Draft

Design Traffic and Transit Operations Methodology

SR 968/Flagler Street Premium Transit Project Development & Environment (PD&E) Study

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Acronyms and Abbreviations

AADT	Average Annual Daily Traffic
ACS	American Community Survey
BRT	Bus Rapid Transit
CCTP	Census Transportation Planning Package
DDHV	Directional Design Hour Volume
DTPW	Department of Transportation and Public Works
FDOT	Florida Department of Transportation
FTA	Florida Transit Administration
LRT	Light Rail Transit
NTD	National Transit Database
PD&E	Preliminary Design and Engineering
SERPM	Southeast Regional Planning Model
STOPS	Simplified Trips on Project
TSM	Transportation System Management

1 Introduction

The purpose of this memorandum is to document the Design Traffic and Transit Operations Analysis Methodology for the SR 968/Flagler Street/SW 1st Street Premium Transit Project Development & Environment (PD&E) Study.

This methodology defines how existing traffic and transit operating conditions will be analyzed and future traffic volumes developed and analyzed from travel demand forecast model output for individual No-Build and Build alternatives. This document also includes the alternatives to be analyzed and the level of traffic and transit operational analysis to be done for each alternative as well as the years and periods of analysis.

This document outlines the general analysis methods to be used in the study and comparison of potential future alternatives for the SR 968/Flagler Street/SW 1st Street Premium Transit PD&E Study. The following sections are described in greater details in the remainder of the document:

- Study Area
- Project Alternatives
- Alternatives Screening Process
- Transit Operations Analysis
- Traffic Analysis Tools Description
- Existing Traffic Data
- Development of Project Design Traffic
- Traffic and Transit Operation Analysis
- Documentation

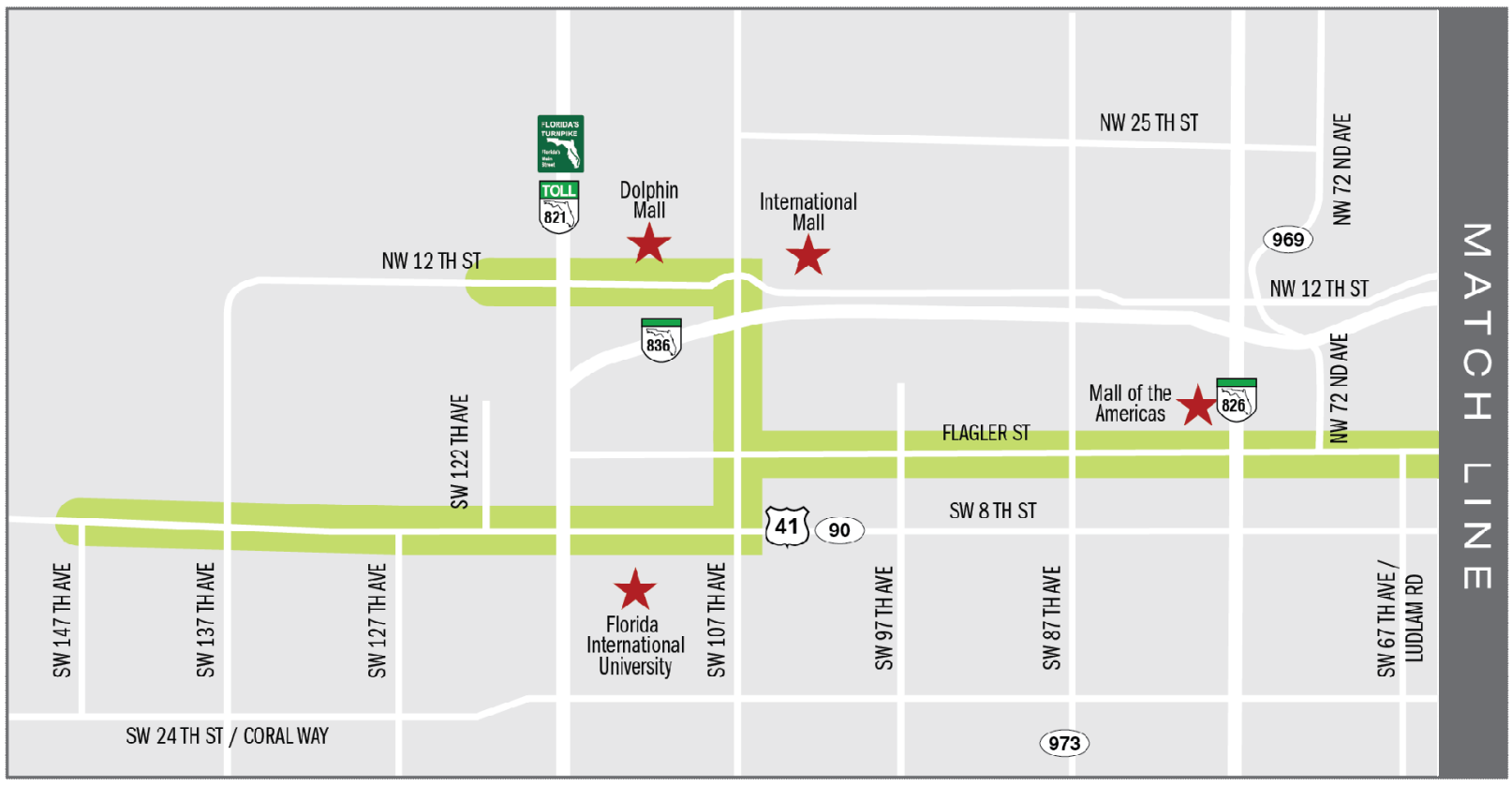
2 Study Area

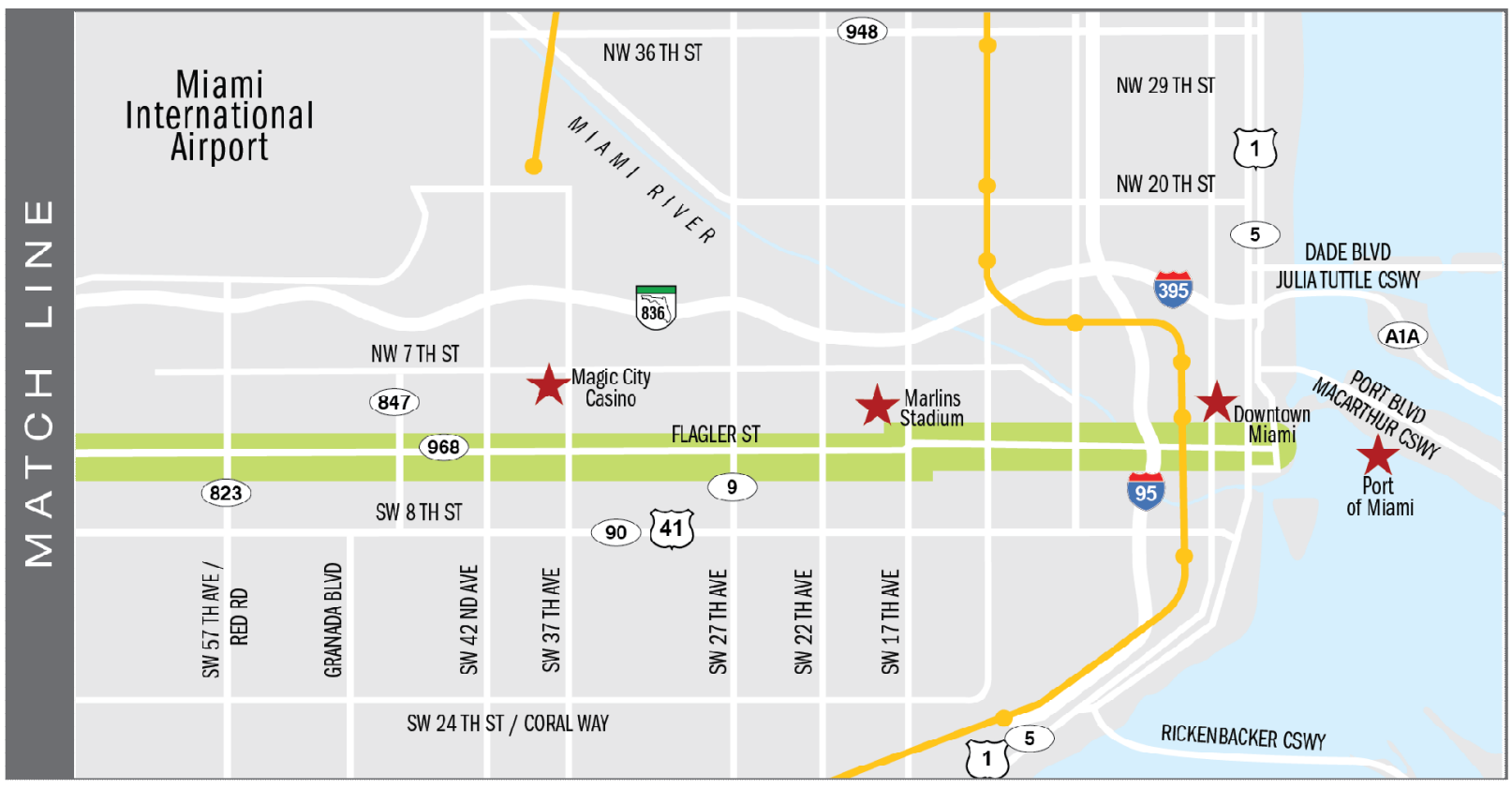
The SR-968/Flagler Street/SW 1st Street Corridor (East-West Corridor) was identified as one of eight Rapid Transit Corridors in the 2002 People's Transportation Plan (PTP) with two segments, HEFT to SR-826, and SR-826 to Port Miami. Most recently, February 2016, the Metropolitan Planning Organization (MPO) identified the Flagler Street Corridor as one of the critical elements of the Bus Express Rapid Transit (BERT) Network. The study corridor is illustrated in Figure 1 and defined by the following roadway segments:

- SR-968/Flagler Street and SW 1st Street from NW 107th Avenue to SR-5/US 1/Biscayne Boulevard and to the proposed Downtown ~~Miami~~ Intermodal Terminal (at Government Center at approximately NW ~~2~~nd Avenue);
- SR-985/NW 107th Avenue from SR-90/SW 8th Street to NW 12th Street;

- SR-90/SW 8th Street from proposed ~~NW~~ 147th Avenue park-and-ride/transit terminal (Tamiami Station) to SR-985/~~NW~~ 107th Avenue; and
- NW 12th Street from ~~NW 107th Avenue to~~ Dolphin Station (at approximately NW 12th Street at NW 122nd Avenue)

Figure 1: Project Location Map





LEGEND |
Flagler Street Corridor
Activity Center
Metrorail

3 Project Alternatives

The Miami-Dade MPO Governing Board recently directed that the Flagler Street component of the East-West Corridor be implemented in an expedited manner assuming Premium Transit including Bus Rapid Transit (BRT) on Exclusive and/or Reversible Lanes. Consequently, alternatives to examine for the transit component of the study corridor include Bus Rapid Transit (BRT) and/or Reversible Lanes. In addition, a Transportation System Management and Operations (TSM&O) alternative will be examined which will include low-cost elements that improve transit operations and service in the corridor, such as stop relocations, headway improvements, and expanded service hours, among other potential improvements.

The No-Build and the TSM Alternatives will be carried through the various stages of the study and used to evaluate the impacts of the proposed improvements. The definition of the alternatives are provided in the following sections

3.1 No-Build Alternative

This alternative will include all of the Cost Feasible projects included in the Miami-Dade County Metropolitan Planning Organization (MPO) 2040 Long Range Transportation Plan. The projects will include both highway and transit projects included in the Plan. All Build Alternatives will use this alternative as a base upon which to add the proposed improvements along the Flagler Street Corridor as identified in the Study Area section of this memorandum.

3.2 TSM Alternative

This alternative will include all of the improvements included in the No-Build Alternative and add TSM options and technologies appropriate to the corridor. TSM Alternative is defined as an alternative that does not require major capital expenditures. For this corridor, the following TSM options will be considered: transit service improvements (headway, amenities, connections, span of service), transit signal priority, Intelligent Transportation Systems options, traffic signalization and phasing.

3.3 Build Alternatives

The BRT alternatives shall comply with the definition established in MAP-21; that is, a bus system in which the majority of each line operates in a separated right-of-way or lane dedicated for public transportation use during peak periods, and that includes features that emulate the services provided by rail fixed guideway public transportation.

In conjunction with the transit technology, the Build alternatives will examine various configurations for the transit lanes, including concurrent flow right-side and left-side exclusive lanes adjacent to the curbside, concurrent right-side exclusive lanes offset from the existing curbside, reversible flow lanes, and widening of the right-of-way to accommodate adding concurrent flow exclusive transit lanes. The analysis of alternatives will be conducted in three

phases. The following section documents the process documented in the Alternatives Screening Methodology Memorandum developed for this study.

3.4 Analysis Years

The following table illustrates the various project alternatives and corresponding analysis years.

Table 1 – Analysis Years

Project Alternatives	2016	2020 Opening Year	2040 Design Year
Existing Conditions	Yes	N/A	N/A
No-Build	N/A	Yes	Yes
TSM&O	N/A	Yes	Yes
Build Alternatives			
Tier 1	N/A	N/A	Yes
Tier 2	N/A	Yes	Yes
Tier 3	N/A	Yes	Yes

4 Alternatives Screening Process

The screening of the various alternatives will be conducted in a tier-based sequence. A first phase shall consist of the screening of alternatives on a qualitative and fatal flaw basis. Up to ten alternatives, defined by street section, transit technology, operating parameters, and station location and amenities shall be analyzed as part of this initial screening. Upon completion of the initial screening analysis, a more comprehensive analysis, including detailed demand forecasts, will be prepared for up to three Build alternatives, as well as for the No-Build and TSM alternatives. These will result in a Recommended Build Alternative that will be further refined in addition to the No-Build and Build Alternatives, leading to the Locally Preferred Alternative (LPA).

Figure 2 illustrates the overall flow of the analysis approach and highlights the specific tools to be used at the various tiers and the corresponding measures of effectiveness to be developed at each tier for alternatives comparison.

Tier 1 Initial Alternatives: This screening effort will focus on the potential initial alternatives along the corridor which include the alternatives identified in the study Scope of Services. The evaluation of initial alternatives in Tier 1 will be based on a set of qualitative measures and will result in the identification of up to three Build Alternatives as well as the No-Build Alternative and TSM Alternative. These alternatives will then advance to a more detailed evaluation in Tier 2. Alternatives considered in Tier 1 are summarized in Table 2.

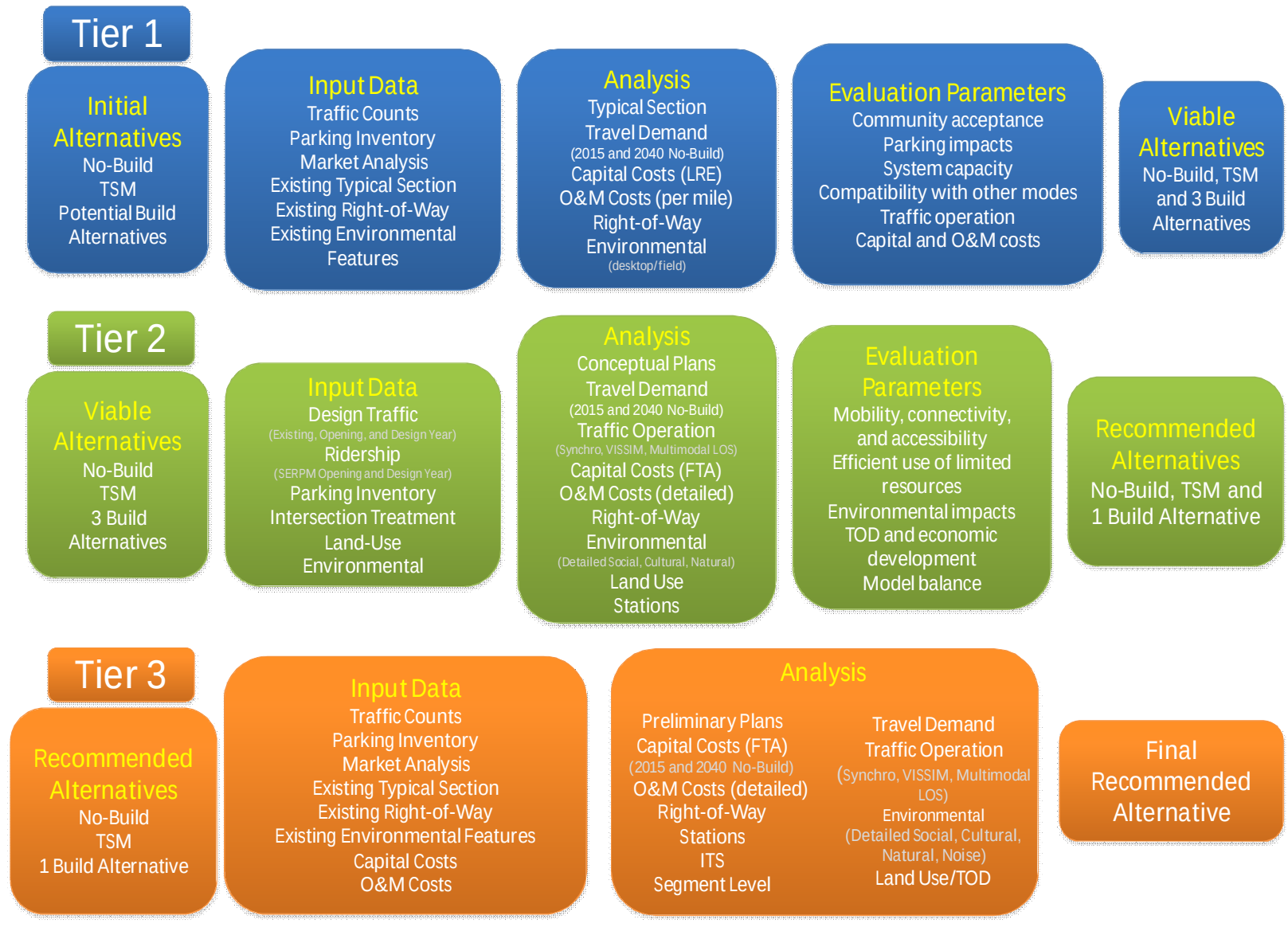
Table 2 – Initial Screening Alternatives

Alternative Number	Basic Lane Configuration	Street Location	Cross-Section Assumption	Mode
1	No-Build	Mixed traffic	No widening	Local Bus
2	TSM&O	Mixed traffic	No widening	Premium Transit
3	Concurrent flow	Exclusive right side lane	No widening	Premium Transit
4	Concurrent flow	Exclusive left side lane	No widening	Premium Transit
5	Concurrent flow	Shared right side lane (BAT lane)	No widening	Premium Transit
6	Concurrent flow	Exclusive right side offset lane	No widening	Premium Transit
7	Concurrent flow	Shared right side offset lane (BAT lane)	No widening	Premium Transit
8a/b	Reversible	Exclusive lane	Lane Re-purposing	Premium Transit /Roadway Only
9	Transitway/Fixed Guideway	At-grade median (2-lane)	Lane Re-purposing	Premium Transit
10	Transitway/Fixed Guideway	Elevated median (2-lane)	No widening	Premium Transit
11	Transitway/Fixed Guideway	At-grade side-of-road (2-lane)	Lane Re-purposing	Premium Transit

Tier 2 Viable Alternatives: This screening effort will focus on the reasonable and feasible (viable) Build Alternatives emerging from the Tier 1 screening and will include a further evaluation of the No-Build and TSM alternatives. A more detailed set of performance measures related to the overall project goals and objectives will be developed in Tier 2 to allow both qualitative and quantitative analyses, where applicable. The Tier 2 screening analysis will result in the identification of a Recommended Build Alternative which will be further refined, evaluated and compared to the No-Build and TSM alternatives.

Tier 3 Recommended Alternatives: This final step in the screening process will focus on refinements to the Recommended Build Alternative emerging from the Tier 2 analysis including refinements, as needed, to the No-Build and TSM alternatives. Based on this final evaluation and input from the public and stakeholders, a Locally Preferred Alternative, or LPA will be identified.

Figure 2 – Alternative Screening Process



Traffic and transit operational analyses will be conducted at each of the alternatives screening tiers. Appropriate tools were identified based on the level of analysis required at each of the screening levels based on information available and identified measures of effectiveness. In the following sections, for both transit and traffic operation, detailed description of each of the tools will be provided along with the level of analysis to be performed with each of the identified tools.

5 Transit Operations Analysis

At every step of the study, a transit operation analysis will be conducted to complement the traffic operations analysis. The transit operations analysis will apply two levels of detail:

1. basic evaluation of transit capacity and overall safety evaluation associated with each of the initial alternatives in Tier 1, and

2. use of a more detailed bus capacity analysis spreadsheet tool to closely identify bus lane/guideway impacts on both bus and general traffic operations, and as input into any VISSIM modeling being conducted.

In both cases, the analysis will reflect the basic transit service concept developed for the Flagler Street corridor early on in the study and its potential extensions to Dolphin Mall and/or SW 147th Avenue. A further description of each methodology flows.

5.1 Tier 1 Transit Operations Analysis

At the initial alternatives screening level, the transit operations analysis will focus on the basic impact each alternative street configuration and associated transit operation will have on overall traffic and transit operations. For alternate lane configurations, the transit operations capacity will be identified based on the FDOT Level of Service Handbook and Transit Cooperative Research Program (TCRP) Report 118 – BRT Practitioner's Guide. From this step, the impact of repurposing a lane for transit or added capacity from a separate guideway facility will be identified. The ability of a transit lane to carry as many passengers as the resulting general traffic lanes after any lane repurposing will be assessed, whether used by BRT or also local bus service.

In addition to this basis capacity analysis, the safety associated with the initial alternative lane or guideway configurations for transit will be identified. This will include any potential major conflicts between Premium Transit modes and general traffic related to in-street operation, and access to potential station locations.

5.2 Tier 2 & 3 Transit Operations Analysis

Once Viable Build alternatives are identified, a spreadsheet tool initially developed for inclusion in the TCRP Transit Capacity & Quality of Service 3rd Edition will be applied. The tool is called the *Bus Stop and Facility Capacity and Speed Computational Engine*, and has the ability of calculating bus lane and mixed traffic capacity and speeds based on more specific characteristics of the bus lane or guideway operation, in particular interface with stations to be served, adjacent buses operating in the same lane, and traffic signals. The tool will be able to provide refined bus speeds for integration into the refined travel demand modeling, and provide input to the Synchro and VISSIM analyses to be applied in the Tier 2 and 3 evaluations.

Also as part of Tier 2 and 3, an assessment of where transit signal priority, queue jump, curb extension, or other transit priority treatments are most needed will be conducted. This will be based on criteria from TCRP Synthesis Report 83, *Bus and Rail Preferential Treatments on Urban Streets*, TCRP Report 26. *Operational Analysis of Bus Lanes on Urban Streets*, and other sources. The operational benefits of different treatments will be identified as input into the final screening of the Build alternatives and development of the Recommended Alternative.

6 Traffic Analysis Tools Description

Traffic operational analysis will be performed for existing and future conditions and at various levels. The following summarizes the level of analysis and tools used at various stages of the analysis:

- Existing Conditions – Detailed peak period traffic and transit operation using micro-simulation tools, Synchro and VISSIM
- Tier 1 – Planning daily level link level analysis
- Tier 2 – Detailed peak period traffic and transit operation using micro-simulation tools, Synchro and VISSIM
- Tier 3 – Detailed peak period traffic and transit operation using micro-simulation tools, Synchro and VISSIM

Each of the tools identified are described in the following sections.

6.1 Planning Level Analysis – Tier 1

The purpose of Tier 1 is to evaluate a broad range of alternatives and identify up to three viable alternatives in addition to the No-Build and the TSM Alternatives. At this stage of the study, a travel demand forecast will be developed for the No-Build Alternative for the year 2040. Using the daily volumes estimated from the model, the projected base planning daily level of service will be evaluated using FDOT Generalized Level of Service Tables. For the proposed alternatives identified in this first tier, overall daily system capacity will be evaluated and compared to the No-Build conditions. The system capacity will be evaluated based on number of traffic lanes, left turn treatment, and transit mode and frequency. Capacity based on traffic lanes and left turn treatment will be based on the FDOT Generalized Level of Service Tables. Transit system capacity on average daily capacity will be based on transit mode and proposed frequency.

6.2 Micro-simulation – Existing Conditions, Tier 2 and Tier 3

In Tier 2 and Tier 3, traffic operation during peak periods will be evaluated using micro-simulation tools. Micro-simulation is the dynamic and stochastic (random) modeling of individual vehicle movements within a system of transportation facilities. While macroscopic models look at vehicle flow through a network, in micro simulation, each vehicle is moved through the network of transportation facilities on a split second by split second basis according to the physical characteristics of the vehicle (length, maximum acceleration rate, etc.), the fundamental rules of motion (e.g. acceleration times time equals velocity, velocity times time equals distance) and rules of driver behavior (car following rules, lane changing rules, etc.). Input from the bus operational analysis will also be used to account for transit modes and refine both the Synchro and VISSIM models. The following sections provide a description of the analysis to be performed with each of the tools identified.

6.2.1 Synchro Modeling

The entirety of the Flagler Street study corridor will be analyzed using Synchro for existing conditions, as well as 2040 No Build, TSM, and Build Alternatives. The following Measures of Effectiveness (MOE) will be developed using Synchro: queue lengths, travel times, delay, volume to capacity (V/C) ratios, and Level of Service. For future conditions, traffic operational analysis will be performed for Tier 2 and Tier 3 only for the design year 2040.

6.2.2 VISSIM Modeling

The extent of the VISSIM networks will be limited to 10 miles along the corridor, and will be employed in highly congested sections of the corridor and where limitations within the Synchro software prevent estimation of the effects of extended vehicle queuing and the impact of , transit priority treatments such as transit signal priority and queue jump treatments. All reported VISSIM results will be the average of 10 runs. The following MOEs will be used from VISSIM: total vehicles processed, queue lengths, travel times, delay, and delay / proxy-LOS at intersections. VISSIM models will be developed for existing, and 2040 conditions for Tier 2 and Tier 3 only.

6.3 Model Calibration

Calibration of the VISSIM models will be conducted using 2016 traffic counts, travel times, queues, and delay collected from the field, in order to replicate existing conditions as much as possible. Because varying levels of congestion may exist during the AM and PM peak periods, AM peak hour and PM peak hour models will be calibrated individually.

Model calibration will follow the guidelines included in the Traffic Analysis Toolbox Volume III – Guidelines for Applying Traffic Micro-simulation Modeling Software [FHWA; Publication No. FHWA-HRT-04-040, 2004]. Accordingly, the calibration of the model(s) (AM and PM) should meet the thresholds indicated in the referenced publication. These thresholds are summarized in Table 2.

Most of the criteria included in Table 2 are self explanatory, with the possible exception of the GEH Statistic. This measure, which gets its name from Geoffrey E. Havers, is a formula used in traffic modeling to compare two sets of traffic volumes (Observed and Modeled). Its mathematical formulation is similar to the Chi-Squared test, but it is not a true statistical test, rather a simplified empirical formula. The formulation for the GEH Statistic is as follows:

$$GEH = \sqrt{\frac{2(M-C)^2}{M+C}}$$

Where M is the hourly traffic volume from the traffic model and C is the real-world hourly traffic counts collected in the field.

Table 3 –Microsimulation Calibration Targets

Criteria and Measures	Calibration Acceptance Targets
Hourly Flows, Model Versus Observed	
Individual Link Flows	
Within 15%, for 700 veh/h < Flow < 2700 veh/h	> 85% of cases
Within 100 veh/h, for Flow < 700 veh/h	> 85% of cases
Within 400 veh/h, for Flow > 2700 veh/h	> 85% of cases
Sum of All Link Flows	Within 5% of sum of all link counts
GEH Statistic < 5 for Individual Link Flows*	> 85% of cases
GEH Statistic for Sum of All Link Flows	GEH < 4 for sum of all link counts
Travel Times, Model Versus Observed	
Journey Times, Network	
Within 15% (or 1 min, if higher)	> 85% of cases
Visual Audits	
Individual Link Speeds	
Visually Acceptable Speed-Flow Relationship	To analyst's satisfaction
Bottlenecks	
Visually Acceptable Queuing	To analyst's satisfaction

This statistic is typically used to offset the discrepancies that occur when using only simple percentages, as traffic volumes vary over a wide range. In other words, if using only percentages, small absolute discrepancies have no impact on large volumes but a large percent impact in smaller numbers, and vice versa. It has been shown that for traffic volumes smaller than 10,000 a five percent variation yields smaller numbers than a GEH of five. Beyond 10,000, five percent differences keep growing linearly whereas GEH=5 follows a decaying curve.

7 Existing Traffic Data

An extensive data collection is being performed as part of this study. The collected data will be documented in the *Existing Traffic Data Collection Memorandum* developed for this study. The collected data includes 72-hour counts, peak hour turning movement counts, classification counts, queue lengths, and travel time studies.

Due to the fact that significant portions of eastern SR 968/Flagler Street and SW 1st Street are presently being reconstructed, an alternative method is required for establishing both existing and future AADTs and DHVs. The following improvements are being implemented:

Table 4 – Current Projects within Study Area

Project Name and Limits	FM Number(s)	Type of Work	Construction End
SR 968/Flagler Street From west of 69th Avenue to west of SR 9/NW 27th Avenue	425271-3	Resurfacing	2018
SR 968/SW 1st Street from Flagler Street to SW 17th Avenue	438056-3	Landscaping	2018
SR 968/SW 1st Street from SW 17th Avenue to SW 16th Avenue	438056-4	Landscaping	2019
SR 968/SW 1st Street at Miami River (bridge #870660)	424407-1	Bridge Replacement	2019
SR 968/SW 1st Street from SW 17th Avenue to east of SW 16th Avenue	418312-2	Pavement Reconstruction	2018
SR 968/SW 1st Street from Flagler Street to east of 17th Avenue	414633-2	Pavement Reconstruction	2018
SR 968/West. Flagler Street from west of SR 9/27th Avenue to West 14th Avenue	418091-1	Pavement Reconstruction	2018
SR 968/West Flagler Street from West 14th Avenue to West 2nd Avenue	414633-1	Pavement Reconstruction	2018
SR 968/West Flagler Street from West 75th Avenue to east of Tamiami Canal Road	429194-1	Resurfacing	2018
SR 968/West Flagler Street from SW 14th Avenue to SW 2nd Avenue	438056-2	Landscaping	2018
SR 968/West Flagler Street from SW 27th Avenue to SW 14th Avenue	438056-1	Landscaping	2018
SR 985/SW 107th Avenue from SW 1100 block to north of SR 968/Flagler Street	412479-4	Landscaping	2019

As part of these projects, the lane configuration on Flagler Street and SW 1st Street is being modified. The new configuration will eliminate the eastbound lane on Flagler Street from 27th Avenue to 6th Avenue and provide for three westbound only lanes with on-street parking on both sides. SW 1st Street between 22nd Avenue and 17th Avenue will also be modified in that segment to provide for three eastbound lanes and parking on both sides of the street. For the purpose of the analysis, this will be used as existing conditions in that segment of the corridor.

As the construction of these improvements is currently under way, traffic counts will not be collected as they would not provide a true representation of traffic conditions in the area. Instead, traffic data from the SR 968/West Flagler Street/SW 1st Street PD&E Study developed for identification of impacts associated with the proposed improvements will be used. This data will be adjusted to represent 2016 figures, based on growth identified from FDOT's Online Traffic Data system.

8 Development of Project Design Traffic

Future year Average Annual Daily Traffic (AADT) and Design Hour Volumes (DHVs) will be developed for the various segments of the SR 968/Flagler Street/SW 1st Street PD&E study for Tier 2 and Tier 3 the following years:

- Opening Year: 2020
- Interim Year: 2030
- Design Year: 2040

Opening year, Interim year and design year volumes will be developed for the No-Build Alternative, and up to three Build Alternatives. The volumes will be developed along all facilities within the study corridor and major cross-streets within the study area. Opening and Interim year AADT volumes will only be used for comparison purposes between the alternatives. Design year design hour link volumes and turning movements will be used for traffic operational analysis following the methodology described in the previous section. AADTs and DHVs for the Opening and Interim years will be developed by interpolating between 2015 data and 2040 Design year estimates and will be used for alternatives comparison only. Traffic operational analysis will not be performed for opening and interim years.

The following sections describe the methodology that will be followed to identify the design traffic parameters, development of link and turning movement volumes as well as evaluation of growth rates for development of opening and interim year traffic data for the alternatives identified in Tier 2 and Tier 3.

8.1 Design Hour Parameters

The 2014 FDOT *Project Traffic Forecasting Handbook* (Topic No. 525-030-120) identifies a series of factors that are to be used to convert model output traffic volumes into peak hour directional

volumes to be used for traffic operational analysis. These factors, which are discussed below, will be developed from analysis of existing counts and individual traffic count stations on FDOT's Online Traffic Database.

8.1.1 Model Output Conversion Factor (MOCF)

As the data produced by the SERPM model already represents average daily travel conditions, a model output conversion factor (MOCF) will not be needed in this analysis. The MOCF is usually applied to the Peak Season Weekday Annual Daily Traffic (PSWADT) volumes to obtain average annual daily traffic (AADT).

8.1.2 Design Hour Percentage (K)

This factor is used to convert AADT to bi-directional design hour volume (DHV), representing traffic volumes along the roadways within the study area during weekday peak period conditions. Weekday factors will be developed based on the guidelines from the FDOT District Four Standard K Factors Memorandum (November 19, 2011), FDOT's *Project Traffic Forecasting Handbook*, and the latest FDOT Florida Traffic Online Database. As described in the Traffic Forecasting Handbook, the Standard K will initially be reviewed and compared to data from permanent count stations along the corridor as well as traffic counts collected as part of this study. Because the Flagler Corridor goes through various area types from downtown Miami in the east to more suburban setting in the west, there may be a need to identify more than one K Factor within the study area.

8.1.3 Directional Distribution Factor (D)

This factor is used to convert bi-directional DHV into weekday AM and PM directional peak hour traffic volumes. Weekday factors will developed based on the guidelines from the FDOT *Project Traffic Forecasting Handbook*, using data from the permanent count stations from the latest FDOT Florida Traffic Online Database. The resulting D Factors will be compared to data from the traffic counts collected as part of this study.

8.1.4 Truck Factor (T)

The truck factor is used to account for the impact of heavy vehicles in the traffic stream. Truck factors will be based on data from available permanent count stations from the FDOT Database as well as data from classification counts collected as part of this study.

8.2 Design Hour Link Volumes

Design hour link volumes will be developed for No-Build, TSM, and the Build alternatives identified in Tier 2 and Tier 3 of the Alternative Screening, following the traditional methodology defined in the *FDOT Project Traffic Forecasting Handbook*. For these alternatives, the design hour parameters will be applied to the AADTs from the travel demand model. The resulting DHVs will be used to estimate weekday AM and PM peak hour volumes for input into the traffic operational models. AM and PM peak hour link volumes will be developed by applying the directional (D) factor to the DHVs.

8.3 Design Year Future Turning Movement Volumes

Design year turning movement volumes will also be developed for all analyzed intersections along the corridors. Turning movements will be projected using iterative balancing methods based on TMTool and/or Van Zuylen as a starting point. Manual adjustments to the TMTool output will be incorporated whenever necessary.

Future turning movement volumes for the design year will be balanced along each facility within the study limits within acceptable levels of tolerance based on NCHRP 255 criteria and summarized in exhibits or figures for weekday AM and PM peak hour conditions during an average weekday for each of the alternatives analyzed. AM and PM peak hour volumes will be developed from the DHVs based on current traffic patterns obtained from the traffic counts collected in 2016 along Flagler Street/SW 1st Street and the other facilities within the study area.

8.4 Opening and Interim Turning Movement Volumes

While Design Year traffic volumes will be based on AADT from travel forecasts from the SERPM model, opening and interim year traffic data will be developed based on interpolation between 2015 and 2040 forecasts. Adjustment factors will be developed by comparing sets of alternatives. For example, No-Build 2020 and 2030 estimates will be developed by comparing 2015 and 2040 model AADTs for No-Build Alternatives. The resulting adjustment factors will be applied to the 2040 design hour volumes.

9 Traffic and Transit Operations Analysis

Table 4 summarizes the various alternatives and tools that will be used for analysis of traffic and transit data as well as years and time periods of the analyses.

Table 5 – Traffic and Transit Operation Analysis Summary

Project Alternatives	Alternatives Screening Stage	Ridership	Average Annual Daily Traffic (AADT)	Project Traffic (DDHV)	Traffic/Transit Operational Analysis
Existing Conditions	n/a	From transit agency	From traffic counts	2016 Traffic Counts	Synchro VISSIM
2015 Base Year/No-Build	Tier 1, Tier 2 and Tier 3	From SERPM	From SERPM	From SERPM estimates	Synchro
2015 TSM Alternative	Tier 1, Tier 2 and Tier 3	From SERPM	From SERPM	From SERPM estimates	Synchro
2015 Build Alternatives (3)	Tier 2 and Tier 3	From SERPM	From SERPM	From SERPM estimates	Synchro
2020 No-Build	Tier 3	n/a	From interpolation of 2040 – 2015 AADTs	From interpolation of 2040 – 2015 DDHVs	n/a
2020 TSM	Tier 3	n/a	From interpolation of 2040 – 2015 AADTs	From interpolation of 2040 – 2015 DDHVs	n/a
2020 Build Alternatives (3)	Tier 3	n/a	From interpolation of 2040 – 2015 AADTs	From interpolation of 2040 – 2015 DDHVs	n/a
2030 No-Build	Tier 3	n/a	From interpolation of 2040 – 2015 AADTs	From interpolation of 2040 – 2015 DDHVs	n/a
2030 TSM	Tier 3	n/a	From interpolation of 2040 – 2015 AADTs	From interpolation of 2040 – 2015 DDHVs	n/a
2030 Build Alternatives (3)	Tier 3	n/a	From interpolation of 2040 – 2015 AADTs	From interpolation of 2040 – 2015 DDHVs	n/a
2040 No-Build	Tier 1, Tier 2 and Tier 3	From SERPM and STOPS	From SERPM	From SERPM estimates	Peak Period Synchro VISSIM
2040 TSM	Tier 1, Tier 2 and Tier 3	From SERPM and STOPS	From SERPM	From SERPM estimates	Peak Period Synchro VISSIM
2040 Build Alternatives (3)	Tier 2 and Tier 3	From SERPM and STOPS	From SERPM	From SERPM estimates	Peak Period Synchro VISSIM/Bus Capacity Analysis Tool

10 Documentation

The Design Traffic and Transit Operations Analysis Technical Memorandum (DTTM) will document the traffic forecasting and traffic and transit operations analysis for the full study corridor. This document will be formatted according to the following general outline:

1. Introduction
   Purpose and objectives of the study and specific corridor description will be included in this section.

2. Data Collection Summary
   This section will include a summary of the data collection effort to be documented in the Existing Conditions – Traffic and Transit Data Collection Memorandum, the methodology used to balance the traffic counts, and the results of the traffic and transit data collection effort. This section will also include detailed information on development of traffic data in the sections where existing counts could not be obtained due to on-going construction.

3. Existing Conditions Analysis
   This section will include a description of the methodology used to develop the input data for Synchro and VISSIM, the rationale for selecting the segments to be modeled in VISSIM as well as the calibration process and results for the VISSIM models.

4. Alternatives Description
   Each of the alternatives evaluated will be described in this section. The alternatives will be grouped by their corresponding Tier level. The No-Build and TSM Alternatives will also be described including detailed information on the highway and transit network assumptions. The Build Alternatives descriptions will include the changes to the highway and transit networks corresponding to each alternative.

5. Future Traffic Data Development
   This section will summarize the methodology and parameters used to develop daily and project design traffic volumes for each of the alternatives evaluated as appropriate. Volumes will be presented in tables and/or maps as appropriate and reference alternative year, time period, and specific alternative.

6. Future Conditions Analysis
   The planning level (Tier 1) and operational (Tier 2 and Tier 3, Synchro, VISSIM, and Bus Capacity Analysis Tool) analyses will be included in this chapter. The section will include the methodology used to evaluate the various alternatives as well as the results using the MOEs identified in previous sections of this memorandum. Results will be presented in tabular and graphical format.

7. Conclusions and Recommendations.

As the study progresses, changes to this outline may be identified and applied.