments. The additional travel lane in each direction along SR 16 is expected to significantly improve the traffic operations of the roadway. The 2030 Build alternative is expected to operate at LOS A or LOS B for both AM and PM peaks.

Table 6-9: Opening Year 2030 Build HCS Highway Segment Analysis

Highway Segment	Direction	Average Speed (mi/hr)	Density (pc/mi/ln)	LOS
2030 AM Peak				
SR 16 West of Francis Road	Eastbound	53.0	12.3	B
	Westbound	52.7	9.4	A
SR 16 East of Francis Road	Eastbound	53.2	13.4	B
	Westbound	53.4	10.1	A
2030 PM Peak				
SR 16 West of Francis Road	Eastbound	53.0	9.0	A
	Westbound	57.2	12.0	B
SR 16 East of Francis Road	Eastbound	53.2	9.9	A
	Westbound	53.4	13.0	B

6.4 2050 Design Year Build Analysis

6.4.1 2050 Build Intersection Analysis

Synchro 11 was used to analyze study intersections under the Design Year 2050 Build conditions. The 2050 Build roadway network is the same as the 2030 Build network. **Figure 6-4** shows the 2050 Build peak hour volumes.

Table 6-10 summarizes the delay and LOS for intersections within the study area. The results of the analysis indicate that the signalized intersection at International Golf Parkway/Pacetti Road is expected to operate at LOS F during both the AM and PM peak hours, similar to the No-Build alternative.

The intersections at Murabella Parkway, Commerce Plaza Boulevard and San Giacomo Road are expected to operate at LOS E or F during the AM peak hour, similar to No-Build conditions. During

the PM peak hour, the unsignalized intersections at Commerce Plaza Boulevard and San Giacomo Road are expected to operate at LOS E or F, similar to the No-Build conditions.

The intersections at Turnbull Creek Road, Windward Ranch Boulevard, Downs Corner Road, and Whisper Ridge Drive are expected to operate at LOS B or better during both peak hours due to the Build improvements, which convert them to signal-controlled. It should be noted that each of these intersections was shown to operate at LOS F during both peak hours under No-Build conditions, under which they remained stop-controlled.

The intersection improvements at Francis Road and Toms Road are expected to operate at LOS B or better during both peaks. Both locations are converted to alternative signalized intersections as part of the Build Alternative and were shown to operate at LOS E or F under No-Build conditions. It should be noted that both locations include signal control at their U-turn intersections, which provides an acceptable LOS during the Design Year 2050.

Table 6-10: Design Year 2050 Build Synchro Intersection Analysis

Intersection		Intersection Approach				Overall Intersection	
		Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
				AM (PM)	AM (PM)	AM (PM)	AM (PM)
International Golf Parkway / Pacetti Road		Eastbound	Left	196.3 (187.7)	F (F)	82.7 (121.6)	**F (F)**
			Through	61.4 (46.3)	E (D)		
			Right	12.0 (24.1)	B (C)		
		Westbound	Left	80.0 (72.5)	E (E)		
			Through	74.4 (74.8)	E (E)		
			Right	14.6 (0.3)	B (A)		
		Northbound	Left	77.2 (204.2)	E (F)		
			Through	106.7 (78.8)	F (E)		
			Right	1.3 (11.3)	A (B)		
		Southbound	Left	101.9 (156.0)	F (F)		
			Through	50.2 (165.5)	D (F)		
			Right	24.4 (185.6)	C (F)		
Murabella Parkway*		Westbound	Left	14.7 (19.5)	B (C)	43.8 (19.5)	**E** (C)
		Northbound	Right	43.8 (15.9)	E (C)		
		Southbound	Right	13.4 (14.2)	B (B)		
Verona Way*		Northbound	Right	25.2 (14.4)	D (B)	25.2 (14.4)	D (B)
Commerce Plaza Boulevard*	Eastbound / Westbound Main	Southbound	Left	32.4 (43.8)	D (E)	32.4 (43.8)	D **(E)**
			Left	13.3 (16.5)	B (C)		
	Eastbound U-turn	Eastbound	Right	68.4 (49.5)	F (E)	68.4 (49.5)	**F (E)**
San Giacomo Road*		Westbound	Left	14.3 (12.1)	B (B)	70.5 (36.2)	**F (E)**
		Northbound	Left	70.5 (36.2)	F (E)		
			Right	19.2 (13.1)	C (B)		
CR 2209	Eastbound / Westbound Main	Eastbound	Through	15.9 (14.3)	B (B)	13.5 (14.5)	B (B)
		Westbound	Through	8.3 (12.3)	A (B)		
		Southbound	Left	33.2 (29.2)	C (C)		
			Right	10.8 (18.8)	B (B)		
	Eastbound U-turn	Eastbound	U-turn	28.8 (32.4)	C (C)	11.6 (6.9)	B (A)
		Westbound	Through	21.7 (11.2)	C (B)		
Francis Road	Eastbound / Westbound Main	Eastbound	Through	16.8 (16.6)	B (B)	14.3 (19.2)	B (B)
		Westbound	Through	8.8 (18.7)	A (B)		
			Right	1.9 (2.3)	A (A)		
		Southbound	Left / Right	51.8 (48.8)	D (D)		
	Eastbound U-turn	Eastbound	U-turn	43.2 (36.8)	D (D)	4.4 (3.8)	A (A)
		Westbound	Through	6.6 (6.3)	A (A)		
Turnbull Creek Road / Tomoka Pines Drive		Eastbound	Left	29.5 (34.9)	C (C)	14.3 (17.3)	B (B)
			Through	17.8 (24.2)	B (C)		
			Right	3.5 (6.2)	A (A)		
		Westbound	Left	49.1 (53.7)	D (D)		
			Through	7.5 (10.3)	A (B)		
			Right	0.0 (0.0)	A (A)		
		Northbound	Left	41.6 (40.0)	D (D)		
			Right	4.3 (2.2)	A (A)		
		Southbound	Left	37.5 (37.4)	D (D)		
			Right	0.7 (0.5)	A (A)		

Intersection		Intersection Approach				Overall Intersection	
		Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
				AM (PM)	AM (PM)	AM (PM)	AM (PM)
Windward Ranch Boulevard		Eastbound	Through	29.3 (10.6)	C (B)	21.4 (12.1)	C (B)
			Right	1.7 (1.8)	A (A)		
		Westbound	Left	35.5 (42.5)	D (D)		
			Through	10.1 (10.4)	B (B)		
		Northbound	Left	44.1 (43.4)	D (D)		
			Right	11.2 (14.2)	B (B)		
Downs Corner Road		Eastbound	Left	46.4 (43.1)	D (D)	9.4 (9.7)	A (A)
			Through	9.4 (6.6)	A (A)		
		Westbound	Through	8.7 (11.5)	A (B)		
			Right	5.7 (5.8)	A (A)		
		Southbound	Left	38.6 (39.2)	D (D)		
			Right	17.7 (19.5)	B (B)		
Whisper Ridge Drive		Eastbound	Through	14.2 (20.4)	B (C)	11.1 (12.8)	B (B)
			Right	4.7 (11.6)	A (B)		
		Westbound	Left	40.6 (42.9)	D (D)		
			Through	4.7 (5.6)	A (A)		
		Northbound	Left	46.0 (40.5)	D (D)		
			Right	13.9 (15.5)	B (B)		
West Outlet Mall Access /Elevation Parkway		Eastbound	Left	6.1 (12.9)	A (B)	25.4 (34.3)	C (C)
			Through	25.8 (35.0)	C (C)		
			Right	0.1 (0.1)	A (A)		
		Westbound	Left	80.5 (72.1)	F (E)		
			Through	10.5 (19.0)	B (B)		
			Right	0.0 (0.1)	A (A)		
		Northbound	Through / Left	77.1 (81.7)	E (F)		
			Right	29.0 (9.7)	C (A)		
		Southbound	Through / Left	60.5 (60.2)	E (E)		
			Right	0.3 (0.7)	A (A)		
Toms Road / Factory Outlets Drive	Westbound U-turn	Eastbound	Through	25.7 (12.5)	C (B)	15.6 (7.8)	B (A)
			Right	2.8 (2.2)	A (A)		
		Westbound	Left / U-turn	39.6 (42.0)	D (D)		
		Northbound	Right	18.5 (1.7)	B (A)		
	Eastbound / Westbound Main	Eastbound	Through / Right	13.8 (8.1)	B (A)	13.5 (12.7)	B (B)
		Westbound	Through	7.4 (12.2)	A (B)		
			Right	0.8 (1.2)	A (A)		
		Northbound	Left	31.2 (35.9)	C (D)		
			Right	48.7 (27.2)	D (C)		
		Southbound	Left / Right	6.4 (41.4)	A (D)		
	Eastbound U-turn	Eastbound	U-turn	31.5 (42.6)	C (D)	2.3 (6.7)	A (A)
		Westbound	Through	4.4 (10.5)	A (B)		
CR 208		Eastbound	Through / Right	55.7 (20.3)	E (C)	35.1 (14.9)	D (B)
		Westbound	Left	38.1 (32.8)	D (C)		
			Through	0.3 (1.2)	A (A)		
		Northbound	Right	50.7 (39.8)	D (D)		

Intersection	Intersection Approach				Overall Intersection	
	Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
			AM (PM)	AM (PM)	AM (PM)	AM (PM)
I-95 Southbound Ramp Terminal	Eastbound	Through	47.0 (40.6)	D (D)	45.2 (54.4)	D (D)
		Right	18.8 (28.7)	B (C)		
	Westbound	U-turn	58.9 (56.9)	E (E)		
		Through	25.6 (50.6)	C (D)		
	Southbound	Left	93.7 (103.1)	F (F)		
		Right	30.2 (39.7)	C (D)		

* Indicates an unsignalized intersection reporting the highest movement delay (LOS) for the overall intersection.
- Intersection LOS in **red** exceeds target LOS D.

The experienced travel time (ETT) was calculated to compare the No-Build and Build intersection operations that include alternative intersections, specifically the proposed hybrid MUT/thru-cut intersections, except for Turnbull Creek Road since the thru-cut has minimal side-street through traffic. For most turning movements, the ETT is consistent with the control delay, as documented in the previous section. For turning movements that are displaced, such as those channelized through an additional U-turn, the ETT is determined by adding the extra distance travel time (EDTT) between intersections to the control delay incurred at each turning movement. In addition, the overall intersection ETT is developed by weighing each movement ETT by its respective demand volume. This approach allows for a better understanding of the change in operations for the intersection as a whole.

The detailed ETT analysis for Francis Road is shown in **Table 6-11**. Under No-Build conditions, this intersection is a three-leg unsignalized intersection. The Build alternative proposes a hybrid MUT/thru-cut in which the eastbound left-turn movement is channeled through a U-turn intersection approximately 720 feet east on SR 16. For the northbound and southbound approaches, the through movements must perform a right turn onto SR 16, use the U-turn intersection, and then perform a right turn to complete their desired turning movement. Under No-Build conditions, the southbound turning movements from Francis Road experience very high levels of delay due to the high volumes on eastbound and westbound SR 16, which limit the acceptable gaps for the two-stage southbound left-turn. The Build alternative resolves this issue by providing signal control at the main intersection and channeling the eastbound left-turn movement through a downstream U-turn; this configuration allows two-phase signal operation and a shorter cycle length. It should be noted that signal control is needed at the eastbound U-turn intersection in order to provide acceptable operations during the Design Year 2050. In terms of the overall intersection, the Build alternative provides a significant improvement in ETT over the No-Build alternative.

Table 6-11: Design Year 2050 Francis Road ETT Analysis

Approach / Movement		Volume (vph)	No-Build		Build	
			Movement ETT (s/veh)	Overall ETT (s/veh)	Movement ETT (s/veh)	Overall ETT (s/veh)
2050 AM PEAK						
SR 16 Eastbound	Left	100	23.1	**1,475.8**	80.0	15.3
	Through	1,815	0.0		8.4	
SR 16 Westbound	Through	1,660	0.0		15.0	
	Right	210	0.0		8.0	
Francis Road Southbound	Left	180	26,855.4		51.8	
	Right	40	26,855.4		51.8	
2050 PM PEAK						
SR 16 Eastbound	Left	40	20.5	**1,913.6**	74.0	24.0
	Through	1,660	0.0		18.7	
SR 16 Westbound	Through	1,815	0.0		25.0	
	Right	180	0.0		9.0	
Francis Road Southbound	Left	210	24,720.4		48.8	
	Right	100	24,720.4		48.8	

- Intersection delay in **red** exceeds target LOS D.

The detailed ETT analysis for Toms Road is shown in **Table 6-12**. Under No-Build conditions, the SR 16 intersection at Toms Road is a 4-leg signalized intersection. The Build alternative proposes a hybrid MUT/thru-cut in which the eastbound left-turn movement is channeled through a U-turn intersection approximately 540 feet east on SR 16, and the westbound left-turn movement is channelized through a U-turn intersection approximately 360 feet west on SR 16. For the northbound and southbound approaches, the through movements must perform a right turn onto SR 16, use the U-turn intersection, and then perform a right turn to complete their desired turning movement. Under No-Build conditions, the westbound through movement on SR 16 experiences high levels of delay corresponding to LOS F. The Build alternative provides shorter travel times along SR 16 and lower overall ETT by accommodating two-phase signal operation and a shorter cycle length. It should be noted that signal control is needed at all three intersections in order to provide acceptable operations during the Design Year 2050.

Table 6-12: Design Year 2050 Toms Road ETT Analysis

Approach / Movement		Volume (vph)	No-Build		Build	
			Movement ETT (s/veh)	Overall ETT (s/veh)	Movement ETT (s/veh)	Overall ETT (s/veh)
2050 AM PEAK						
SR 16 Eastbound	U-turn	10	7.8	27.6	95.0	31.3
	Left	10	7.8		88.0	
	Through	1,935	35.0		40.0	
	Right	60	35.0		40.0	
SR 16 Westbound	U-turn	30	44.0		76.0	
	Left	100	44.0		76.0	
	Through	1,440	15.2		12.0	
	Right	30	15.2		5.0	
Toms Rd Northbound	Left	75	80.5		31.2	
	Through	10	80.5		97.0	
	Right	225	15.4		48.7	
Factory Outlets Drive Southbound	Left	15	42.8		6.4	
	Through	10	27.4		71.0	
	Right	10	27.4		6.4	
2050 PM PEAK						
SR 16 Eastbound	U-turn	45	27.8	**74.5**	92.0	27.9
	Left	20	27.8		81.0	
	Through	1,475	56.9		21.0	
	Right	30	56.9		21.0	
SR 16 Westbound	U-turn	55	53.6		84.0	
	Left	155	53.6		84.0	
	Through	1,865	100.1		23.0	
	Right	180	100.1		12.0	
Toms Rd Northbound	Left	125	77.4		35.9	
	Through	20	77.4		87.0	
	Right	130	3.4		27.2	
Factory Outlets Drive Southbound	Left	175	42.4		41.4	
	Through	25	15.2		102.0	
	Right	40	15.2		41.4	

- Intersection delay in **red** exceeds target LOS D.

Table 6-13 compares the Build and No-Build Design Year 2050 intersection analysis in terms of overall intersection delay for the 14 study area intersections. At intersections with conventional intersection control, the overall intersection performance is based on intersection delay. At intersections where the Build alternative includes conversion from a TWSC or signalized intersection to an alternative intersection, the overall intersection performance for the Build alternative is based on the ETT methodology described in the preceding sections. At Francis Road and Toms Road, alternative intersections are proposed as part of the Build alternative with hybrid MUT/thru-cuts that restrict the SR 16 left turns and cross-street through movements. The most significant delay reductions are observed at the unsignalized intersections between CR 2209 and the West Outlet Mall Access, where the conversion from TWSC to signalized operations provides much better conditions for vehicles entering SR 16 from the side streets.

Table 6-13: Design Year 2050 Intersection Analysis Results Summary

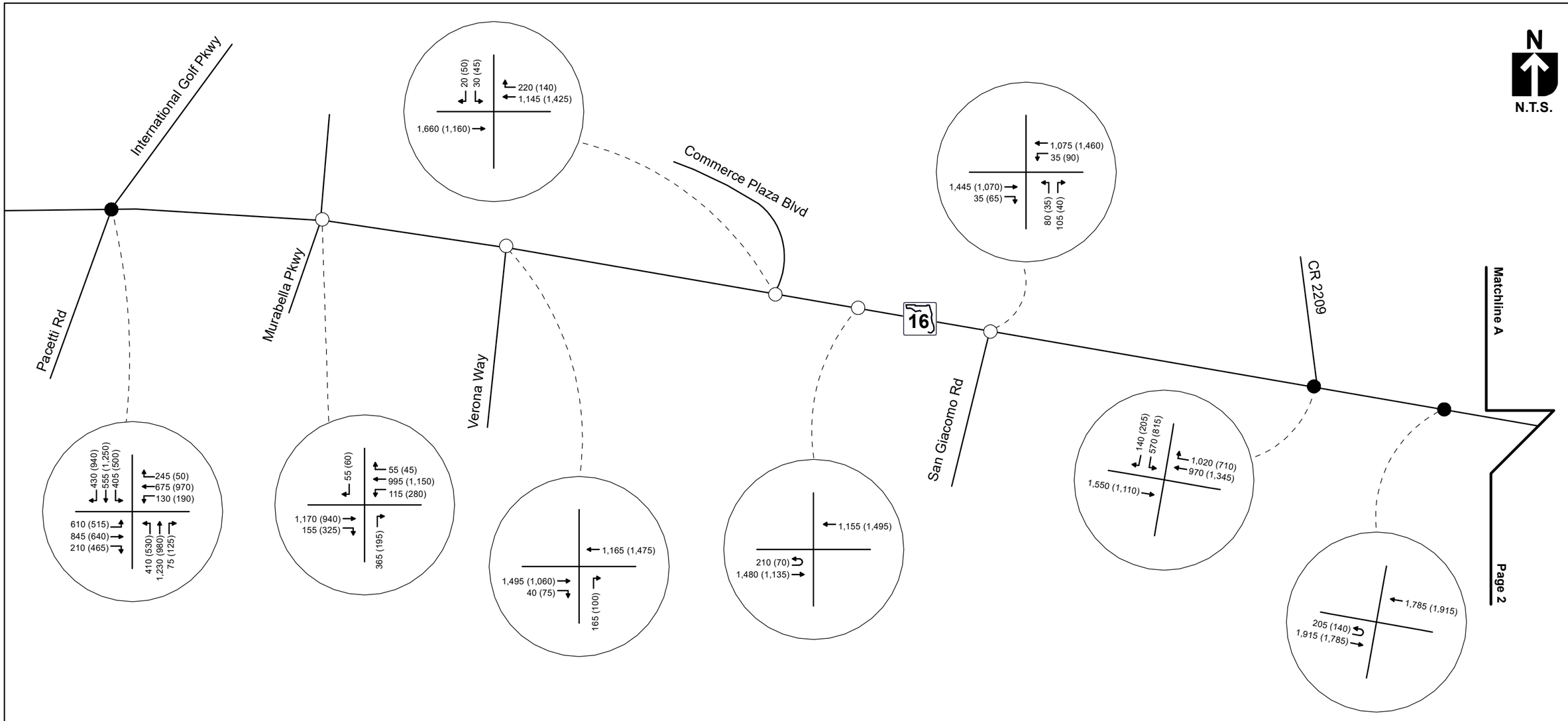
Intersection	AM Peak Delay (sec/veh)		PM Peak Delay (sec/veh)	
	No-Build	Build	No-Build	Build
International Golf Parkway / Pacetti Road	**87.0**	**82.7**	**121.5**	**121.6**
Murabella Parkway	43.8	43.8	19.5	19.5
Verona Way	25.2	25.2	14.4	14.4
Commerce Plaza Boulevard	32.4	32.4	43.8	43.8
San Giacomo Boulevard	**70.5**	**70.5**	36.2	36.2
CR 2209	14.8	13.5	15.8	14.5
Francis Road*	**1,475.8**	15.3	**1,913.6**	24.0
Turnbull Creek Road / Tomoka Pines Drive	**1,695.3**	14.3	**2,343.3**	17.3
Windward Ranch Boulevard	**8,476.3**	18.8	**5,377.4**	12.1
Downs Corner Road	**1,866.4**	8.2	**893.0**	9.7
Whisper Ridge Drive	**3,763.0**	11.0	**1,915.7**	12.8
West Outlet Mall Access / Elevation Parkway	27.4	25.4	33.5	34.3
Toms Road / Factory Outlets Drive*	27.6	31.3	74.5	27.9
CR 208	36.8	35.1	15.6	14.9
I-95 Southbound Ramps	45.2	45.2	54.4	54.4

*Overall intersection performance is based on total ETT for the Build alternative.
- Intersection delay in **red** exceeds target LOS D.

Queue length analysis for the Build Alternative was also performed for the Design Year 2050 using Synchro 11. The AM and PM 95th percentile queue lengths were used to inform the selection of the appropriate queue storage lengths at the study area intersections between CR 2209 and Toms Road. **Table 6-14** shows the calculated queue lengths for each approach (based on the maximum of the AM and PM 95th percentile queues), in addition to the recommended queue storage.

Table 6-14: Design Year 2050 Queue Length Analysis

SR 16 Intersection	Approach/ Movement		95th Percentile Queue (ft)		Calculated Queue Length (ft)	Recommended Queue Storage (ft)
			2050 AM	2050 PM		
International Golf Pkwy / Pacetti Rd	EB	Left	557	454	557	*
		Right	105	325	325	*
	WB	Left	108	136	136	*
		Right	125	0	125	*
	NB	Left	279	473	473	*
		Right	10	70	70	*
	SB	Left	362	428	428	*
		Right	371	1448	1448	*
CR 2209	SB	Left	175	213	213	**250**
U-turn East of CR 2209	EB	U-turn	99	74	99	**200**
U-turn East of Francis Rd	EB	U-turn	73	27	73	**100**
Turnbull Creek Rd	EB	Left	8	14	14	**100**
		Right	23	44	44	**100**
	WB	Left	48	72	72	**200**
		Right	0	0	0	**100**
	NB	Right	12	0	12	**100**
	SB	Right	0	0	0	**100**
Windward Ranch Blvd	EB	Right	3	17	17	**100**
	WB	Left	35	111	111	**150**
	NB	Right	50	35	50	**100**
Downs Corner Rd	EB	Left	5	10	10	**100**
	WB	Right	5	4	5	**100**
	SB	Right	24	19	24	**100**
Whisper Ridge Dr	EB	Right	11	44	44	**100**
	WB	Left	27	81	81	**100**
	NB	Right	38	28	38	**100**
Elevation Pkwy	EB	Left	10	23	23	**100**
		Right	0	0	0	**100**
	WB	Left	179	346	346	**400**
		Right	0	0	0	**100**
	NB	Right	188	77	188	**200**
	SB	Left	45	94	94	**100**
U-turn West of Tom's Rd	WB	Left/U-turn	112	153	153	**200**
U-turn East of Tom's Rd	EB	U-turn	45	62	62	**100**



Legend

X,XXX (X,XXX)	AM (PM) Peak Hour Volumes
●	Signalized Intersection
○	Unsignalized Intersection

SR 16 from International Golf Parkway to I-95 PD&E Study	Build Design Year 2050 AM (PM) Peak Hour Volumes	Page 1 of 2	Figure 6-4

Matchline A

Page 1

N

N.T.S.

S Francis Rd

Tomoka Pines Dr

Turnbull Creek Rd

Windward Ranch Blvd

Downs Corner Rd

West Outlet Mall Access

Whisper Ridge Dr

Elevation Pkwy

Factory Outlets Dr

Toms Rd

CR 208

I-95 Southbound Off-Ramp

I-95 Southbound On-Ramp

16

30 (20)
15 (10)
10 (15)
1,895 (1,545)
100 (105)
15 (15)
1,500 (1,895)
50 (80)
135 (90)
85 (70)

25 (15)
10 (15)
15 (15)
2,030 (1,350)
10 (15)
1,420 (1,890)

2,000 (1,555)
15 (15)
15 (15)
1,535 (2,075)
140 (235)

1,985 (1,595)
170 (210)
20 (65)
15 (175)
75 (125)
235 (150)
50 (220)
1,580 (2,120)

30 (85)
2,205 (1,835)
1,600 (2,255)

40 (100)
180 (210)
1,915 (1,700)
310 (220)
1,660 (1,815)

100 (40)
1,995 (1,870)
1,870 (1,995)

1,910 (1,310)
35 (100)
1,410 (1,775)
35 (130)
100 (60)
135 (55)

1,830 (1,180)
40 (65)
75 (35)
65 (35)
1,340 (1,705)
15 (75)

10 (50)
10 (110)
10 (45)
1,685 (1,135)
15 (35)
35 (30)
20 (35)
1,270 (1,405)
225 (485)
15 (105)
85 (150)
10 (115)
320 (245)

2,145 (1,805)
20 (25)
585 (485)
1,590 (2,200)
545 (455)

195 (285)
1,030 (1,070)
2,160 (2,905)

220 (460)
1,030 (1,070)
2,340 (1,790)
465 (530)

Legend

X,XXX (X,XXX)	AM (PM) Peak Hour Volumes
●	Signalized Intersection
○	Unsignalized Intersection

SR 16 from International Golf Parkway to I-95 PD&E Study

Build Design Year 2050
AM (PM) Peak Hour Volumes

Page 2 of 2

Figure 6-4

6.4.2 2050 Build Highway Analysis

Highway Capacity Software (HCS) 2023 was used to analyze the highway portion of the study area, which is between CR 2209 and the West Outlet Mall Access and covers approximately 4.4 miles of roadway. The analysis was conducted on two segments, which are west and east of Francis Road. The Build alternative is considered a multilane highway, and several performance measures are available, which include average speed and density. The LOS criteria for a multilane highway is based on density (passenger cars/mile/lane). **Table 6-15** provides the analysis results for the two highway segments. The additional travel lane in each direction along SR 16 is expected to significantly improve the traffic operations of the roadway. The design year is expected to operate at LOS B or LOS C for both AM and PM peaks.

Table 6-15: Design Year 2050 Build HCS Highway Segment Analysis

Highway Segment	Direction	Average Speed (mi/hr)	Density (pc/mi/ln)	LOS
2050 AM Peak				
SR 16 West of Francis Road	Eastbound	53.0	18.4	C
	Westbound	52.7	13.9	B
SR 16 East of Francis Road	Eastbound	53.2	20.2	C
	Westbound	53.4	15.1	B
2050 PM Peak				
SR 16 West of Francis Road	Eastbound	53.0	13.5	B
	Westbound	52.7	18.0	B
SR 16 East of Francis Road	Eastbound	53.2	14.8	B
	Westbound	53.4	19.5	C

6.5 Future Conditions Safety Analysis

The AASHTO Highway Safety Manual (HSM) methodology was used to compare the predicted crashes of the No-Build and Build alternatives to determine the safety benefit of the improvements proposed as part of the Build alternative.

The HSM Chapter 12 spreadsheets were used to apply the HSM predictive methodologies for this analysis. This spreadsheet-based tool helps to streamline the application of Safety Performance Functions (SPFs) and Crash Modification Factors (CMFs) as specified for urban and suburban arterials from Chapter 12 of the Highway Safety Manual. This spreadsheet tool incorporates the geometry along SR 16 as well as the intersections within the project area, which have geometric or operational improvements between the No-Build and Build alternatives. The primary difference between the No-Build and Build alternatives is the widening of SR 16 from a two-lane undivided roadway to a four-lane divided roadway. Major geometric changes were also incorporated in the

Build alternative at Francis Road and Toms Road as well as signalizing the intersections of Turnbull Creek Road, Windward Ranch Boulevard, Downs Corner Road, and Whisper Ridge Drive.

The Build alternative safety analysis also incorporates the crash modification factor (CMF) which accounts for conversion of a signalized intersection to an MUT. CMF ID 10865: *Convert intersection to median U-Turn (MUT) intersection* was used to estimate the benefit of converting the Francis Road and Toms Road intersections from full-access intersections to partial MUT intersections. The CMF for converting a signalized intersection to an MUT is 0.6508 representing a 34.92% reduction in crashes of all types and severities. It should be noted that Turnbull Creek Road is being converted into a signalized thru-cut intersection, but no CMF exists for this intersection configuration. Therefore, the number of crashes in the analysis represents a conventional signalized intersection.

Table 6-16 summarizes the segment, intersection, and total annual predicted crashes for the No-Build and Build alternatives. As shown in the table, the Build alternative is expected to provide a 28.6% reduction in predicted crashes per year over the No-Build alternative. Backup documentation for the future condition safety analysis is provided in **Appendix H**.

Table 6-16: Future Conditions Safety Analysis (Predicted Crashes Per Year)

Location	No-Build	Build	% Difference
Segments			
International Golf Parkway to Verona Way	5.1	2.7	-47.0%
Verona Way to Francis Road	16.5	10.2	-38.2%
Francis Road to 0.13 miles west of West Outlet Mall Access	48.5	28.8	-40.6%
0.13 miles west of West Outlet Mall Access to I-95 Southbound Terminal	8.8	8.8	0%
Intersections			
SR 16 at Francis Road	5.1	3.7	-27.5%
SR 16 at Turnbull Creek Road	2.7	4.3	59.3%
SR 16 at Windward Ranch Boulevard	3.6	4.2	16.7%
SR 16 at Downs Corner Road	1.8	2.1	16.7%
SR 16 at Whisper Ridge Drive	2.9	3.7	27.6%
SR 16 at Toms Road	7.7	4.8	-37.7%
Total Crashes	**102.7**	**73.3**	**-28.6%**

Note: Crash Rate is expressed as crashes per year

7.0 Summary of Analysis Results

Due to the recent and projected growth within the study area, congestion along and adjacent to SR 16 will continue to increase. This is reflected in the results of the No-Build analysis, which show that 10 of the 15 study area intersections are expected to operate at LOS E or F during one or both of the peak hours under Design Year conditions. In addition, the highway segment analysis shows that the current two-lane capacity of SR 16 between CR 2209 and Elevation Parkway/West Outlet Mall Access is expected to reach LOS E by Opening Year and LOS F by Design Year.

The Build alternative provides operational benefits over the No-Build alternative by providing a four-lane facility from CR 2209 to Elevation Parkway/West Outlet Mall Access, in addition to incorporating signal control at several of the study area intersections in that area, providing significantly improved operations for traffic entering and exiting the affected residential communities. Under Build conditions, all study area intersections from CR 2209 to the I-95 interchange are expected to operate at LOS D or better through the Design Year. The four-lane capacity provided in the Build alternative along SR 16 between CR 2209 and Elevation Parkway/West Outlet Mall Access is expected to operate at LOS C or better through the Design Year.

The Build alternative provides intersection improvements at several study area intersections, which include both alternative control strategies and conventional traffic signals. At Francis Road and Toms Road, alternative intersections are proposed as part of the Build alternative with hybrid MUT/thru-cut intersections. The intersection of Turnbull Creek Road is proposed to be converted from conventional TWSC to a signalized thru-cut intersection. In addition, the intersections of SR 16 at Windward Ranch Boulevard, Downs Corner Roads, and Whisper Ridge Drive are proposed to be converted from TWSC to signalized operations. These changes in intersection control provide significant delay reductions for vehicles entering SR 16 from the side streets.

A predictive safety analysis was completed to determine the safety benefits of the Build alternatives over the No-Build. The HSM Chapter 12 spreadsheets were used to determine the predicted number of crashes for SR 16 and the study intersections with and without the proposed improvements. The predictive safety analysis results indicate that the Build alternative is expected to reduce crashes throughout the study area by approximately 29%.