TAMPA BAY EXPRESS

I-4 Project Development and Environment (PD&E) Study
from east of 50th Street to the Polk Parkway

# Draft Traffic Technical Memorandum (TTM)

Revised September 2015

**Project Limits:**
I-4 from east of 50th Street (MP 11.089) to County Line Road (MP 32.836 = MP 0.000) to Polk Parkway (MP 0.400)

Hillsborough County, Florida
Polk County, Florida

**Work Program Item Segment Number:**
431746-1

Prepared for:

FDOT

Florida Department of Transportation
District Seven
11201 North McKinley Drive
Tampa, Florida 33612-6456

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# GLOSSARY OF TERMS

| | |
|---|---|
| AADT | Annual Average Daily Traffic |
| DDHV | Directional Design Hour Volumes |
| DHV | Design Hour Volume |
| FDOT | Florida Department of Transportation |
| FHWA | Federal Highway Administration |
| FSUTMS | Florida Standard Urban Transportation Modeling Structure |
| FTI | Florida Traffic Information |
| HCM | Highway Capacity Manual |
| LOS | Level of Service |
| LRTP | Long Range Transportation Plan |
| MOCF | Model Output Conversion Factor |
| MPH | Miles per Hour |
| MPO | Metropolitan Planning Organization |
| NEPA | National Environmental Policy Act |
| PD&E | Project Development and Environment |
| PSWADT | Peak Season Weekday Average Daily Traffic |
| ROW | Right-of-Way |
| TAZ | Traffic Analysis Zones |
| TBRPM | Tampa Bay Regional Planning Model |
| TMC's | Turning Movement Counts |
| TSM | Transportation System Management |
| TTM | Traffic Technical Memorandum |
| ZDATA | Socio-Economic Zonal Data |

# EXECUTIVE SUMMARY

The need for interstate system improvements within the Tampa Bay has been extensively documented in numerous studies, such as the Tampa Interstate Study (TIS), several Project Development and Environment (PD&E) studies, Tampa Bay Express (TBX) Master Plan. Within the I-275, I-4, and I-75 corridors, eight segments were identified based on the needs assessment as potential express lane projects. The evaluation of interstate express lanes by the TBX Master Plan identified projects that can provide new driver choices that will improve driver mobility on the interstate system in the Tampa Bay Region and reduce the costs drivers pay due to traffic congestion.

Development of the Interstate 275 (I-275) and I-4 corridors within the urban boundaries of Tampa has been guided by the TIS that provided concept plans for approximately 37 miles of interstate improvements, including the recently completed I-4/Selmon Expressway connectors. The TIS Final Environmental Impact Statement (FEIS) Approved Alternative provides a roadway system that includes general use lanes (GULs), separated express lanes (EL), and a dedicated transit envelope.

The PD&E study will examine the need for express lane improvements along the 22.1 mile segment of I-4 from east of 50th Street (US 41/SR 583) in Hillsborough County to the Polk Parkway (SR 570) in Polk County. The express lane improvements are needed to increase the capacity and improve the operations and safety of I-4. As part of the Master Plan, the improvements being considered for this study include widening I-4 to accommodate four express lanes with two express lanes in each direction. The preliminary proposed typical section allows for two 11-foot express lanes, a 4-foot buffer, two 11-foot general use lanes, and one 12-foot general use lane at a minimum in each direction. As part of the Staged Implementation, the I-4 Starter Project typical section will consist of the six general use lanes (three in each direction) and two express lanes (one in each direction). The preliminary proposed typical section allows for one 11-foot express lanes, a 4-foot buffer, two 11-foot general use lanes, and one 12-foot general use lane at a minimum in each direction.

The traffic operational characteristics were assessed through CORSIM models utilizing existing data such as traffic counts, truck percentages, speeds, geometry, capacity, and signal timings. Existing (2012) AM and PM CORSIM models were prepared for calibration and a review of the CORSIM networks and traffic data inputs were performed to ensure the network and traffic data reflect the desired model scenarios.

The existing (2012) simulation models showed speed drops along I-4 at the following locations:

1. Between 50th Street on-ramp and the MLK off ramp – EB direction.
2. Between I-75 on-ramp and the on-ramp to the US 301/US 92 CD system. – WB direction.
3. Between US 301/US 92 on-ramp and the I-75 off-ramp – EB direction.
4. Between I-75 SB on-ramp and the I-75 NB on-ramp – EB direction.

With the express lanes consideration for the staged implementation (Starter Project for 2020 and 2030) and Master Plan (2040 build condition), the study indicated significant benefits with better operating speeds and fewer delays along the I-4 mainline. For the 2020 Starter Year Condition, I-4 mainline showed an average speed of 56 MPH in the AM peak hour and an average speed of 53 MPH in the PM peak hour. For the 2030 Starter Year, I-4 mainline showed an average speed of 52 MPH in the AM peak hour and an average speed of 49 MPH in the PM peak hour.

The speed profile analyses show the following friction locations for 2020 and 2030:

- **I-4 GUL Westbound**: Between US 301/US 92 CD system on-ramp and the MLK off-ramp caused due to the merge condition caused by heavy traffic from the CD system to the I-4.
- **I-4 GUL Eastbound:** Between US 301/US 92 on-ramp and the I-75 off-ramp, due to the weaving condition created by the on-ramp traffic from the CD system and off-ramp traffic to the I-75.
- **I-4 GUL Eastbound**: Between the 50th Street on-ramp and the MLK off ramp.
- **I-4 GUL Westbound**: Between the McIntosh Road ramps, and near the off-ramp CD roadway system traffic just west of the Mango Road.

No new friction locations were caused by the Express Lanes (EL) or its connections to and from the General Use Lanes (GUL).

In addition, the following freeway measures of effectiveness (MOEs) were compared for the 2040 Build Alternative and 2040 No Build Alternative at the end of peak hours:

- Vehicle Miles Travelled
- Move Time (in vehicle-hours)
- Total Time (in vehicle-hours)
- Delay (in vehicle-hours)
- Speed.

The results of the simulation analysis showed significant improvements in the I-4 system MOEs during AM and PM peak hours due to the Express Lanes (EL) implementation within the study area.

1. 24% increase in the freeway throughput for the AM peak hour and 10% increase in the freeway throughput for the PM peak hour.
2. 25% increase in the freeway travel time for the AM peak hour and 11% increase in the freeway travel time for the PM peak hour.
3. 71% reduction in freeway delay for the AM peak hour and 71% reduction in freeway delay for the PM peak hour.
4. 7% reduction in the overall vehicle hours traveled in the freeway for the AM peak hour and 22% reduction in the overall vehicle hours traveled in the freeway for the PM peak hour.
5. 32% increase in the freeway speed for the AM peak hour and 41% increase in the freeway speed for the PM peak hour.

The express lane consideration showed significant improvements in increasing the capacity and improves the operations and safety of the I-4 corridor.

# 1.0 PROJECT DESCRIPTION

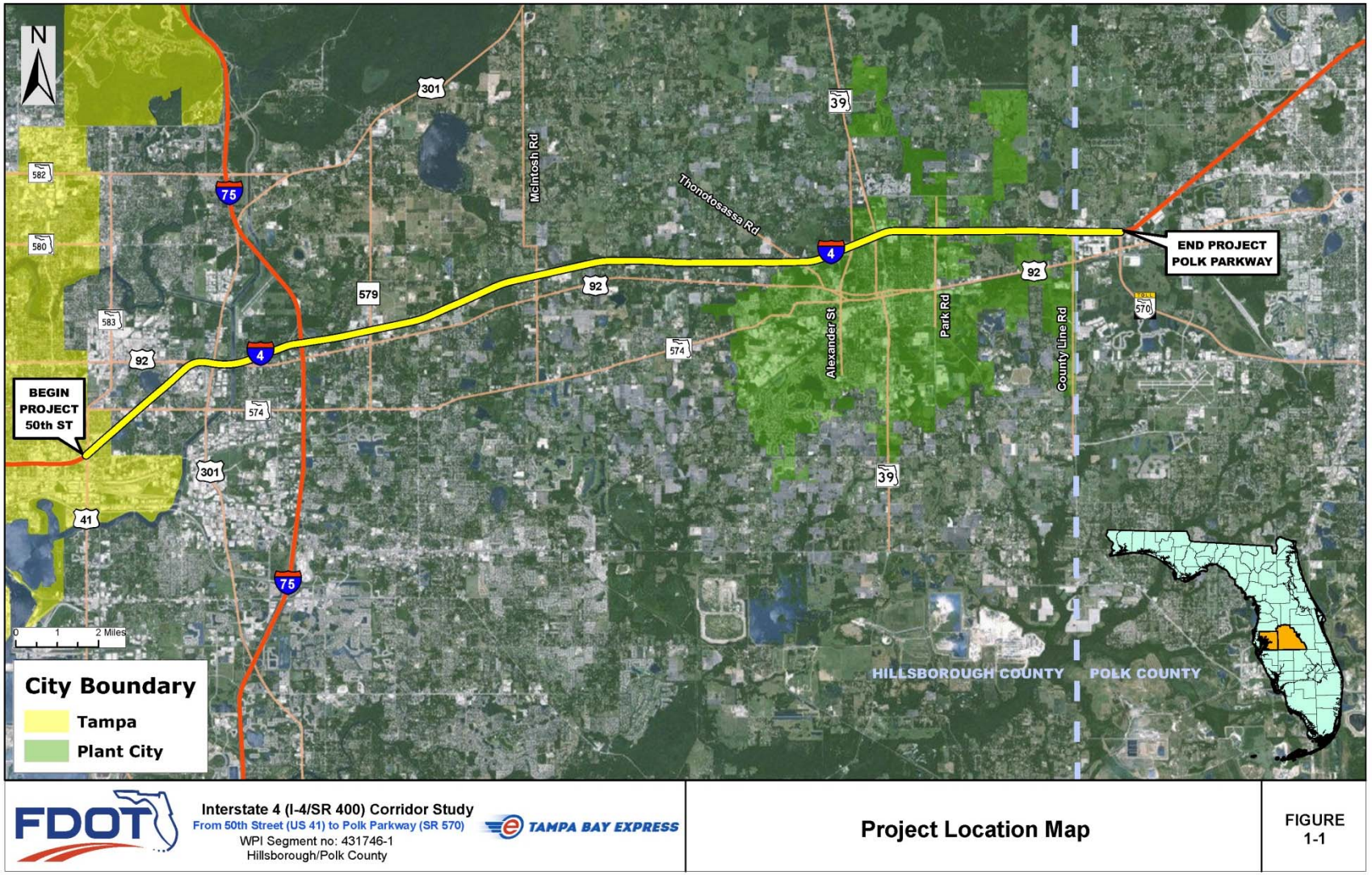
I-4 is a major east-west interstate that connects I-275, the Lee Roy Selmon Expressway, I-75 and the Polk Parkway. I-4 provides access to important industrial areas, such as the Port of Tampa, as well as downtown Tampa and residential/commercial areas in eastern Hillsborough County and western Polk County. I-4 provides an important connection to the regional and statewide transportation network linking the Tampa Bay region to the remainder of the state and nation. On a more regional scale, I-4 extends from the I-275 interchange in downtown Tampa to I-95 in Daytona Beach. The Florida Department of Transportation has designated I-4 eastbound from Tampa as one of seven one-way evacuation routes in Florida.

The Project Development and Environment (PD&E) study will examine the need for express lane improvements along the 22.1 mile segment of I-4 from east of 50th Street (US 41/SR 583) in Hillsborough County to the Polk Parkway (SR 570) in Polk County. The express lane improvements are needed to increase the capacity and improve the operations and safety of I-4. Throughout the project study limits, I-4 typically includes six 12-foot general use lanes, 10-foot paved outside shoulders, 10-foot paved inside shoulders, and a 64-foot grassed median. The existing right-of-way (ROW) ranges from approximately 240 feet to 390 feet wide. The posted speed limit varies between 60 miles per hour (MPH) and 70 MPH.

The improvements being considered for this study include widening I-4 to accommodate four express lanes with two express lanes in each direction. The preliminary proposed typical section allows for two 11-foot express lanes, a 4-foot buffer, two 11-foot general use lanes, and one 12-foot general use lane at a minimum in each direction.

From 1995 to 1997, Southwest Florida Water Management District (SWFWMD) issued permits for the construction of a surface water management system to serve the reconstruction and widening of I-4. The project involved widening I-4 from four lanes to six lanes. The permits and permitted design calculations confirm that the stormwater management facilities (SMFs) were designed and constructed to accommodate the future build-out of I-4 to ten lanes. Therefore, right of way acquisition for additional ponds is not required. However, if during design the I-4 express lane improvements encroach on any existing permitted ponds, compensation might be required for reduction in treatment and storage capacity. **Figure 1-1** depicts the location map for I-4 from west of the Crosstown Connector to east of Mango Road.

**Figure 1-1 Project Location Map**



## 1.1 Description of Existing Facility

I-4 is a limited access facility that runs in an east and west direction with a posted speed limit that varies between 60 miles per hour (MPH) and 70 MPH. Within the project limits, I-4 is a six-lane divided highway and is classified as a Freeway System.

The existing typical section for I-4 from east of 50th Street in Hillsborough County to the Polk Parkway in Polk County consists of three (one 12-foot and two 11-foot) general use travel lanes in each direction, one 12-foot auxiliary lane in each direction, a 10-foot paved outside shoulder and a 10-foot paved inside shoulder. The Limited Access (L/A) ROW width varies along the project corridor with a minimum width of 186.5 feet and a maximum width of 390 feet. I-4 includes fourteen interchanges within the project limits. **Table 1-1** depicts existing interchanges within I-4 from east of 50$^{th}$ Street to Polk Parkway project limits.

**Table 1-1: I-4 from east of 50th Street to Polk Parkway Existing Interchanges**

| Location | Type | Movements Provided |
|---|---|---|
| North 50$^{th}$ Street | Half Diamond | To/From East |
| MLK Boulevard | Diamond | All Movements |
| Orient Road | Half Diamond | To/From West |
| US 301/Hillsborough Avenue | Diamond/Clover Leaf | All Movements via a C-D system |
| I-75 | Directional | All Movements |
| Mango Road | Diamond | All Movements |
| McIntosh Road | Diamond | All Movements |
| Branch Forbes Road | Diamond | All Movements |
| Thonotosassa Road | Diamond | All Movements |
| Alexander Street | Trumpet | From the West |
| North Wheeler Street (SR 39) | Dual-Trumpet | To/From East and To West |
| Park Road | Diamond | All Movements |
| County Line Road | Partial Clover Leaf | All Movements |
| Polk Parkway | Trumpet | All Movements |

## 1.2 Need for Project

The purpose of this project is to conduct a Project Development and Environment (PD&E) study for widening the I-4 corridor from east of 50th Street to the Polk Parkway.

Development of the Interstate 275 (I-275) and I-4 corridors within urban Tampa has been guided by the Tampa Interstate Study (TIS) that provided concept plans for approximately 37 miles of interstate improvements, including the recently completed I-4 Selmon Expressway connectors. The TIS Final

Environmental Impact Statement (FEIS) Approved Alternative provides a roadway system that includes general use lanes (GULs), separated express lanes, and a dedicated transit envelope. The master plan describes the current I-4 typical section as being consistent with the TIS FEIS. The I-4 widening project, which created the existing typical section, was completed in 2007. It includes a total of eight general use lanes (four in each direction); along with a median width sufficient for future express lanes, that are planned in the TIS FEIS between I-275 and the 50th Street interchange. The I-4 Starter Project typical section will consist of the six general use lanes (three in each direction) and one express lane (one in each direction).

The need for interstate system improvements has been extensively documented in numerous studies. Within the I-275, I-4, and I-75 corridors, eight segments were identified based on the needs assessment as potential express lane projects. The evaluation of interstate express lanes by the Tampa Bay Express (TBX) Master Plan identified projects that can provide new driver choices that will improve driver mobility on the interstate system in the Tampa Bay Region and reduce the costs drivers pay due to traffic congestion.

# 2.0 EXISTING CONDITIONS

The following sections describe the existing conditions within the project limits.

## 2.1 Collection of Traffic Data

The traffic count data was collected between January and February 2014 and used the following methods.

1. Turning Movement Counts: Four-hour turning movement counts collected during Peak periods 7 AM to 9 AM and 4 PM to 6 PM at all I-4 ramp intersections at the following locations within the study area.
    - I-4/N 50th St (2 ramps/ 2 intersections – direct, 2 ramps – indirect from E Columbus Dr)
    - I-4/Martin Luther King Jr. Blvd (4 ramps/2 intersections)
    - I-4/Orient Road (2 ramps/ 2 intersections)
    - I-4/Mango Road (4 ramps/ 2 intersections)
    - I-4/McIntosh Road (4 ramps/ 2 intersections)
    - I-4/Branch Forbes Road (4 ramps/ 2 intersections)
    - I-4/Thonotosassa Road (4 ramps/ 2 intersections)
    - I-4/Alexander Street (2 ramps, 2 frontage roads/ 1 intersection)
    - I-4/N Wheeler Street (2 ramps direct, 2 ramps indirect/ 1 intersection)
    - I-4/N Park Road (4 ramps/ 8 intersections, due to frontage roads)
    - I-4/County Line Road (4 ramps/ 8 intersections due to frontage roads)
2. Hose Counts: 24 hour approach counts at the following locations collected between Tuesday and Thursday.

    - I-4/E Hillsborough Avenue/US 301 ( 4 ramps)
    - E Hillsborough Avenue/US 301 (8 ramps)
    - I-4/I-75 ( 4 ramps to I-4, 4 ramps to I-75)
    - I-4/Polk Parkway (4 ramps)

These counts were collected during regular weekdays when schools were open. No special events or traffic incidents were identified in the general vicinity of the data collection locations during the count periods.

Since micro-simulation analyses will be employed to evaluate the future traffic operations of the EL alternatives, specific traffic data required to calibrate the CORSIM micro simulation models included 4 hour (2 hour AM and 2 hour PM) Peak period travel time runs along I-4 within the study area along with the vehicle queuing observations for I-4 off-ramps.

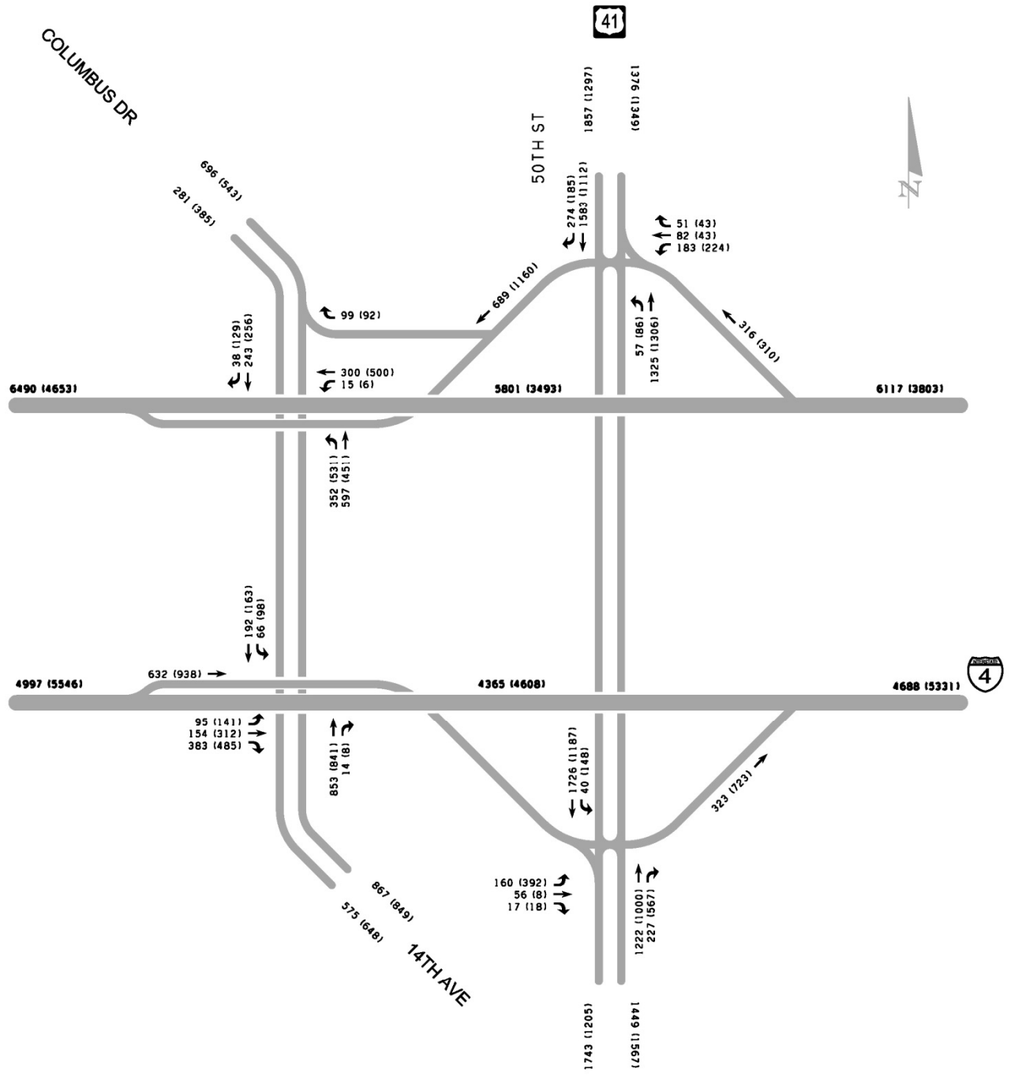
## 2.2 Methodology for the Development of Existing Year (2012) Design Hour Traffic Volumes

The following methodology was used to develop the existing year (2012) Design Hour Traffic Volumes for the I-4 mainline, ramps and ramp terminals.

1. The existing year 2012 AM and PM design hour traffic volumes for the I-4 mainline and ramps were provided by the District. These traffic volumes are included in **Appendix A.** The mainline and ramp design hour traffic volumes were reviewed for reasonableness and revisions were made at most of the locations and rebalanced for the entire I-4 corridor from the field collected data.

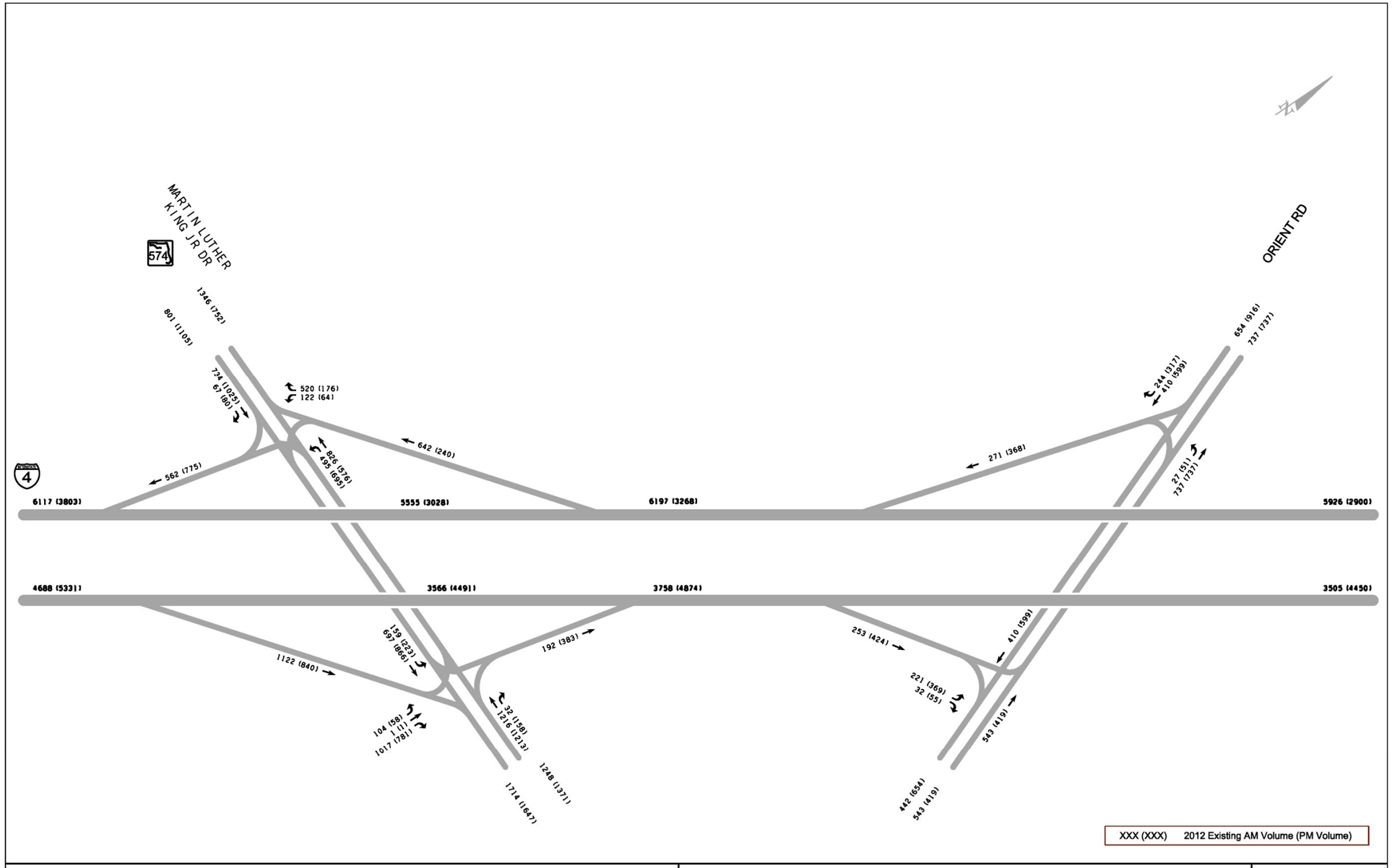
2. In addition, the existing year 2012 ramp terminal and cross street intersections turning movement volumes were estimated from the field collected turning movement counts (included in **Appendix B**) consistent with the ramp design hour volumes provided by the Department. The ramp design hour traffic volumes were used as the control volumes in estimating the existing year 2012 ramp terminal intersection turning movement volumes. The estimated 2012 AM and PM traffic volumes are shown in **Figures 2-1 to 2-9**.

Figure 2-1: Existing (2012) I-4 Mainline and Ramps DDHV and Ramp TMC's



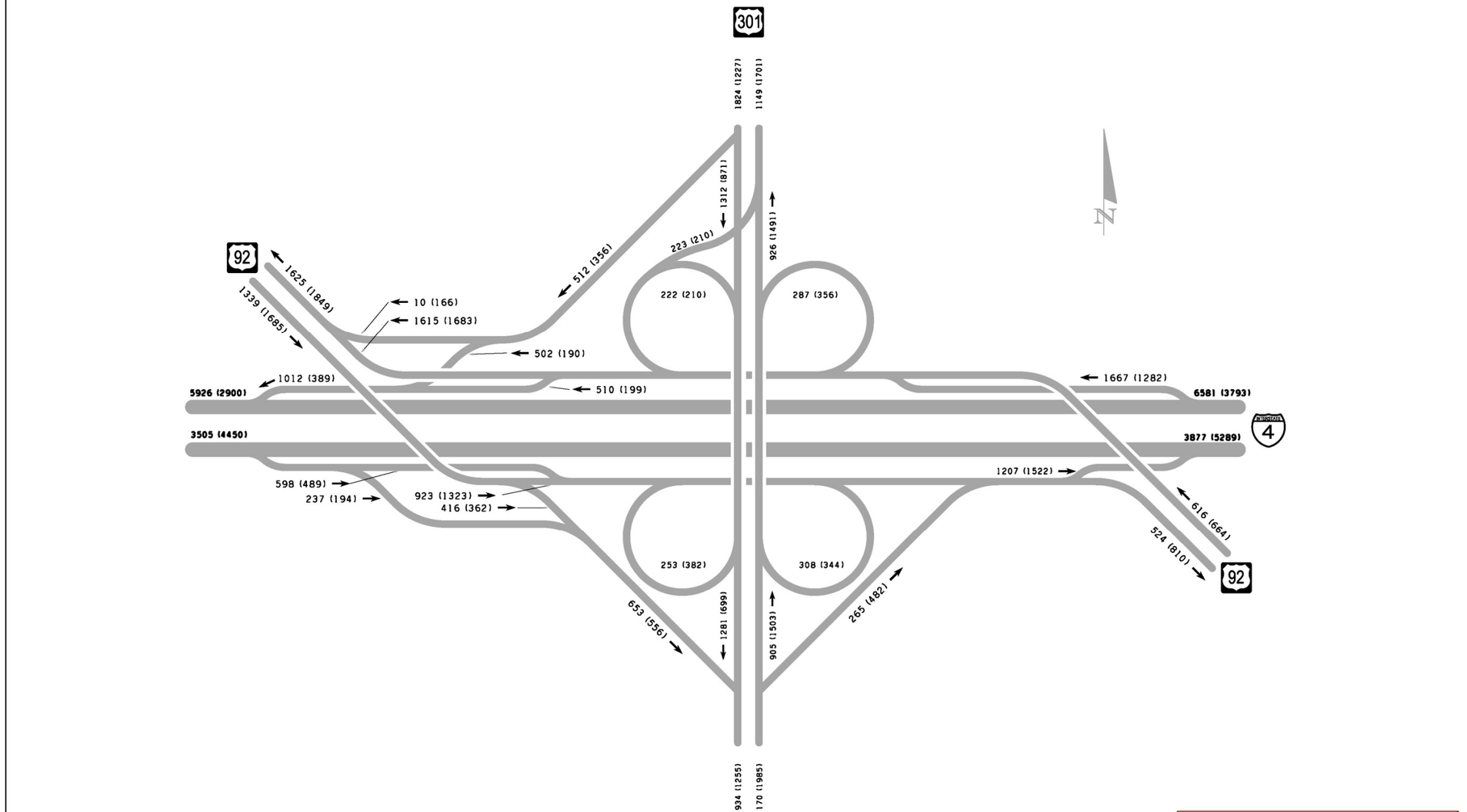

| | | |
|---|---|---|
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for Existing (2012) | Figure 2-1 |

**Figure 2-2: Existing (2012) I-4 Mainline and Ramps DDHV and Ramp TMC's**




| | | | |
|---|---|---|---|
| FDOT | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for Existing (2012) | Figure 2-2 |

Figure 2-3: Existing (2012) I-4 Mainline and Ramps DDHV and Ramp TMC's




| | | | |
|---|---|---|---|
| FDOT | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for Existing (2012) | Figure 2-3 |

**Figure 2-4: Existing (2012) I-4 Mainline and Ramps DDHV and Ramp TMC's**

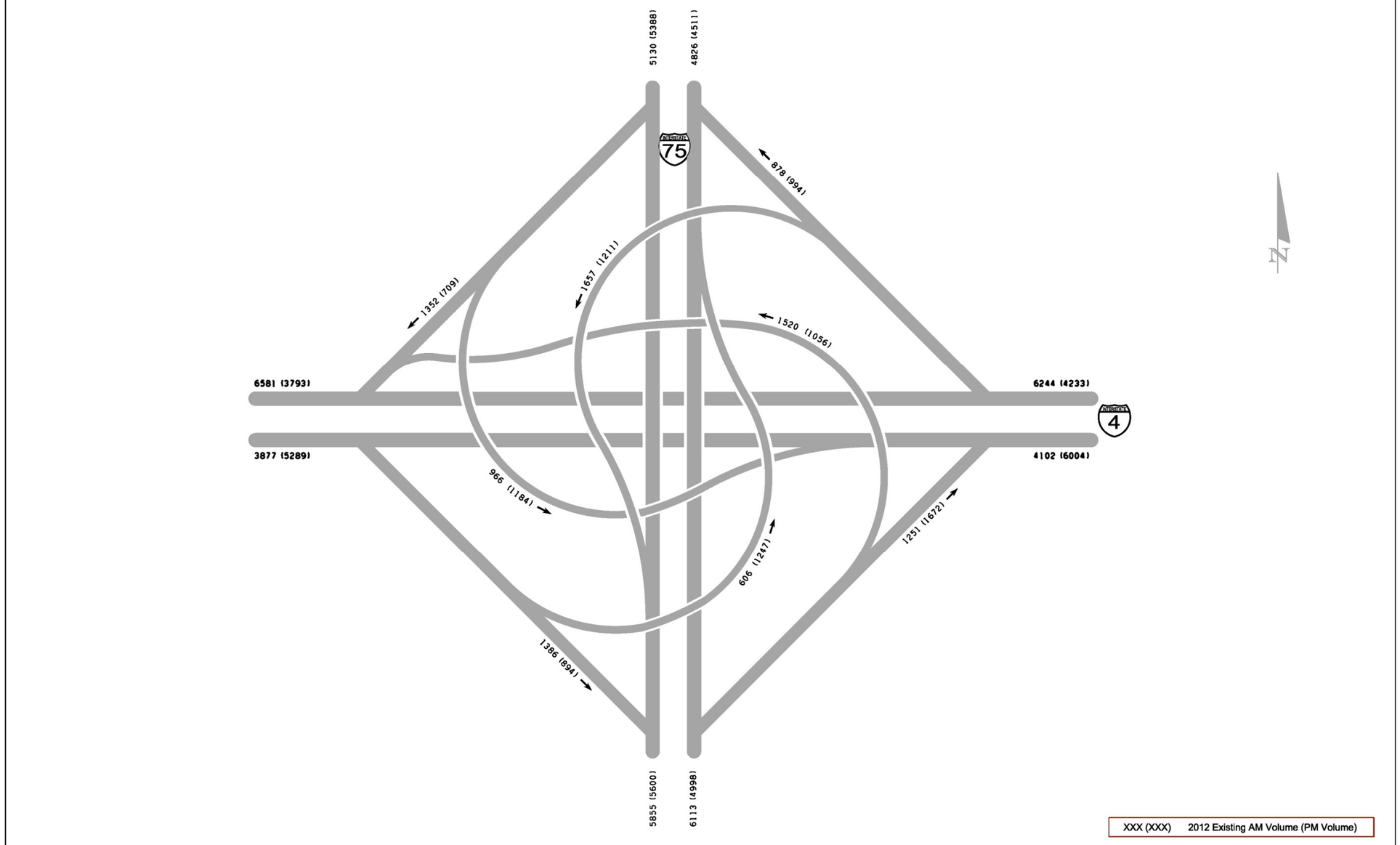
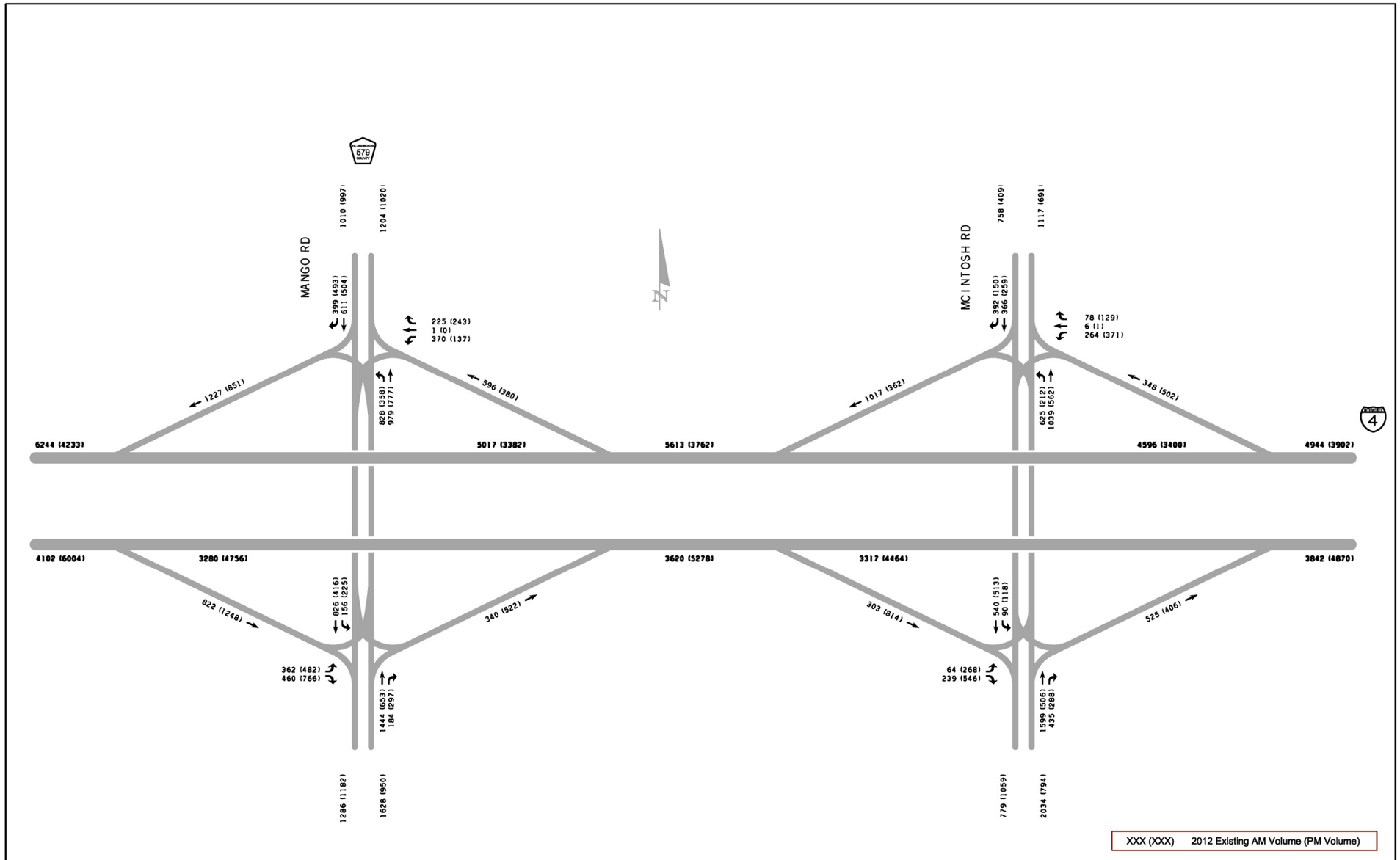
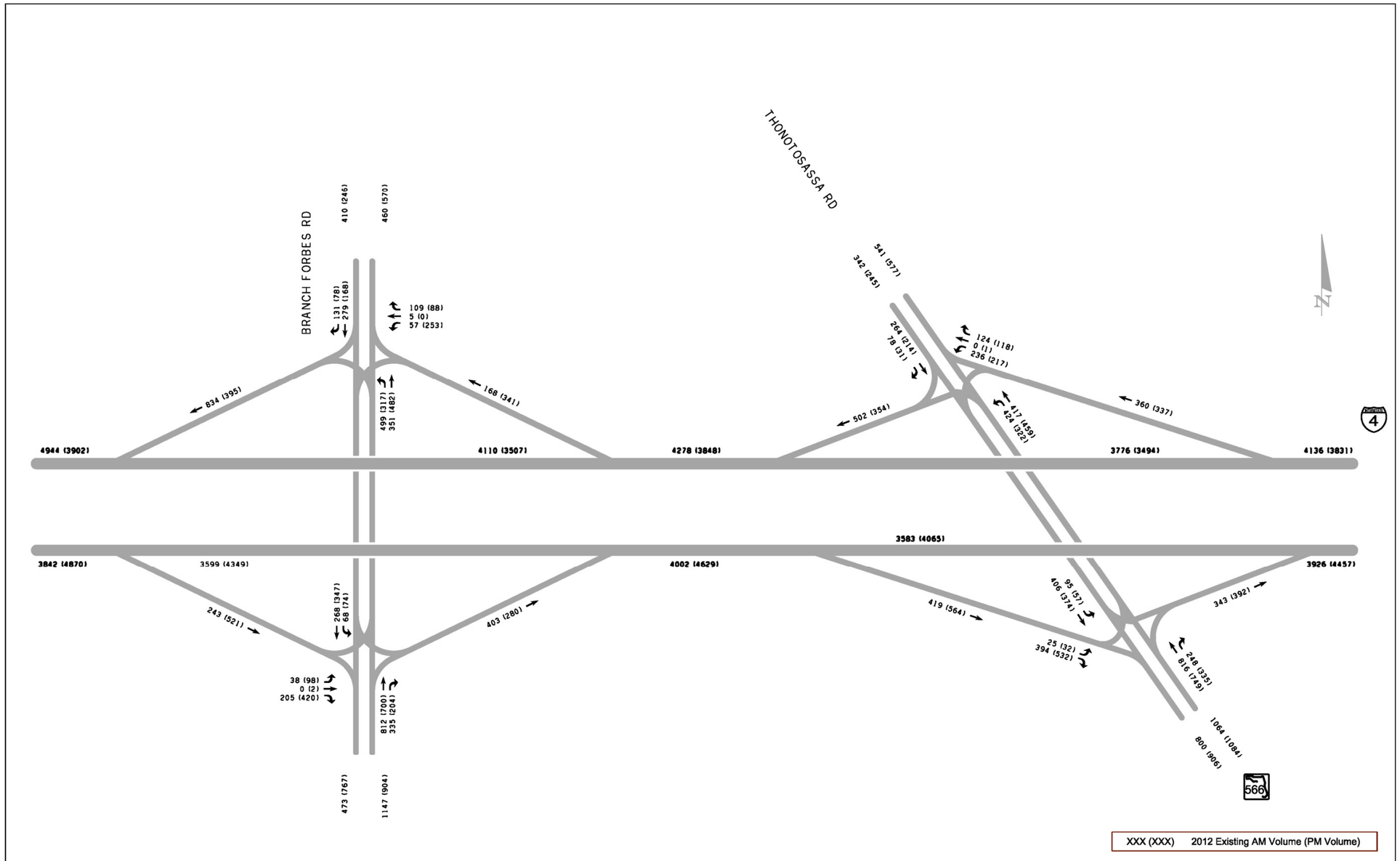


Figure 2-5: Existing (2012) I-4 Mainline and Ramps DDHV and Ramp TMC's



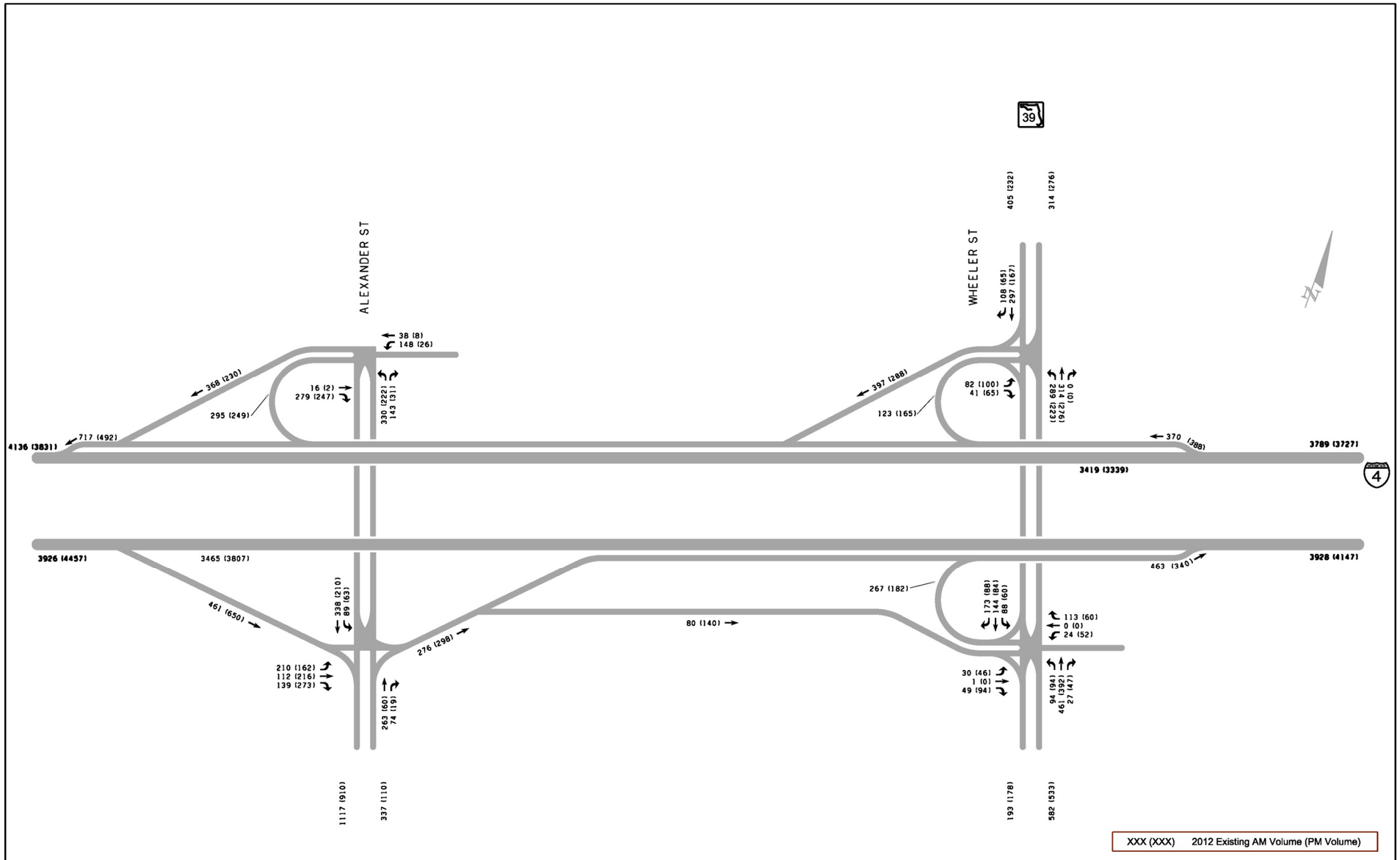

| | | |
|---|---|---|
| FDOT / TAMPA BAY EXPRESS<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for Existing (2012) | Figure 2-5 |

**Figure 2-6: Existing (2012) I-4 Mainline and Ramps DDHV and Ramp TMC's**



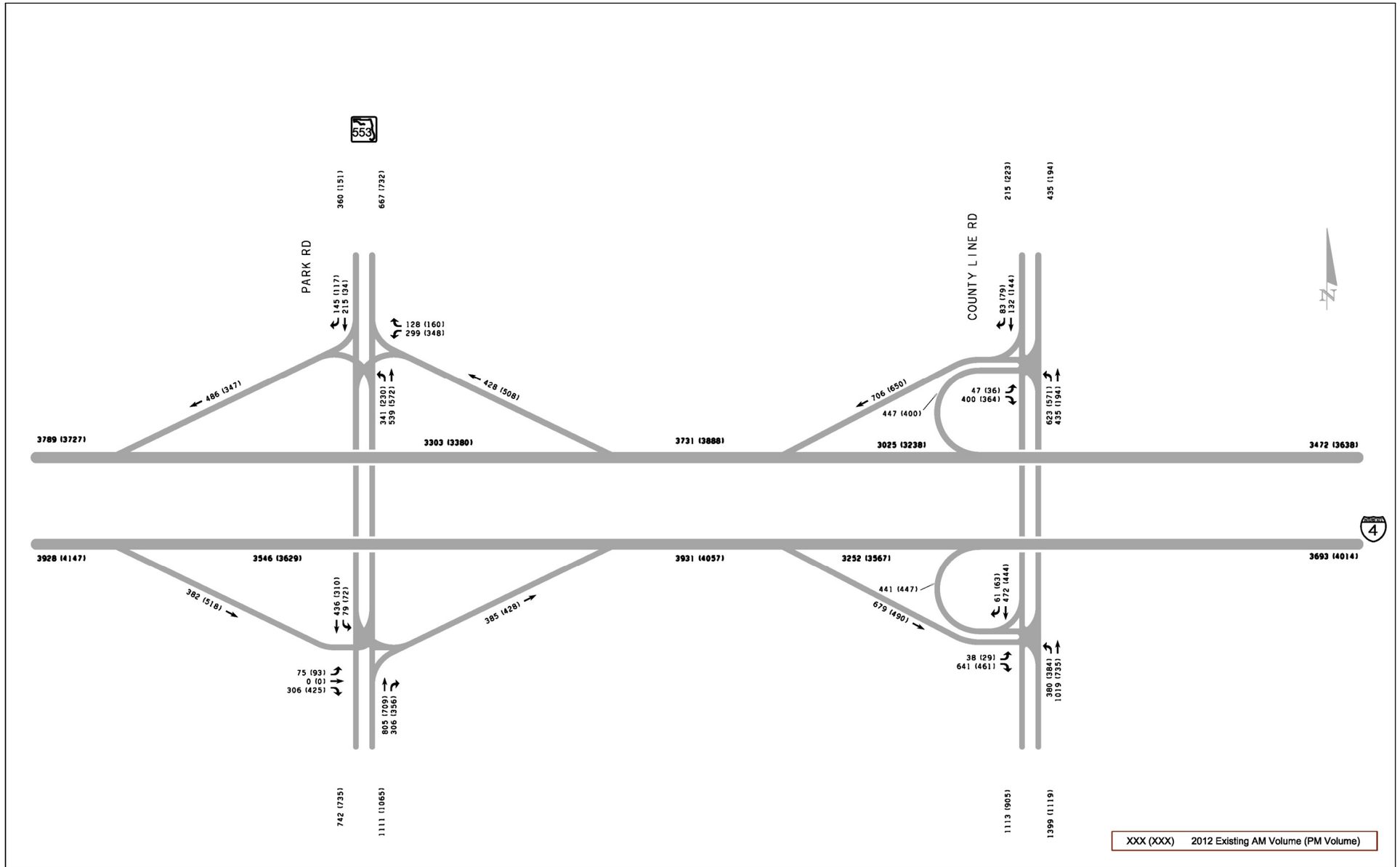

| | | | |
|---|---|---|---|
| FDOT | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for Existing (2012) | Figure 2-6 |

**Figure 2-7: Existing (2012) I-4 Mainline and Ramps DDHV and Ramp TMC's**



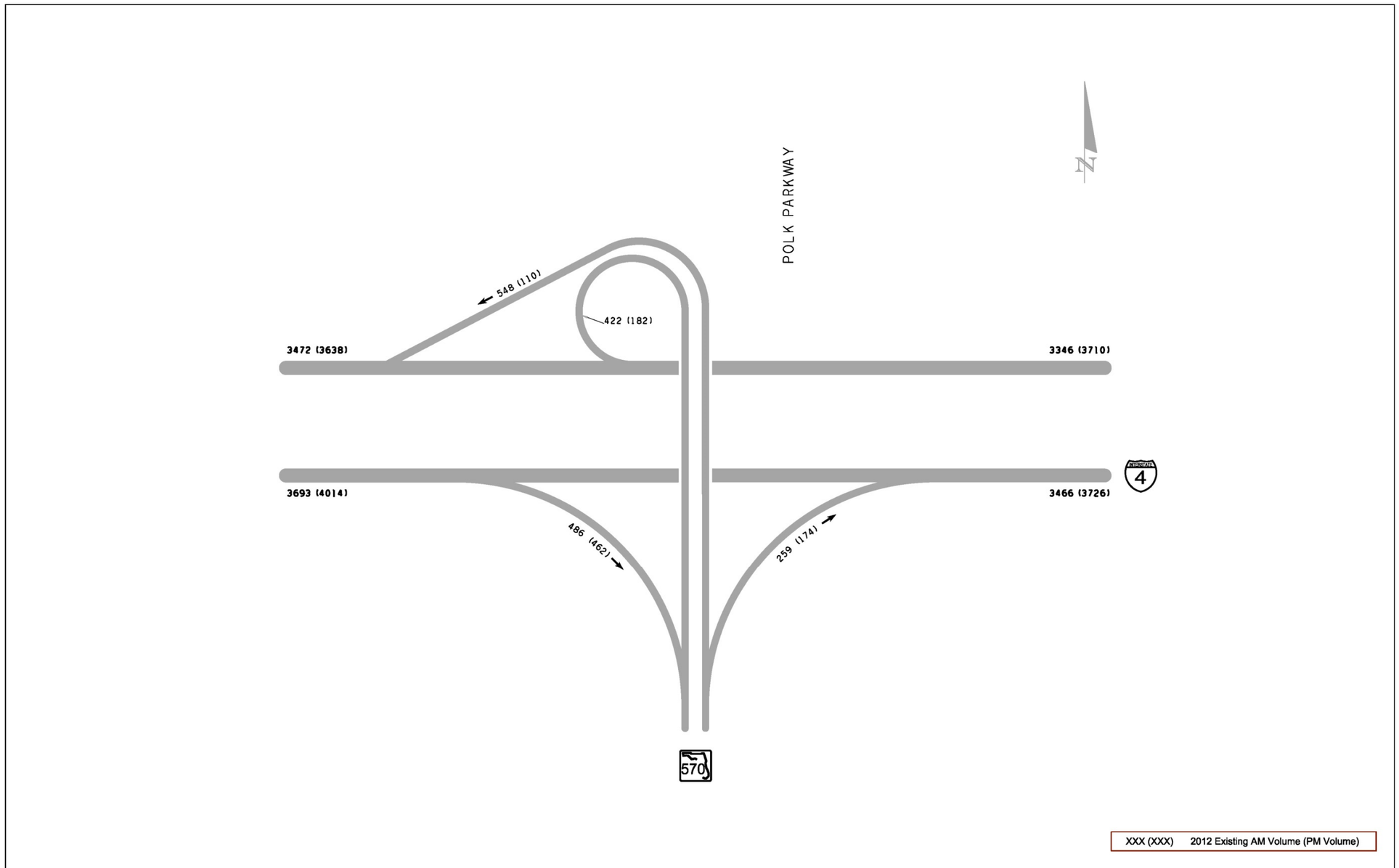

| | | |
|---|---|---|
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for Existing (2012) | Figure 2-7 |

**Figure 2-8: Existing (2012) I-4 Mainline and Ramps DDHV and Ramp TMC's**




| | | | |
|---|---|---|---|
| FDOT | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for Existing (2012) | Figure 2-8 |

**Figure 2-9: Existing (2012) I-4 Mainline and Ramps DDHV and Ramp TMC's**



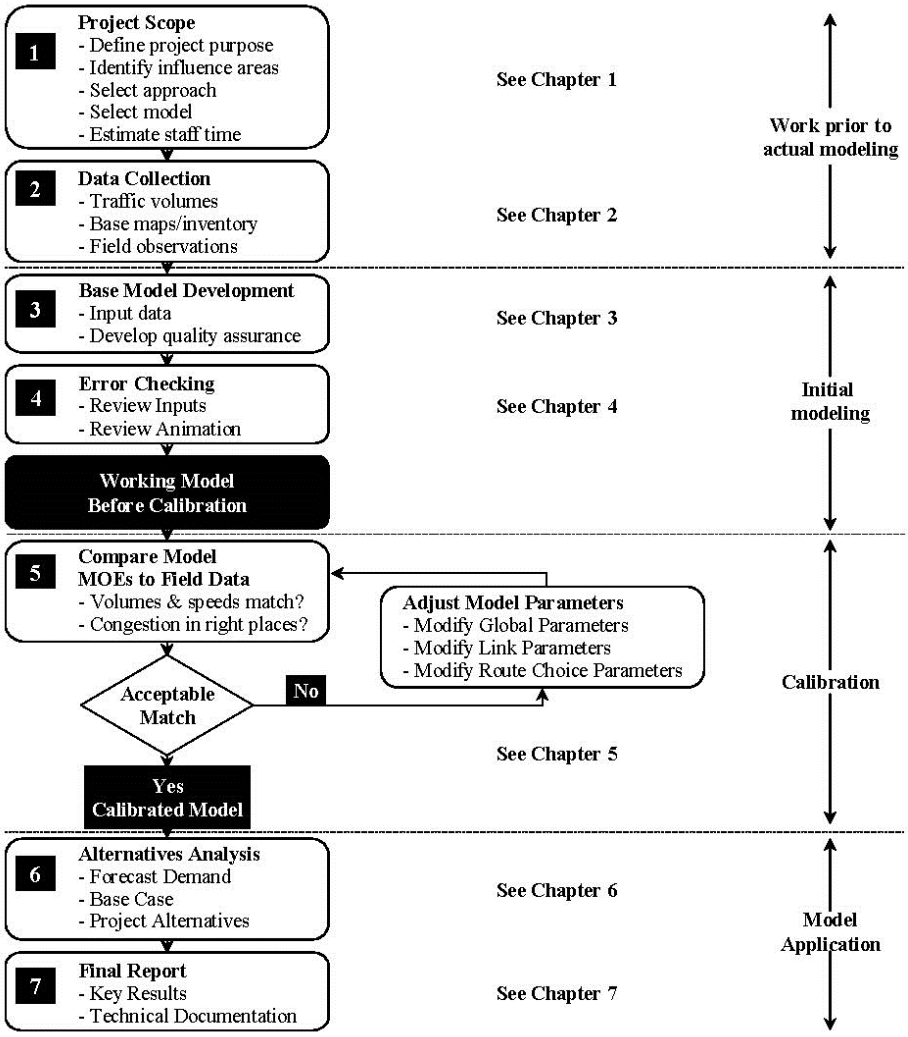

| | | |
|---|---|---|
| FDOT / TAMPA BAY EXPRESS | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for Existing (2012) — Figure 2-9 |

## 2.3 Development of the Base Year CORSIM Model

The existing (2012) traffic operational characteristics were assessed through CORSIM models utilizing existing data such as traffic counts, truck percentages, speeds, geometry, capacity, and signal timings.

CORSIM network were developed by geocoding the interchanges, including the I-4 mainline, ramps, intersecting arterials, and ramp terminal intersections, using XY coordinates generated from aerial photographs. The CORSIM models were calibrated to replicate existing traffic operating conditions, including vehicle counts and speeds on mainline and ramp sections. The methodology used in the CORSIM simulation follows the FHWA Traffic Analysis Toolbox IV as illustrated in **Figure 2-10**.

**Figure 2-10: Simulation Studies Methodology**




Developed by the FHWA Traffic Analysis Tools Team and later adapted from *Advanced Corsim Training Manual*, Short, Elliott, Hendrickson, Inc., Minnesota Department of Transportation, September 2003.

## 2.4 Traffic Volumes

Existing year count data was used for this project for the purposes of calibrating the existing conditions CORSIM model. The limits of the calibration on I-4 is west of 14th Street East to east of Mango Road. The peak hour for the CORSIM simulation was selected as the time period with the highest four consecutive 15-minute volumes (7:00-8:00 and 17:00-18:00). **Figures 2-11 to 2-14** shows the peaking characteristics of traffic on I-4 along the eastbound and westbound direction of travel within the calibration study limits.

**Figure 2-11: I-4 Between 50th Street and MLK Jr Segment Traffic Pattern**

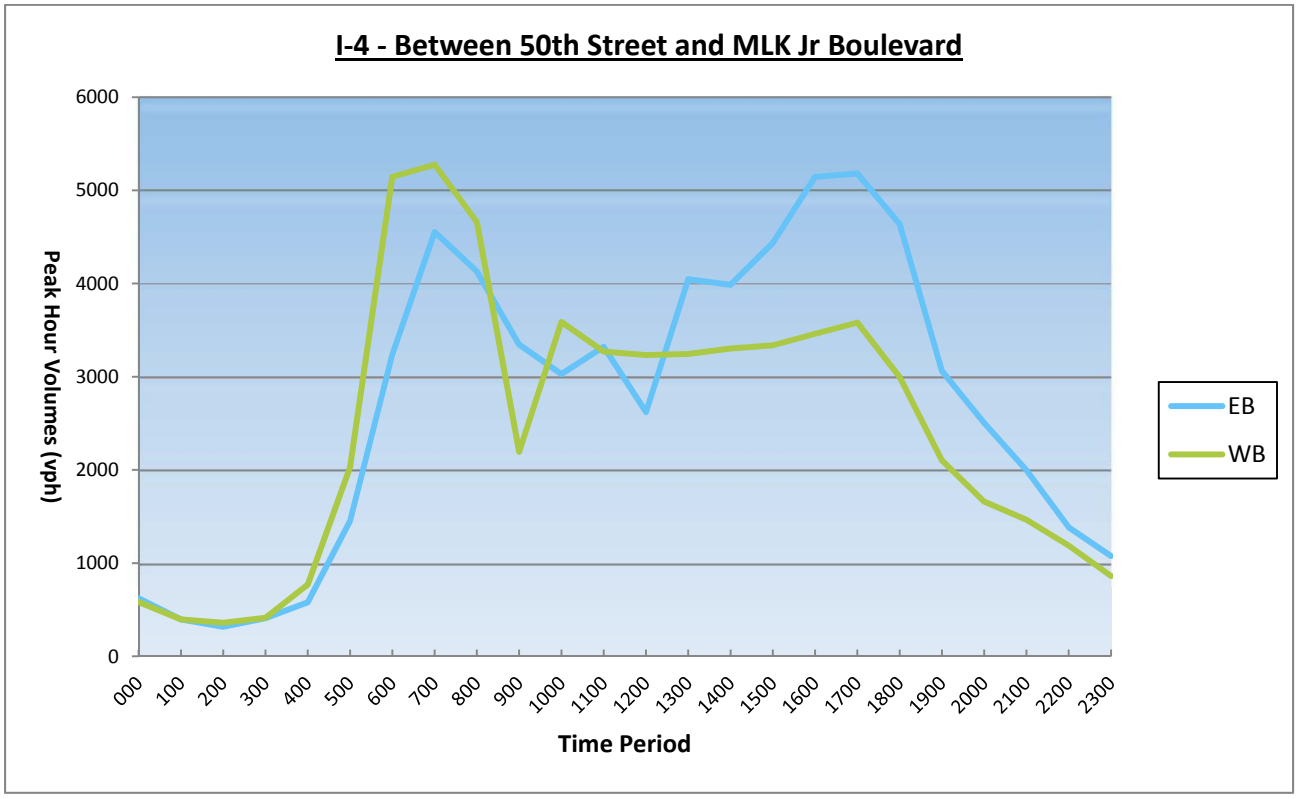


Figure 2-12: I-4 Between Orient Road and US 301 Segment Traffic Pattern

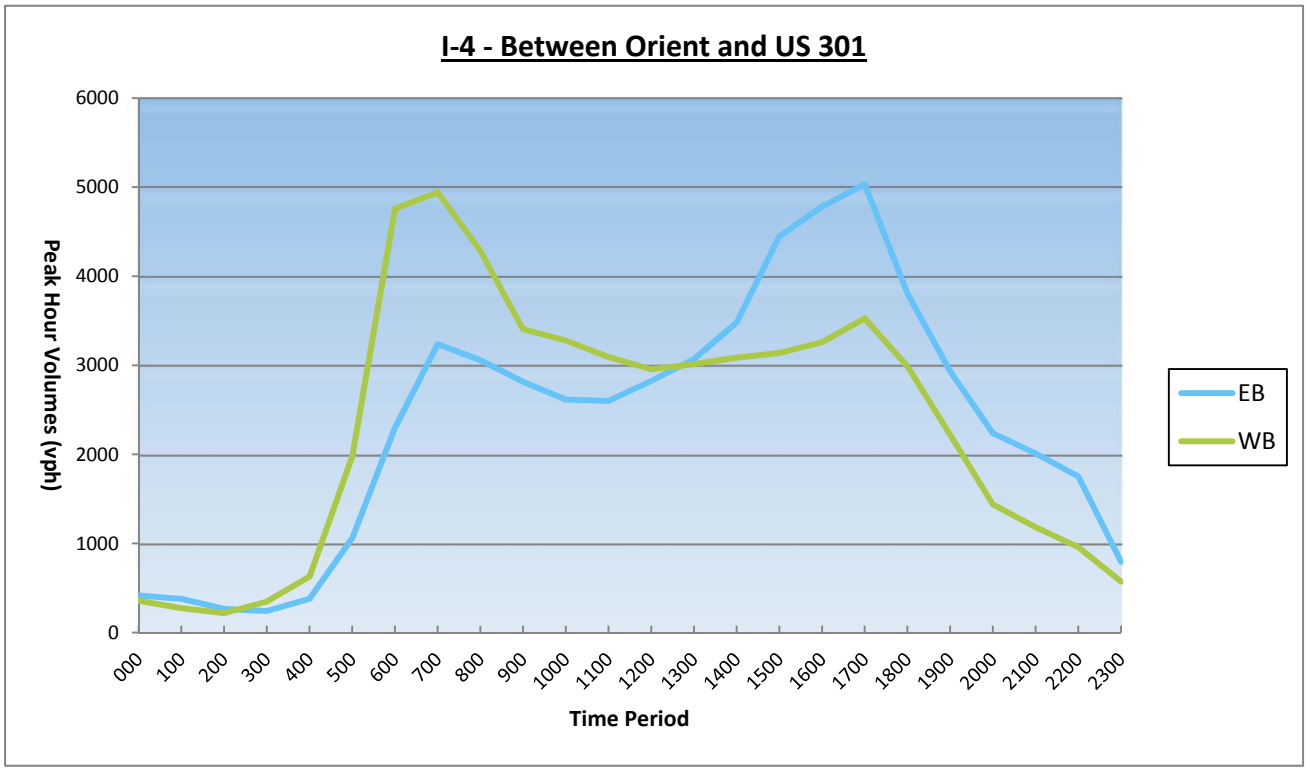



Figure 2-13: I-4 Between US 301 and I-75 Segment Traffic Pattern

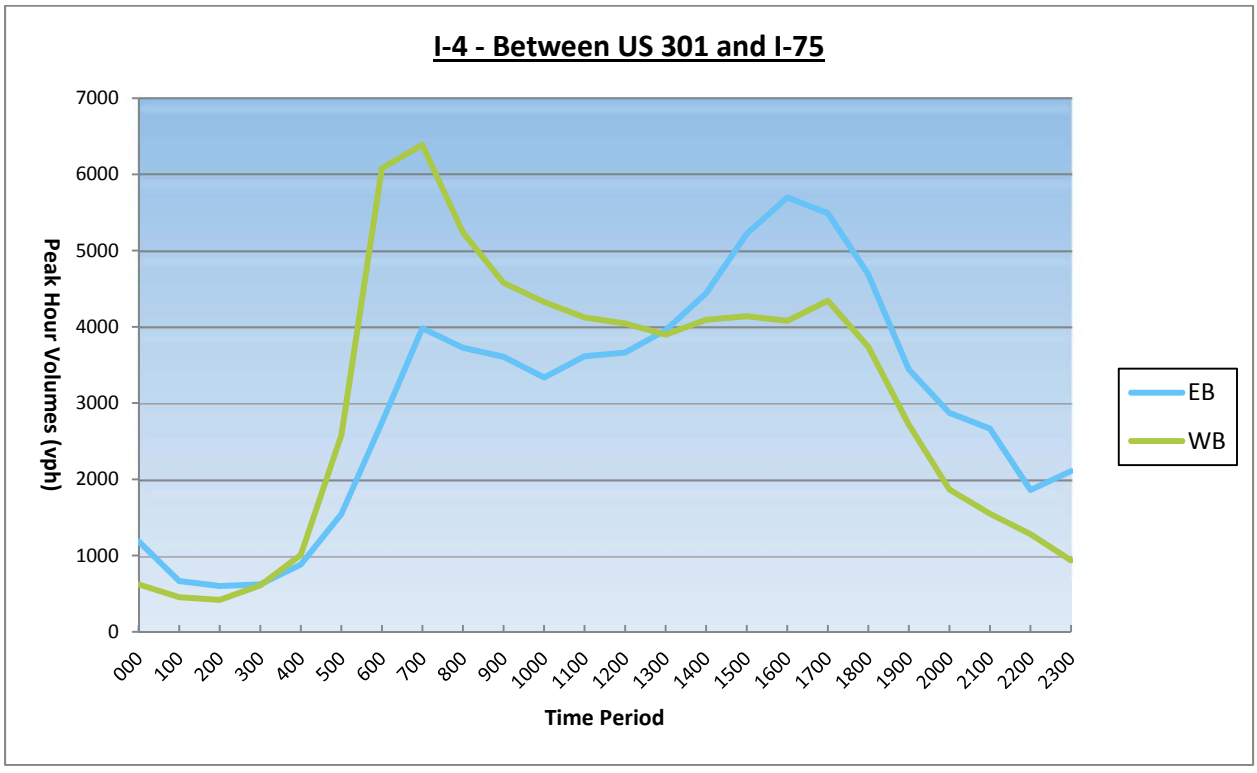
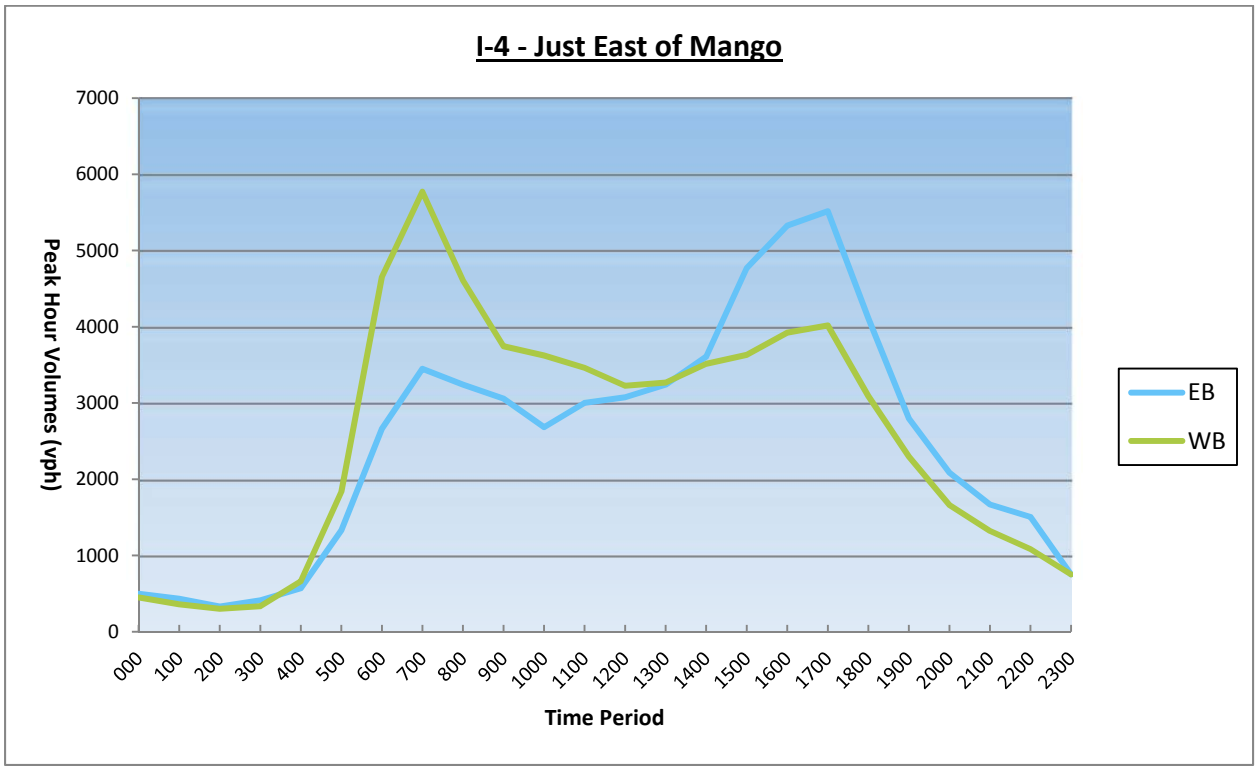


Figure 2-14: I-4 Segment Just east of Mango Road Traffic Pattern




The existing year 2012 AM and PM design hour traffic volumes for the I-4 mainline and ramps were provided by the Department. In addition, the existing year 2012 ramp terminal and cross street intersections turning movement volumes were estimated from the 2014 field-collected turning movement counts. The ramp design hour traffic volumes were used as the control volumes in estimating the existing year 2012 ramp terminal intersection turning movement volumes. These estimated 2012 AM and PM traffic volumes were previously approved by the Department and are shown in **Appendix A.**

## 2.5 Traffic Signal Data

The existing traffic signal data information was collected for all traffic signals in the project study limits from the FDOT District 7, Hillsborough County, and City of Plant City. These signal data was used in the CORSIM calibration model to simulate existing traffic conditions for both the AM and PM Peak periods.

## 2.6 CORSIM Calibration/Validation

The simulation models for the existing, 2020 starter project, 2030 starter project, 2040 master plan and 2040 no-build analysis years were built for multiple period analyses with three hours of actual simulation time. The volumes used in the simulation hours adjacent to the peak hour were scaled down globally from the peak-hour volumes based on FTI synopsis reports counts or field-measured counts by using the weighted average ratio of adjacent peak-hour volumes for all the locations to actual peak-hour volumes and weighting these ratios by peak-hour volumes for all the locations in order to obtain the ratios for the AM and PM peak periods.

For the AM the simulation hours adjacent to the peak hours were scaled down by a factor of 0.82 and 0.88 and for the PM the simulation hours adjacent to the peak hours were scaled down by a factor of 0.98 and 0.80 respectively.

AM and PM CORSIM models were prepared for calibration and a review of the CORSIM networks and traffic data inputs were performed to ensure the network and traffic data reflect the desired model scenarios. No “Fatal Error” messages occurred with any of the modeled scenarios.

### 2.6.1 Network Coding

Aerials for the project were used to develop the 2012 base year and the existing condition models. CORSIM models are provided in Appendix D (on CD).

### 2.6.2 Conditional Turn Movement Inputs

Conditional turn movement is used to prevent vehicles from making a series of unrealistic turn movements, that is, it prohibits vehicles from making a series of consecutive left turns (for example, going around a block). The NETSIM model normally applies turn movement percentages to all vehicles entering a link, regardless of their previous path. Conditional turn movement allows defining discharge turn percentages that are conditioned on the basis of entry movement. Therefore, the percentage of vehicles executing left turns after entering via a left turn can be made substantially less than the percentage of vehicles executing left turns after entering via a through movement.

### 2.6.3 Network Calibration Checks

A model validation was performed for the existing condition analysis. The link volumes were compared to the input data reported in existing traffic figures.

Model runs were performed for the AM and PM peak hour as part of the existing year model validation to address stochastic variance in the model. The results of the model validation of link volumes showed the base model performs well within acceptable ranges based on calibration standards from the FHWA Traffic Analysis Toolbox. These results represent a strong model correlation to existing count data and an acceptable model validation for use in this project.

The calibration checks performed during model calibration are shown below:

1. Individual link flows:
    a. Low volume (1a) is defined as <700 vph delta within 100 vph of field flow for >85% of cases.
    b. Medium volume (1b) is defined as between 700 to 2,700 vph within 15% of field flow for >85% of cases.
    c. High volume (1c) is defined as >2,700 vph delta within 400 vph of field flow for >85% of cases.
2. Sum of all link flows within 5% of sum of all link counts.
3. Geoffrey E. Havers (GEH) statistics for individual link flows <5 for >85% of cases.
4. GEH statistics for sum of all link flows <5.
5. The difference between the actual field speed data to modeled speed values are within 15%.

The GEH statistics is calculated as:

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

Where M is the hourly traffic volume from the traffic model and C is the real-world hourly traffic count.

The speed data from field for the model calibration was collected by performing travel time runs from March 4 to March 6, 2014 for the AM Peak and from March 4 to March 5, 2014 for the PM Peak. The PM Peak travel time runs were not performed on March 6, 2014 due to a crash causing a significant backup within the study limits. Alternatively, the travel time runs for the PM Peak were conducted on March 11, 2014.

The average speeds among the runs were used for the validation efforts. The travel time runs is a space-mean speed data similar to the speed data reported by the CORSIM model. The speed data information is provided in **Appendix C**.

**Tables 2-1 to 2-4** summarizes volume and speed calibration results for the AM and PM peak hours for the I-4 segment from west of 14th Street/Columbus Drive to East of Mango Road.

## Table 2-1: I-4 Segment AM Peak – Volume Calibration

| Location | Nodes (from, to) | Field Volume C (vph) | Model Volume M (vph) | Difference (M-C) [1] | Percent Difference | Low Volume 1a (value) [1] | Medium Volume 1b (value) [1] | Medium Volume 1b (%) | High Volume 1c (value) [1] | GEH Statistics |
|---|---|---|---|---|---|---|---|---|---|---|
| **I-4 Eastbound** | | | | | | | | | | |
| West of 14th Street East | (283,75) | 4,997 | 4,968 | (29) | -1% | - | - | - | (29) | 0.4 |
| Exit ramp to 14th Street East/50th Street | (75,138) | 632 | 638 | 6 | 1% | 6 | - | - | - | 0.2 |
| Entrance ramp from 14th Street East/50th Street | (141,106) | 323 | 300 | (23) | -7% | (23) | - | - | - | 1.3 |
| Between 50th Street and MLK Jr Boulevard | (106,8) | 4,688 | 4,589 | (99) | -2% | - | - | - | (99) | 1.5 |
| Exit ramp to MLK Jr Boulevard | (8,32) | 1,122 | 1,116 | (6) | -1% | - | (6) | -1% | - | 0.2 |
| Entrance ramp from MLK Jr Boulevard | (69,6) | 192 | 163 | (29) | -15% | (29) | - | - | - | 2.2 |
| Between MLK Jr Boulevard and Orient Rd | (6,46) | 3,758 | 3,636 | (122) | -3% | - | - | - | (122) | 2.0 |
| Exit ramp to Orient Rd | (46,67) | 253 | 240 | (13) | -5% | (13) | - | - | - | 0.8 |
| West of US 301/US 92 | (46,205) | 3,505 | 3,392 | (113) | -3% | - | - | - | (113) | 1.9 |
| Exit ramp to US 301/US 92 | (205,47) | 835 | 814 | (21) | -3% | - | (21) | -3% | - | 0.7 |
| Entrance ramp from US 301/US 92 | (234,18) | 1,207 | 1,311 | 104 | 9% | - | 104 | 9% | - | 2.9 |
| Between US 301/US 92 and I-75 | (18,23) | 3,877 | 3,977 | 100 | 3% | - | - | - | 100 | 1.6 |
| Exit ramp to I-75 | (23,85) | 1,992 | 2,094 | 102 | 5% | - | 102 | 5% | - | 2.3 |
| Entrance ramp from I-75 SB | (130,26) | 966 | 925 | (41) | -4% | - | (41) | -4% | - | 1.3 |
| Between I-75 SB on-ramp and I-75 NB on-ramp | (26,27) | 2,851 | 2,834 | (17) | -1% | - | - | - | (17) | 0.3 |
| Entrance ramp from I-75 NB | (124,27) | 1,251 | 1,315 | 64 | 5% | - | 64 | 5% | - | 1.8 |
| Between I-75 and Mango Rd | (28,245) | 4,102 | 3,996 | (106) | -3% | - | - | - | (106) | 1.7 |
| Exit ramp to Mango Rd | (245,342) | 822 | 820 | (2) | 0% | - | (2) | 0% | - | 0.1 |
| Entrance ramp from Mango Rd | (253,246) | 340 | 303 | (37) | -11% | (37) | - | - | - | 2.1 |
| East of Mango Rd | (246,252) | 3,620 | 3,571 | (49) | -1% | - | - | - | (49) | 0.8 |
| | | | | | | | | | | |

| Location | Nodes (from, to) | Field Volume C (vph) | Model Volume M (vph) | Difference (M-C) [1] | Percent Difference | Low Volume 1a (value) [1] | Medium Volume 1b (value) [1] | Medium Volume 1b (%) | High Volume 1c (value) [1] | GEH Statistics |
|---|---|---|---|---|---|---|---|---|---|---|
| **I-4 Westbound** | | | | | | | | | | |
| East of Mango Rd | (254,255) | 5,613 | 5,604 | (9) | 0% | - | - | - | (9) | 0.1 |
| Exit ramp to Mango Rd | (255,343) | 596 | 537 | (59) | -10% | (59) | - | - | - | 2.5 |
| Entrance ramp from Mango Rd | (256,247) | 1,227 | 1,156 | (71) | -6% | - | (71) | -6% | - | 2.1 |
| Between Mango Rd and I-75 | (247,29) | 6,244 | 6,104 | (140) | -2% | - | - | - | (140) | 1.8 |
| Exit ramp to I-75 | (30,94) | 2,535 | 2,552 | 17 | 1% | - | 17 | 1% | - | 0.3 |
| Entrance ramp from I-75 | (110,37) | 2,872 | 2,786 | (86) | -3% | - | - | - | (86) | 1.6 |
| Between I-75 and US 301/US 92 | (41,42) | 6,581 | 6,384 | (197) | -3% | - | - | - | (197) | 2.4 |
| Exit ramp to US 301/US 92 | (42,262) | 1,667 | 1,740 | 73 | 4% | - | 73 | 4% | - | 1.8 |
| Entrance ramp from US 301/US 92 | (267,265) | 1,012 | 1,007 | (5) | 0% | - | (5) | 0% | - | 0.2 |
| Between US 301/US 92 on-ramp and Orient Rd on-ramp | (265,43) | 5,926 | 5,628 | (298) | -5% | - | - | - | (298) | 3.9 |
| Entrance ramp from Orient Rd | (65,43) | 271 | 243 | (28) | -10% | (28) | - | - | - | 1.7 |
| Between Orient Rd and MLK Jr Boulevard | (43,5) | 6,197 | 5,951 | (246) | -4% | - | - | - | (246) | 3.2 |
| Exit ramp to MLK Jr Boulevard | (5,38) | 642 | 720 | 78 | 12% | - | 78 | 12% | - | 3.0 |
| Entrance ramp from MLK Jr Boulevard | (22,7) | 562 | 531 | (31) | -6% | (31) | - | - | - | 1.3 |
| Between MLK Jr Boulevard and 50th Street | (7,107) | 6,117 | 5,983 | (134) | -2% | - | - | - | (134) | 1.7 |
| Exit ramp to 50th Street/14th Street East | (107,136) | 316 | 348 | 32 | 10% | 32 | - | - | - | 1.8 |
| Entrance ramp from 50th Street/14th Street East | (73,93) | 689 | 663 | (26) | -4% | (26) | - | - | - | 1.0 |
| West of 14th Street East | (93,268) | 6,490 | 6,444 | (46) | -1% | - | - | - | (46) | 0.6 |
| | Total | 96,890 | 95,384 | (1,506) | -2% | | | | | 4.9 |
| | | | % met | -2% | | 100% | | 100% | 100% | 100% |
| | | | Calibration Check # | 2 | | 1a | | 1b | 1c | 3 |

Note 1: Parentheses denote links on which CORSIM was underestimating values.

## Table 2-2: I-4 Segment AM Peak – Speed Calibration

| Location | Nodes (from, to) | Speed from Field Data C (MPH) | Speed from CORSIM Model M (MPH) | Difference (M-C) [1] | Calibration Check |
|---|---|---|---|---|---|
| **I-4 Eastbound** | | | | | |
| West of 14th Street East | (283,75) | 62.91 | 61.73 | (1.18) | -2% |
| Between 14th Street East and 50th Street | (74,106) | 63.55 | 61.41 | (2.14) | -3% |
| Between 50th Street and MLK Jr Boulevard | (106,8) | 65.05 | 57.95 | (7.10) | -11% |
| Between MLK Jr Boulevard ramps | (8,6) | 65.92 | 61.82 | (4.10) | -6% |
| Between MLK Jr Boulevard and Orient Rd | (6,46) | 66.58 | 61.15 | (5.43) | -8% |
| West of US 301/US 92 | (46,205) | 65.66 | 62.65 | (3.01) | -5% |
| Between US 301/US 92 ramps | (216,217) | 66.26 | 62.53 | (3.73) | -6% |
| Between US 301/US 92 and I-75 exit ramp | (18,23) | 65.58 | 56.76 | (8.82) | -13% |
| Between I-75 exit ramp and I-75 SB entrance ramp | (23,24) | 66.77 | 63.36 | (3.41) | -5% |
| Between I-75 SB on-ramp and I-75 NB on-ramp | (26,27) | 65.47 | 60.24 | (5.23) | -8% |
| Between I-75 and Mango Rd | (28,245) | 68.36 | 64.67 | (3.69) | -5% |
| Between Mango Rd ramps | (245,246) | 68.36 | 66.76 | (1.60) | -2% |
| East of Mango Rd | (246,252) | 69.66 | 66.40 | (3.26) | -5% |
| | **Average** | 66.16 | 62.11 | (4.05) | -6% |
| **I-4 Westbound** | | | | | |
| East of Mango Rd | (254,255) | 67.18 | 65.13 | (2.05) | -3% |
| Between Mango Rd ramps | (255,247) | 60.66 | 64.39 | 3.73 | 6% |
| Between Mango Rd and I-75 | (247,29) | 59.78 | 60.95 | 1.18 | 2% |
| Between I-75 exit ramp and I-75 entrance ramp | (34,35) | 65.62 | 62.21 | (3.41) | -5% |
| Between I-75 and US 301/US 92 | (41,42) | 66.38 | 56.64 | (9.74) | -15% |
| Between US 301/US 92 ramps | (260,261) | 64.83 | 61.25 | (3.58) | -6% |
| Between US 301/US 92 on-ramp and Orient Rd on-ramp | (265,43) | 63.59 | 60.82 | (2.77) | -4% |
| Between Orient Rd and MLK Jr Boulevard | (43,5) | 63.67 | 58.72 | (4.95) | -8% |
| Between MLK Jr Boulevard ramps | (5,7) | 60.81 | 59.37 | (1.44) | -2% |
| Between MLK Jr Boulevard and 50th Street | (7,107) | 58.52 | 57.49 | (1.03) | -2% |
| Between 50th Street and 14th Street East | (87,90) | 60.19 | 60.65 | 0.46 | 1% |
| West of 14th Street East | (93,268) | 59.80 | 61.48 | 1.68 | 3% |
| | **Average** | 62.58 | 60.76 | (1.83) | -3% |

Note 1: Parentheses denote links on which CORSIM was underestimating values.

The speed calibration shows that the difference between the field speed data and modeled speed values are within the acceptable 15% criteria required by FHWA with an overall average speed difference of 6% for the eastbound and 3% for the westbound directions.

## Table 2-3. I-4 Segment PM Peak – Volume Calibration

| Location | Nodes (from, to) | Field Volume C (vph) | Model Volume M (vph) | Difference (M-C) [1] | Percent Difference | Low Volume 1a (value) [1] | Medium Volume 1b (value) [1] | Medium Volume 1b (%) | High Volume 1c (value) [1] | GEH Statistics |
|---|---|---|---|---|---|---|---|---|---|---|
| **I-4 Eastbound** | | | | | | | | | | |
| West of 14th Street East | (283,75) | 5,546 | 5,476 | (70) | -1% | - | - | - | (70) | 0.9 |
| Exit ramp to 14th Street East/50th Street | (75,138) | 938 | 944 | 6 | 1% | - | 6 | 1% | - | 0.2 |
| Entrance ramp from 14th Street East/50th Street | (141,106) | 723 | 705 | (18) | -2% | - | (18) | -2% | - | 0.7 |
| Between 50th Street and MLK Jr Boulevard | (106,8) | 5,331 | 5,226 | (105) | -2% | - | - | - | (105) | 1.5 |
| Exit ramp to MLK Jr Boulevard | (8,32) | 840 | 852 | 12 | 1% | - | 12 | 1% | - | 0.4 |
| Entrance ramp from MLK Jr Boulevard | (69,6) | 383 | 374 | (9) | -2% | (9) | - | - | - | 0.5 |
| Between MLK Jr Boulevard and Orient Rd | (6,46) | 4,874 | 4,756 | (118) | -2% | - | - | - | (118) | 1.7 |
| Exit ramp to Orient Rd | (46,67) | 424 | 403 | (21) | -5% | (21) | - | - | - | 1.0 |
| West of US 301/US 92 | (46,205) | 4,450 | 4,356 | (94) | -2% | - | - | - | (94) | 1.4 |
| Exit ramp to US 301/US 92 | (205,47) | 683 | 724 | 41 | 6% | - | 41 | 6% | - | 1.5 |
| Entrance ramp from US 301/US 92 | (234,18) | 1,522 | 1,451 | (71) | -5% | - | (71) | -5% | - | 1.8 |
| Between US 301/US 92 and I-75 | (18,23) | 5,289 | 5,250 | (39) | -1% | - | - | - | (39) | 0.5 |
| Exit ramp to I-75 | (23,85) | 2,141 | 2,100 | (41) | -2% | - | (41) | -2% | - | 0.9 |
| Entrance ramp from I-75 SB | (130,26) | 1,184 | 1,228 | 44 | 4% | - | 44 | 4% | - | 1.3 |
| Between I-75 SB on-ramp and I-75 NB on-ramp | (26,27) | 4,332 | 4,462 | 130 | 3% | - | - | - | 130 | 2.0 |
| Entrance ramp from I-75 NB | (124,27) | 1,672 | 1,708 | 36 | 2% | - | 36 | 2% | - | 0.9 |
| Between I-75 and Mango Rd | (28,245) | 6,004 | 5,940 | (64) | -1% | - | - | - | (64) | 0.8 |
| Exit ramp to Mango Rd | (245,342) | 1,248 | 1,180 | (68) | -5% | - | (68) | -5% | - | 2.0 |
| Entrance ramp from Mango Rd | (253,246) | 522 | 516 | (6) | -1% | (6) | - | - | - | 0.3 |
| East of Mango Rd | (246,252) | 5,278 | 5,450 | 172 | 3% | - | - | - | 172 | 2.3 |
| | | | | | | | | | | |

| Location | Nodes (from, to) | Field Volume C (vph) | Model Volume M (vph) | Difference (M-C) [1] | Percent Difference | Low Volume 1a (value) [1] | Medium Volume 1b (value) [1] | Medium Volume 1b (%) | High Volume 1c (value) [1] | GEH Statistics |
|---|---|---|---|---|---|---|---|---|---|---|
| **I-4 Westbound** | | | | | | | | | | |
| East of Mango Rd | (254,255) | 3,762 | 3,726 | (36) | -1% | - | - | - | (36) | 0.6 |
| Exit ramp to Mango Rd | (255,343) | 380 | 374 | (6) | -2% | (6) | - | - | - | 0.3 |
| Entrance ramp from Mango Rd | (256,247) | 851 | 872 | 21 | 2% | - | 21 | 2% | - | 0.7 |
| Between Mango Rd and I-75 | (247,29) | 4,233 | 4,168 | (65) | -2% | - | - | - | (65) | 1.0 |
| Exit ramp to I-75 | (30,94) | 2,205 | 2,196 | (9) | 0% | - | (9) | 0% | - | 0.2 |
| Entrance ramp from I-75 | (110,37) | 1,765 | 1,678 | (87) | -5% | - | (87) | -5% | - | 2.1 |
| Between I-75 and US 301/US 92 | (41,42) | 3,793 | 3,700 | (93) | -2% | - | - | - | (93) | 1.5 |
| Exit ramp to US 301/US 92 | (42,262) | 1,282 | 1,228 | (54) | -4% | - | (54) | -4% | - | 1.5 |
| Entrance ramp from US 301/US 92 | (267,265) | 389 | 373 | (16) | -4% | (16) | - | - | - | 0.8 |
| Between US 301/US 92 on-ramp and Orient Rd on-ramp | (265,43) | 2,900 | 2,840 | (60) | -2% | - | - | - | (60) | 1.1 |
| Entrance ramp from Orient Rd | (65,43) | 368 | 352 | (16) | -4% | (16) | - | - | - | 0.8 |
| Between Orient Rd and MLK Jr Boulevard | (43,5) | 3,268 | 3,238 | (30) | -1% | - | - | - | (30) | 0.5 |
| Exit ramp to MLK Jr Boulevard | (5,38) | 240 | 299 | 59 | 25% | 59 | - | - | - | 3.6 |
| Entrance ramp from MLK Jr Boulevard | (22,7) | 775 | 773 | (2) | 0% | - | (2) | 0% | - | 0.1 |
| Between MLK Jr Boulevard and 50th Street | (7,107) | 3,803 | 3,825 | 22 | 1% | - | - | - | 22 | 0.4 |
| Exit ramp to 50th Street/14th Street East | (107,136) | 310 | 355 | 45 | 15% | 45 | - | - | - | 2.5 |
| Entrance ramp from 50th Street/14th Street East | (73,93) | 1,160 | 1,125 | (35) | -3% | - | (35) | -3% | - | 1.0 |
| West of 14th Street East | (93,268) | 4,653 | 4,424 | (229) | -5% | - | - | - | (229) | 3.4 |
| | Total | 89,521 | 88,646 | (875) | -1% | | | | | 2.9 |
| | | | % met | -1% | | 100% | | 100% | 100% | 100% |
| | | | Calibration Check # | 2 | | 1a | | 1b | 1c | 3 |

.

Note 1: Parentheses denote links on which CORSIM was underestimating values.

## Table 2-4. I-4 Segment PM Peak – Speed Calibration

| Location | Nodes (from, to) | Speed from Field Data C (MPH) | Speed from CORSIM Model M (MPH) | Difference (M-C) [1] | Calibration Check |
|---|---|---|---|---|---|
| **I-4 Eastbound** | | | | | |
| West of 14th Street East | (283,75) | 60.63 | 60.76 | 0.14 | 0% |
| Between 14th Street East and 50th Street | (74,106) | 59.48 | 61.36 | 1.89 | 3% |
| Between 50th Street and MLK Jr Boulevard | (106,8) | 58.44 | 56.57 | (1.87) | -3% |
| Between MLK Jr Boulevard ramps | (8,6) | 64.64 | 61.20 | (3.44) | -5% |
| Between MLK Jr Boulevard and Orient Rd | (6,46) | 65.80 | 60.00 | (5.80) | -9% |
| West of US 301/US 92 | (46,205) | 66.10 | 62.07 | (4.03) | -6% |
| Between US 301/US 92 ramps | (216,217) | 57.38 | 61.65 | 4.27 | 7% |
| Between US 301/US 92 and I-75 exit ramp | (18,23) | 53.99 | 57.08 | 3.09 | 6% |
| Between I-75 exit ramp and I-75 SB entrance ramp | (23,24) | 53.48 | 62.31 | 8.84 | 17% |
| Between I-75 SB on-ramp and I-75 NB on-ramp | (26,27) | 55.33 | 56.40 | 1.08 | 2% |
| Between I-75 and Mango Rd | (28,245) | 51.88 | 58.70 | 6.83 | 13% |
| Between Mango Rd ramps | (245,246) | 59.16 | 63.30 | 4.14 | 7% |
| East of Mango Rd | (246,252) | 67.79 | 63.74 | (4.05) | -6% |
| | **Average** | 59.54 | 60.40 | 0.85 | 1% |
| **I-4 Westbound** | | | | | |
| East of Mango Rd | (254,255) | 68.64 | 67.37 | (1.27) | -2% |
| Between Mango Rd ramps | (255,247) | 68.90 | 66.82 | (2.08) | -3% |
| Between Mango Rd and I-75 | (247,29) | 67.63 | 62.75 | (4.88) | -7% |
| Between I-75 exit ramp and I-75 entrance ramp | (34,35) | 66.37 | 63.51 | (2.86) | -4% |
| Between I-75 and US 301/US 92 | (41,42) | 66.23 | 61.24 | (4.98) | -8% |
| Between US 301/US 92 ramps | (260,261) | 65.79 | 62.92 | (2.87) | -4% |
| Between US 301/US 92 on-ramp and Orient Rd on-ramp | (265,43) | 65.76 | 62.71 | (3.05) | -5% |
| Between Orient Rd and MLK Jr Boulevard | (43,5) | 66.64 | 60.75 | (5.89) | -9% |
| Between MLK Jr Boulevard ramps | (5,7) | 66.14 | 62.65 | (3.49) | -5% |
| Between MLK Jr Boulevard and 50th Street | (7,107) | 64.98 | 60.45 | (4.52) | -7% |
| Between 50th Street and 14th Street East | (87,90) | 63.54 | 62.45 | (1.09) | -2% |
| West of 14th Street East | (93,268) | 62.99 | 64.91 | 1.92 | 3% |
| | **Average** | 66.13 | 63.21 | (2.92) | -4% |

Note 1: Parentheses denote links on which CORSIM was underestimating values.

The speed calibration shows that the difference between the field speed data and modeled speed values are within the acceptable 15% criteria required by FHWA except for one link with an overall average speed difference of only 1% for the eastbound and 4% for the westbound directions.

## 2.7 Existing Year (2012) CORSIM Operational Analysis

**Figure 2-15** shows the Existing Condition speed profile along I-4 mainline for AM Peak and **Figure 2-16** shows the Existing Condition speed profile along I-4 mainline for PM Peak. CORSIM models are provided in **Appendix D (on CD)**.

The following color codes were used to develop these speed profiles.

**Legend**

| | |
|---|---|
| Red | < = 35 MPH |
| Orange | > 35 MPH and < = 45 MPH |
| Yellow | > 45 MPH < = 50 MPH |
| Dark Green | > 50 MPH < = 55 MPH |
| Green | > 55 MPH < = 60 MPH |
| Light Green | > 60 MPH < = 65 MPH |
| Gray | > 65 MPH |

The posted speed limit within the calibration limits is 65 MPH. The Existing Condition speed profile analyses are summarized as below:

1. **I-4 Eastbound AM Peak**: The speed drops to between 55 MPH and 60 MPH between the 50$^{th}$ Street on-ramp and the MLK off ramp that is within 10 MPH of the posted speed limit. The remaining segments have speeds operating between 60 MPH and 65 MPH.
2. **I-4 Westbound AM Peak**: The speed drops to between 43 MPH to 55 MPH between I-75 on-ramp and the on-ramp to the US 301/US 92 CD system. This is caused due to heavy I-75 traffic merging into I-4 mainline and also due to merge condition caused by CD system However, the remaining westbound segment operates between 57 MPH and 65 MPH.

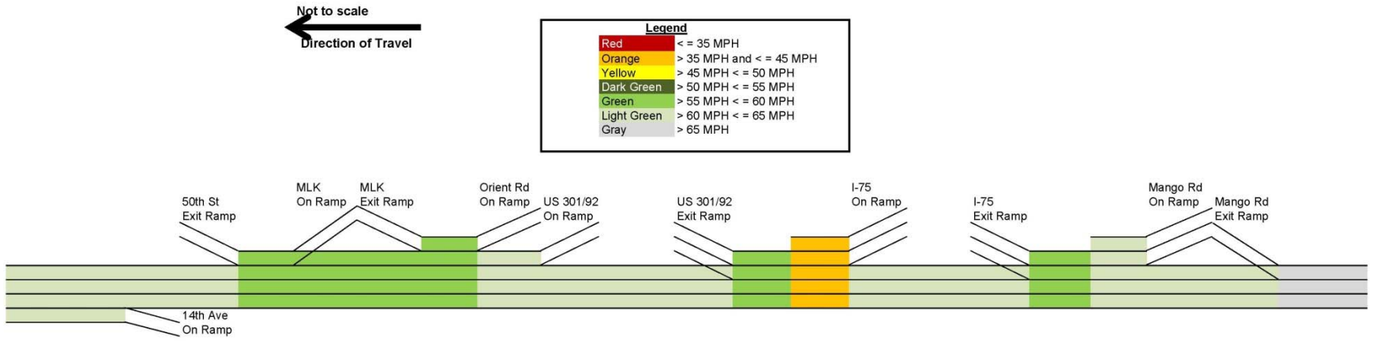
3. **I-4 Eastbound PM Peak**: The speed is around 55 MPH between 50th Street on-ramp and MLK off-ramp, US 301/US 92 on-ramp to I-75 off-ramp, and the segment of I-75 SB on-ramp to I-75 NB on-ramp. However, the remaining segments have speeds operating between 60 MPH and 65 MPH.
4. **I-4 Westbound PM Peak**: The speed drops to less than 60 MPH between I-75 on-ramp and the on-ramp to the US 301/US 92 CD system, and the segment between the merge lane from Mango Road on-ramp and I-75 off-ramp. The remaining segments have speeds operating between 60 MPH and 65 MPH.

In summary, the simulation models showed speed drops along I-4 at the following locations:

5. Between 50th Street on-ramp and the MLK off ramp – EB direction.
6. Between I-75 on-ramp and the on-ramp to the US 301/US 92 CD system. – WB direction.
7. Between US 301/US 92 on-ramp and the I-75 off-ramp – EB direction.
8. Between I-75 SB on-ramp and the I-75 NB on-ramp – EB direction.

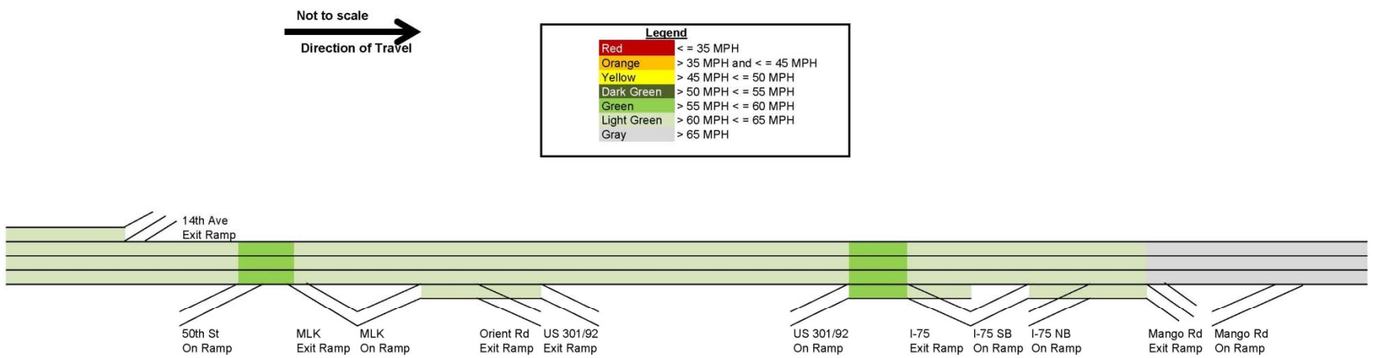
## Figure 2-15: Existing (2012) Speed Temperature Chart – AM Peak

**Average Speed - Existing Conditions - Year 2012 - AM Peak Hour - 7:00AM - 8:00AM**
**I-4 Westbound Direction**




| I-4 WB Ends | | | | | | | | | | | | | | | | | | | | | | I-4 WB Begins |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (From,to) | (93,268) | (93,268) | (90,101) | (107,87) | (7,107) | (5,7) | (5,7) | (43,5) | (265,43) | (266,265) | (264,266) | (260,261) | (41,42) | (37,41) | (34,35) | (31,34) | (30,31) | (29,30) | (247,29) | (255,247) | (255,247) | (254,255) |
| Link Length (ft) | 2,725 | 2,725 | 1,234 | 2,305 | 3,250 | 3,945 | 3,945 | 1,248 | 3,343 | 1,171 | 607 | 1,078 | 2,087 | 1,204 | 1,021 | 1,330 | 1,529 | 1,727 | 2,079 | 3,316 | 3,316 | 4,283 |
| No. of Lanes | 4 | 4 | 3 | 3 | 3.3 | 3.6 | 3.6 | 4.3 | 4 | 3 | 3 | 3 | 4 | 4.5 | 3 | 3 | 3 | 4 | 4.1 | 3 | 3 | 3 |
| Other Lanes | | Aux Ln | | | Accel Ln | Ln Drop | Ln Drop | Accel Ln | Aux Ln | | | | Aux Ln | Aux Ln | | | | Aux Ln | Aux Ln | | | |
| DDHV | 6,490 | 6,490 | 5,801 | 5,801 | 6,117 | 5,555 | 5,555 | 6,197 | 5,926 | 4,914 | 4,914 | 4,914 | 6,581 | 6,581 | 3,709 | 3,709 | 3,709 | 6,244 | 6,244 | 5,017 | 5,017 | 5,613 |
| Simulated Vol/Lane | 1,611 | 1,611 | 1,769 | 1,770 | 1,813 | 1,466 | 1,466 | 1,384 | 1,407 | 1,541 | 1,541 | 1,544 | 1,596 | 1,448 | 1,206 | 1,206 | 1,207 | 1,543 | 1,526 | 1,678 | 1,678 | 1,868 |
| Total Simulated Vol | 6,444 | 6,444 | 5,307 | 5,310 | 5,983 | 5,278 | 5,278 | 5,951 | 5,628 | 4,623 | 4,623 | 4,632 | 6,384 | 6,516 | 3,618 | 3,618 | 3,621 | 6,172 | 6,257 | 5,034 | 5,034 | 5,604 |
| % of DDHV | 0.99 | 0.99 | 0.91 | 0.92 | 0.98 | 0.95 | 0.95 | 0.96 | 0.95 | 0.94 | 0.94 | 0.94 | 0.97 | 0.99 | 0.98 | 0.98 | 0.98 | 0.99 | 1.00 | 1.00 | 1.00 | 1.00 |
| Density | 26.21 | 26.21 | 29.22 | 29.35 | 31.53 | 24.70 | 24.70 | 23.57 | 23.14 | 25.24 | 25.19 | 25.21 | 28.18 | 33.24 | 19.38 | 19.34 | 19.78 | 27.17 | 25.04 | 26.05 | 26.05 | 28.68 |
| Speed | 61.48 | 61.48 | 60.54 | 60.30 | 57.49 | 59.37 | 59.37 | 58.72 | 60.82 | 61.05 | 61.18 | 61.25 | 56.64 | 43.57 | 62.21 | 62.37 | 61.02 | 56.81 | 60.95 | 64.39 | 64.39 | 65.13 |

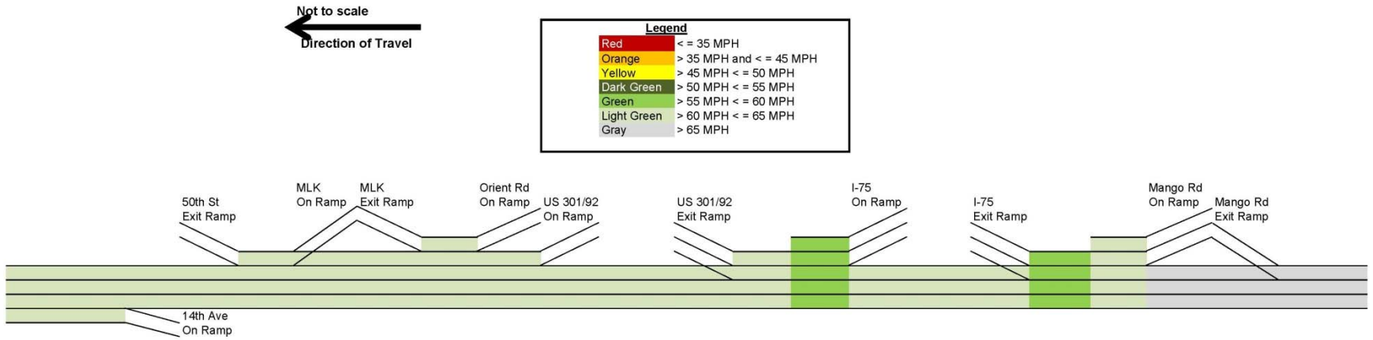
**Average Speed - Existing Conditions - Year 2012 - AM Peak Hour - 7:00AM - 8:00AM**
**I-4 Eastbound Direction**




| I-4 EB Begins | | | | | | | | | | | | | | | | | | | | | | I-4 EB Ends |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (From,to) | (161,283) | (283,75) | (160,99) | (148,78) | (106,8) | (8,6) | (8,6) | (6,46) | (46,205) | (205,211) | (211,212) | (212,213) | (215,216) | (218,18) | (18,23) | (23,24) | (25,26) | (26,27) | (28,245) | (245,246) | (245,246) | (246,252) |
| Link Length (ft) | 327 | 2,733 | 297 | 716 | 2,416 | 3,881 | 3,881 | 1,112 | 3,163 | 1,430 | 447 | 727 | 1,240 | 1,971 | 2,692 | 1,121 | 1,971 | 909 | 2,913 | 3,304 | 3,304 | 4,035 |
| No. of Lanes | 4 | 4 | 3 | 3 | 3.3 | 3 | 3 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 3.9 | 3 | 3.6 | 4 | 3 | 3 | 3.2 |
| Other Lanes | | | | | Accel Ln | | | Aux Ln | Deccel Ln | | | | | | Aux Ln | Ln Drop | | Accel Ln | Aux Ln | | | Accel Ln |
| DDHV | 4,997 | 4,997 | 4,365 | 4,365 | 4,688 | 3,566 | 3,566 | 3,758 | 3,505 | 2,670 | 2,670 | 2,670 | 2,670 | 2,670 | 3,877 | 1,885 | 1,885 | 2,851 | 4,102 | 3,280 | 3,280 | 3,620 |
| Simulated Vol/Lane | 1,314 | 1,242 | 1,442 | 1,440 | 1,434 | 1,158 | 1,158 | 909 | 848 | 857 | 857 | 857 | 854 | 852 | 947 | 457 | 586 | 766 | 999 | 1,056 | 1,056 | 1,116 |
| Total Simulated Vol | 5,256 | 4,968 | 4,326 | 4,320 | 4,732 | 3,474 | 3,474 | 3,636 | 3,392 | 2,571 | 2,571 | 2,571 | 2,562 | 2,556 | 3,977 | 1,782 | 1,758 | 2,758 | 3,996 | 3,168 | 3,168 | 3,571 |
| % of DDHV | 1.05 | 0.99 | 0.99 | 0.99 | 1.01 | 0.97 | 0.97 | 0.97 | 0.97 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 1.03 | 0.95 | 0.93 | 0.97 | 0.97 | 0.97 | 0.97 | 0.99 |
| Density | 20.96 | 20.13 | 23.33 | 23.33 | 24.75 | 18.73 | 18.73 | 14.87 | 13.53 | 13.67 | 13.69 | 13.69 | 13.65 | 13.63 | 16.68 | 7.21 | 9.21 | 12.72 | 15.45 | 15.83 | 15.83 | 16.80 |
| Speed | 62.69 | 61.73 | 61.83 | 61.71 | 57.95 | 61.82 | 61.82 | 61.15 | 62.65 | 62.69 | 62.59 | 62.61 | 62.57 | 62.56 | 56.76 | 63.36 | 63.67 | 60.24 | 64.67 | 66.76 | 66.76 | 66.40 |

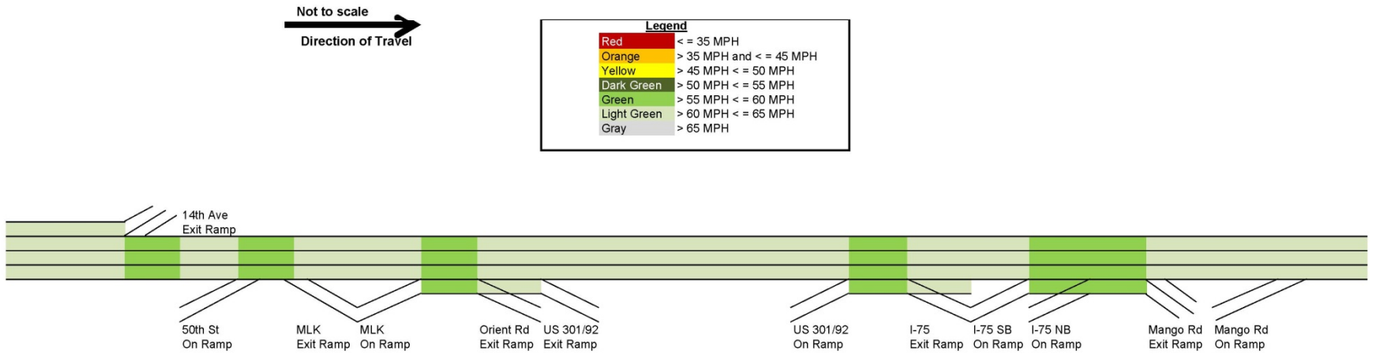
## Figure 2-16: Existing (2012) Speed Temperature Chart – PM Peak

**Average Speed - Existing Conditions - Year 2012 - PM Peak Hour - 5:00PM - 6:00PM**
**I-4 Westbound Direction**




| I-4 WB Ends | | | | | | | | | | | | | | | | | | | | | | I-4 WB Begins |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (From,to) | (93,268) | (93,268) | (90,101) | (107,87) | (7,107) | (5,7) | (5,7) | (43,5) | (265,43) | (266,265) | (264,266) | (260,261) | (41,42) | (37,41) | (34,35) | (31,34) | (30,31) | (29,30) | (247,29) | (255,247) | (255,247) | (254,255) |
| Link Length (ft) | 2,725 | 2,725 | 1,234 | 2,305 | 3,250 | 3,945 | 3,945 | 1,248 | 3,343 | 1,171 | 607 | 1,078 | 2,087 | 1,204 | 1,021 | 1,330 | 1,529 | 1,727 | 2,079 | 3,316 | 3,316 | 4,283 |
| No. of Lanes | 4 | 4 | 3 | 3 | 3.3 | 3.6 | 3.6 | 4.3 | 4 | 3 | 3 | 3 | 4 | 4.5 | 3 | 3 | 3 | 4 | 4.1 | 3 | 3 | 3 |
| Other Lanes | | Aux Ln | | | Accel Ln | Ln Drop | Ln Drop | Accel Ln | Aux Ln | | | | Aux Ln | Aux Ln | | | | Aux Ln | Aux Ln | | | |
| DDHV | 4,653 | 4,653 | 3,493 | 3,493 | 3,803 | 3,028 | 3,028 | 3,268 | 2,900 | 2,511 | 2,511 | 2,511 | 3,793 | 3,793 | 2,028 | 2,028 | 2,028 | 4,233 | 4,233 | 3,382 | 3,382 | 3,762 |
| Simulated Vol/Lane | 1,106 | 1,106 | 1,098 | 1,097 | 1,159 | 825 | 825 | 753 | 710 | 823 | 824 | 824 | 925 | 837 | 672 | 672 | 674 | 1,056 | 1,042 | 1,112 | 1,112 | 1,242 |
| Total Simulated Vol | 4,424 | 4,424 | 3,294 | 3,291 | 3,825 | 2,970 | 2,970 | 3,238 | 2,840 | 2,469 | 2,472 | 2,472 | 3,700 | 3,767 | 2,016 | 2,016 | 2,022 | 4,224 | 4,272 | 3,336 | 3,336 | 3,726 |
| % of DDHV | 0.95 | 0.95 | 0.94 | 0.94 | 1.01 | 0.98 | 0.98 | 0.99 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.99 | 0.99 | 0.99 | 1.00 | 1.00 | 1.01 | 0.99 | 0.99 | 0.99 |
| Density | 17.04 | 17.04 | 17.62 | 17.64 | 19.18 | 13.17 | 13.17 | 12.39 | 11.33 | 13.10 | 13.09 | 13.10 | 15.11 | 14.00 | 10.58 | 10.57 | 10.70 | 17.96 | 16.60 | 16.65 | 16.65 | 18.43 |
| Speed | 64.91 | 64.91 | 62.31 | 62.18 | 60.45 | 62.65 | 62.65 | 60.75 | 62.71 | 62.83 | 62.93 | 62.92 | 61.24 | 59.82 | 63.51 | 63.59 | 62.96 | 58.79 | 62.75 | 66.82 | 66.82 | 67.37 |

**Average Speed - Existing Conditions - Year 2012 - PM Peak Hour - 5:00PM - 6:00PM**
**I-4 Eastbound Direction**




| I-4 EB Begins | | | | | | | | | | | | | | | | | | | | | | I-4 EB Ends |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (From,to) | (161,283) | (283,75) | (75,160) | (99,148) | (106,8) | (8,6) | (8,6) | (6,46) | (46,205) | (205,211) | (211,212) | (212,213) | (215,216) | (218,18) | (18,23) | (23,24) | (25,26) | (26,27) | (28,245) | (245,246) | (245,246) | (246,252) |
| Link Length (ft) | 327 | 2,733 | 880 | 717 | 2,416 | 3,881 | 3,881 | 1,112 | 3,163 | 1,430 | 447 | 727 | 1,240 | 1,971 | 2,692 | 1,121 | 1,971 | 909 | 2,913 | 3,304 | 3,304 | 4,035 |
| No. of Lanes | 4 | 4 | 3 | 3 | 3.3 | 3 | 3 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 3.9 | 3 | 3.6 | 4 | 3 | 3 | 3.2 |
| Other Lanes | | | | | Accel Ln | | | Aux Ln | Deccel Ln | | | | | | Aux Ln | Ln Drop | | Accel Ln | Aux Ln | | | Accel Ln |
| DDHV | 5,546 | 5,546 | 4,608 | 4,608 | 5,331 | 4,491 | 4,491 | 4,874 | 4,450 | 3,767 | 3,767 | 3,767 | 3,767 | 3,767 | 5,289 | 3,148 | 3,148 | 4,332 | 6,004 | 4,756 | 4,756 | 5,278 |
| Simulated Vol/Lane | 1,447 | 1,369 | 1,511 | 1,510 | 1,633 | 1,462 | 1,462 | 1,189 | 1,089 | 1,213 | 1,213 | 1,213 | 1,212 | 1,213 | 1,250 | 777 | 998 | 1,206 | 1,485 | 1,585 | 1,585 | 1,703 |
| Total Simulated Vol | 5,788 | 5,476 | 4,533 | 4,530 | 5,389 | 4,386 | 4,386 | 4,756 | 4,356 | 3,639 | 3,639 | 3,639 | 3,636 | 3,639 | 5,250 | 3,030 | 2,994 | 4,342 | 5,940 | 4,755 | 4,755 | 5,450 |
| % of DDHV | 1.04 | 0.99 | 0.98 | 0.98 | 1.01 | 0.98 | 0.98 | 0.98 | 0.98 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.99 | 0.96 | 0.95 | 1.00 | 0.99 | 1.00 | 1.00 | 1.03 |
| Density | 23.14 | 22.53 | 25.21 | 24.40 | 28.87 | 23.89 | 23.89 | 19.82 | 17.55 | 19.61 | 19.63 | 19.65 | 19.65 | 19.71 | 21.91 | 12.48 | 15.96 | 21.39 | 25.30 | 25.05 | 25.05 | 26.72 |
| Speed | 62.55 | 60.76 | 59.93 | 61.89 | 56.57 | 61.20 | 61.20 | 60.00 | 62.07 | 61.86 | 61.77 | 61.73 | 61.65 | 61.54 | 57.08 | 62.31 | 62.52 | 56.40 | 58.70 | 63.30 | 63.30 | 63.74 |

## 2.8 Crash Analysis

The five-year crash data, between 2009 and 2013, was analyzed for the I-4 segment between west of East Columbus Drive and east of the Polk Parkway. The crash data was downloaded from the FDOT Crash Analysis Reporting System (CARS) system. The crash data includes data for the I-4 mainline.

The five-year crash data analysis showed that there were 2,944 crashes within this 24-mile segment of I-4 in the last five years. Out of those 2,944 crashes there were twenty-eight (28) fatal crashes, 1,217 injury crashes and 1,699 property damage only crashes. **Figure 2-17** and **Table 2-5** show the summary of crashes by severity within the study area.

**Figure 2-17 Crash Severity Summary**

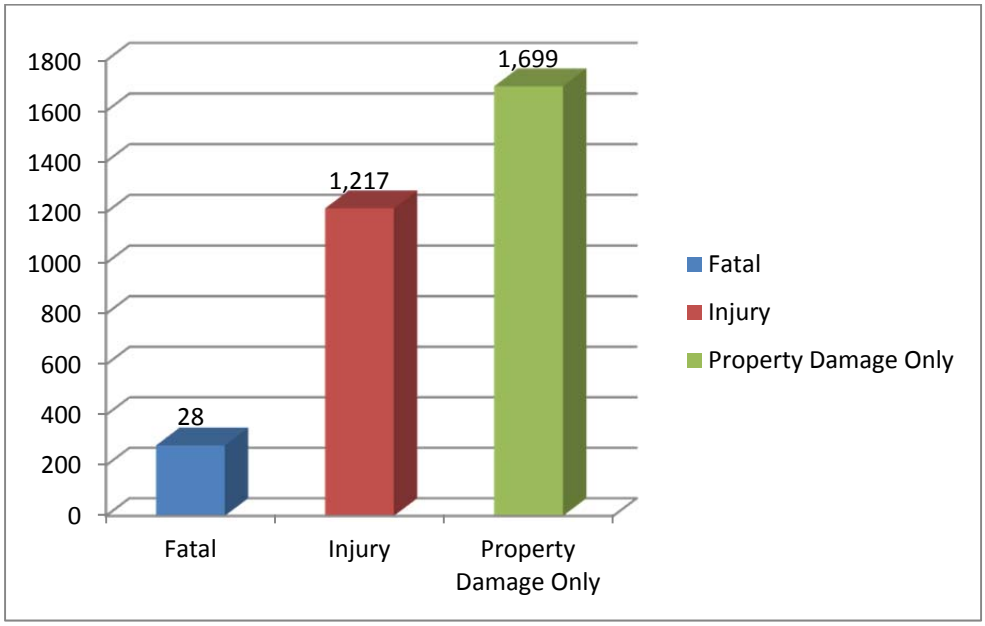



**Table 2-5 Crash Severity Summary**

| Crash Severity | 2009 | 2010 | 2011 | 2012 | 2013 | Total |
|---|---|---|---|---|---|---|
| **Fatal** | 3 | 4 | 10 | 7 | 4 | **28** |
| **Injury** | 227 | 249 | 253 | 243 | 245 | **1,217** |
| **Property Damage Only** | 373 | 316 | 249 | 362 | 399 | **1,699** |
| **Total** | **603** | **569** | **512** | **612** | **648** | **2,944** |

During the five-year study period, of the crashes that were classified as specific crash events, the highest were rear end collisions (978 crashes), hitting guard rail collisions (254 crashes) and angle collisions (247 crashes). Of the crashes that had a specified contributing cause, the highest were careless driving (1,322

crashes) followed by improper lane change (206 crashes). **Table 2-6** provides a summary of the types of crashes within the study area and **Table 2-7** provides a summary of contributing causes.

**Table 2-6 Crash Event Summary**

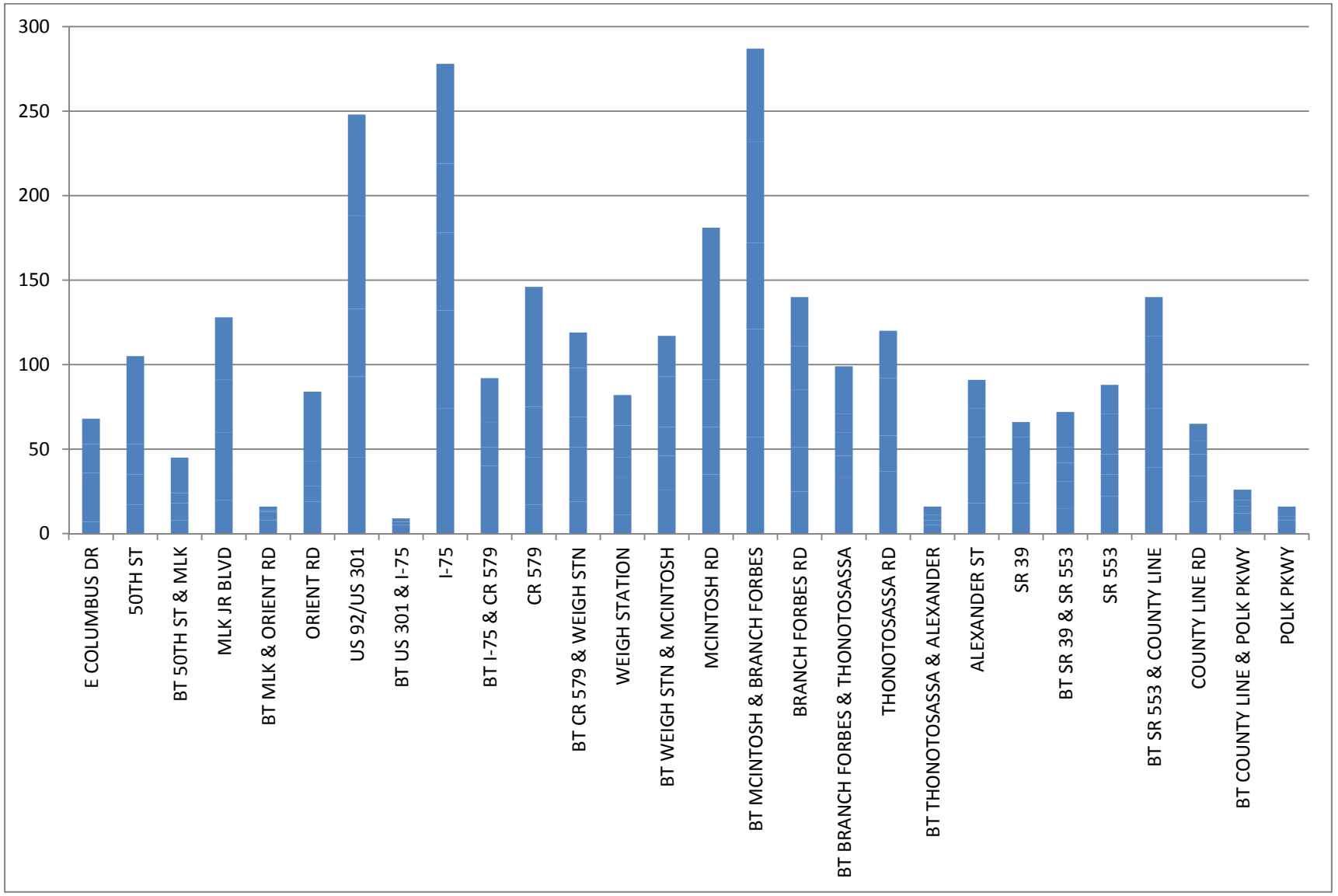
| Harmful Event | 2009 | 2010 | 2011 | 2012 | 2013 | Total |
|---|---|---|---|---|---|---|
| Rear End | 227 | 186 | 154 | 185 | 226 | 978 |
| Other/Unknown | 65 | 79 | 172 | 243 | 275 | 834 |
| Hit Guardrail | 53 | 57 | 54 | 47 | 43 | 254 |
| Angle | 67 | 65 | 44 | 48 | 23 | 247 |
| Sideswipe | 86 | 65 | 0 | 0 | 0 | 151 |
| Hit Concrete Barrier Wall | 30 | 31 | 24 | 20 | 24 | 129 |
| Overturned | 19 | 25 | 19 | 22 | 19 | 104 |
| Hit Object | 16 | 9 | 21 | 9 | 9 | 64 |
| Cargo Loss or Shift | 8 | 9 | 3 | 5 | 5 | 30 |
| Ran Into Ditch | 7 | 7 | 3 | 3 | 1 | 21 |
| Hit Fence | 2 | 6 | 1 | 6 | 3 | 18 |
| Hit Sign | 7 | 5 | 1 | 3 | 1 | 17 |
| Hit Pole | 3 | 4 | 2 | 3 | 2 | 14 |
| Fire | 4 | 4 | 1 | 4 | 0 | 13 |
| Hit Attenuators | 0 | 2 | 2 | 3 | 4 | 11 |
| Jackknifed | 3 | 2 | 1 | 1 | 2 | 9 |
| Separation of Units | 0 | 1 | 2 | 2 | 3 | 8 |
| Head On | 0 | 4 | 1 | 1 | 2 | 8 |
| Parked Car | 0 | 3 | 1 | 0 | 3 | 7 |
| Collision with Animal | 1 | 2 | 1 | 2 | 0 | 6 |
| Hit Bridge/Pier/Abutment/Rail | 0 | 0 | 2 | 2 | 1 | 5 |
| Collision with Pedestrian | 0 | 1 | 1 | 1 | 2 | 5 |
| Fell From Vehicle | 2 | 0 | 0 | 1 | 0 | 3 |
| Median Crossover | 1 | 1 | 1 | 0 | 0 | 3 |
| Backed Into | 2 | 0 | 0 | 0 | 0 | 2 |
| Left Turn | 0 | 0 | 0 | 1 | 0 | 1 |
| Ran Off Road Into Water | 0 | 0 | 1 | 0 | 0 | 1 |
| Hit Tree/Shrubbery | 0 | 1 | 0 | 0 | 0 | 1 |
| **Total** | **603** | **569** | **512** | **612** | **648** | **2,944** |

Table 2-7 Contributing Cause Summary

| Crash Contributing Cause | 2009 | 2010 | 2011 | 2012 | 2013 | Total |
|---|---|---|---|---|---|---|
| Careless Driving | 320 | 269 | 212 | 247 | 274 | 1,322 |
| Other/ Unknown | 83 | 88 | 138 | 179 | 215 | 703 |
| No Improper Driving | 52 | 85 | 124 | 126 | 108 | 495 |
| Improper Lane Change | 113 | 93 | 0 | 0 | 0 | 206 |
| Failed to Yield | 1 | 4 | 13 | 26 | 20 | 64 |
| Exceeded Safe Speed Limit | 8 | 2 | 10 | 11 | 15 | 46 |
| Followed Too Closely | 2 | 4 | 9 | 12 | 13 | 40 |
| Failed to Maintain Equipment/Vehicle | 7 | 8 | 0 | 0 | 0 | 15 |
| Improper Load | 7 | 5 | 0 | 0 | 0 | 12 |
| Improper Passing | 2 | 0 | 1 | 5 | 2 | 10 |
| Alcohol-Under Influence | 3 | 5 | 0 | 0 | 0 | 8 |
| Improper Turn | 0 | 2 | 2 | 2 | 0 | 6 |
| Improper Backing | 2 | 0 | 1 | 0 | 1 | 4 |
| Disregarded Traffic Signal | 0 | 1 | 0 | 3 | 0 | 4 |
| Drugs-Under Influence | 2 | 1 | 0 | 0 | 0 | 3 |
| Obstructing Traffic | 1 | 1 | 0 | 0 | 0 | 2 |
| Disregarded Stop Sign | 0 | 0 | 0 | 1 | 0 | 1 |
| Fleeing Police | 0 | 1 | 0 | 0 | 0 | 1 |
| Disregarded Other Traffic Control | 0 | 0 | 1 | 0 | 0 | 1 |
| Driving Wrong Side/Way | 0 | 0 | 1 | 0 | 0 | 1 |
| **Total** | **603** | **569** | **512** | **612** | **648** | **2,944** |

**Figure 2-18** provides a summary of the number of crashes by location along the project corridor. The entire 24-mile segment experiences an average of approximately 589 crashes per year. The area from US 92/US 301 to the I-75 interchange and the area from McIntosh Road to Branch Forbes Road had the highest number of crashes during the study period.

**Figure 2-18 Total Crashes by Location**



# 3.0 FUTURE CONDITIONS

I-4 provides an important connection to the regional and statewide transportation network linking the Tampa Bay region to the remainder of the state and nation. The current geometry will be unable to handle the future growth in the traffic. This study will examine the need for express lane improvements to increase the capacity and improve the operations and safety of I-4 along the 22.1 mile segment of I-4 from east of 50th Street (US 41/SR 583) in Hillsborough County to the Polk Parkway (SR 570) in Polk County.

The improvements being considered for the Build (Master Plan) alternative include widening I-4 to accommodate four express lanes with two express lanes in each direction by the design year (2040). The preliminary proposed typical section allows for two 11-foot express lanes, a 4-foot buffer, two 11-foot general use lanes, and one 12-foot general use lane at a minimum in each direction.

However, as part of the staged implementation for 2020 and 2030, two express lanes with one express lane in each direction will be considered as Starter Project. These express lanes are being considered from 50$^{th}$ Street (US 41/SR 583) to east of Mango Road and will evaluate the Starter project for capacity and operational benefits along I-4 corridor. The preliminary proposed typical section allows for one 11-foot express lanes, a 4-foot buffer, two 11-foot general use lanes, and one 12-foot general use lane at a minimum in each direction.

## 3.1 Methodology for Development of Future Year 2020, 2030 and 2040 Design Hour Traffic Volumes

The Department provided future year 2020, 2030 and 2040 design hour traffic volumes for the No-Build, Starter Project and Master Plan alternatives. These traffic volumes were provided for the I-4 mainline (general use lanes (GULs) and ELs) locations and ramps. The key steps of the methodology followed by the Department are:

1. The Tampa Bay Regional Planning Model Managed Lanes (TPRPM-ML) time of day models for the No-Build, Starter Project and Master Plan alternatives were developed for the year 2035 Directional Design Hour Volumes (DDHV). The DDHV values obtained from the TBRPM-ML time of day model for each alternative were for the AM and PM Peak periods and were used as the basis to develop future year design hour volumes. The AM period in the TBRPM-ML time of day model is for two and a half hours in the morning. The PM period is the TBRPM-ML time of day

model is for three hours during the afternoon Peak. The TBRPM-ML AM period was adjusted to the AM peak hour by the diurnal factor of 0.41 obtained from the existing 2012 traffic counts within the I-4 study area. Similarly, the TBRPM-ML PM period was adjusted to the PM peak hour by the diurnal factor of 0.35.

2. In order to ensure reasonable growth patterns, the annual growth rates were calculated by comparing the existing DDHVs from the FDOT *Florida Traffic Online (2012)* website and the 2035 DDHVs from the TBRPM-ML model. An average growth rate was calculated for the I-4 study area and increase/decrease factors for each design year were estimated. A decrease factor of 0.6 was applied to I-4 study area to convert the year 2035 model volumes to the year 2020 traffic volumes.

3. The estimated year 2020 traffic volumes were compared to the year FDOT *Florida Traffic Online (2012)* website to ensure reasonableness and adjustments were made if necessary.

4. It is anticipated that more traffic will use ELs during the peak hours than during the off-peak periods. Therefore, the peak-to-daily ratios on the ELs should be higher than those on the GULs. The traffic volumes were adjusted to yield reasonable peak-to-daily ratios. The capacity of the express lanes was assumed to be 1,650 vehicles per hour per lane (vphpl). If travel demand on an express lane was greater than 1,650 vphpl, the excess volume was manually shifted to the GULs.

5. The 2020 DDHVs were increased by using expansion factors to develop the DDHVs for the years 2030 and 2040. The expansion factor from 2020 to 2030 is 1.2, and the expansion factor from 2020 to 2040 is 1.4, based on an interpolation/extrapolation between 2012 and 2035 traffic volumes.

In addition to the years 2020, 2030 and 2040 design hour volumes provided for the I-4 mainline and ramps corresponding to the design alternatives the Department also provided year 2035 DDHVs for the interchange cross streets obtained from the TBRPM-ML model.

The future year mainline and ramp design hour traffic volumes provided by the Department were reviewed for reasonableness and revisions were made at some locations and rebalanced for the entire I-4 corridor. The future years 2020, 2030 and 2040 ramp terminal and cross street intersections turning movement counts for the design alternatives were estimated by applying growth rates to the field collected turning movement volumes as indicated below.

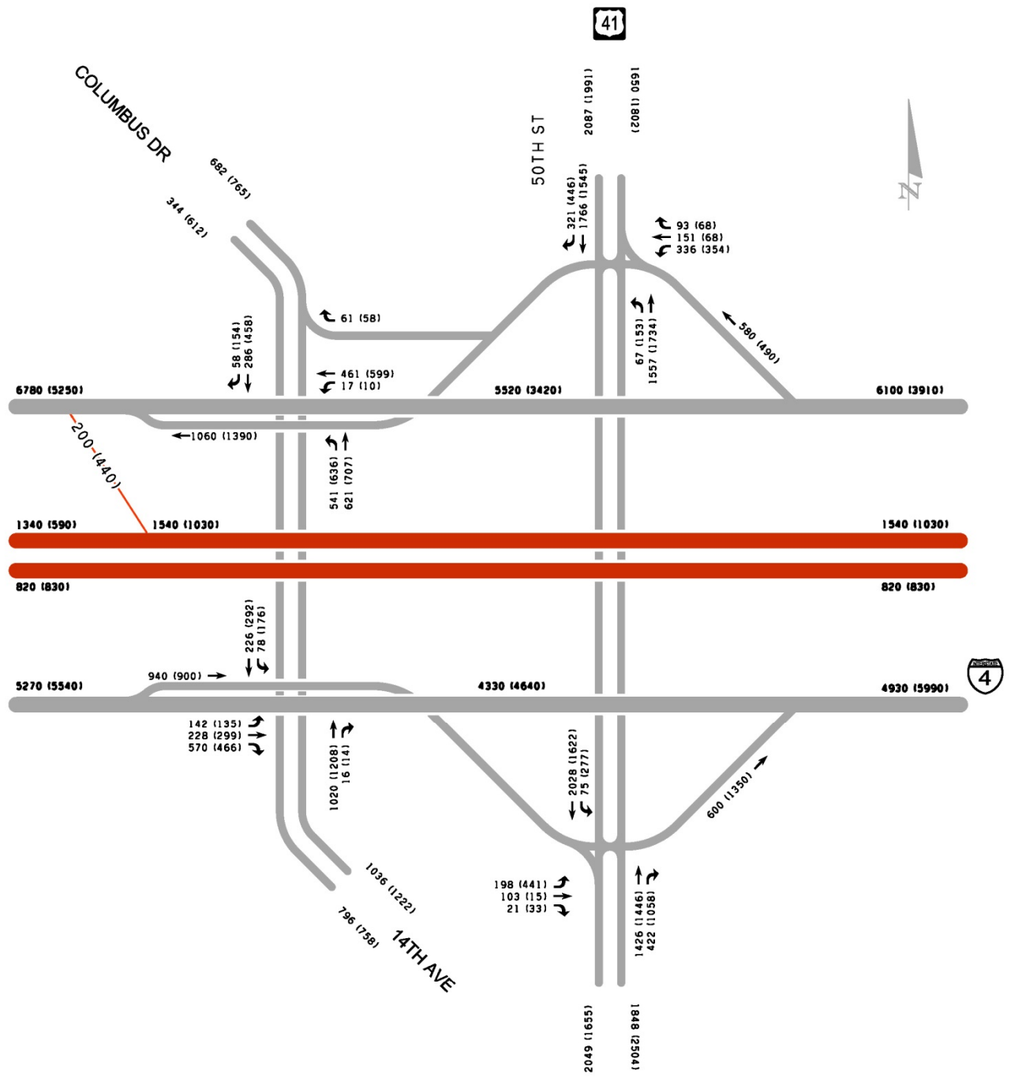
1. The growth rate for each ramp intersection turning movement was estimated consistent with the corresponding ramp volume growth rate obtained from the design hour volumes provided

by the Department. The future year ramp design hour traffic volumes were used as the control volumes in estimating the future years 2020, 2030 and 2040 ramp terminal intersection turning movement volumes.

2. The growth rates estimated from the year 2035 cross street DDHVs (TBRPM-ML) were used to estimate the future years 2020, 2030 and 2040 cross street through traffic volumes.

The estimated years 2020 Starter, 2030 Starter and 2040 Master and No-Build AM and PM traffic volumes are also shown in **Figures 3-1 to 3-36.**

**FIGURE 3-1: 2020 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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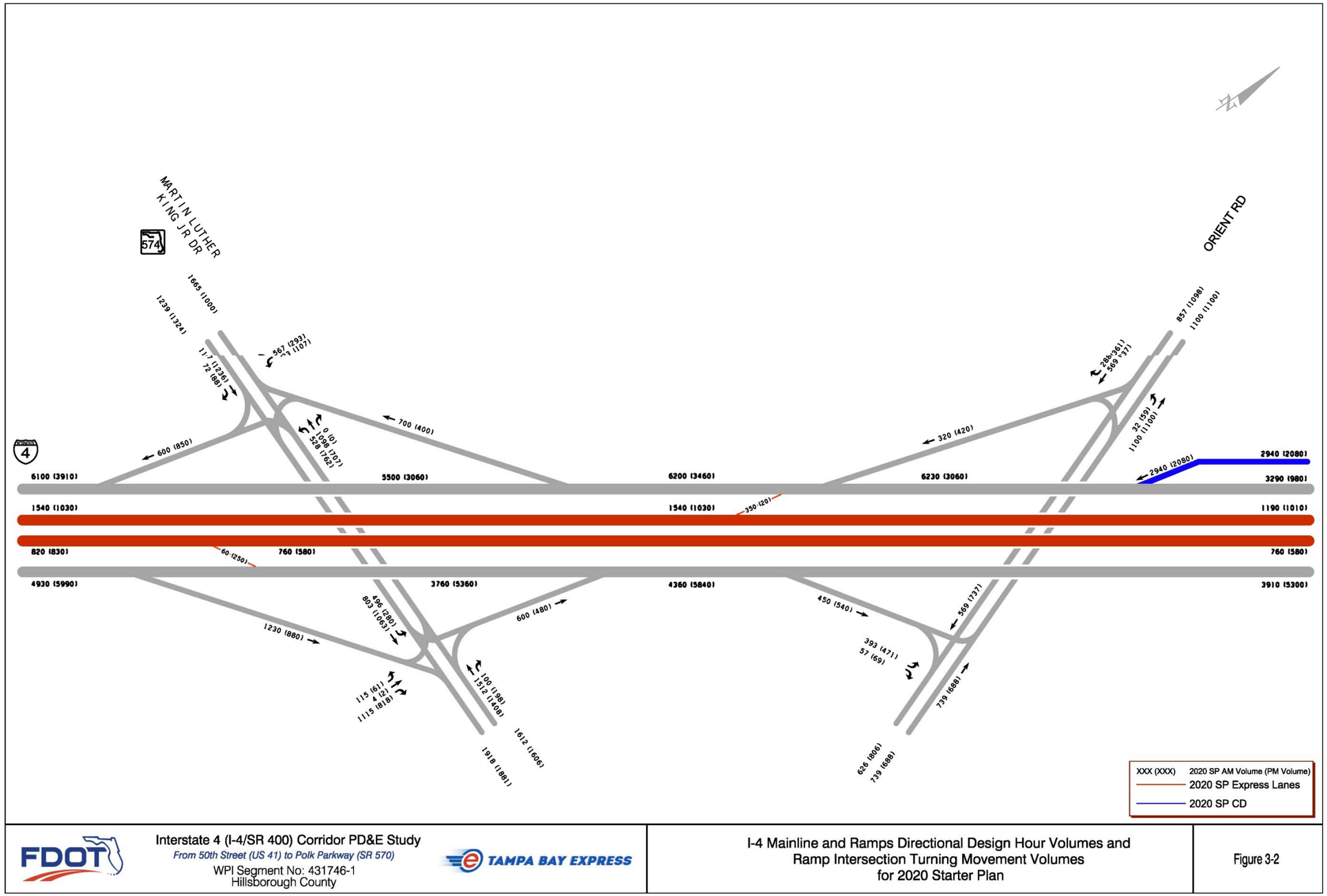
| FDOT / TAMPA BAY EXPRESS<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2020 Starter Plan | Figure 3-1 |

**FIGURE 3-2: 2020 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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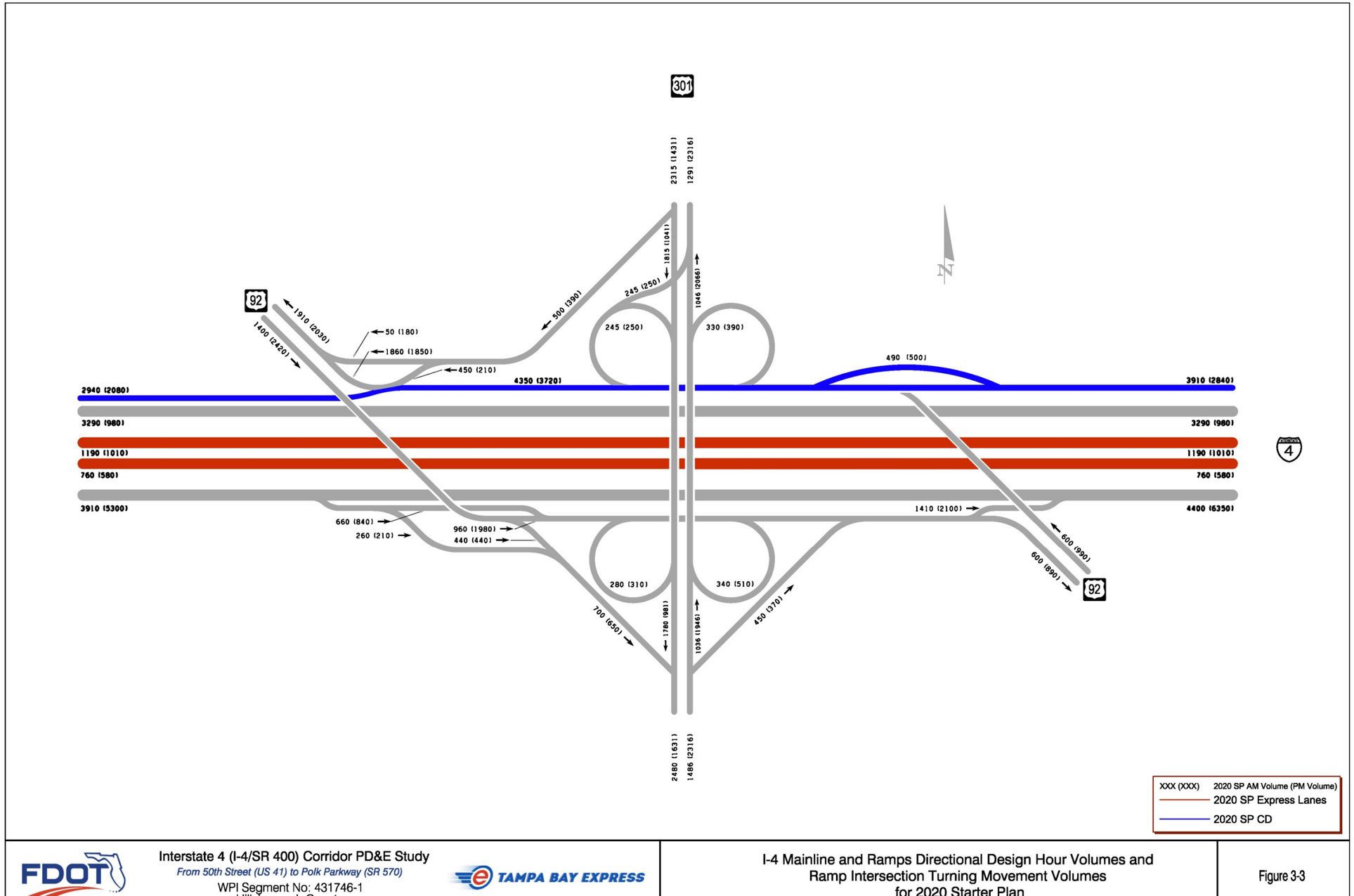
| FDOT<br>TAMPA BAY EXPRESS | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2020 Starter Plan |
| | | Figure 3-2 |

**FIGURE 3-3: 2020 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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| FDOT / TAMPA BAY EXPRESS<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2020 Starter Plan | Figure 3-3 |

**FIGURE 3-4: 2020 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

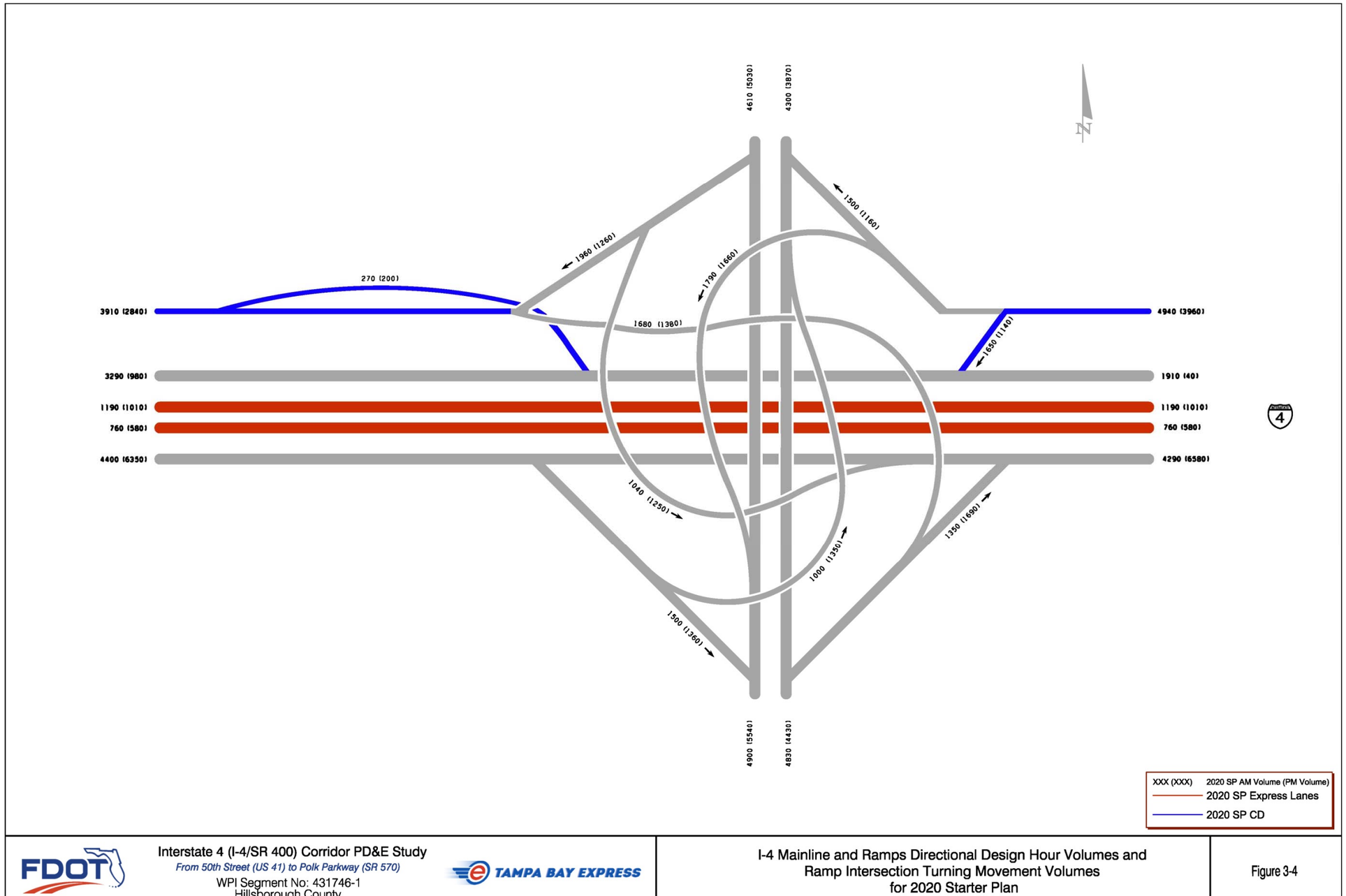
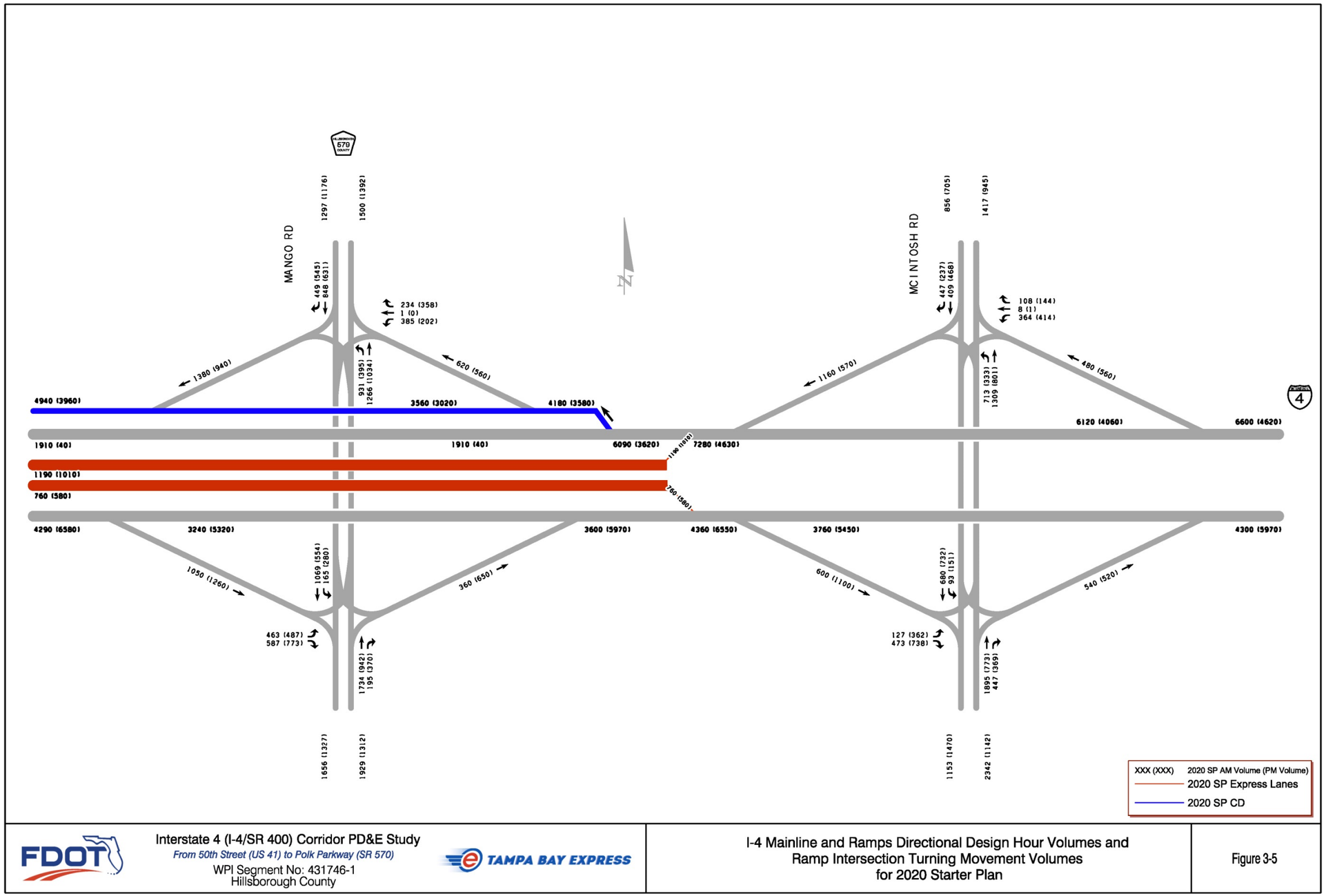


**FIGURE 3-5: 2020 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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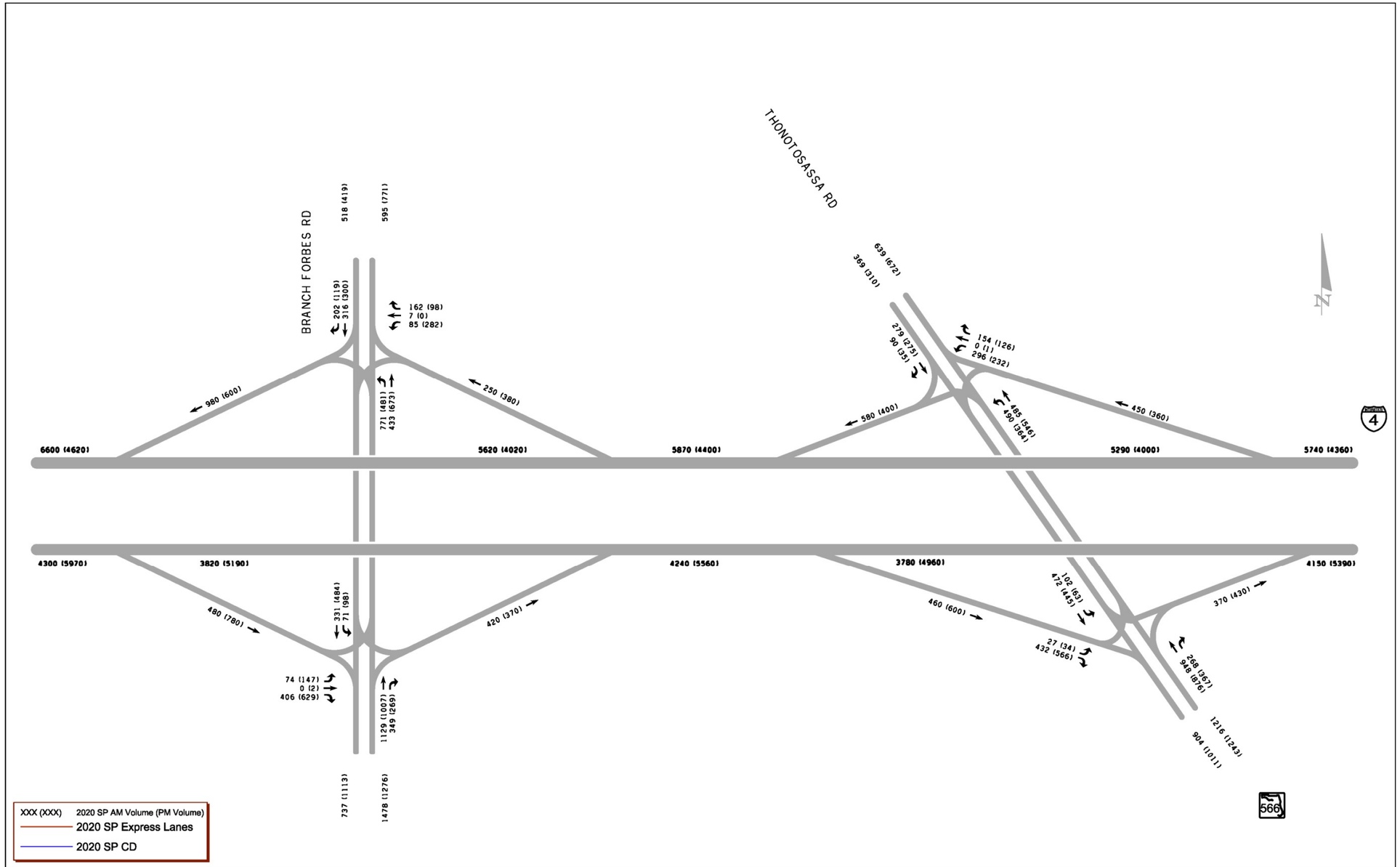
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2020 Starter Plan | Figure 3-5 |

**FIGURE 3-6: 2020 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

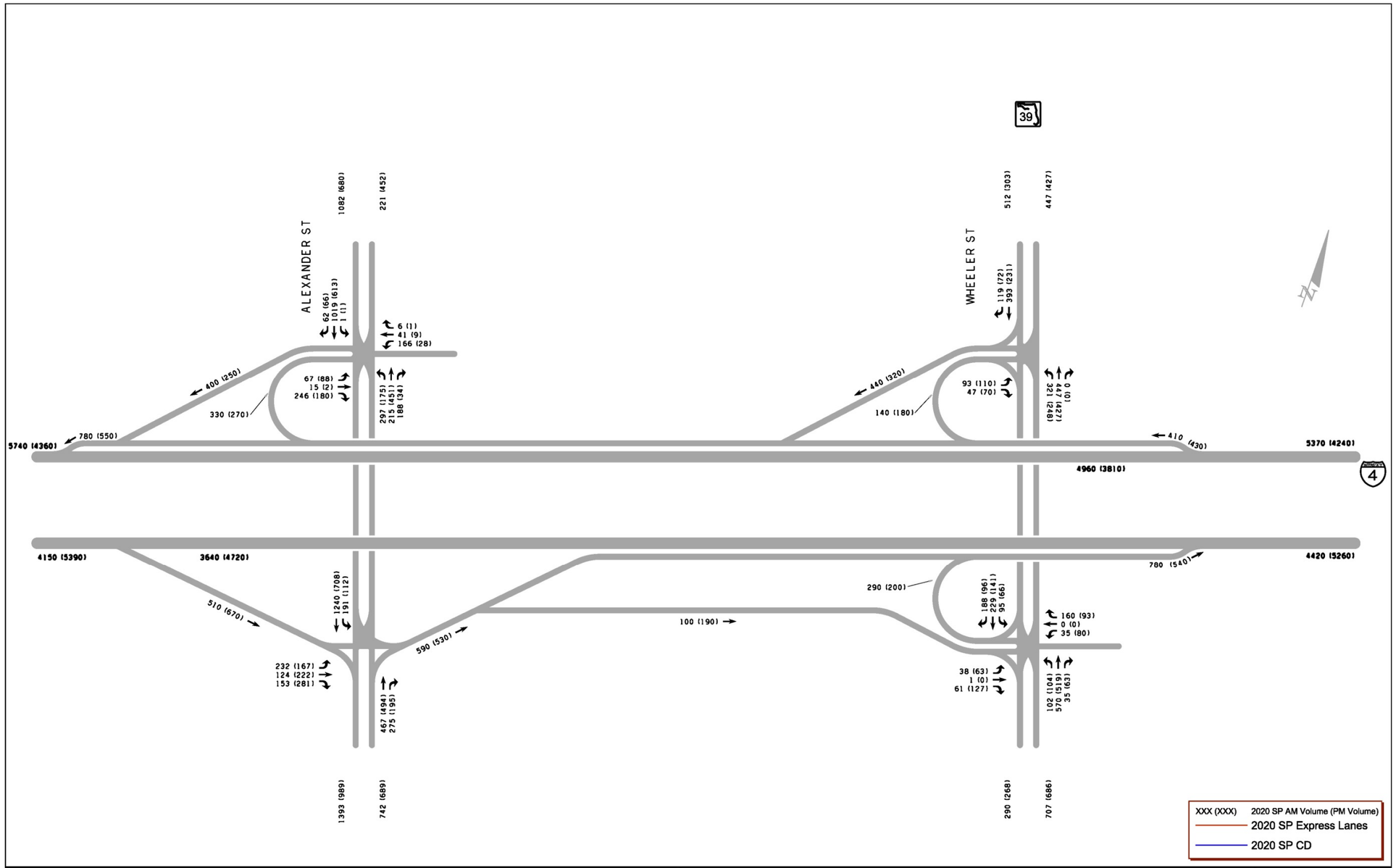



Interstate 4 (I-4/SR 400) Corridor PD&E Study
*From 50th Street (US 41) to Polk Parkway (SR 570)*
WPI Segment No: 431746-1
Hillsborough County

I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2020 Starter Plan

Figure 3-6

**FIGURE 3-7: 2020 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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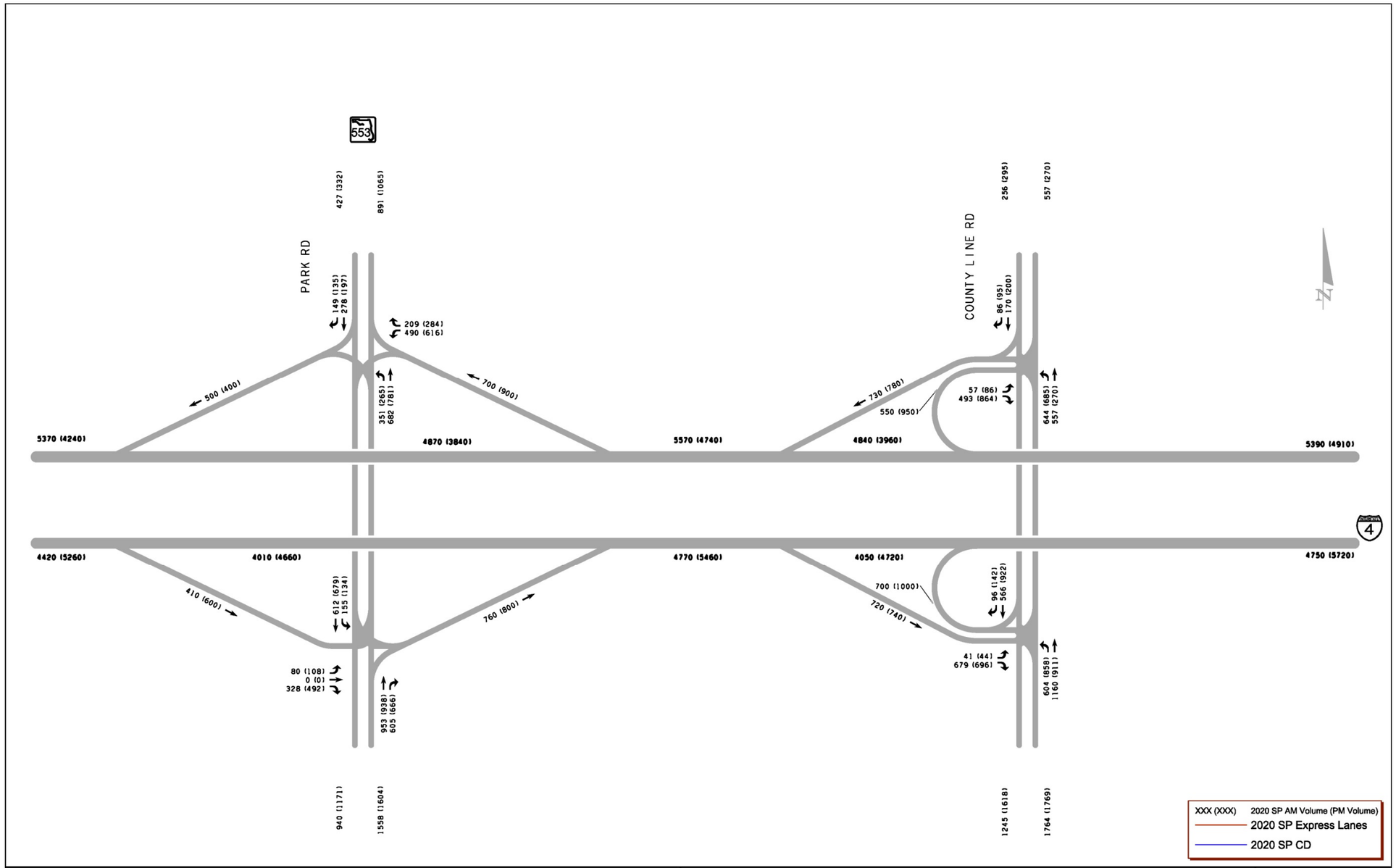
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2020 Starter Plan | Figure 3-7 |

**FIGURE 3-8: 2020 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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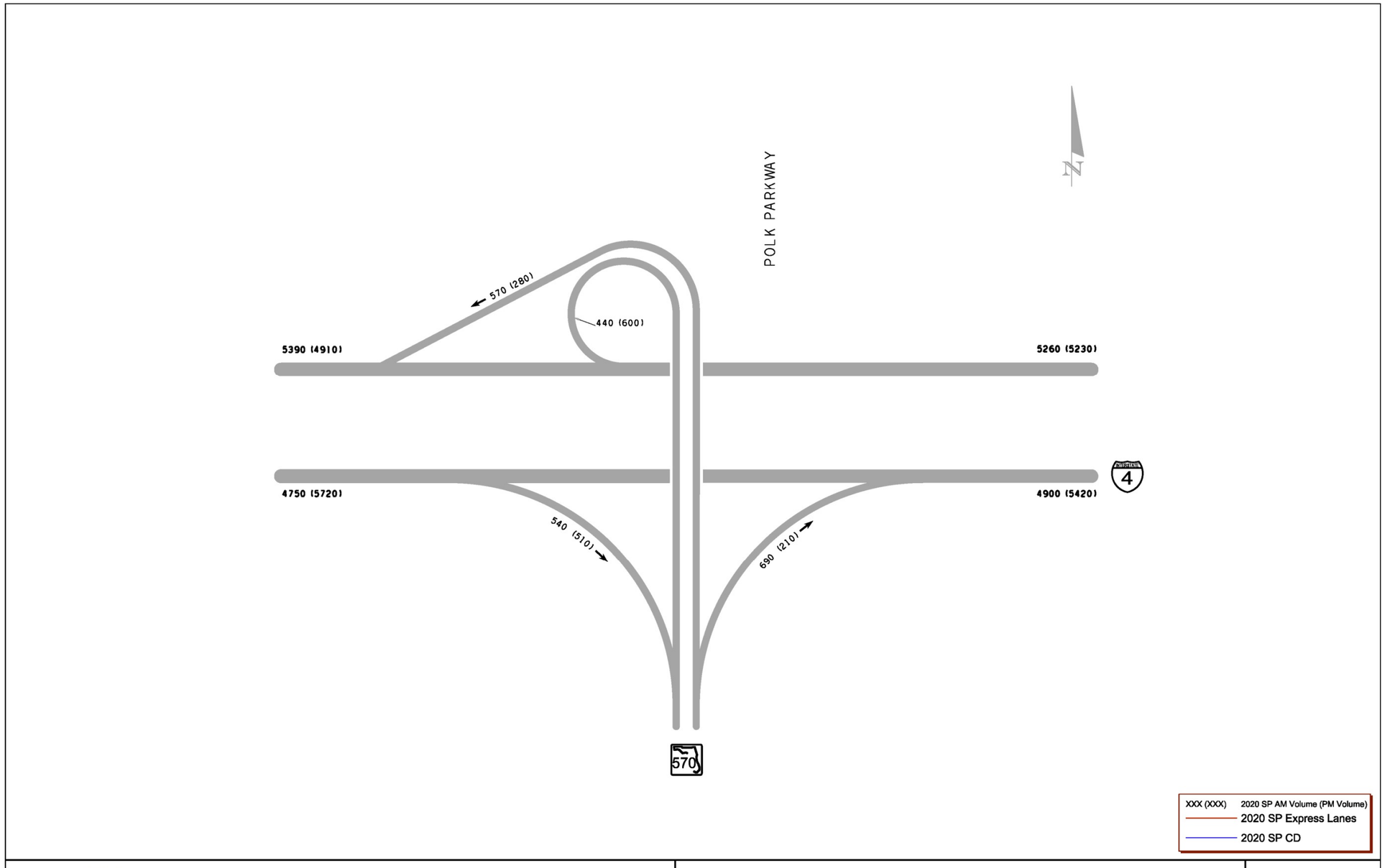
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2020 Starter Plan | Figure 3-8 |

**FIGURE 3-9: 2020 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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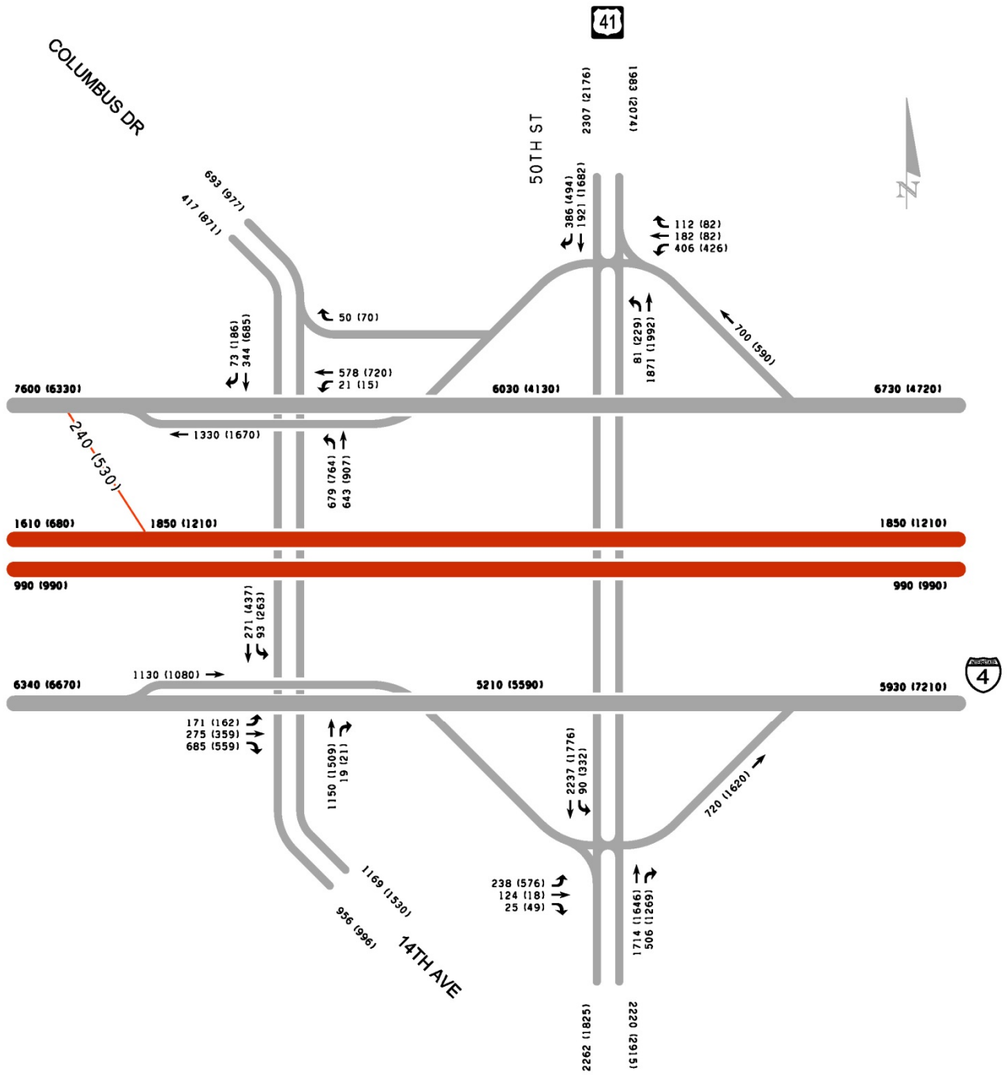
| FDOT | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2020 Starter Plan | Figure 3-9 |

**FIGURE 3-10: 2030 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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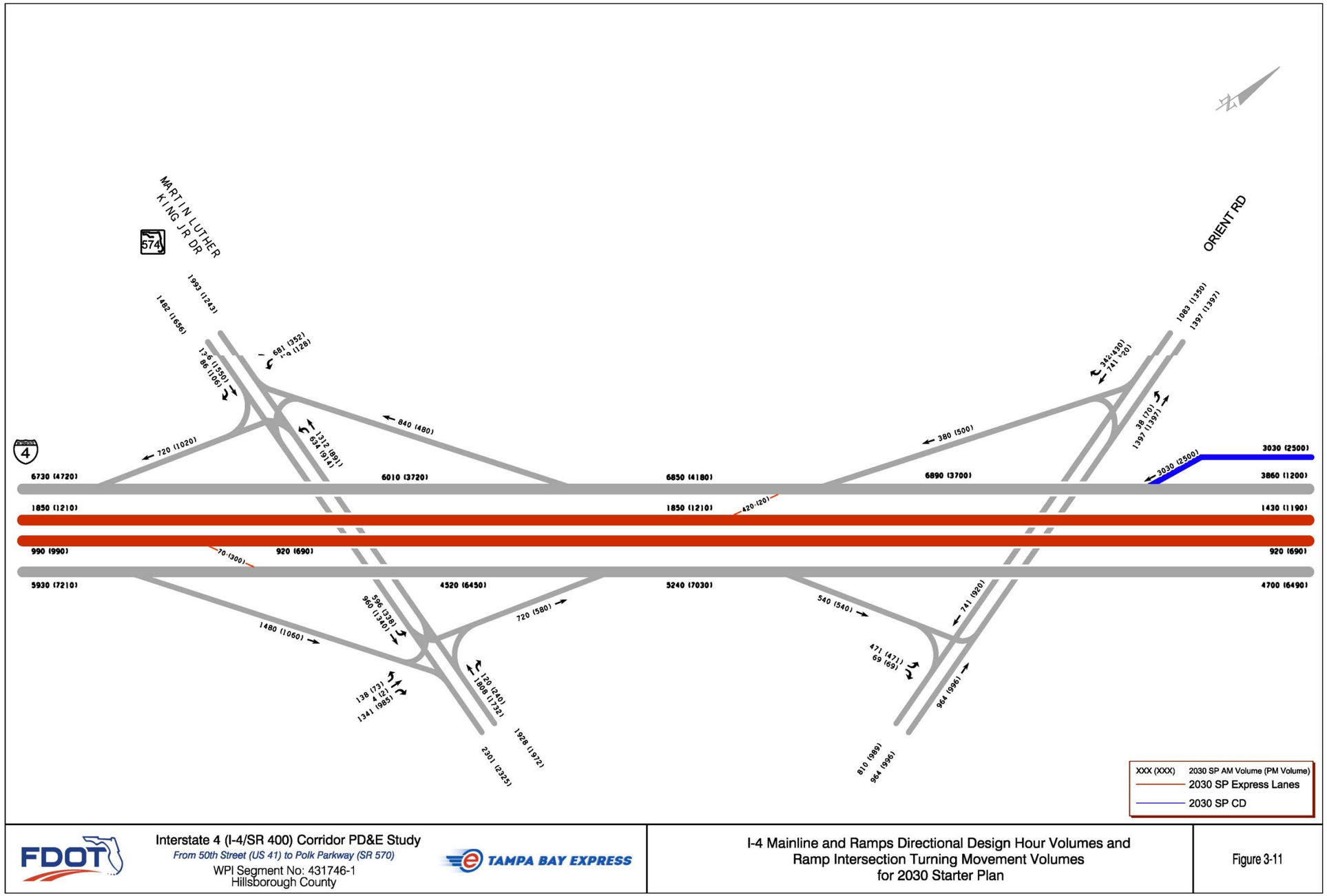
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2030 Starter Plan | Figure 3-10 |

**FIGURE 3-11: 2030 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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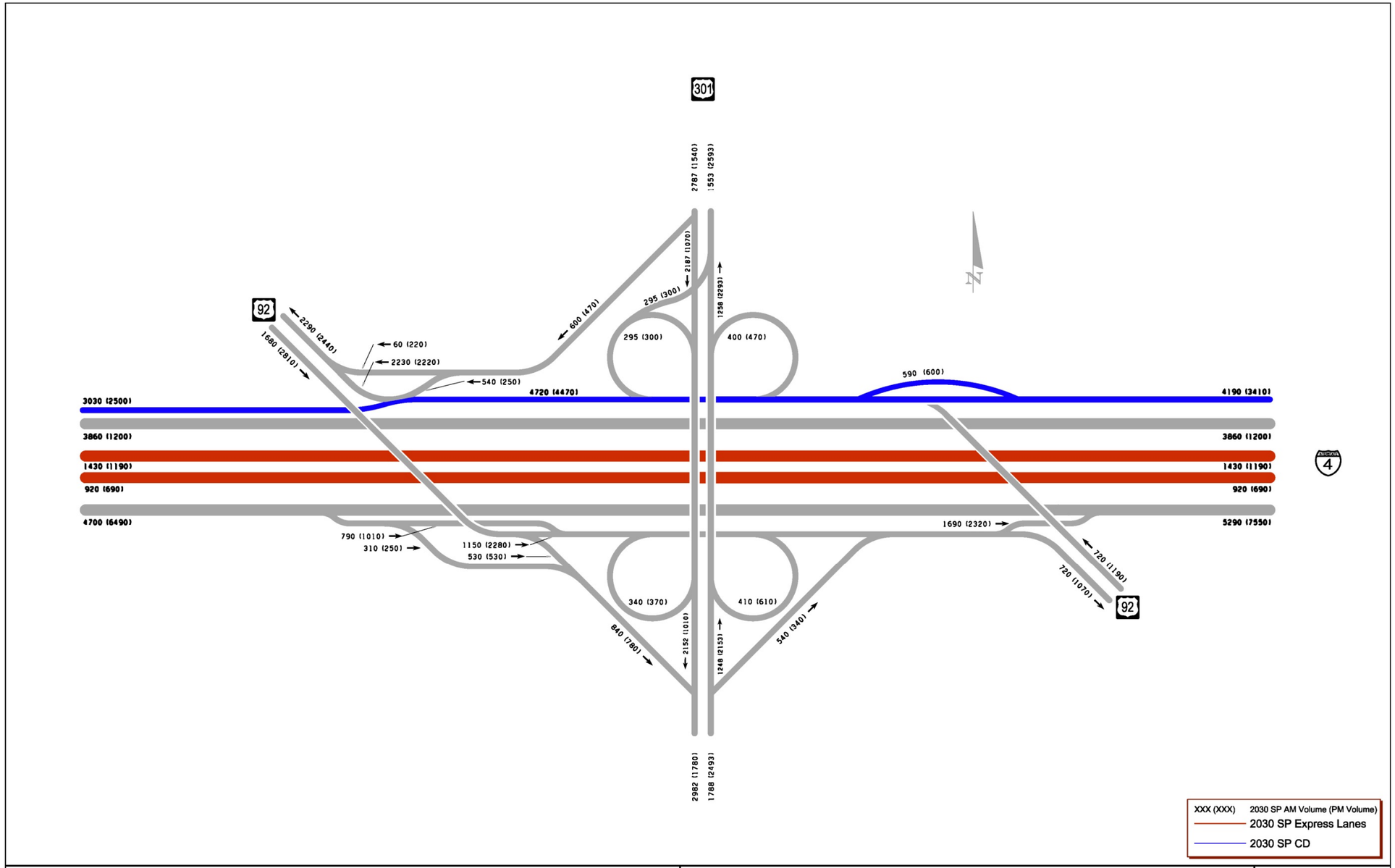
| FDOT<br>TAMPA BAY EXPRESS | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2030 Starter Plan |
| | | Figure 3-11 |

**FIGURE 3-12: 2030 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2030 Starter Plan | Figure 3-12 |

**FIGURE 3-13: 2030 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

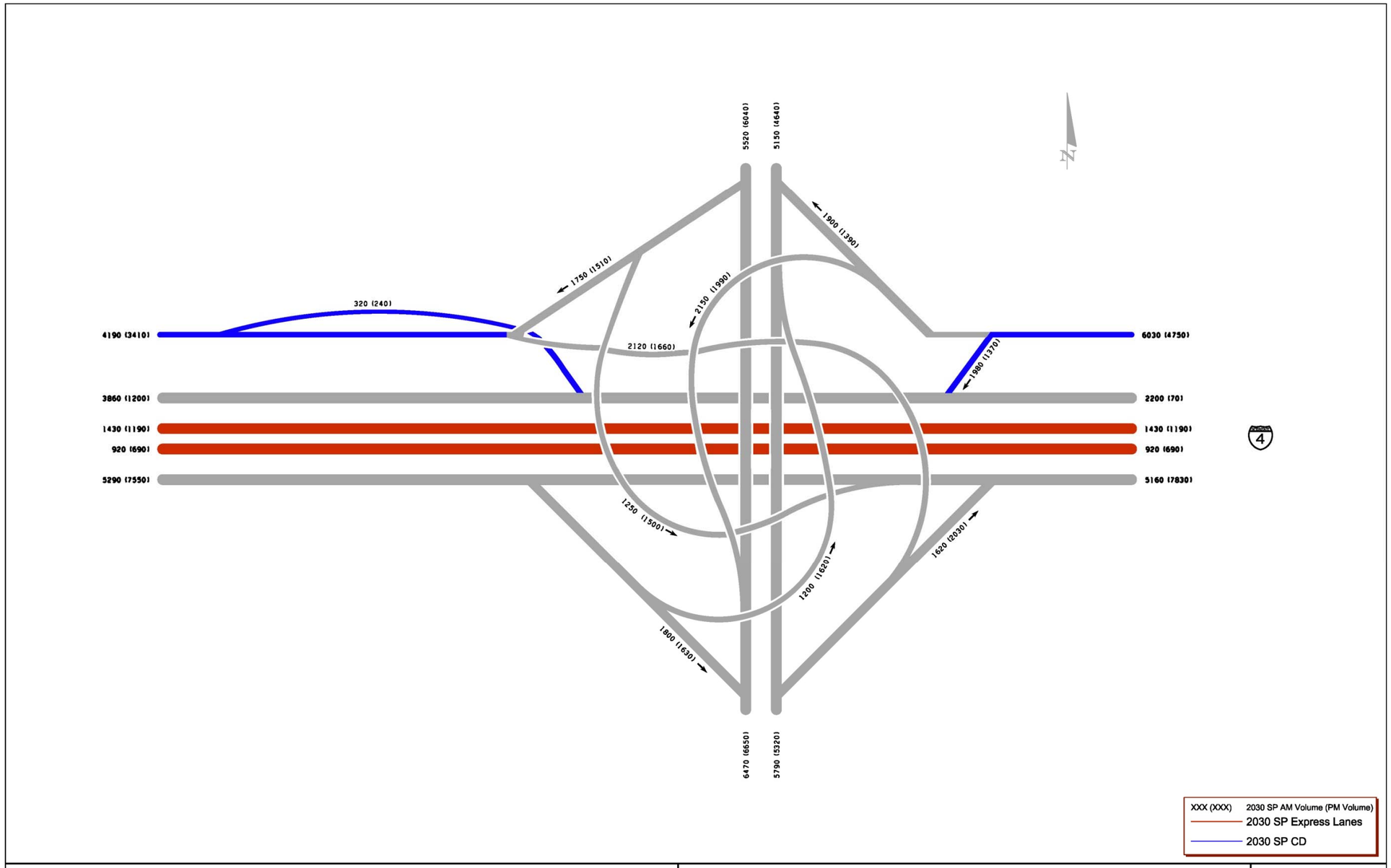
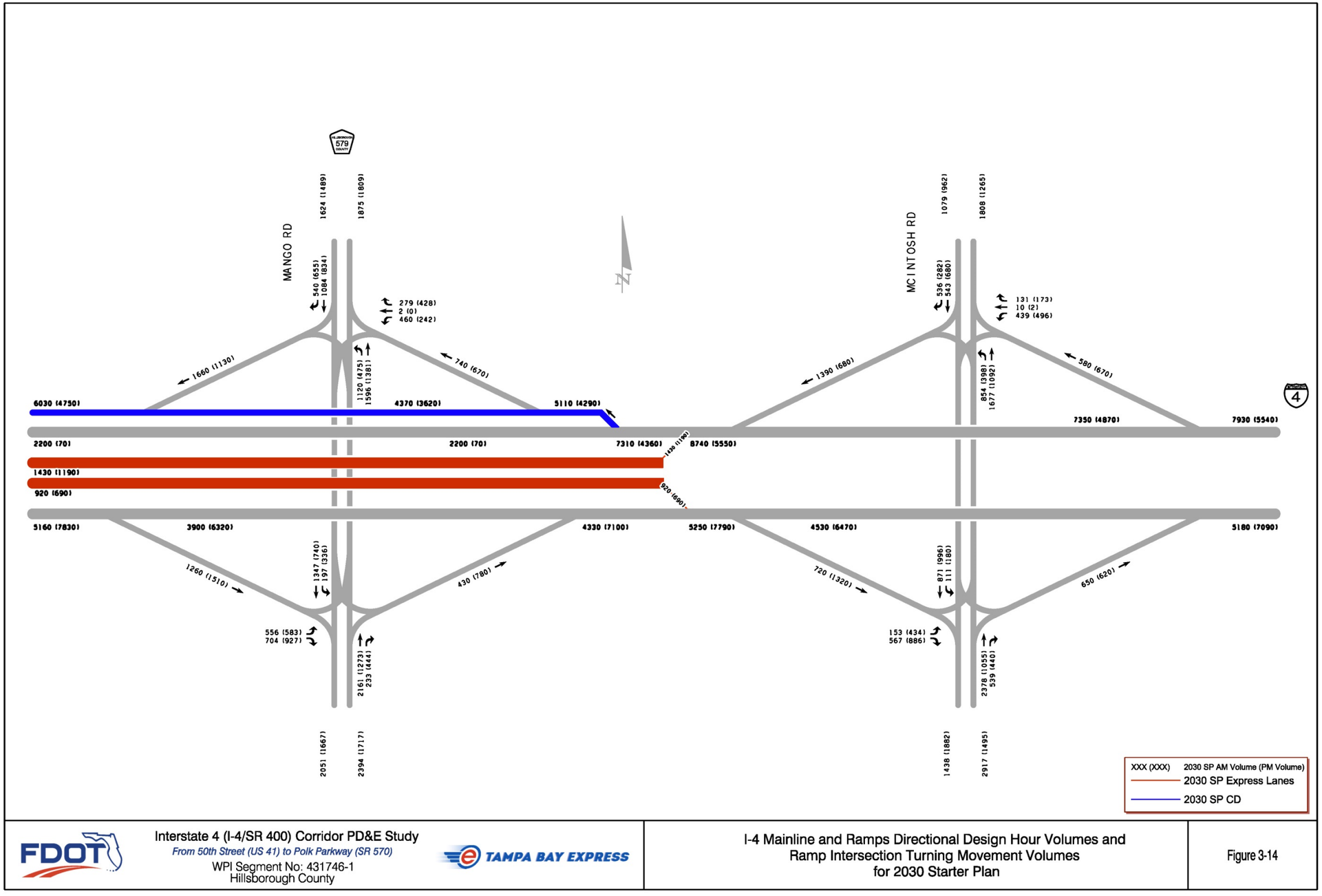


**FIGURE 3-14: 2030 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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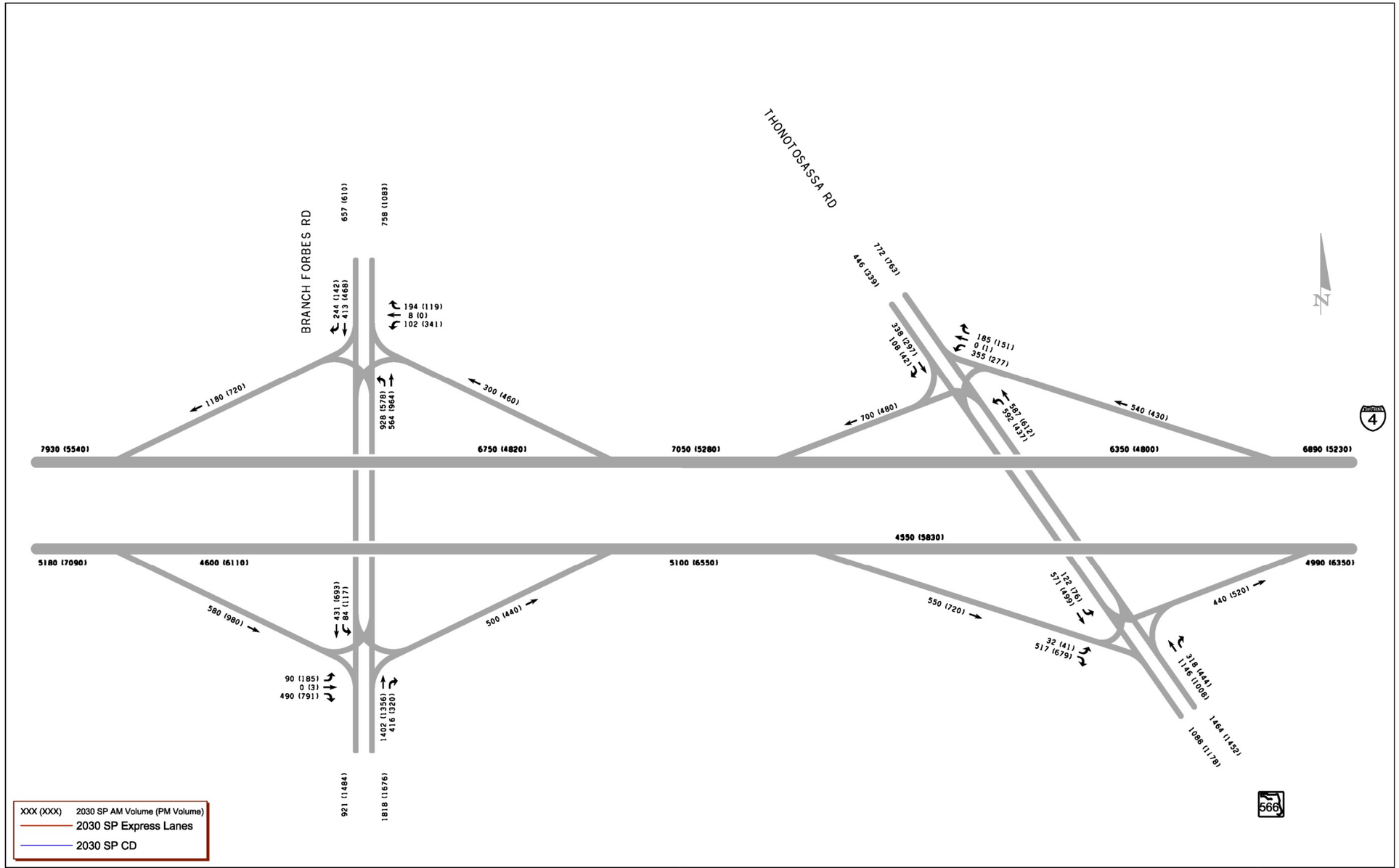
| FDOT / TAMPA BAY EXPRESS<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2030 Starter Plan | Figure 3-14 |

**FIGURE 3-15: 2030 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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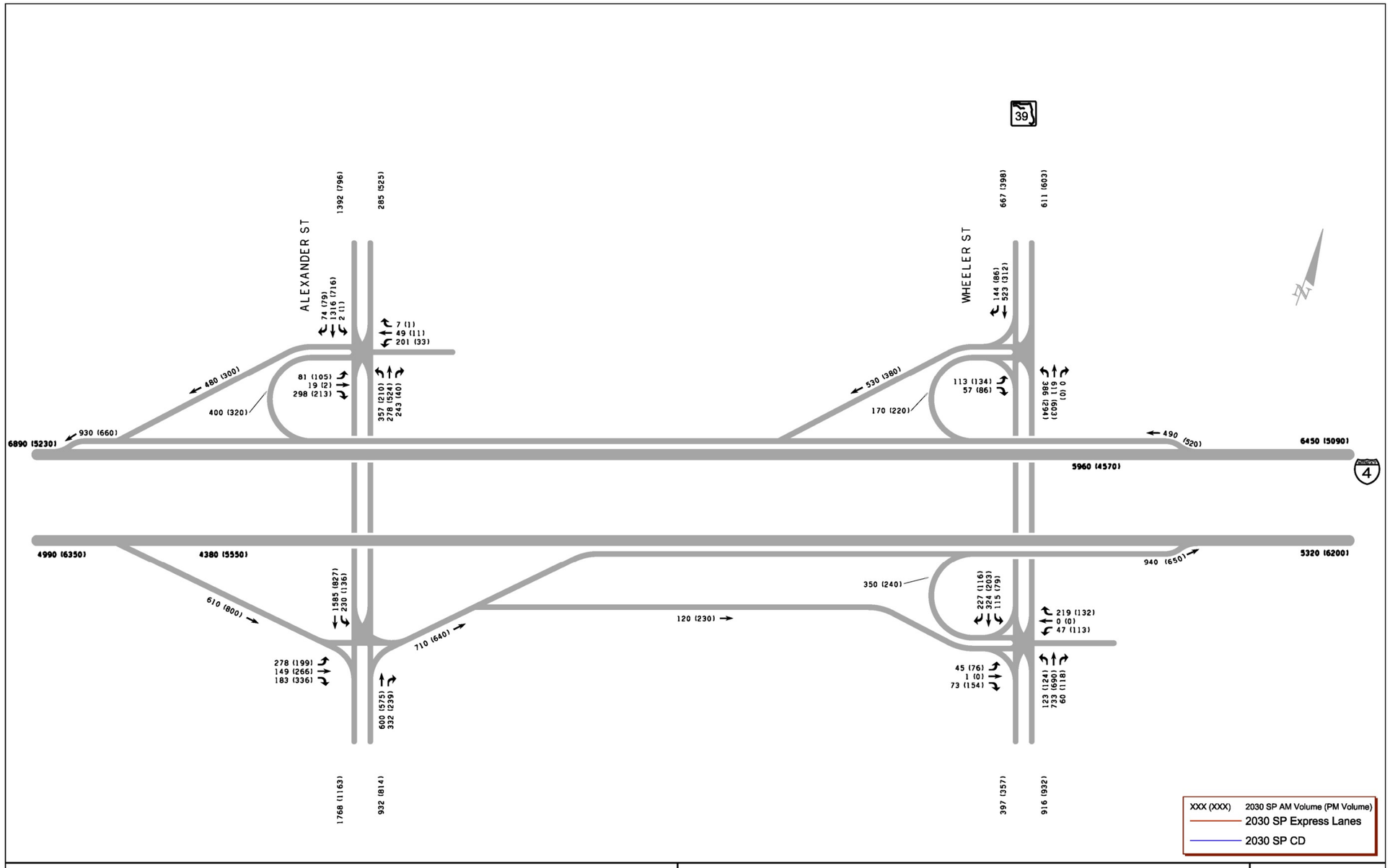
| FDOT / TAMPA BAY EXPRESS<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2030 Starter Plan | Figure 3-15 |

**FIGURE 3-16: 2030 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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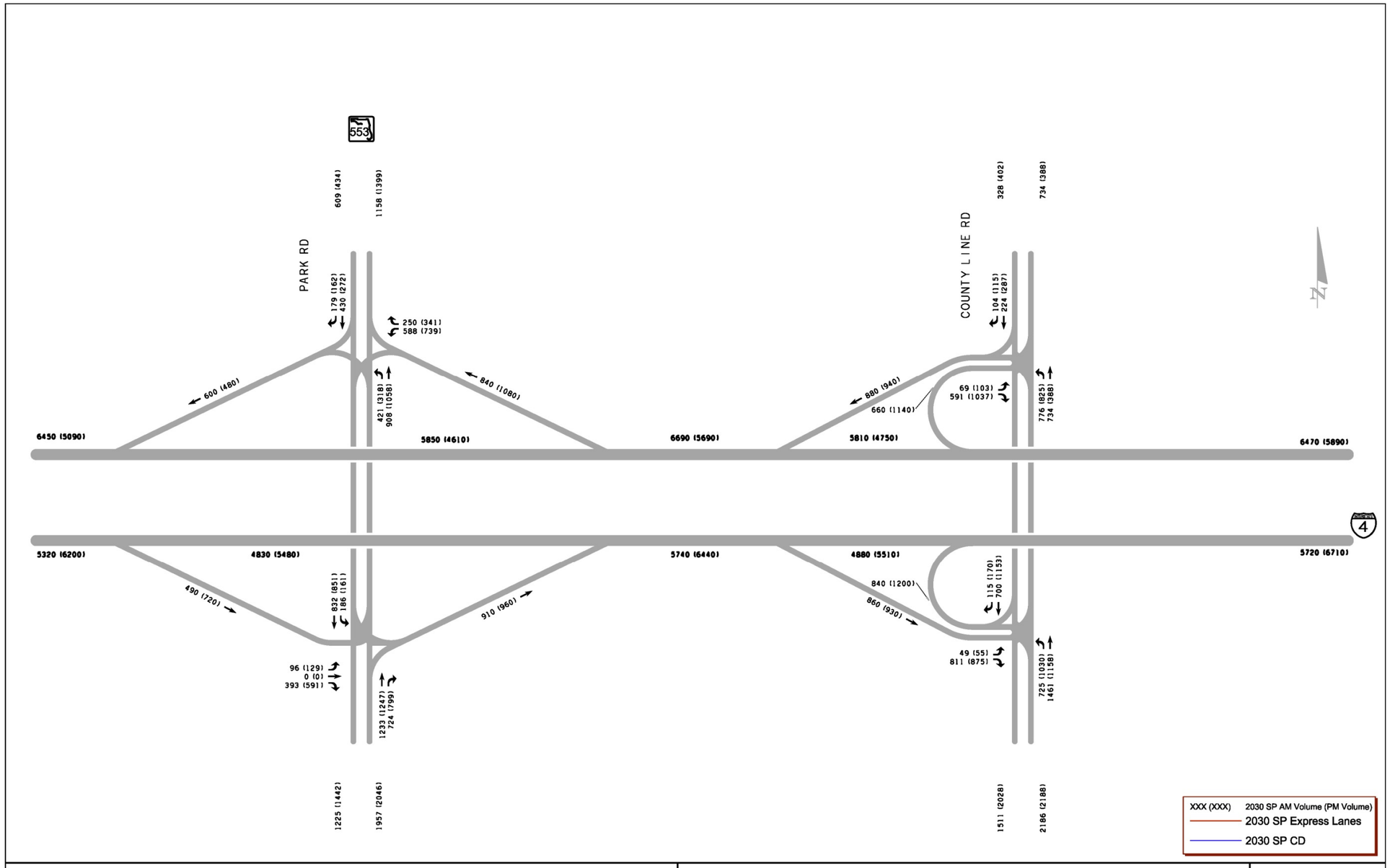
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2030 Starter Plan | Figure 3-16 |

**FIGURE 3-17: 2030 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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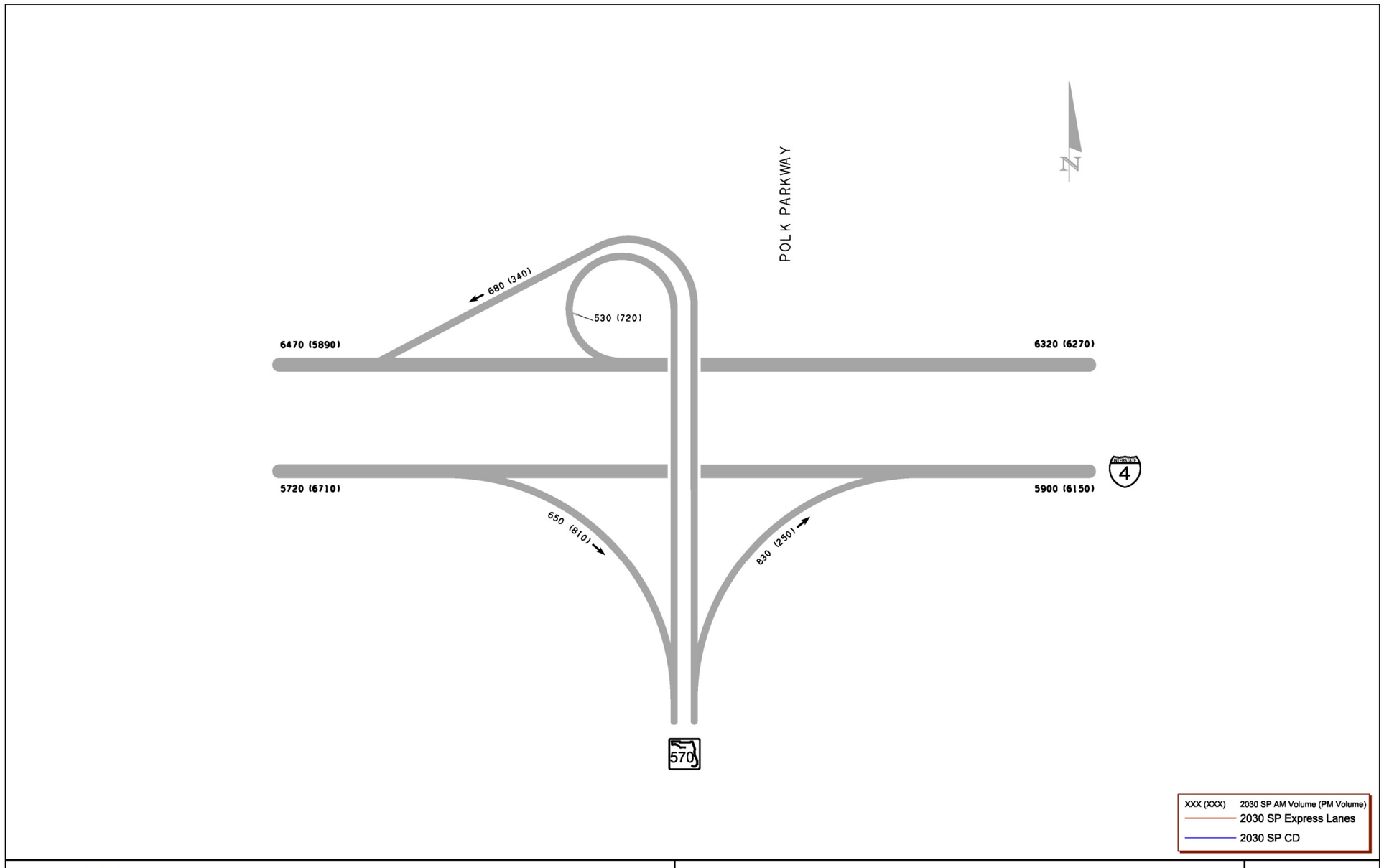
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2030 Starter Plan | Figure 3-17 |

**FIGURE 3-18: 2030 STARTER I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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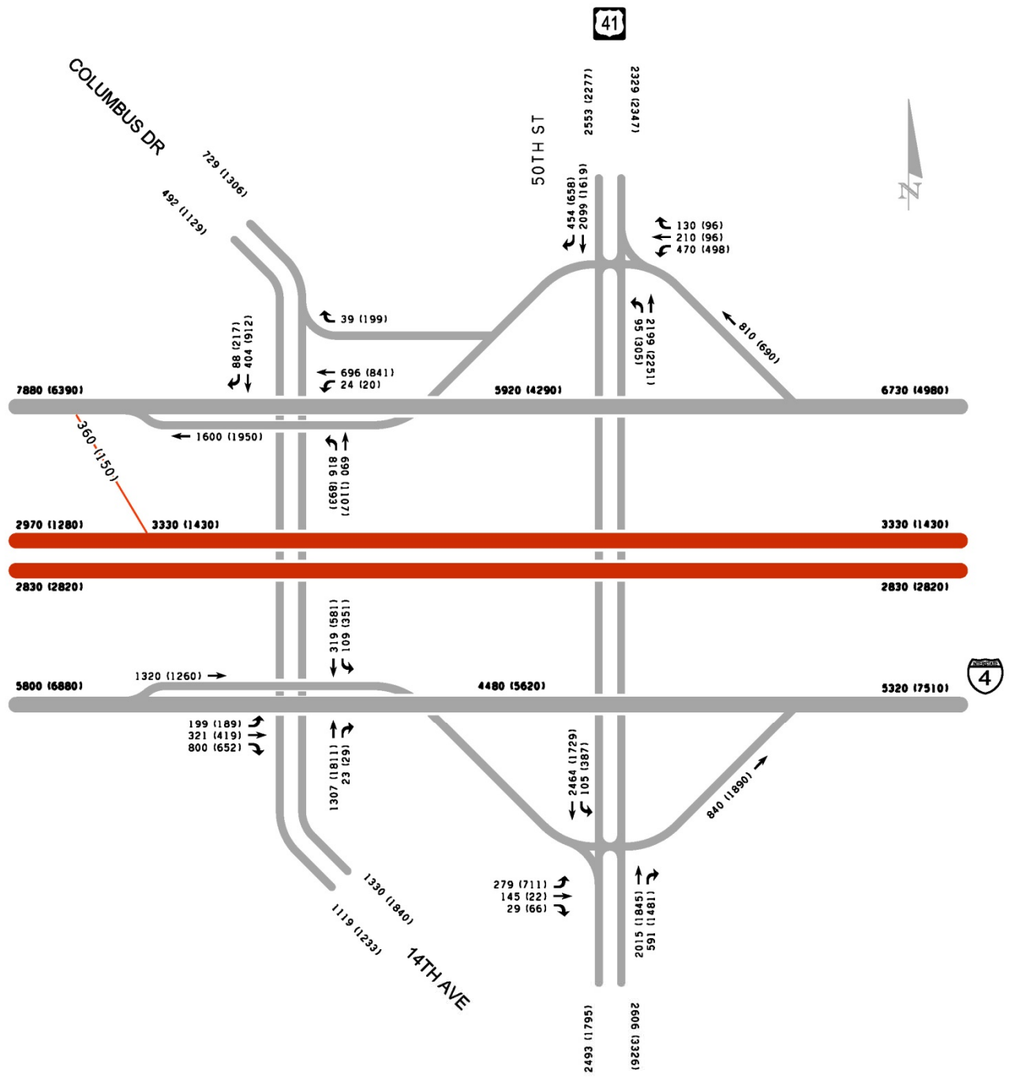
| FDOT | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2030 Starter Plan | Figure 3-18 |

**FIGURE 3-19: 2040 MASTER (BUILD) I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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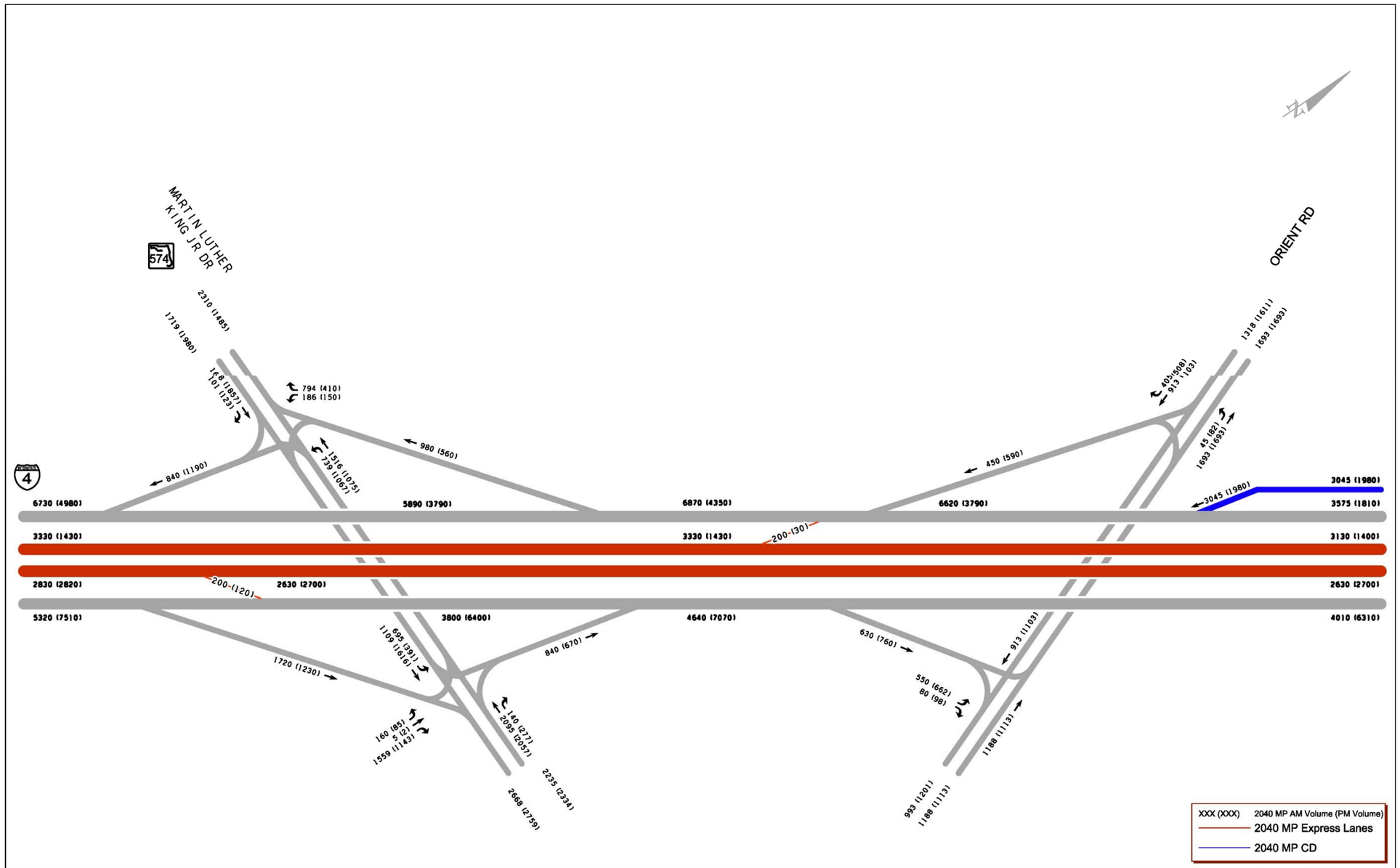
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 Master Plan | Figure 3-19 |

**FIGURE 3-20: 2040 MASTER (BUILD) I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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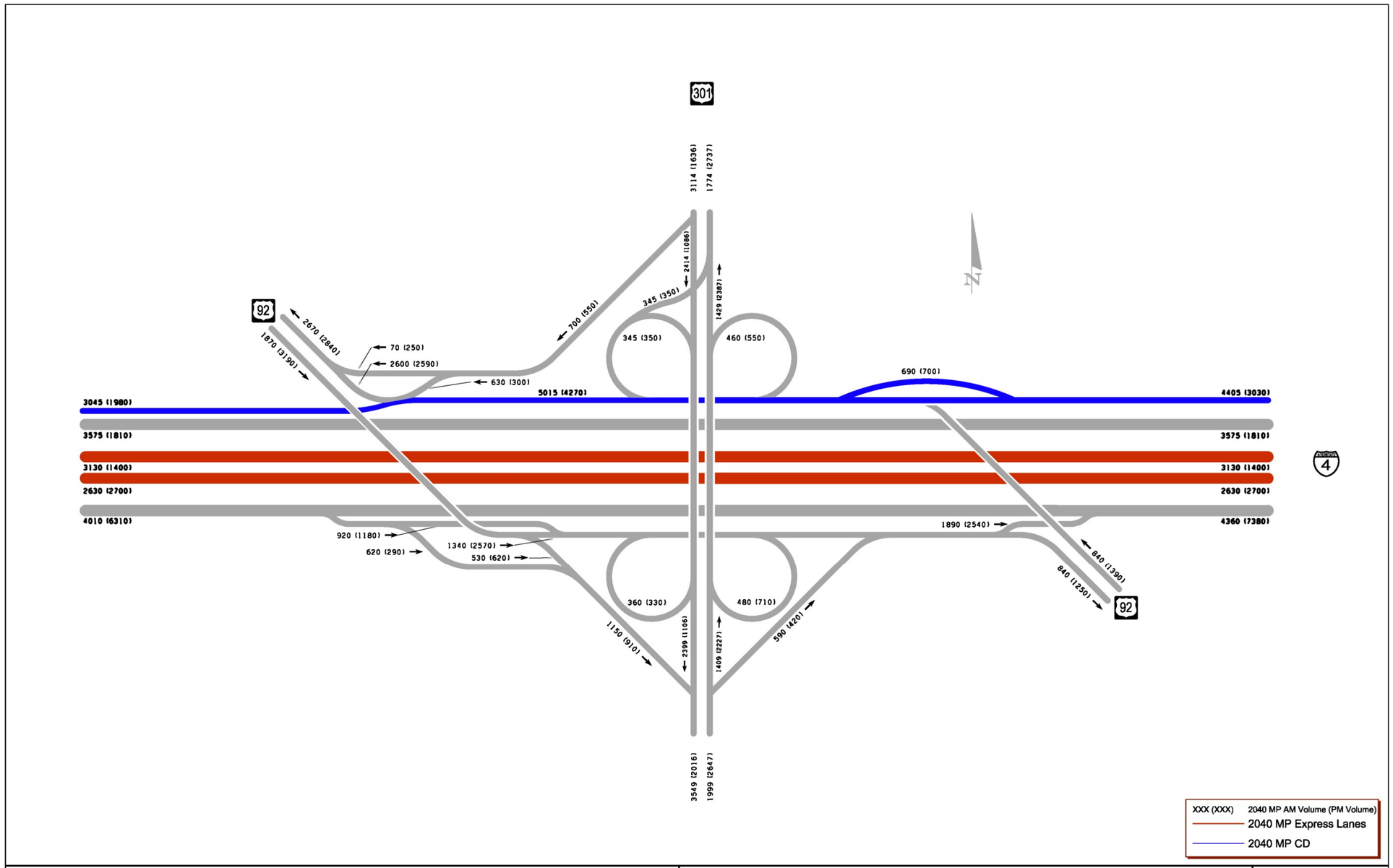
| FDOT | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 Master Plan |

Figure 3-20

**FIGURE 3-21: 2040 MASTER (BUILD) I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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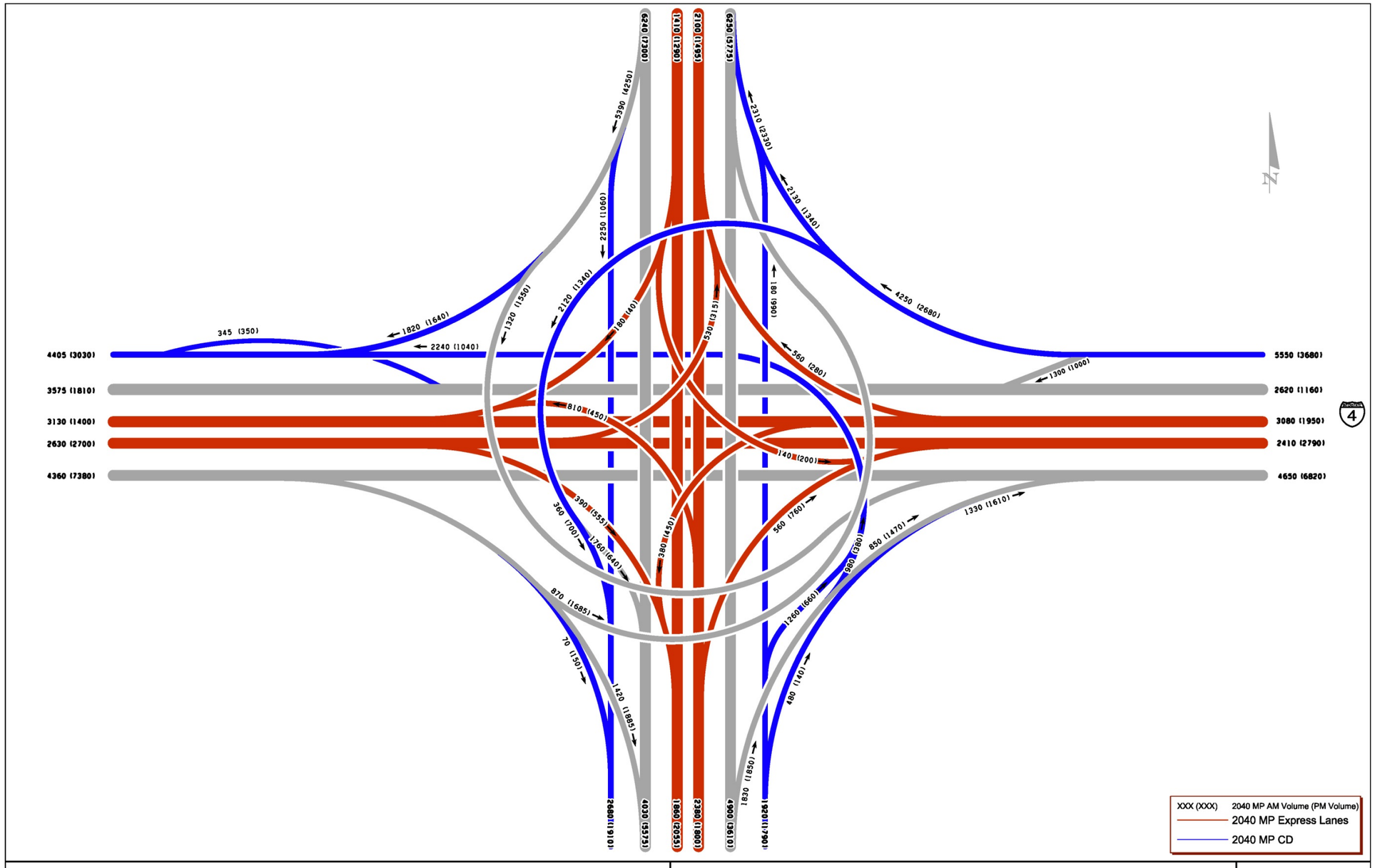
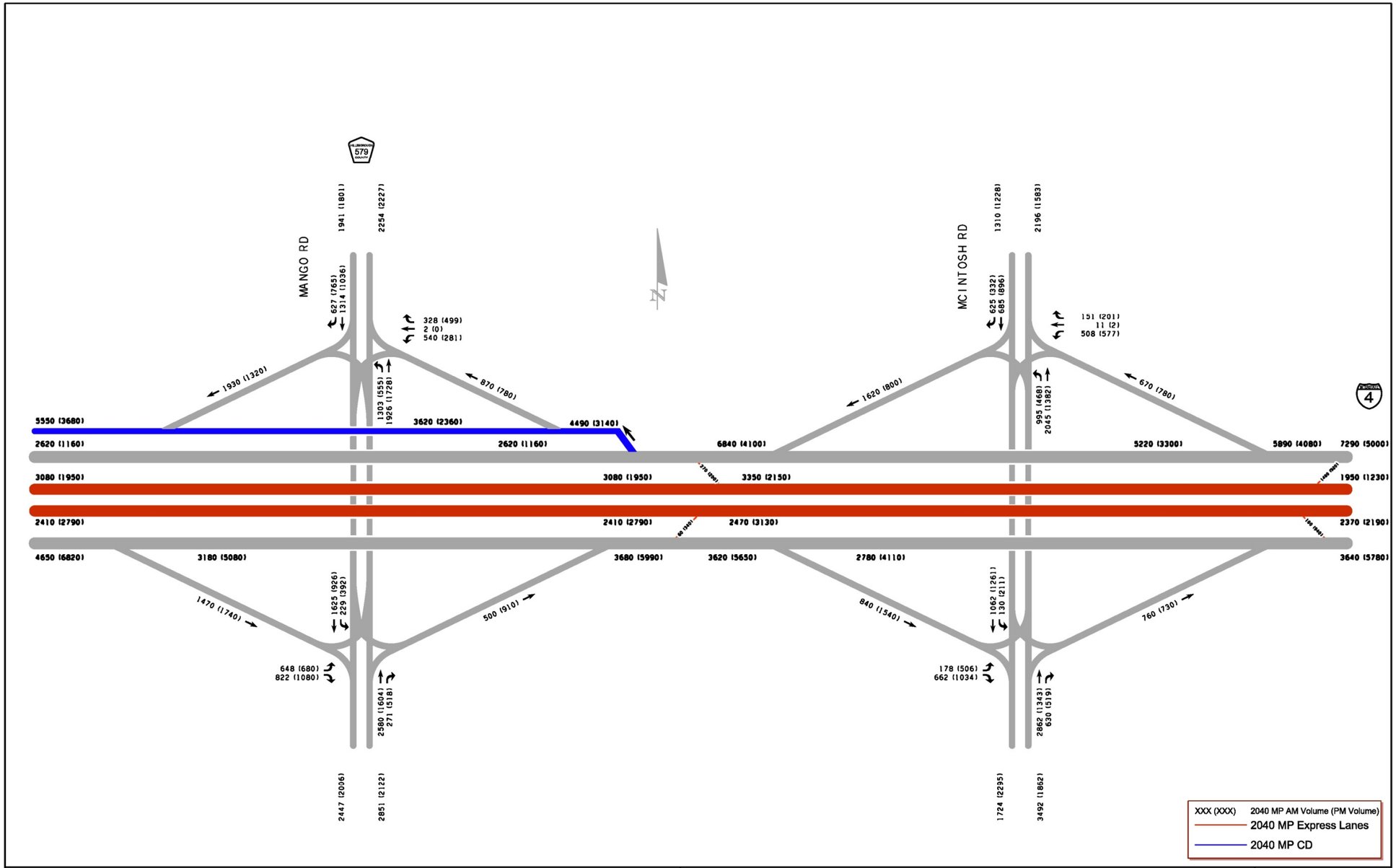
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 Master Plan | Figure 3-21 |

**FIGURE 3-22: 2040 MASTER (BUILD) I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**




| | | |
|---|---|---|
| FDOT / TAMPA BAY EXPRESS | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 Master Plan |
| | | Figure 3-22 |

**FIGURE 3-23: 2040 MASTER (BUILD) I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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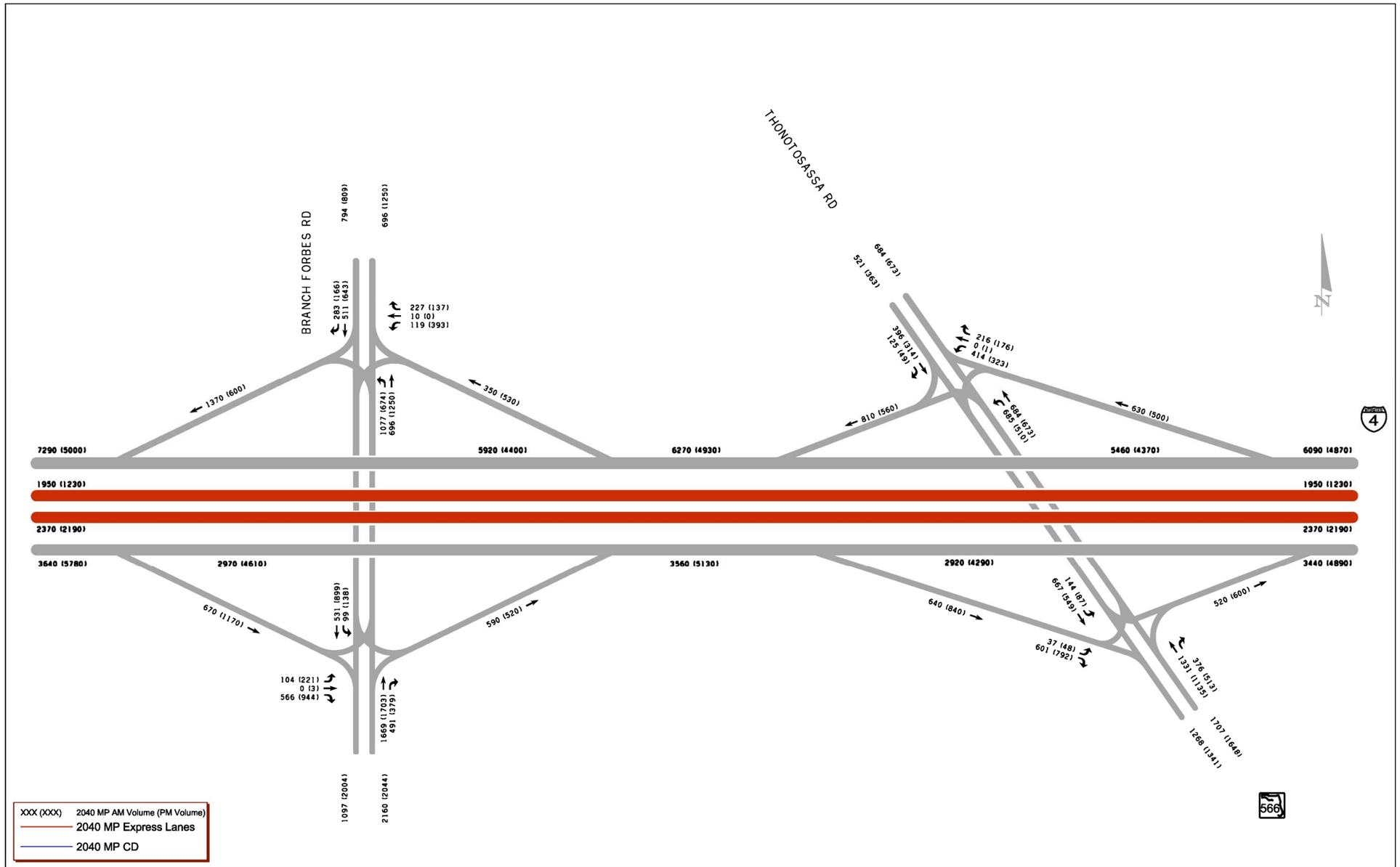
|---|---|---|
| FDOT<br>TAMPA BAY EXPRESS | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 Master Plan |
| | | Figure 3-23 |

**FIGURE 3-24: 2040 MASTER (BUILD) I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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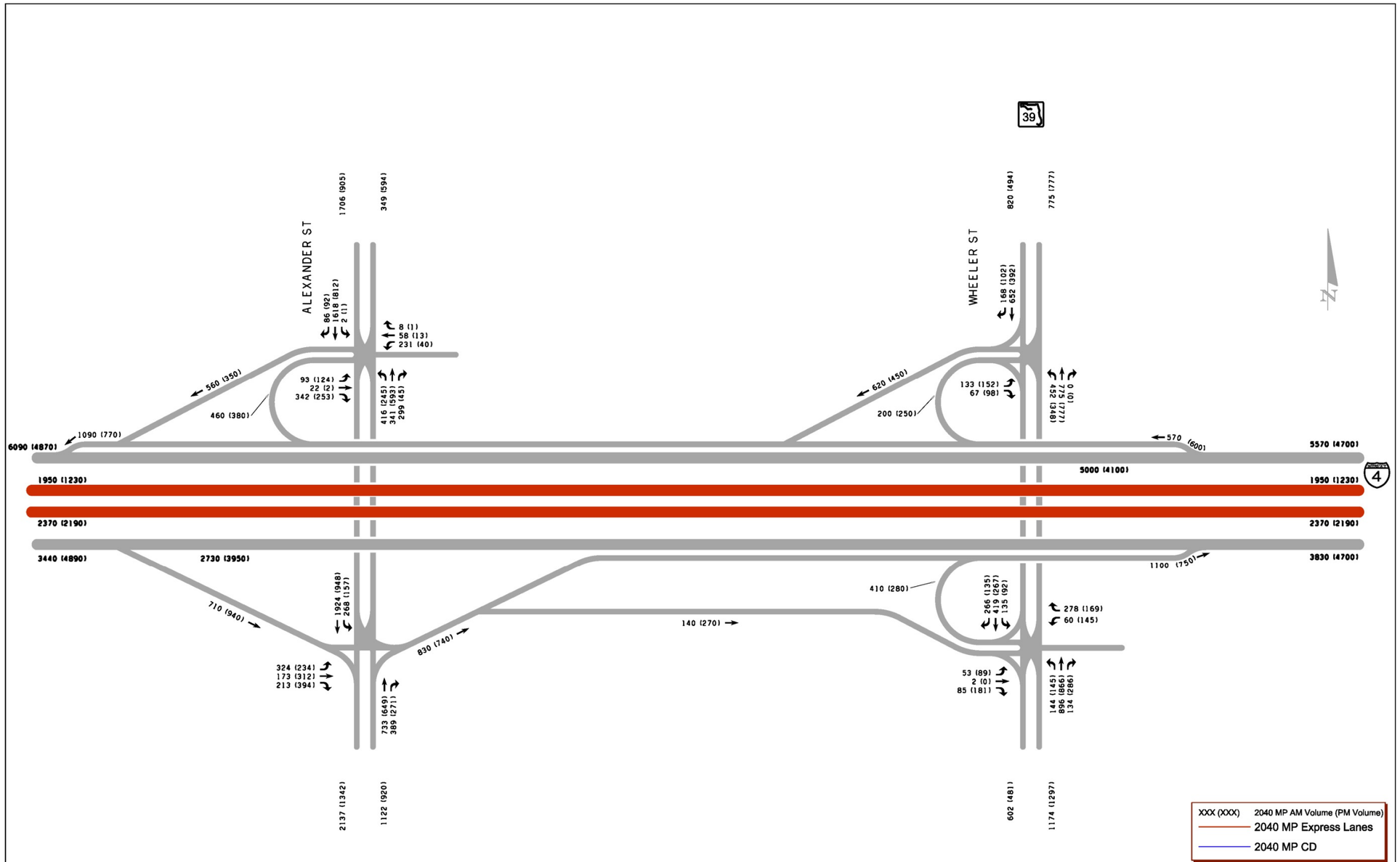
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 Master Plan | Figure 3-24 |

**FIGURE 3-25: 2040 MASTER (BUILD) I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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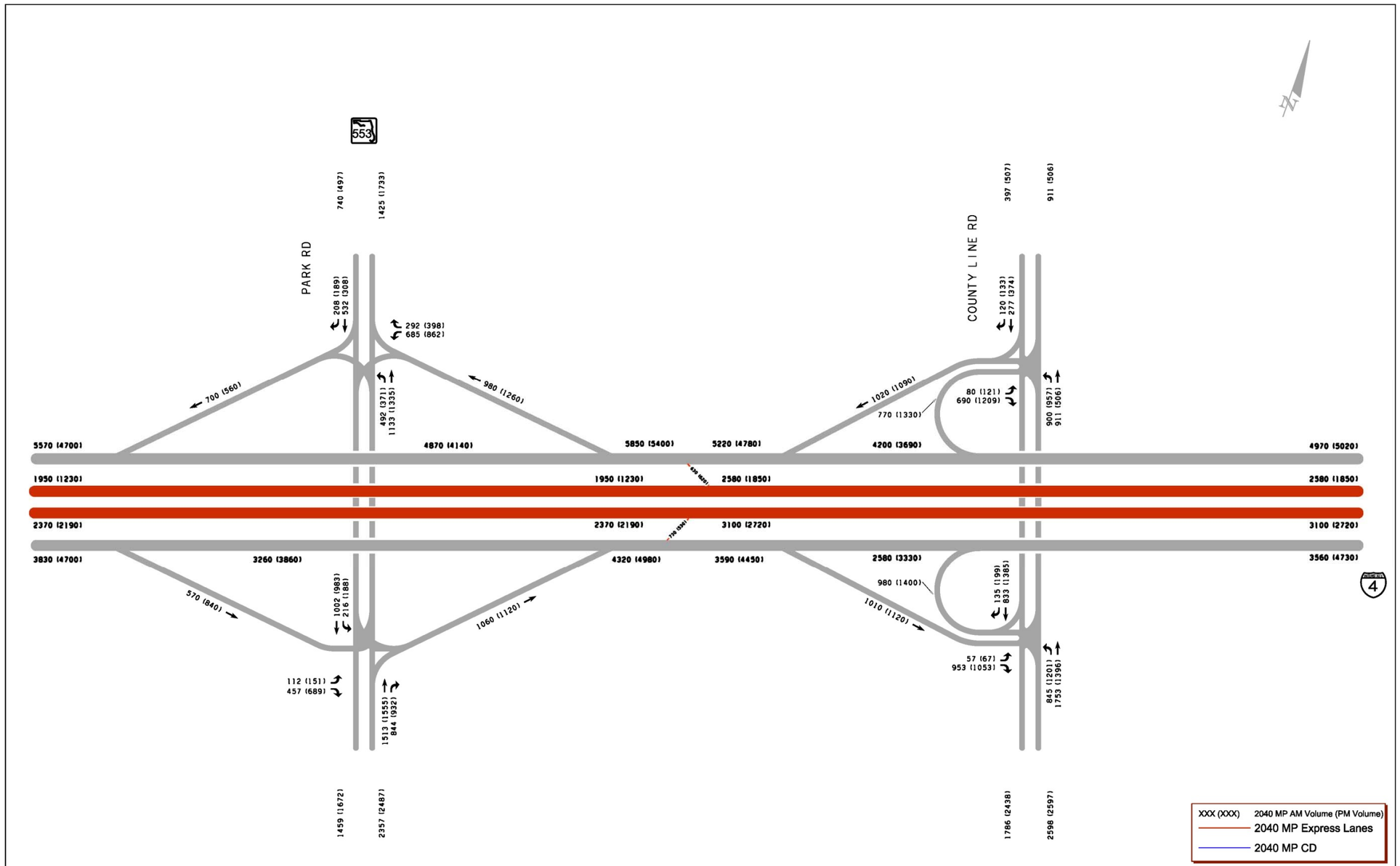
| FDOT<br>TAMPA BAY EXPRESS | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 Master Plan<br>Figure 3-25 |

**FIGURE 3-26: 2040 MASTER (BUILD) I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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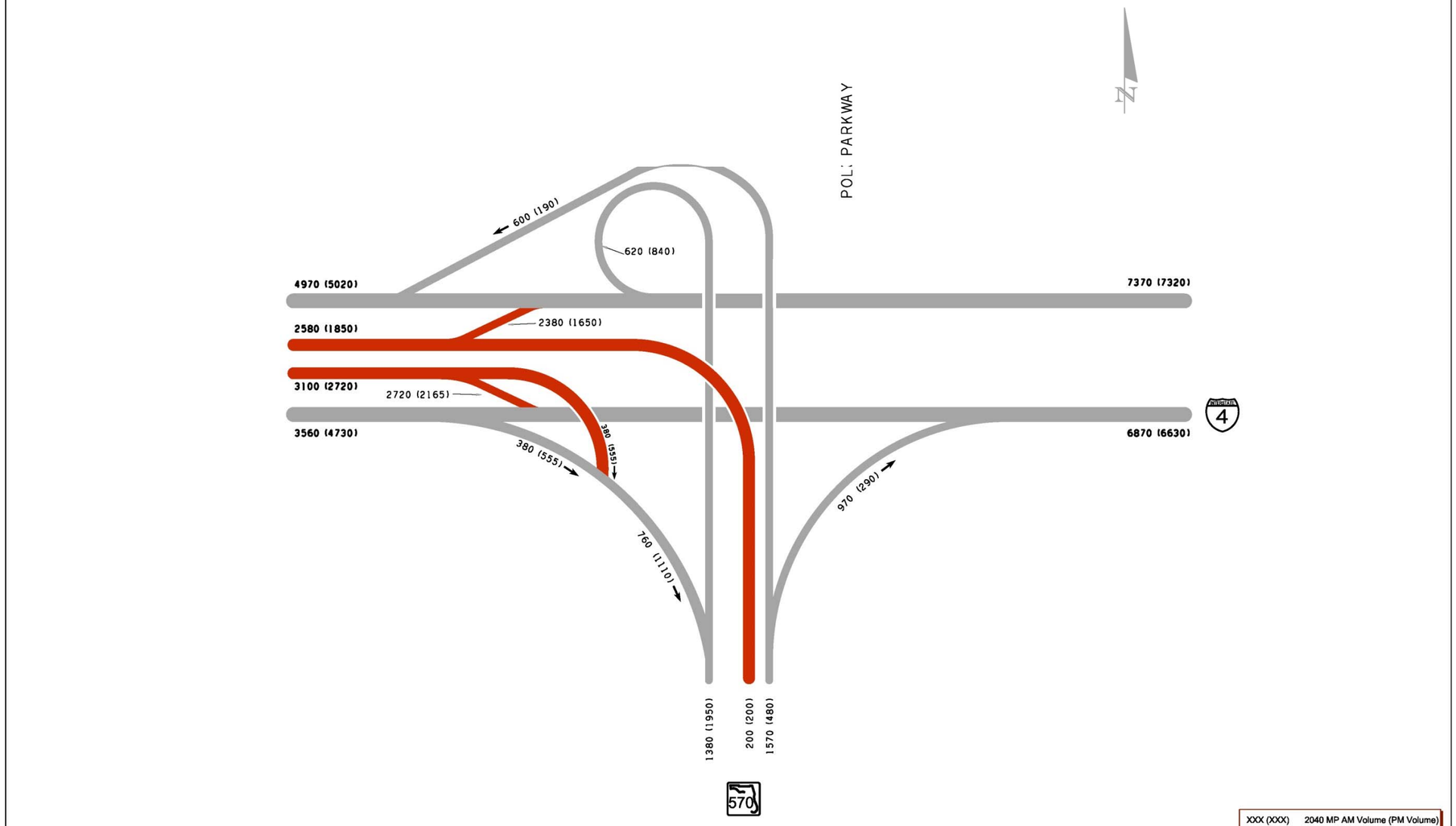
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 Master Plan | Figure 3-26 |

**FIGURE 3-27: 2040 MASTER (BUILD) I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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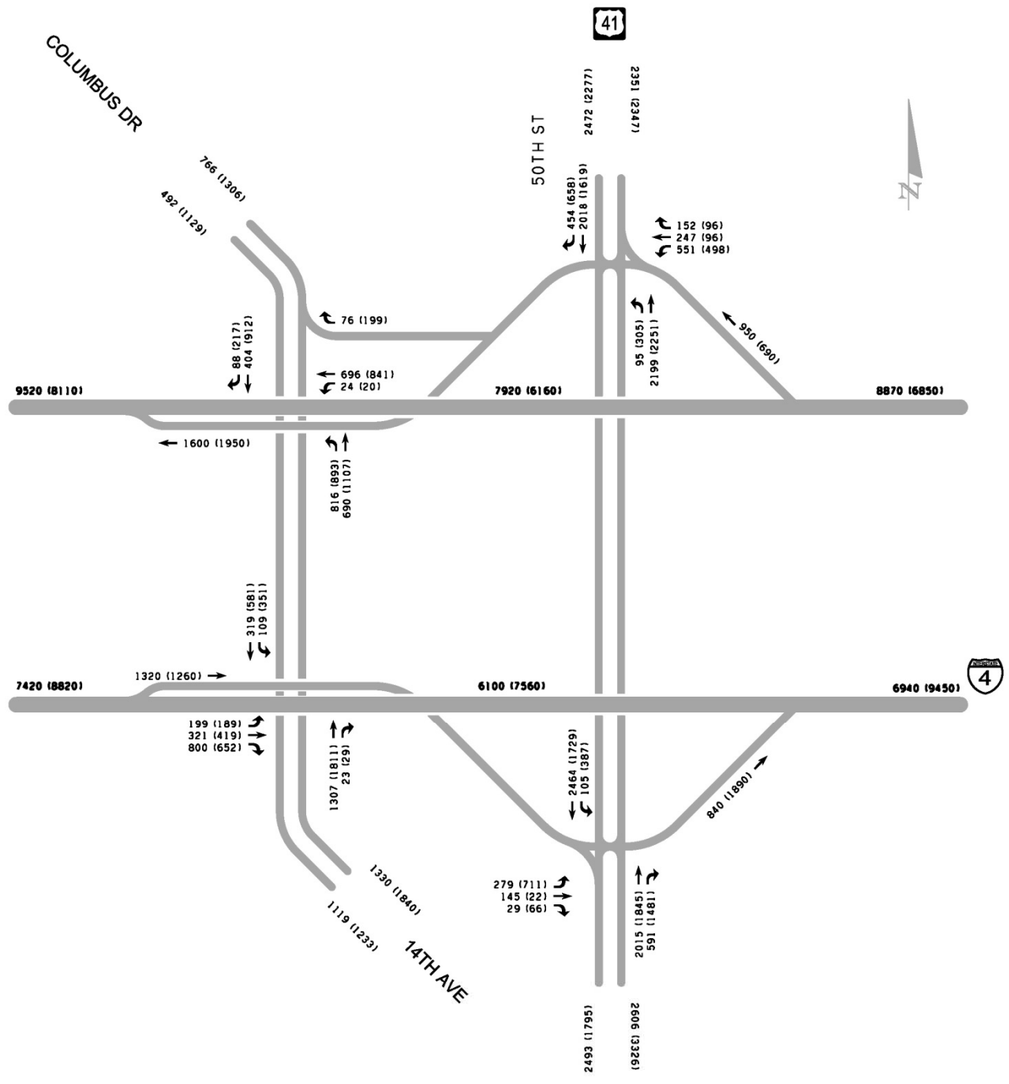
|---|---|---|
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 Master Plan | Figure 3-27 |

**FIGURE 3-28: 2040 NO-BUILD I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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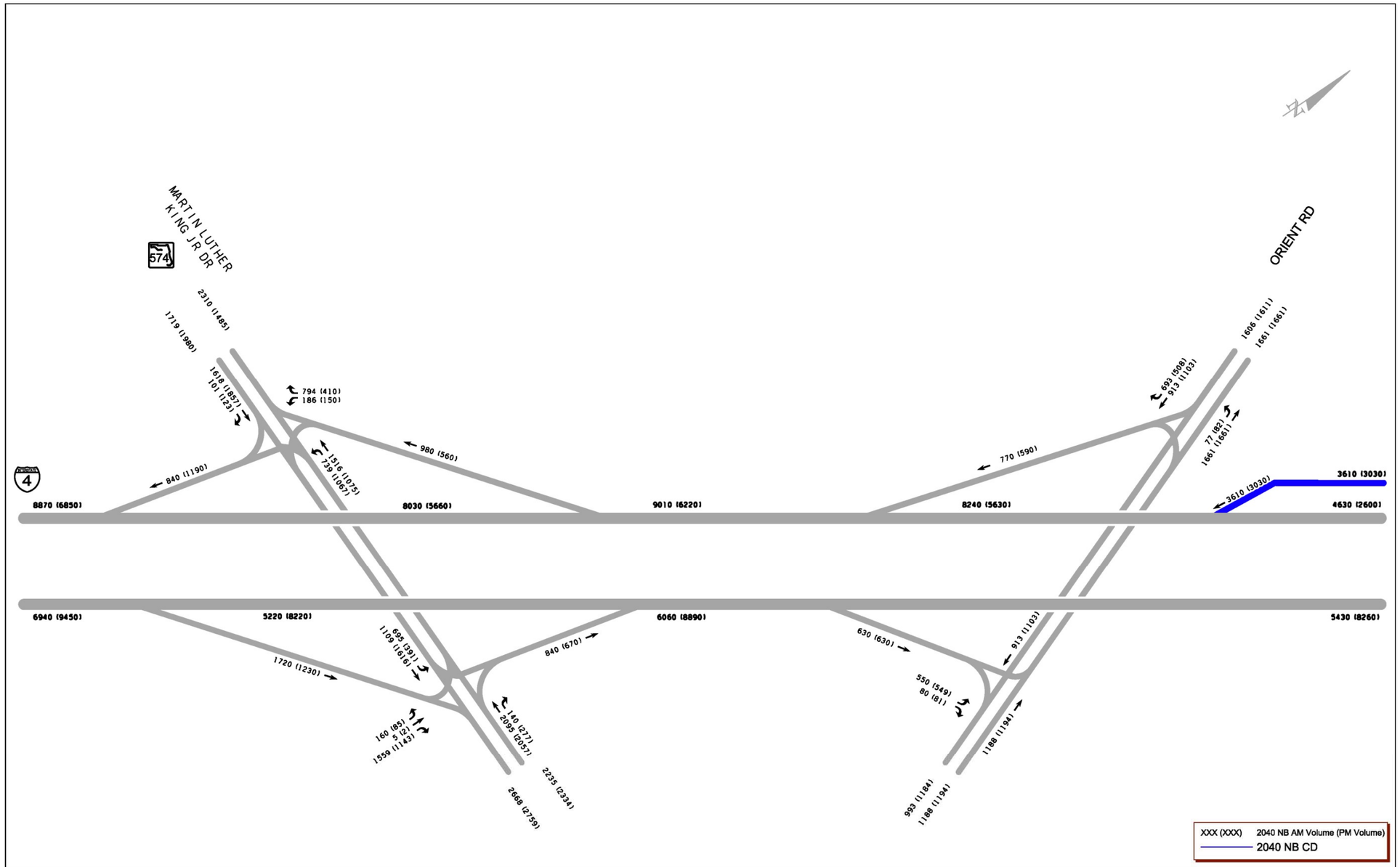
|---|---|---|
| FDOT<br>TAMPA BAY EXPRESS | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 No Build |
| | | Figure 3-28 |

**FIGURE 3-29: 2040 NO-BUILD I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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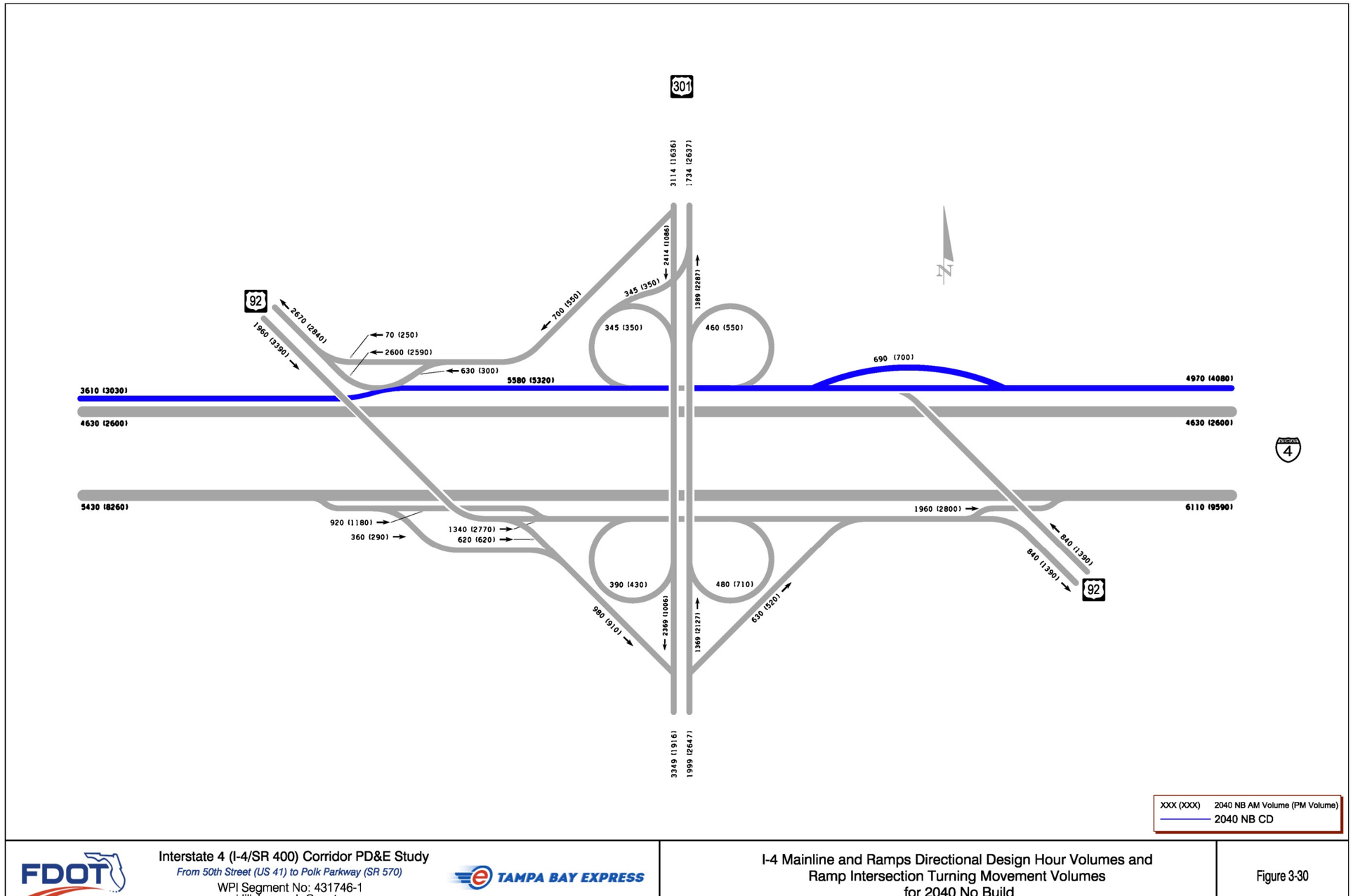
|---|---|---|
| FDOT<br>TAMPA BAY EXPRESS | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 No Build |
| | | Figure 3-29 |

**FIGURE 3-30: 2040 NO-BUILD I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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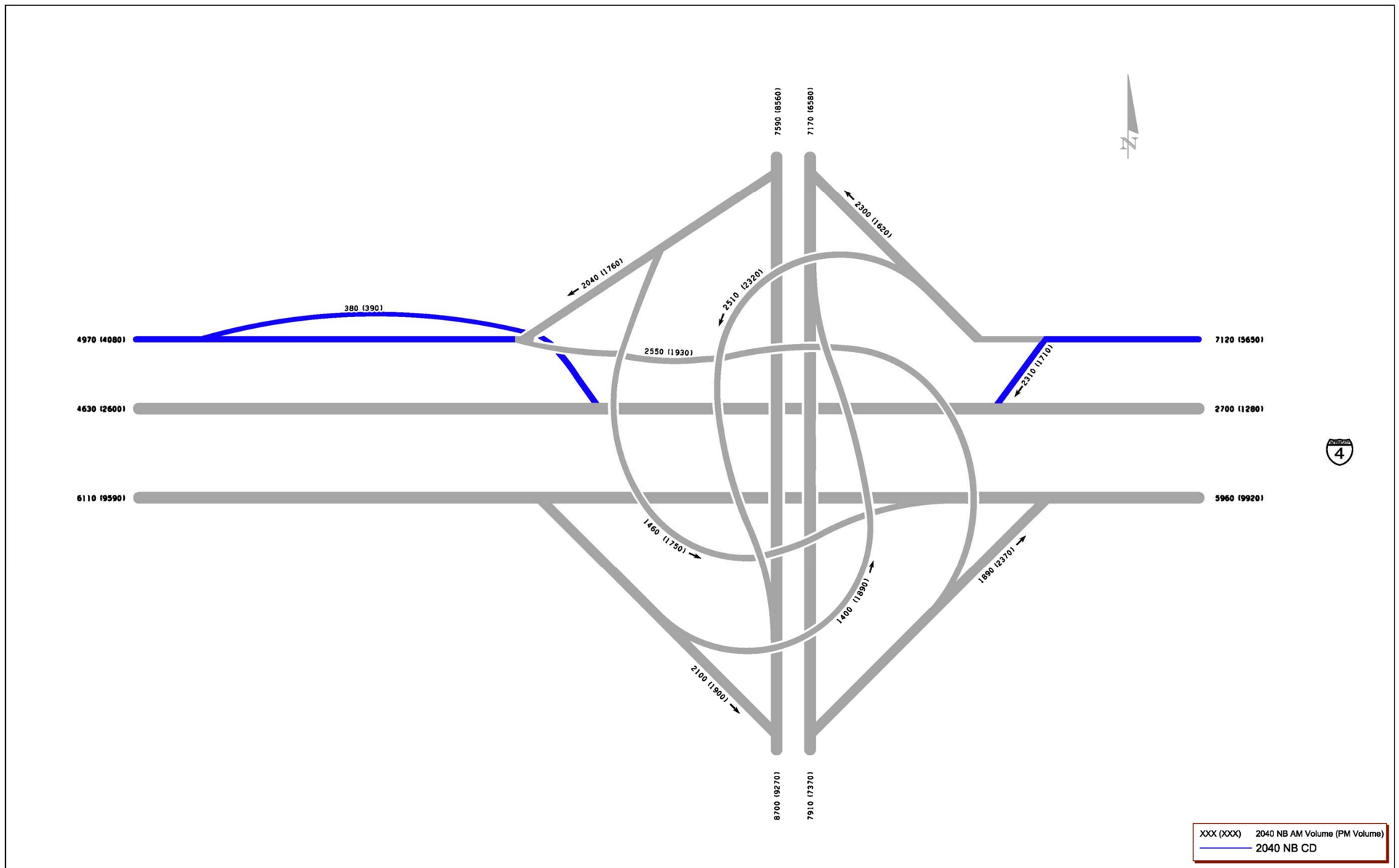
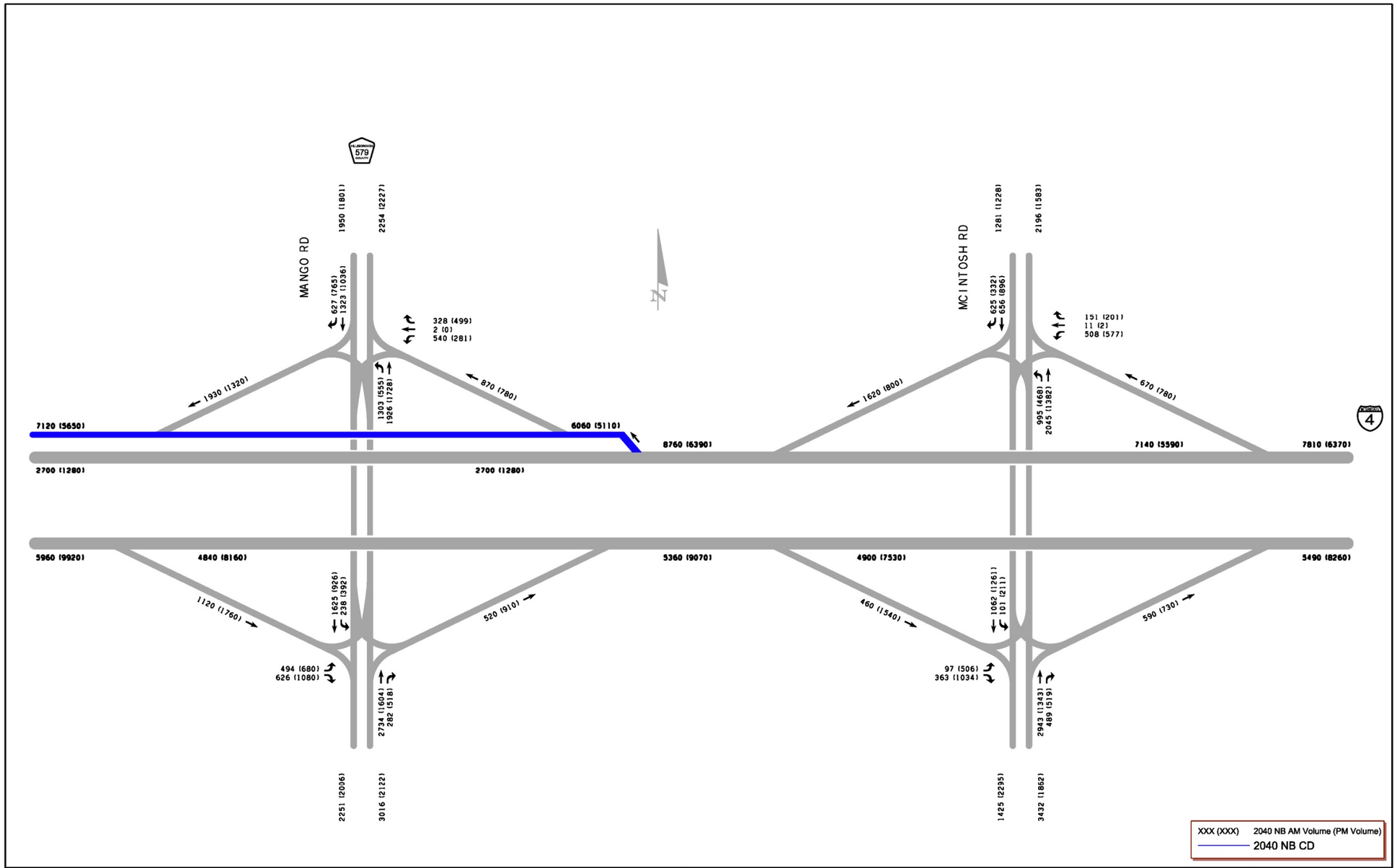
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 No Build | Figure 3-30 |

**FIGURE 3-31: 2040 NO-BUILD I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**




| | | | |
|---|---|---|---|
| FDOT | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 No Build |
| | | | Figure 3-31 |

**FIGURE 3-32: 2040 NO-BUILD I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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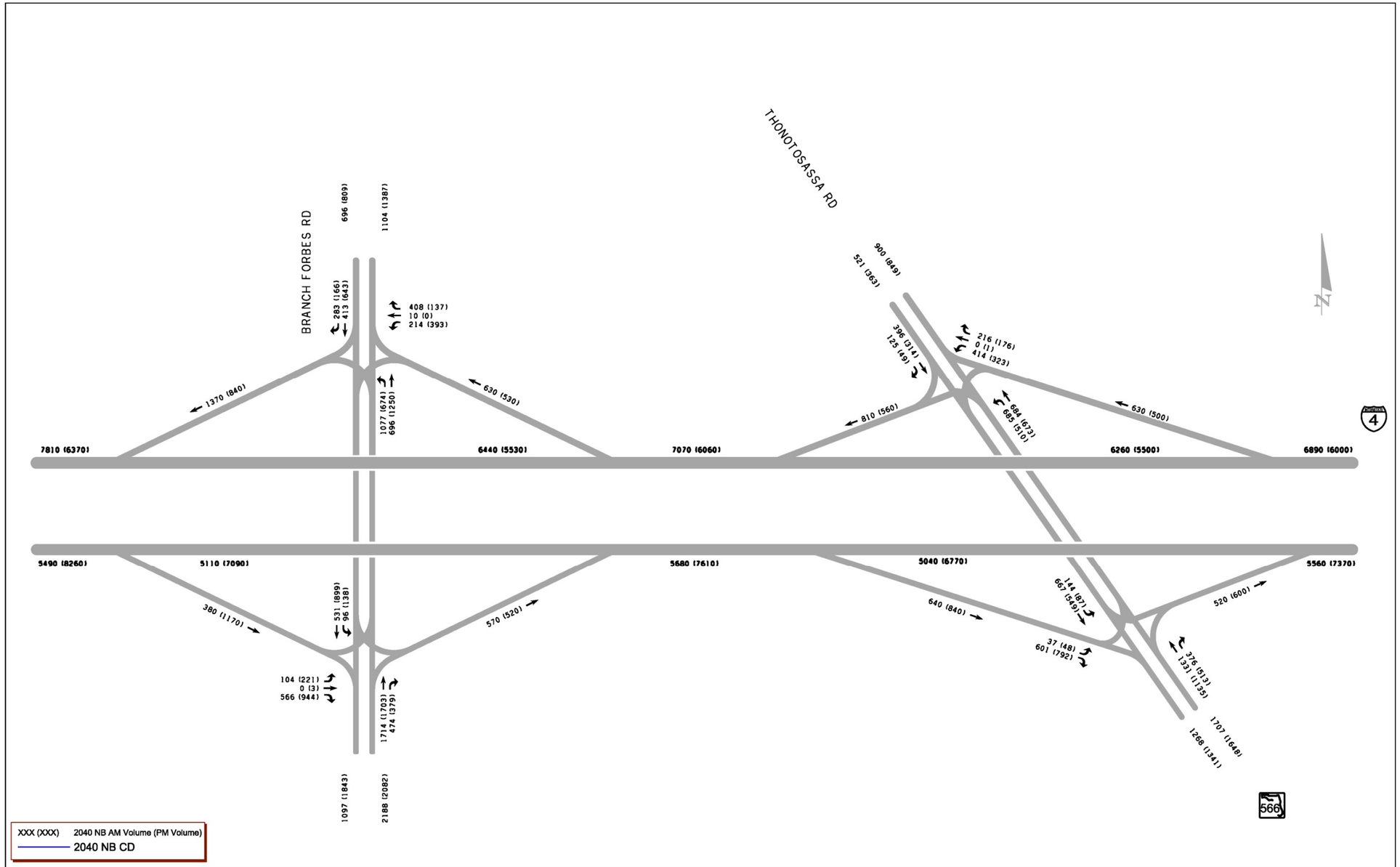
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 No Build | Figure 3-32 |

**FIGURE 3-33: 2040 NO-BUILD I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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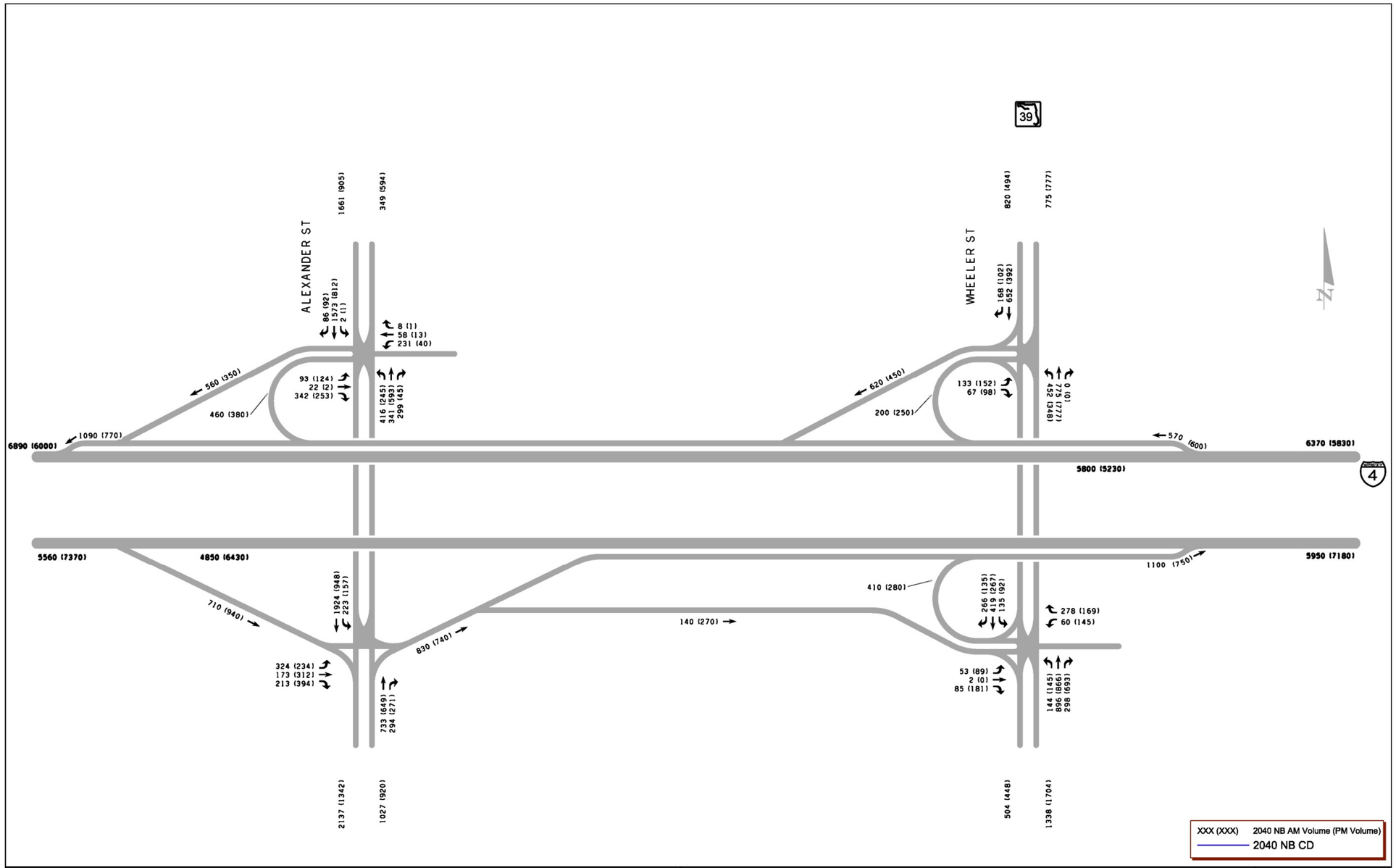
|---|---|---|
| FDOT<br>TAMPA BAY EXPRESS | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 No Build |
| | | Figure 3-33 |

**FIGURE 3-34: 2040 NO-BUILD I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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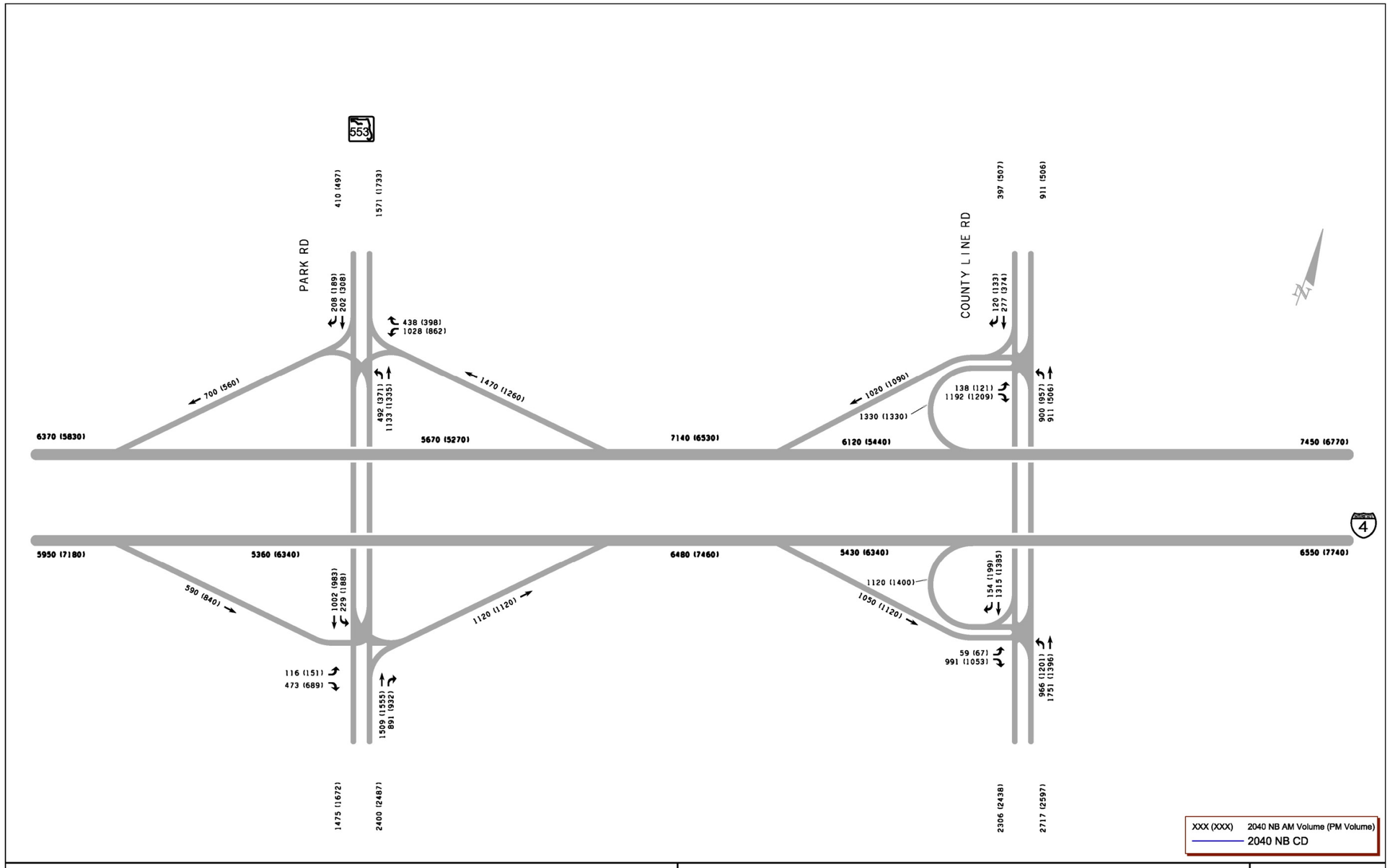
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 No Build | Figure 3-34 |

**FIGURE 3-35: 2040 NO-BUILD I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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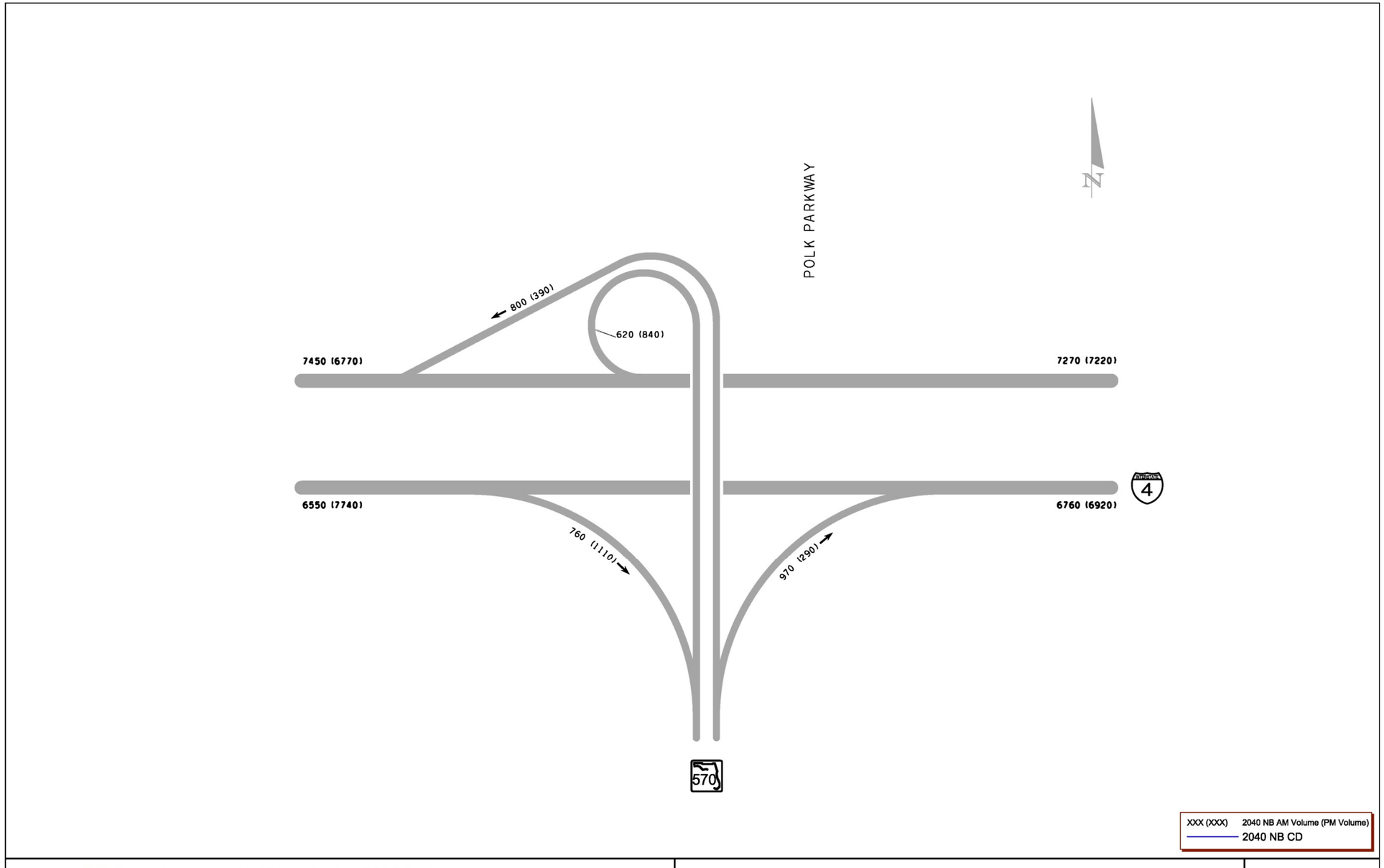
|---|---|---|
| FDOT<br>Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County<br>TAMPA BAY EXPRESS | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 No Build | Figure 3-35 |

**FIGURE 3-36: 2040 NO-BUILD I-4 MAINLINE AND RAMPS DDHV AND RAMP TMC'S**

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| FDOT<br>TAMPA BAY EXPRESS | Interstate 4 (I-4/SR 400) Corridor PD&E Study<br>*From 50th Street (US 41) to Polk Parkway (SR 570)*<br>WPI Segment No: 431746-1<br>Hillsborough County | I-4 Mainline and Ramps Directional Design Hour Volumes and Ramp Intersection Turning Movement Volumes for 2040 No Build |
| | | Figure 3-36 |

## 3.2 Development of 2020 Starter Project Analysis

In order for the system to process the appropriate volumes on the General Use Lanes (GUL) and Express Lanes (EL), the following minor improvements were needed.

1. I-4 EB Ramp & McIntosh Rd intersection
    - changed SB left turn phasing from permissive only to protected/permissive
    - extended length of SB left turn pocket
    - added NB right turn lane
2. I-4 WB Ramp & McIntosh Rd intersection
    - extended length of NB left turn pocket
    - added SB right turn lane
3. I-4 EB Ramp & County Line Rd intersection
    - modeled as signalized intersection with a right turn overlap for the EBR turn movements
    - extended length of NB left turn pocket
4. I-4 WB Ramp & County Line Rd intersection
    - modeled as signalized intersection with a right turn overlap for the EBR turn movements
5. I-4 EB Off-Ramp to I-75 NB & SB
    - extended length of right deceleration lane

The 2020 Starter Project Year operational analysis was performed for I-4 GUL and EL segments during AM and PM Peak periods. Based on the geometric modifications discussed above, the signal timings and offsets were re-optimized in SYNCHRO to obtain better progression as needed. The revised offsets were updated in the CORSIM network analysis.

## 3.3 2020 Starter Project CORSIM Operational Analysis

**Figure 3-37** shows the 2020 Starter Year Condition speed profile along I-4 General Use Lanes (GUL) and Express Lanes (EL) for AM Peak and **Figure 3-38** shows the 2020 Starter Year Condition speed profile along I-4 GUL and EL for PM Peak. CORSIM models are provided in **Appendix D (on CD)**.

The following color codes were used to develop these speed profiles.

| Legend | |
|---|---|
| Red | < = 35 MPH |
| Orange | > 35 MPH and < = 45 MPH |
| Yellow | > 45 MPH < = 50 MPH |
| Dark Green | > 50 MPH < = 55 MPH |
| Green | > 55 MPH < = 60 MPH |
| Light Green | > 60 MPH < = 65 MPH |
| Gray | > 65 MPH |

The 2020 Starter Year Condition speed profile analyses for the General Use Lanes (GUL) are summarized as below:

1. **I-4 GUL Eastbound AM Peak**: The speed drops to between 55 MPH and 60 MPH between the 50th Street on-ramp to the MLK off ramp, MLK on-ramp to Orient Road off-ramp. The speed reduction is within 10 MPH of the posted speed limit. Most of the segments have speeds operating between 60 MPH and 65 MPH. Most of the segments east of the Mango Road off-ramp are operating more than 65 MPH.
2. **I-4 GUL Westbound AM Peak**: The speed drops to 50 MPH just east of the Express Lane ramp. Also, there is a minor friction between on-ramp from the US 301/US 92 CD system to the MLK off-ramp. This is due to merge condition caused by the heavy traffic from the CD system to the I-4. However, the remaining westbound segment operates between 60 MPH and 65 MPH.
3. **I-4 GUL Eastbound PM Peak**: The speed is around 53 MPH between 50th Street on-ramp and MLK off-ramp and segment just west of the McIntosh off-ramp. The speed reduces to 32 MPH between US 301/US 92 on-ramp to I-75 off-ramp. This is due to the weaving condition created by the on-ramp traffic from the CD system and off-ramp traffic to the I-75. However, the remaining segments have speeds operating between 57 MPH and 65 MPH.
4. **I-4 GUL Westbound PM Peak**: Minor friction can be seen between on-ramp from the US 301/US 92 CD system to the MLK off-ramp. The remaining segments have speeds operating between 60 MPH and 67 MPH.

Similarly, the 2020 Starter Year Condition speed profile analyses for the Express Lanes (EL) are summarized as below:

1. **I-4 EL Eastbound AM Peak**: Most of the segments have speeds operating between 58 MPH and 65 MPH.
2. **I-4 EL Westbound AM Peak**: Most of the segments have speeds operating between 58 MPH and 62 MPH.
3. **I-4 EL Eastbound PM Peak**: Most of the EL segments have speeds operating between 58 MPH and 65 MPH.
4. **I-4 EL Westbound PM Peak**: No friction is seen and most of the EL segments are operating between 57 MPH and 65 MPH.

In summary, the simulation models showed speed drops along I-4 at the following locations:

1. Between 50$^{th}$ Street on-ramp and the MLK off ramp (GUL) – EB direction.
2. Between US 301/US 92 CD system to the MLK off-ramp - WB direction.
3. Just west of the Express Lane entrance ramp - WB direction.
4. Between US 301/US 92 on-ramp and the I-75 off-ramp (GUL) - EB direction.

## 3.4 2020 Starter Project - Systemwide Network MOE Summary

**Table 3-1** shows the MOEs for the I-4 eastbound and westbound directions at the end of AM and PM peak hours.

**Table 3-1: 2020 Starter Project I-4 MOE Summary**

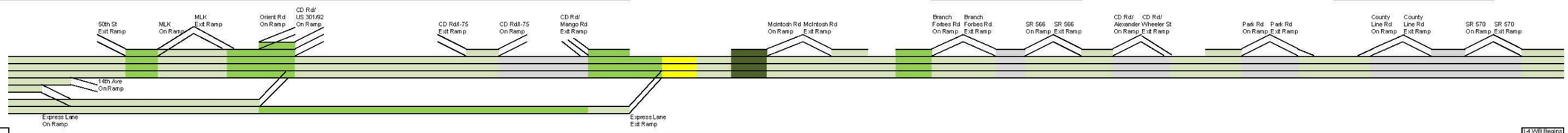
| Measure of Effectiveness | 2020 Starter Average | |
|---|---|---|
| | AM Peak | PM Peak |
| TOTAL VEHICLE MILES | 590,387 | 582,422 |
| VEHICLE HOURS OF | | |
| MOVE TIME | 8,908 | 8,794 |
| DELAY TIME | 1,561 | 2,081 |
| TOTAL TIME | 10,469 | 10,875 |
| AVERAGE SPEED (MPH) | 56.39 | 53.56 |
| MOVE/TOTAL | 0.85 | 0.81 |
| MINUTES/MILE OF | | |
| DELAY TIME | 0.16 | 0.21 |
| TOTAL TIME | 1.06 | 1.12 |

The MOE results show that the average speed on the I-4 mainline is approximately 56 MPH in the AM peak hour and 53 MPH in the PM peak hour.

## Figure 3-37: 2020 Starter Year Speed Temperature Chart – AM Peak

**Average Speed - Starter Conditions - Year 2020 - AM Peak Hour - 7:00AM - 8:00AM**
**I-4 Westbound Direction**

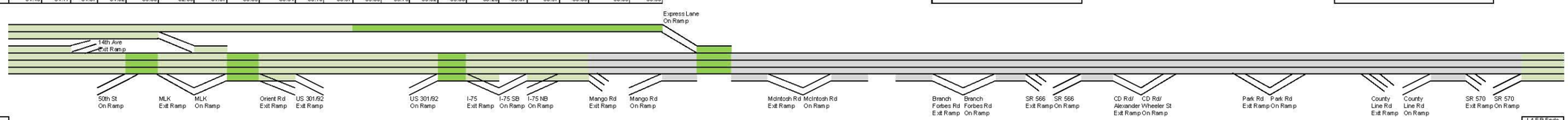
| EL WB Ends (From_to) | (503,444) | (446,503) | (448,446) | (454,450) | (457,454) | (459,457) | (461,459) | (526,461) | (463,526) | (471,469) | (501,471) | (476,474) | (479,478) | (481,479) | (488,486) | (491,488) | (493,491) | (494,493) | (496,494) | EL WB Begins (498,496) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Link Length (ft) | 726 | 2,001 | 1,432 | 2,343 | 3,258 | 3,938 | 1,204 | 606 | 2,684 | 1,362 | 915 | 635 | 933 | 2,088 | 1,377 | 1,486 | 1,729 | 2,159 | 3,313 | 4,190 |
| No. of Lanes | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Other Lanes | | | | | | | | | | | | | | | | | | | | |
| DDHV | 1,340 | 1,740 | 1,540 | 1,540 | 1,540 | 1,540 | 1,540 | 1,540 | 1,190 | 1,190 | 1,190 | 1,190 | 1,190 | 1,190 | 1,190 | 1,190 | 1,190 | 1,190 | 1,190 | 1,190 |
| Simulated Vol/Lane | 726 | 832 | 832 | 836 | 839 | 842 | 843 | 844 | 1,136 | 1,142 | 1,143 | 1,146 | 1,147 | 1,149 | 1,153 | 1,153 | 1,153 | 1,155 | 1,156 | 1,159 |
| Total Simulated Vol | 1,452 | 1,663 | 1,665 | 1,672 | 1,678 | 1,684 | 1,687 | 1,688 | 1,136 | 1,142 | 1,143 | 1,146 | 1,147 | 1,149 | 1,153 | 1,153 | 1,153 | 1,155 | 1,156 | 1,159 |
| % of DDHV | 1.08 | 0.96 | 1.08 | 1.09 | 1.09 | 1.09 | 1.10 | 1.10 | 0.95 | 0.96 | 0.96 | 0.96 | 0.96 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Density | 11.63 | 13.46 | 13.43 | 13.48 | 13.53 | 13.54 | 13.53 | 13.95 | 19.59 | 19.64 | 19.67 | 19.67 | 19.67 | 19.67 | 19.59 | 19.55 | 19.50 | 19.43 | 19.27 | 19.00 |
| Speed | 62.41 | 61.76 | 61.97 | 62.01 | 62.05 | 62.18 | 62.35 | 60.50 | 58.00 | 58.13 | 58.13 | 58.24 | 58.31 | 58.42 | 58.84 | 58.99 | 59.17 | 59.45 | 59.97 | 61.00 |




| I-4 WB Ends (From_to) | (268,502) | (93,268) | (90,101) | (107,87) | (7,107) | (5,7) | (5,7) | (43,5) | (265,525) | (266,265) | (264,266) | (260,261) | (259,260) | (42,257) | (34,35) | (30,34) | (28,30) | (256,247) | (519,255) | (254,519) | (504,254) | (506,504) | (164,163) | (174,175) | (177,174) | (177,174) | (171,177) | (183,171) | (188,185) | (190,188) | (190,188) | (192,190) | (193,192) | (193,192) | (198,193) | (197,198) | (197,198) | (415,197) | (208,415) | (209,208) | (209,208) | (375,209) | (221,375) | (236,221) | (236,221) | (236,236) | (224,223) | (224,223) | I-4 WB Begins (232,224) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Link Length (ft) | 3,255 | 2,725 | 1,234 | 2,305 | 3,250 | 3,945 | 3,945 | 1,248 | 2,246 | 1,171 | 607 | 1,078 | 1,158 | 669 | 632 | 3,213 | 1,762 | 3,316 | 871 | 3,412 | 438 | 1,440 | 6,770 | 1,215 | 3,773 | 3,773 | 5,502 | 1,989 | 3,418 | 3,872 | 3,872 | 6,620 | 4,227 | 4,227 | 1,575 | 7,403 | 7,403 | 1,496 | 1,495 | 4,351 | 4,351 | 6,198 | 5,218 | 2,020 | 2,020 | 3,114 | 1,975 | 1,975 | 965 |
| No. of Lanes | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 3 | 3 | 3.5 | 3 | 3 | 3.1 | 3.2 | 3 | 3 | 4 | 3 | 3 | 4 |
| Other Lanes | Accel Ln | Aux Ln | | | Accel Ln | Ln Drop | Ln Drop | Accel Ln | Aux Ln | | | | | | | Aux Ln | | | | Decel Ln | | | | Accel Ln | | | Decel Ln | | Accel Ln | | | Aux Ln | | | Aux Ln | | | Decel Ln | Accel Ln | | | | | | Aux Ln | | | Aux Ln |
| DDHV | 6,760 | 6,580 | 5,520 | 5,520 | 6,100 | 5,550 | 5,550 | 5,200 | 5,860 | 3,290 | 3,290 | 3,290 | 3,290 | 3,290 | 3,290 | 3,360 | 1,910 | 1,910 | 1,910 | 6,090 | 6,090 | 7,280 | 7,280 | 7,280 | 6,120 | 6,120 | 6,600 | 6,600 | 6,800 | 5,820 | 5,820 | 5,870 | 5,290 | 5,290 | 5,740 | 4,960 | 4,960 | 5,370 | 5,270 | 4,870 | 4,870 | 5,570 | 5,570 | 4,840 | 4,840 | 5,390 | 4,820 | 4,820 | 5,260 |
| Simulated Vol/Lane | 1,235 | 1,358 | 1,512 | 1,514 | 1,599 | 1,277 | 1,277 | 1,280 | 1,167 | 975 | 976 | 979 | 980 | 882 | 986 | 855 | 589 | 590 | 590 | 1,498 | 1,763 | 2,153 | 2,166 | 1,820 | 1,848 | 1,848 | 1,989 | 2,020 | 1,899 | 1,734 | 1,734 | 1,373 | 1,659 | 1,659 | 1,338 | 1,542 | 1,542 | 1,543 | 1,461 | 1,544 | 1,544 | 1,760 | 1,701 | 1,569 | 1,569 | 1,321 | 1,588 | 1,588 | 1,302 |
| Total Simulated Vol | 5,681 | 5,431 | 4,535 | 4,543 | 5,278 | 4,598 | 4,598 | 5,505 | 5,718 | 2,926 | 2,928 | 2,937 | 2,939 | 2,946 | 2,959 | 3,419 | 1,766 | 1,770 | 1,770 | 5,391 | 5,289 | 6,458 | 6,497 | 6,550 | 5,545 | 5,545 | 6,165 | 6,059 | 6,268 | 5,201 | 5,201 | 5,493 | 4,977 | 4,977 | 5,343 | 4,625 | 4,625 | 5,091 | 5,113 | 4,633 | 4,633 | 5,456 | 5,443 | 4,708 | 4,708 | 5,382 | 4,764 | 4,764 | 5,208 |
| % of DDHV | 0.84 | 0.83 | 0.82 | 0.82 | 0.87 | 0.83 | 0.83 | 0.89 | 0.97 | 0.89 | 0.89 | 0.89 | 0.89 | 0.90 | 0.90 | 0.96 | 0.92 | 0.93 | 0.93 | 0.89 | 0.87 | 0.89 | 0.89 | 0.90 | 0.91 | 0.91 | 0.93 | 0.92 | 0.95 | 0.93 | 0.93 | 0.94 | 0.94 | 0.94 | 0.93 | 0.93 | 0.93 | 0.95 | 0.95 | 0.95 | 0.95 | 0.98 | 0.98 | 0.97 | 0.97 | 0.98 | 0.99 | 0.99 | 0.99 |
| Density | 19.95 | 20.99 | 24.55 | 24.65 | 27.08 | 20.99 | 20.99 | 22.62 | 19.86 | 15.59 | 15.59 | 15.64 | 15.62 | 15.33 | 15.72 | 13.85 | 8.62 | 8.62 | 8.96 | 25.56 | 30.61 | 43.10 | 35.76 | 35.40 | 28.95 | 28.95 | 31.48 | 31.76 | 32.60 | 26.93 | 26.93 | 21.01 | 25.56 | 25.56 | 21.09 | 23.57 | 23.57 | 24.15 | 23.07 | 23.62 | 23.62 | 27.35 | 26.70 | 23.95 | 23.95 | 20.12 | 24.22 | 24.22 | 20.24 |
| Speed | 61.91 | 64.70 | 61.58 | 61.44 | 59.07 | 60.82 | 60.82 | 56.50 | 58.76 | 62.55 | 62.58 | 62.58 | 62.70 | 64.05 | 62.72 | 61.74 | 68.32 | 68.44 | 65.87 | 58.61 | 57.59 | 49.97 | 60.58 | 51.53 | 63.86 | 63.86 | 63.18 | 63.58 | 58.30 | 64.37 | 64.37 | 65.38 | 64.91 | 64.91 | 63.33 | 65.40 | 65.40 | 63.87 | 63.32 | 65.38 | 65.38 | 64.35 | 63.72 | 65.51 | 65.51 | 65.63 | 65.55 | 65.55 | 64.32 |

**Average Speed - Starter Conditions - Year 2020 - AM Peak Hour - 7:00AM - 8:00AM**
**I-4 Eastbound Direction**

| EL EB Begins (From_to) | (445,447) | (447,449) | (449,453) | (453,451) | (455,456) | (456,458) | (458,460) | (460,462) | (462,464) | (464,466) | (466,468) | (468,470) | (470,473) | (473,475) | (475,477) | (477,480) | (480,483) | (483,484) | (484,487) | (487,489) | EL EB Ends (497,499) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Link Length (ft) | 2,734 | 1,459 | 1,202 | 720 | 3,303 | 3,905 | 1,162 | 3,213 | 1,350 | 498 | 700 | 1,400 | 1,171 | 1,455 | 899 | 1,991 | 2,652 | 1,140 | 531 | 1,927 | 4,116 |
| No. of Lanes | 2 | 2 | 2 | 2 | 2 | 1.5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Other Lanes | | | | | | | | | | | | | | | | | | | | | |
| DDHV | 820 | 820 | 820 | 820 | 820 | 760 | 760 | 760 | 760 | 760 | 760 | 760 | 760 | 760 | 760 | 760 | 760 | 760 | 760 | 760 | 760 |
| Simulated Vol/Lane | 409 | 406 | 406 | 405 | 405 | 497 | 749 | 748 | 747 | 746 | 746 | 746 | 746 | 746 | 745 | 745 | 744 | 742 | 741 | 742 | 739 |
| Total Simulated Vol | 817 | 812 | 811 | 811 | 810 | 745 | 749 | 748 | 747 | 746 | 746 | 746 | 746 | 746 | 745 | 745 | 744 | 742 | 741 | 742 | 739 |
| % of DDHV | 1.00 | 0.99 | 0.99 | 0.99 | 0.99 | 0.98 | 0.99 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.97 |
| Density | 6.35 | 6.32 | 6.33 | 6.34 | 6.34 | 7.92 | 12.17 | 12.28 | 12.38 | 12.40 | 12.43 | 12.46 | 12.49 | 12.53 | 12.54 | 12.57 | 12.60 | 12.59 | 12.59 | 12.61 | 12.66 |
| Speed | 64.40 | 64.17 | 64.07 | 64.02 | 63.86 | 62.66 | 61.57 | 60.89 | 60.34 | 60.18 | 60.07 | 59.88 | 59.79 | 59.52 | 59.38 | 59.25 | 59.07 | 58.97 | 58.89 | 58.83 | 58.38 |



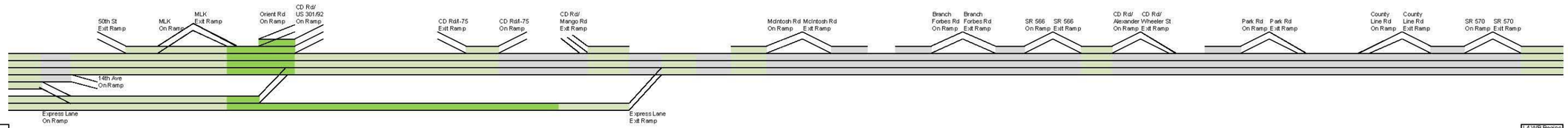

| I-4 EB Begins (From_to) | (161,283) | (283,75) | (75,160) | (89,148) | (106,8) | (8,500) | (500,6) | (6,46) | (46,205) | (205,211) | (211,212) | (212,213) | (213,215) | (215,216) | (218,18) | (18,23) | (23,24) | (25,26) | (26,27) | (28,245) | (245,246) | (245,246) | (246,252) | (505,507) | (176,173) | (173,178) | (173,178) | (178,172) | (172,184) | (186,187) | (187,189) | (187,189) | (189,191) | (191,184) | (191,194) | (194,195) | (195,401) | (401,196) | (196,416) | (416,207) | (207,210) | (207,210) | (210,374) | (374,220) | (220,237) | (220,237) | (237,222) | (222,231) | (231,227) | I-4 EB Ends (227,230) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Link Length (ft) | 327 | 2,733 | 880 | 717 | 2,416 | 500 | 3,381 | 1,112 | 3,163 | 1,430 | 447 | 727 | 1,240 | 1,971 | 2,692 | 1,121 | 1,971 | 909 | 2,913 | 3,304 | 3,304 | 4,035 | 1,464 | 1,177 | 3,805 | 3,805 | 5,493 | 1,962 | 3,513 | 3,140 | 3,140 | 7,428 | 4,092 | 4,092 | 2,490 | 3,224 | 3,228 | 1,736 | 1,739 | 4,346 | 4,346 | 5,727 | 5,727 | 1,882 | 1,882 | 3,812 | 2,278 | 1,108 | 2,235 |
| No. of Lanes | 4 | 4 | 3 | 3 | 3.3 | 3 | 3.3 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 3.9 | 3 | 3.6 | 4 | 3 | 3 | 3.2 | 3.4 | 3.2 | 3 | 3 | 3.2 | 3 | 3.1 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 3 | 3.5 | 3.2 | 3 | 3 | 3.2 | 3.1 | 3 | 3 | 4 | 3 | 3 | 3.3 |
| Other Lanes | | | | Accel Ln | | | | Aux Ln | Decel Ln | | | | | | Aux Ln | Ln Drop | | Accel Ln | Aux Ln | | | Accel Ln | Accel Ln | Decel Ln | | | Accel Ln | | Decel Ln | | | Aux Ln | | | Aux Ln | | | Accel Ln | Decel Ln | | | Aux Ln | | | | | | Aux Ln | | | Accel Ln |
| DDHV | 5,270 | 5,270 | 4,330 | 4,330 | 4,930 | 3,700 | 3,760 | 4,360 | 3,910 | 2,990 | 2,990 | 2,990 | 2,990 | 2,990 | 4,400 | 1,900 | 1,900 | 2,940 | 4,290 | 3,240 | 3,240 | 3,600 | 4,360 | 4,360 | 3,760 | 3,760 | 4,300 | 4,300 | 4,300 | 3,820 | 3,820 | 4,240 | 3,780 | 3,780 | 4,150 | 3,640 | 3,640 | 4,420 | 4,420 | 4,010 | 4,010 | 4,770 | 4,770 | 4,050 | 4,050 | 4,750 | 4,210 | 4,210 | 4,900 |
| Simulated Vol/Lane | 1,318 | 1,245 | 1,360 | 1,361 | 1,435 | 1,125 | 1,068 | 880 | 858 | 853 | 853 | 852 | 850 | 849 | 819 | 430 | 550 | 692 | 914 | 864 | 864 | 937 | 1,088 | 1,136 | 1,052 | 1,052 | 1,143 | 1,202 | 1,169 | 1,042 | 1,042 | 872 | 1,010 | 1,010 | 840 | 981 | 979 | 1,058 | 1,161 | 1,085 | 1,085 | 1,262 | 1,289 | 1,136 | 1,136 | 1,011 | 1,186 | 1,194 | 1,280 |
| Total Simulated Vol | 5,271 | 4,981 | 4,086 | 4,084 | 4,734 | 3,376 | 3,516 | 3,922 | 3,432 | 2,559 | 2,558 | 2,557 | 2,550 | 2,546 | 3,860 | 1,675 | 1,650 | 2,491 | 3,655 | 2,593 | 2,593 | 2,997 | 3,700 | 3,637 | 3,155 | 3,155 | 3,659 | 3,605 | 3,623 | 3,125 | 3,125 | 3,487 | 3,029 | 3,029 | 3,361 | 2,942 | 2,937 | 3,701 | 3,715 | 3,285 | 3,285 | 4,040 | 3,998 | 3,409 | 3,409 | 4,043 | 3,587 | 3,582 | 4,224 |
| % of DDHV | 1.00 | 0.95 | 0.94 | 0.94 | 0.96 | 0.91 | 0.94 | 0.90 | 0.88 | 0.86 | 0.86 | 0.86 | 0.85 | 0.85 | 0.88 | 0.88 | 0.87 | 0.85 | 0.85 | 0.80 | 0.80 | 0.83 | 0.85 | 0.83 | 0.84 | 0.84 | 0.85 | 0.84 | 0.84 | 0.82 | 0.82 | 0.82 | 0.80 | 0.80 | 0.81 | 0.81 | 0.81 | 0.84 | 0.84 | 0.82 | 0.82 | 0.95 | 0.84 | 0.84 | 0.84 | 0.86 | 0.85 | 0.85 | 0.88 |
| Density | 21.08 | 20.25 | 22.49 | 21.92 | 25.22 | 18.74 | 17.14 | 16.39 | 13.89 | 13.60 | 13.60 | 13.60 | 13.57 | 13.59 | 16.06 | 6.78 | 8.65 | 11.41 | 14.07 | 12.82 | 12.82 | 14.02 | 18.24 | 17.45 | 15.72 | 15.72 | 17.28 | 18.12 | 17.73 | 15.59 | 15.59 | 13.08 | 15.08 | 15.08 | 12.53 | 14.62 | 14.62 | 16.16 | 17.49 | 16.35 | 16.35 | 19.13 | 19.51 | 16.99 | 16.99 | 15.26 | 17.91 | 17.90 | 19.79 |
| Speed | 62.56 | 61.49 | 60.57 | 62.11 | 56.88 | 60.06 | 62.16 | 59.82 | 62.67 | 62.72 | 62.68 | 62.66 | 62.62 | 62.51 | 57.25 | 63.39 | 63.60 | 60.63 | 64.94 | 67.40 | 67.40 | 66.80 | 59.67 | 65.11 | 66.92 | 66.92 | 66.17 | 66.31 | 65.91 | 66.83 | 66.83 | 67.03 | 66.97 | 66.97 | 67.07 | 67.08 | 66.99 | 65.45 | 66.39 | 66.95 | 66.95 | 66.02 | 66.06 | 66.86 | 66.86 | 66.48 | 66.75 | 66.71 | 64.87 |

Note: Express Lane Ramps naming convention is relative the I-4 General Use Lanes.

**Figure 3-38: 2020 Starter Year Speed Temperature Chart – PM Peak**

Average Speed - Starter Conditions - Year 2020 - PM Peak Hour - 5:00PM - 6:00PM
I-4 Westbound Direction

| EL WB Ends (From /to) | (503,444) | (446,503) | (448,446) | (454,450) | (457,454) | (459,457) | (461,459) | (526,461) | (463,526) | (471,469) | (501,471) | (476,474) | (479,478) | (481,479) | (488,486) | (491,488) | (493,491) | (494,493) | (496,494) | EL WB Begins (498,496) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Link Length (ft) | 726 | 2,001 | 1,432 | 2,343 | 3,258 | 3,938 | 1,204 | 606 | 2,684 | 1,362 | 915 | 635 | 933 | 2,088 | 1,377 | 1,486 | 1,729 | 2,159 | 3,313 | 4,190 |
| No. of Lanes | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Other Lanes | | | | | | | | | | | | | | | | | | | | |
| DDHV | 590 | 1,030 | 1,030 | 1,030 | 1,030 | 1,030 | 1,030 | 1,030 | 1,010 | 1,010 | 1,010 | 1,010 | 1,010 | 1,010 | 1,010 | 1,010 | 1,010 | 1,010 | 1,010 | 1,010 |
| Simulated Vol/Lane | 283 | 491 | 492 | 495 | 496 | 498 | 499 | 500 | 954 | 959 | 960 | 963 | 964 | 965 | 968 | 969 | 972 | 974 | 977 | 979 |
| Total Simulated Vol | 565 | 982 | 984 | 989 | 992 | 996 | 998 | 1,000 | 954 | 959 | 960 | 963 | 964 | 965 | 968 | 969 | 972 | 974 | 977 | 979 |
| % of DDHV | 0.96 | 0.95 | 0.96 | 0.96 | 0.96 | 0.97 | 0.97 | 0.97 | 0.94 | 0.95 | 0.95 | 0.95 | 0.95 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.97 | 0.97 |
| Density | 4.42 | 7.82 | 7.77 | 7.83 | 7.87 | 7.94 | 7.96 | 8.35 | 16.41 | 16.46 | 16.47 | 16.49 | 16.49 | 16.49 | 16.42 | 16.41 | 16.41 | 16.36 | 16.27 | 15.97 |
| Speed | 63.91 | 62.79 | 63.33 | 63.18 | 63.00 | 62.75 | 62.69 | 59.88 | 58.11 | 58.25 | 58.29 | 58.37 | 58.45 | 58.53 | 58.94 | 59.06 | 59.24 | 59.50 | 60.03 | 61.26 |




| I-4 WB Ends (From /to) | (268,502) | (93,268) | (90,101) | (107,87) | (7,107) | (5,7) | (5,7) | (43,5) | (265,525) | (266,265) | (264,266) | (260,261) | (259,260) | (42,257) | (34,35) | (30,34) | (29,30) | (255,247) | (519,255) | (254,519) | (504,254) | (506,504) | (164,183) | (174,175) | (177,174) | (177,174) | (171,177) | (183,171) | (188,185) | (190,188) | (190,189) | (192,190) | (193,192) | (193,192) | (198,193) | (197,198) | (197,198) | (415,197) | (208,415) | (209,208) | (209,209) | (375,209) | (221,375) | (236,221) | (236,221) | (223,236) | (224,223) | (224,223) | I-4 WB Begins (232,224) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Link Length (ft) | 3,255 | 2,725 | 1,234 | 2,305 | 3,250 | 3,945 | 3,945 | 1,248 | 2,246 | 1,171 | 697 | 1,078 | 1,158 | 669 | 632 | 3,213 | 1,762 | 3,316 | 871 | 3,412 | 438 | 1,440 | 6,770 | 1,215 | 3,773 | 3,773 | 5,502 | 1,989 | 3,418 | 3,872 | 3,872 | 6,820 | 4,227 | 4,227 | 1,575 | 7,483 | 7,483 | 1,496 | 1,495 | 4,351 | 4,351 | 6,198 | 5,218 | 2,020 | 2,020 | 3,114 | 1,975 | 1,975 | 985 |
| No. of Lanes | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 4 |
| Other Lanes | Accel Ln | Aux Ln | | | Accel Ln | Ln Drop | Ln Drop | Accel Ln | Aux Ln | | | | | | | Aux Ln | | | | Decel Ln | | | | Accel Ln | | | Decel Ln | | Accel Ln | | | Aux Ln | | | Aux Ln | | | Decel Ln | Accel Ln | | | Decel Ln | Accel Ln | | | Aux Ln | | | Aux Ln |
| DDHV | 5,250 | 4,810 | 3,420 | 3,420 | 3,910 | 3,060 | 3,060 | 3,460 | 3,060 | 980 | 980 | 980 | 980 | 980 | 980 | 1,180 | 40 | 40 | 40 | 3,620 | 3,620 | 4,630 | 4,630 | 4,630 | 4,060 | 4,060 | 4,620 | 4,620 | 4,620 | 4,020 | 4,020 | 4,400 | 4,000 | 4,000 | 4,360 | 3,810 | 3,810 | 4,240 | 4,240 | 3,840 | 3,840 | 4,740 | 4,740 | 3,960 | 3,960 | 4,910 | 4,630 | 4,630 | 5,230 |
| Simulated Vol/Lane | 1,047 | 1,090 | 995 | 995 | 1,145 | 805 | 805 | 626 | 641 | 284 | 284 | 285 | 285 | 286 | 287 | 337 | 11 | 11 | 11 | 955 | 1,123 | 1,450 | 1,452 | 1,213 | 1,271 | 1,271 | 1,438 | 1,456 | 1,364 | 1,255 | 1,255 | 1,043 | 1,258 | 1,258 | 1,058 | 1,223 | 1,223 | 1,258 | 1,191 | 1,248 | 1,248 | 1,537 | 1,482 | 1,298 | 1,298 | 1,216 | 1,525 | 1,525 | 1,292 |
| Total Simulated Vol | 4,816 | 4,360 | 2,986 | 2,986 | 3,777 | 2,898 | 2,898 | 3,552 | 3,143 | 852 | 853 | 855 | 856 | 857 | 860 | 1,350 | 33 | 33 | 34 | 3,437 | 3,370 | 4,351 | 4,355 | 4,357 | 3,812 | 3,812 | 4,458 | 4,367 | 4,501 | 3,766 | 3,766 | 4,174 | 3,773 | 3,773 | 4,231 | 3,669 | 3,669 | 4,151 | 4,168 | 3,745 | 3,745 | 4,763 | 4,741 | 3,893 | 3,893 | 4,863 | 4,576 | 4,576 | 5,168 |
| % of DDHV | 0.92 | 0.91 | 0.87 | 0.87 | 0.97 | 0.95 | 0.95 | 1.03 | 1.03 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.88 | 1.14 | 0.83 | 0.84 | 0.84 | 0.95 | 0.93 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.96 | 0.95 | 0.97 | 0.94 | 0.94 | 0.95 | 0.94 | 0.94 | 0.97 | 0.96 | 0.96 | 0.98 | 0.98 | 0.98 | 1.00 | 1.00 | 0.98 | 0.98 | 0.99 | 0.99 | 0.99 | 0.99 |
| Density | 16.71 | 16.76 | 15.74 | 15.80 | 19.04 | 12.88 | 12.88 | 14.39 | 10.87 | 4.41 | 4.41 | 4.43 | 4.43 | 4.44 | 4.49 | 5.56 | 0.17 | 0.16 | 0.16 | 15.89 | 17.19 | 23.17 | 22.07 | 18.77 | 19.16 | 19.16 | 22.02 | 22.13 | 20.88 | 18.93 | 18.93 | 15.65 | 18.99 | 18.99 | 17.04 | 18.42 | 18.42 | 19.28 | 18.26 | 18.79 | 18.79 | 23.62 | 22.77 | 19.52 | 19.52 | 18.33 | 23.10 | 23.10 | 20.04 |
| Speed | 62.65 | 65.04 | 63.24 | 63.01 | 60.12 | 62.53 | 62.53 | 57.40 | 58.98 | 64.46 | 64.44 | 64.40 | 64.40 | 64.35 | 63.89 | 60.68 | 65.45 | 69.76 | 68.07 | 60.08 | 65.36 | 62.60 | 65.77 | 64.62 | 66.30 | 66.30 | 65.28 | 65.79 | 65.34 | 66.33 | 66.33 | 66.68 | 66.23 | 66.23 | 62.61 | 66.40 | 66.40 | 65.25 | 65.20 | 66.44 | 66.44 | 65.06 | 65.06 | 66.50 | 66.50 | 66.33 | 66.04 | 66.04 | 64.48 |

Average Speed - Starter Conditions - Year 2020 - PM Peak Hour - 5:00PM - 6:00PM
I-4 Eastbound Direction

| EL EB Begins (From /to) | (445,447) | (447,449) | (449,453) | (453,451) | (455,456) | (456,458) | (458,460) | (460,462) | (462,464) | (464,466) | (466,468) | (468,470) | (470,473) | (473,475) | (475,477) | (477,480) | (480,483) | (483,484) | (484,487) | (487,489) | EL EB Ends (497,499) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Link Length (ft) | 2,734 | 1,459 | 1,202 | 720 | 3,303 | 3,905 | 1,162 | 3,213 | 1,350 | 498 | 700 | 1,400 | 1,171 | 1,455 | 899 | 1,991 | 2,652 | 1,140 | 531 | 1,927 | 4,116 |
| No. of Lanes | 2 | 2 | 2 | 2 | 2 | 1.5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Other Lanes | | | | | | | | | | | | | | | | | | | | | |
| DDHV | 830 | 830 | 830 | 830 | 830 | 580 | 580 | 580 | 580 | 580 | 580 | 580 | 580 | 580 | 580 | 580 | 580 | 580 | 580 | 580 | 580 |
| Simulated Vol/Lane | 412 | 409 | 410 | 410 | 409 | 379 | 573 | 573 | 573 | 573 | 573 | 573 | 574 | 574 | 573 | 573 | 573 | 572 | 572 | 573 | 574 |
| Total Simulated Vol | 824 | 819 | 819 | 819 | 819 | 568 | 573 | 573 | 573 | 573 | 573 | 573 | 574 | 574 | 573 | 573 | 573 | 572 | 572 | 573 | 574 |
| % of DDHV | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.98 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| Density | 6.40 | 6.38 | 6.39 | 6.40 | 6.42 | 6.00 | 9.21 | 9.31 | 9.40 | 9.42 | 9.44 | 9.47 | 9.51 | 9.54 | 9.55 | 9.58 | 9.61 | 9.62 | 9.64 | 9.66 | 9.79 |
| Speed | 64.36 | 64.13 | 64.06 | 64.00 | 63.79 | 63.15 | 62.19 | 61.55 | 60.99 | 60.83 | 60.72 | 60.53 | 60.32 | 60.12 | 59.99 | 59.81 | 59.59 | 59.44 | 59.34 | 59.28 | 58.87 |


| I-4 EB Begins (From /to) | (161,283) | (283,75) | (75,160) | (99,148) | (106,8) | (8,500) | (500,6) | (6,46) | (46,205) | (205,211) | (211,212) | (212,213) | (215,216) | (218,218) | (18,23) | (23,24) | (25,26) | (26,27) | (28,245) | (245,246) | (246,252) | (505,507) | (176,173) | (173,178) | (173,178) | (178,172) | (172,184) | (186,187) | (187,189) | (187,189) | (189,191) | (191,194) | (191,194) | (194,195) | (195,401) | (401,196) | (196,416) | (416,207) | (207,210) | (207,210) | (210,374) | (374,220) | (220,237) | (220,237) | (237,222) | (222,231) | (231,227) | I-4 EB Ends (227,230) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Link Length (ft) | 327 | 2,733 | 880 | 717 | 2,416 | 500 | 3,381 | 1,112 | 3,163 | 1,430 | 447 | 727 | 1,240 | 1,971 | 2,692 | 1,121 | 1,971 | 909 | 2,913 | 3,304 | 3,304 | 4,035 | 1,464 | 1,177 | 3,805 | 3,805 | 5,493 | 1,962 | 3,513 | 3,140 | 3,140 | 7,428 | 4,092 | 4,092 | 2,490 | 3,224 | 3,228 | 1,736 | 1,739 | 4,346 | 4,346 | 5,727 | 5,727 | 1,882 | 1,882 | 3,612 | 2,278 | 1,108 | 2,235 |
| No. of Lanes | 4 | 4 | 3 | 3 | 3.3 | 3 | 3.3 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 3.9 | 3 | 3.6 | 4 | 3 | 3 | 3.2 | 3.4 | 3.2 | 3 | 3 | 3.2 | 3 | 3.1 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 3 | 3.5 | 3.2 | 3 | 3 | 3.2 | 3.1 | 3 | 3 | 4 | 3 | 3 | 3.3 |
| Other Lanes | | | | Accel Ln | | | | Aux Ln | Decel Ln | | | | | | Aux Ln | Ln Drop | | Accel Ln | Aux Ln | | | Accel Ln | Accel Ln | Decel Ln | | Accel Ln | | Decel Ln | | | Aux Ln | | | Aux Ln | | | Accel Ln | Decel Ln | | | Accel Ln | Decel Ln | | | Aux Ln | | | Accel Ln |
| DDHV | 5,540 | 5,540 | 4,640 | 4,640 | 5,990 | 5,110 | 5,360 | 5,840 | 5,300 | 4,250 | 4,250 | 4,250 | 4,250 | 4,250 | 6,350 | 3,640 | 3,840 | 4,890 | 6,580 | 5,320 | 5,320 | 5,970 | 6,550 | 6,550 | 5,450 | 5,450 | 5,970 | 5,970 | 5,970 | 5,190 | 5,190 | 5,560 | 4,960 | 4,960 | 5,390 | 4,720 | 4,720 | 5,260 | 5,260 | 4,660 | 4,660 | 5,460 | 5,460 | 4,720 | 4,720 | 5,720 | 5,210 | 5,210 | 5,420 |
| Simulated Vol/Lane | 1,449 | 1,369 | 1,528 | 1,528 | 1,817 | 1,833 | 1,595 | 1,999 | 1,245 | 1,300 | 1,300 | 1,301 | 1,301 | 1,302 | 1,418 | 803 | 1,030 | 1,184 | 1,447 | 1,525 | 1,525 | 1,673 | 1,723 | 1,807 | 1,533 | 1,533 | 1,814 | 1,699 | 1,858 | 1,448 | 1,448 | 1,173 | 1,368 | 1,368 | 1,129 | 1,277 | 1,274 | 1,271 | 1,394 | 1,249 | 1,249 | 1,444 | 1,473 | 1,274 | 1,274 | 1,203 | 1,436 | 1,436 | 1,372 |
| Total Simulated Vol | 5,795 | 5,478 | 4,584 | 4,584 | 5,995 | 4,889 | 5,264 | 5,397 | 4,978 | 3,900 | 3,901 | 3,902 | 3,903 | 3,905 | 5,355 | 3,133 | 3,091 | 4,263 | 5,789 | 4,574 | 4,574 | 5,352 | 5,859 | 5,783 | 4,599 | 4,599 | 5,168 | 5,098 | 5,141 | 4,345 | 4,345 | 4,691 | 4,105 | 4,105 | 4,517 | 3,830 | 3,822 | 4,447 | 4,462 | 3,746 | 3,746 | 4,820 | 4,567 | 3,823 | 3,823 | 4,811 | 4,307 | 4,302 | 4,528 |
| % of DDHV | 1.05 | 0.99 | 0.99 | 0.99 | 1.00 | 0.96 | 0.98 | 0.96 | 0.94 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.94 | 0.86 | 0.85 | 0.97 | 0.88 | 0.86 | 0.86 | 0.90 | 0.89 | 0.88 | 0.84 | 0.84 | 0.87 | 0.85 | 0.86 | 0.84 | 0.84 | 0.84 | 0.83 | 0.83 | 0.84 | 0.81 | 0.81 | 0.85 | 0.85 | 0.80 | 0.80 | 0.85 | 0.84 | 0.81 | 0.81 | 0.84 | 0.83 | 0.83 | 0.84 |
| Density | 23.23 | 22.53 | 25.45 | 24.72 | 33.95 | 27.65 | 26.28 | 23.71 | 20.16 | 21.09 | 21.13 | 21.15 | 21.19 | 21.27 | 43.59 | 12.92 | 16.53 | 20.41 | 24.05 | 23.92 | 23.92 | 26.32 | 28.49 | 34.84 | 23.49 | 23.49 | 24.91 | 26.20 | 25.96 | 22.04 | 22.04 | 17.76 | 20.79 | 20.79 | 17.09 | 19.31 | 19.32 | 19.74 | 21.51 | 18.81 | 18.81 | 22.15 | 22.62 | 19.21 | 19.21 | 18.37 | 21.80 | 21.72 | 20.95 |
| Speed | 62.36 | 60.78 | 60.05 | 61.82 | 53.50 | 58.95 | 60.75 | 59.03 | 61.73 | 61.63 | 61.55 | 61.50 | 61.39 | 61.20 | 32.72 | 62.18 | 62.33 | 58.04 | 60.20 | 63.74 | 63.74 | 63.56 | 60.50 | 53.21 | 65.25 | 65.25 | 64.81 | 64.88 | 63.88 | 65.72 | 65.72 | 66.02 | 65.83 | 65.83 | 66.06 | 66.12 | 65.94 | 64.39 | 64.82 | 66.37 | 66.37 | 65.18 | 65.14 | 66.33 | 66.33 | 65.48 | 65.86 | 66.02 | 65.49 |

Note: Express Lane Ramps naming convention is relative the I-4 General Use Lanes.

## 3.5 Development of 2030 Starter Project Analysis

In order for the system to process the appropriate volumes on the General Use Lanes (GUL) and Express Lanes (EL), the following additional minor improvements were needed apart from the improvements identified in 2020.

1. I-4 EB Ramp & Park Rd intersection
    - modeled as signalized intersection
2. I-4 EB Ramp & SR 566 intersection
    - modeled as signalized intersection
3. I-4 WB Ramp & SR 566 intersection
    - modeled as signalized intersection
4. I-4 EB Ramp & County Line Rd intersection
    - added 2nd NBL turn lane on County Line Rd with protected-only phasing
    - added two receiving lanes on the I-4 EB on-ramp with a downstream lane drop to accommodate dual NB left turns
5. I-4 WB Ramp & County Line Rd intersection
    - added 2nd EBR turn lane on the I-4 WB off-ramp
6. I-4 EB Ramp & MLK intersection
    - added 2nd EBL turn lane on MLK with protected-only phasing
7. I-4 WB Ramp & MLK intersection
    - added 2nd WBL turn lane on MLK with protected-only phasing
8. McIntosh Rd
    - widened road from 2 to 4 lanes
    - modeled both ramp intersections under one Controller
9. I-4 WB Ramp & McIntosh Rd intersection
    - added 2nd NBL turn lane on McIntosh Rd with protected-only phasing
    - added two receiving lanes on the I-4 WB on-ramp with a downstream lane drop to accommodate dual NB left turns

The 2030 Starter Project Year operational analysis was performed for I-4 GUL and EL segments during AM and PM Peak periods. Based on the geometric modifications discussed above, the signal timings and

offsets were re-optimized in SYNCHRO to obtain better progression as needed. The revised offsets were updated in the CORSIM network analysis.

## 3.6 2030 Starter Project CORSIM Operational Analysis

**Figure 3-39** shows the 2030 Starter Year Condition speed profile along I-4 General Use Lanes (GUL) and Express Lanes (EL) for AM Peak and **Figure 3-40** shows the 2030 Starter Year Condition speed profile along I-4 GUL and EL for PM Peak. CORSIM models are provided in **Appendix D (on CD)**.

The following color codes were used to develop these speed profiles.

| Legend | |
|---|---|
| Red | < = 35 MPH |
| Orange | > 35 MPH and < = 45 MPH |
| Yellow | > 45 MPH < = 50 MPH |
| Dark Green | > 50 MPH < = 55 MPH |
| Green | > 55 MPH < = 60 MPH |
| Light Green | > 60 MPH < = 65 MPH |
| Gray | > 65 MPH |

The 2030 Starter Year Condition speed profile analyses for the General Use Lanes (GUL) are summarized as below:

1. **I-4 GUL Eastbound AM Peak**: The speed drops to between 50 MPH and 55 MPH between the 50th Street on-ramp to the MLK off ramp, MLK on-ramp and Orient Road off-ramp. Most of the segments have speeds operating between 60 MPH and 65 MPH. Several segments east of the Mango Road off-ramp are operating more than 65 MPH.
2. **I-4 GUL Westbound AM Peak**: The speed drops to around 28 MPH due to friction between the McIntosh Road on-ramp traffic and the entrance ramp traffic to the EL. Also, there is a minor friction between the on-ramp traffic from US 301/US 92 CD system to the MLK off-ramp. This is

due to merge condition caused by the US 301/US 92 CD system to the I-4 GUL. However, the remaining westbound segments operate between 55 MPH and 65 MPH.

3. **I-4 GUL Eastbound PM Peak**: The speed drops to around 42 MPH between 50th Street on-ramp and MLK off-ramp, and to around 49 MPH between the MLK on-ramp and the Orient Road off-ramp. The speed reduces to 36 MPH between US 301/US 92 on-ramp to I-75 off-ramp. This is due to the weaving condition created by the on-ramp traffic from the CD system and off-ramp traffic to the I-75. However, the remaining segments have speeds operating between 60 MPH and 65 MPH.
4. **I-4 GUL Westbound PM Peak**: The speed drops to between 22 MPH to 35 MPH between 50th Street off-ramp and MLK off-ramp. Minor friction is seen between US 301/US 92 CD system on-ramp to the MLK off-ramp. The remaining segments have speeds operating between 60 MPH and 65 MPH.

Similarly, the 2030 Starter Year Condition speed profile analyses for the Express Lanes (EL) are summarized as below:

1. **I-4 EL Eastbound AM Peak**: Most of the segments have speeds operating between 58 MPH and 65 MPH.
2. **I-4 EL Westbound AM Peak**: Most of the segments have speeds operating between 57 MPH and 60 MPH.
3. **I-4 EL Eastbound PM Peak**: Most of the segments have speeds operating between 58 MPH and 64 MPH.
4. **I-4 EL Westbound PM Peak**: No friction is seen and most of the EL segments are operating between 57 MPH and 60 MPH.

In summary, the simulation models showed speed drops along I-4 at the following locations:

1. Between 50th Street on-ramp and the MLK off ramp (GUL) – EB direction.
2. Between the MLK on ramp and the Orient Road off-ramp (GUL) – EB direction.
3. Between the McIntosh Road on-ramp and the entrance ramp to the EL. (GUL) – WB direction.
4. Between US 301/US 92 CD system on-ramp and MLK off-ramp (GUL) – WB direction.
5. Between US 301/US 92 on-ramp and the I-75 off-ramp (GUL) – EB direction.
6. Between 50th Street off-ramp and MLK off-ramp (GUL) – WB direction.

## 3.7 2030 Starter Project - Systemwide Network MOE Summary

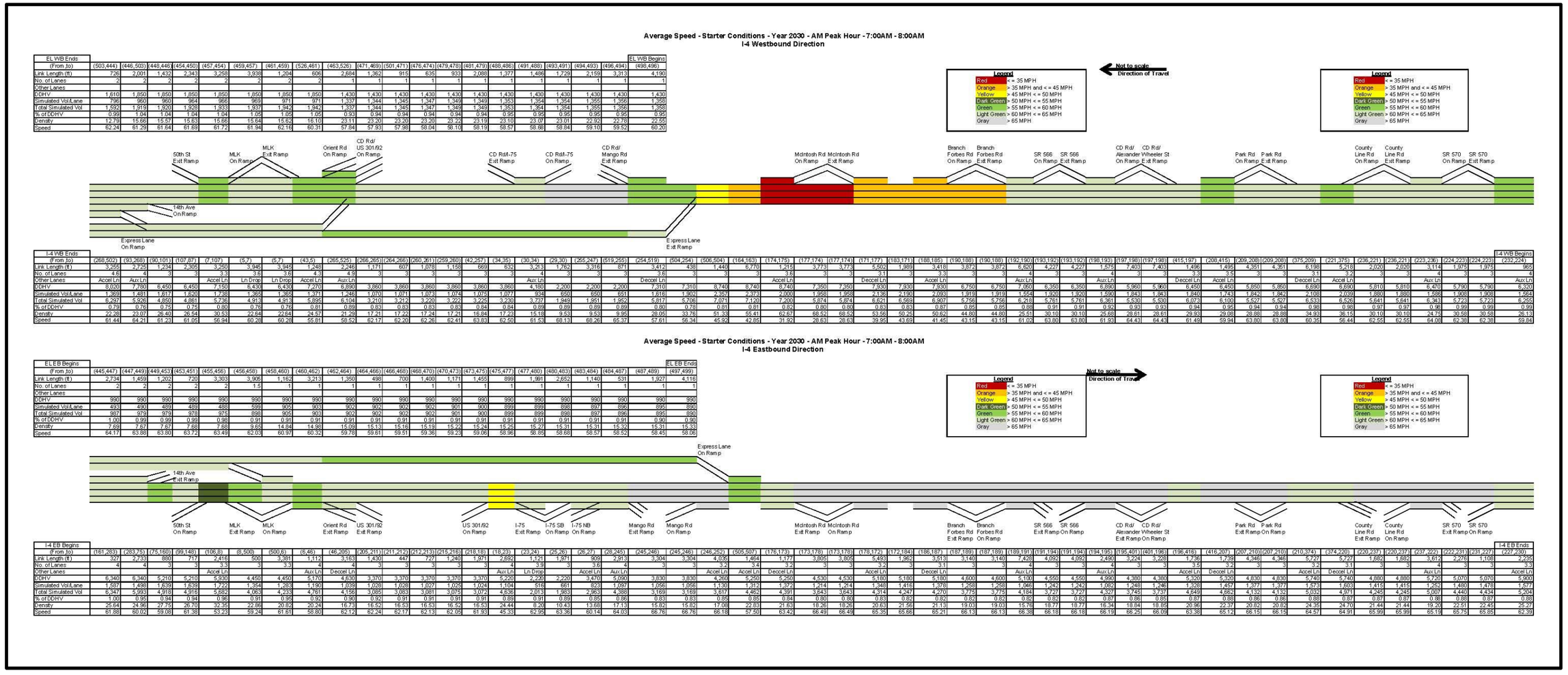
**Table 3-2** shows the MOEs for the I-4 eastbound and westbound directions at the end of AM and PM peak hours.

**Table 3-2: 2030 Starter Project I-4 MOE Summary**

| Measure of Effectiveness | 2030 Starter Average | |
|---|---|---|
| | AM Peak | PM Peak |
| TOTAL VEHICLE MILES | 686,930 | 661,874 |
| VEHICLE HOURS OF | | |
| MOVE TIME | 10,360 | 9,988 |
| DELAY TIME | 2,726 | 3,506 |
| TOTAL TIME | 13,086 | 13,494 |
| AVERAGE SPEED (MPH) | 52.50 | 49.05 |
| MOVE/TOTAL | 0.79 | 0.74 |
| MINUTES/MILE OF | | |
| DELAY TIME | 0.24 | 0.32 |
| TOTAL TIME | 1.14 | 1.22 |

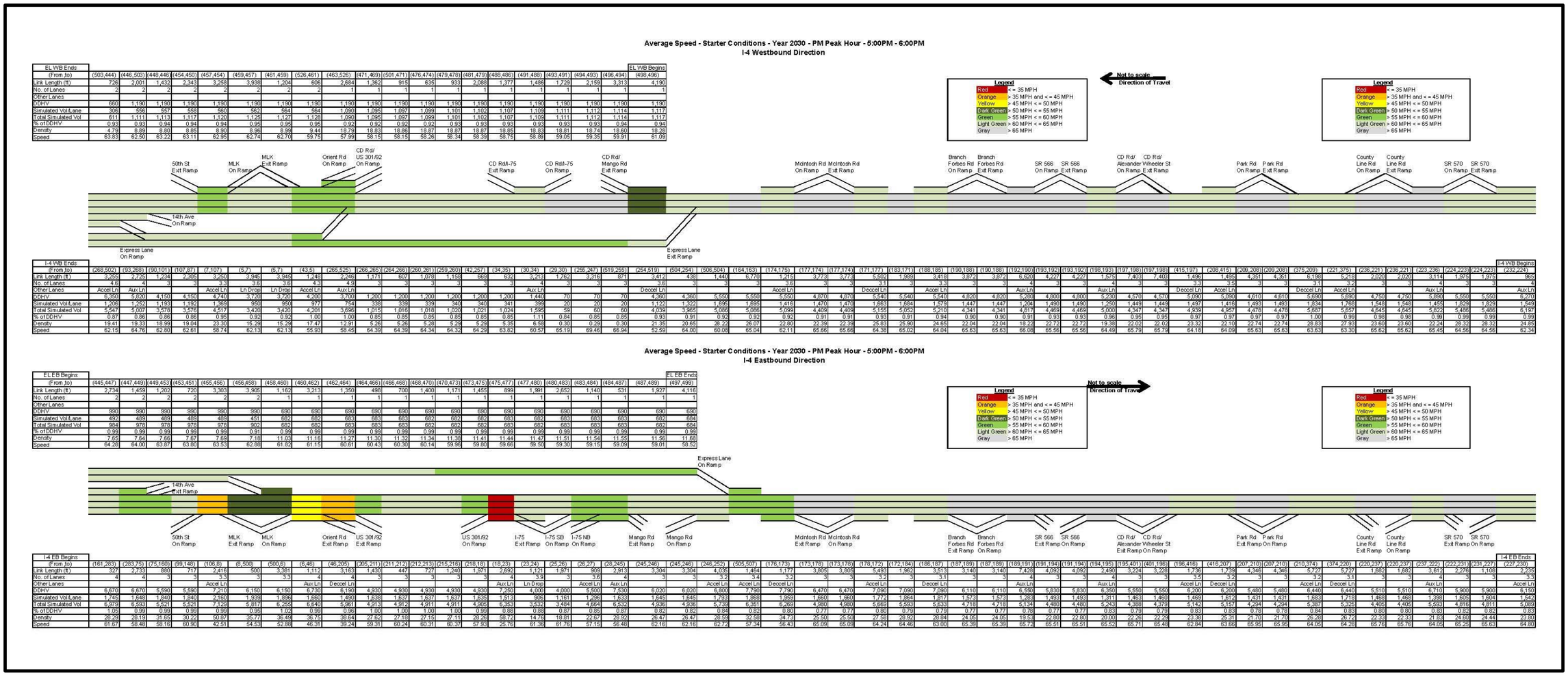
The MOE results show that the average speed on the I-4 mainline is approximately 52 MPH in the AM peak hour and 49 MPH in the PM peak hour.

## Figure 3-39: 2030 Starter Year Speed Temperature Chart – AM Peak




Note: Express Lane Ramps naming convention is relative the I-4 General Use Lanes.

## Figure 3-40 2030 Starter Year Speed Temperature Chart – PM Peak




Note: Express Lane Ramps naming convention is relative the I-4 General Use Lanes.

## 3.8 Development of 2040 No-Build Project Analysis

In order for the system to process the appropriate volumes on the General Use Lanes (GUL), the following additional improvements were needed apart from the improvements identified in 2030.

1. I-4 EB Ramp & Orient Rd intersection
    - modeled as signalized intersection
2. I-4 EB Ramp & Park Rd intersection
    - modeled as signalized intersection
3. I-4 WB Ramp & Park Rd intersection
    - added 2nd WBL turn lane on the I-4 WB off-ramp
4. I-4 EB Ramp & SR 566 intersection
    - modeled as signalized intersection
5. I-4 WB Ramp & SR 566 intersection
    - modeled as signalized intersection
6. I-4 EB Ramp & County Line Rd intersection
    - added 2nd NBL turn lane on County Line Rd with protected-only phasing
    - added two receiving lanes on the I-4 EB on-ramp with a downstream lane drop to accommodate dual NB left turns
7. I-4 WB Ramp & County Line Rd intersection
    - added 2nd EBR turn lane on the I-4 WB off-ramp
    - added 2nd NBL turn lane on County Line Rd with protected-only phasing
    - added two receiving lanes on the I-4 WB on-ramp with a downstream lane drop to accommodate dual NB left turns
8. County Line Rd
    - added 3rd SB through lane between the I-4 EB & WB ramps
9. I-4 EB Ramp & MLK intersection
    - added 2nd EBL turn lane on MLK with protected-only phasing
10. I-4 WB Ramp & MLK intersection
    - added 2nd WBL turn lane on MLK with protected-only phasing
    - modeled SBR as a channelized free right turn
    - added 2nd EBT lane
11. McIntosh Rd

- widened road from 2 to 4 lanes
- modeled both ramp intersections under one Controller

12. I-4 WB Ramp & McIntosh Rd intersection
    - added 2nd NBL turn lane on McIntosh Rd with protected-only phasing
    - added two receiving lanes on the I-4 WB on-ramp with a downstream lane drop to accommodate dual NB left turns

The 2040 No-Build Project Year operational analysis was performed for I-4 GUL during AM and PM Peak periods. Based on the geometric modifications discussed above, the signal timings and offsets were re-optimized in SYNCHRO to obtain better progression as needed. The revised offsets were updated in the CORSIM network analysis.

## 3.9 2040 No-Build Project CORSIM Operational Analysis

**Figure 3-41** shows the 2040 No-Build Year Condition speed profile along I-4 General Use Lanes (GUL) for AM Peak and **Figure 3-42** shows the speed profile along I-4 GUL for PM Peak. CORSIM models are provided in **Appendix D (on CD)**.

The following color codes were used to develop these speed profiles.

| Legend | |
|---|---|
| Red | < = 35 MPH |
| Orange | > 35 MPH and < = 45 MPH |
| Yellow | > 45 MPH < = 50 MPH |
| Dark Green | > 50 MPH < = 55 MPH |
| Green | > 55 MPH < = 60 MPH |
| Light Green | > 60 MPH < = 65 MPH |
| Gray | > 65 MPH |

The 2040 No-Build Year Condition speed profile analyses for the General Use Lanes (GUL) are summarized as below:

1. **I-4 GUL Eastbound AM Peak**: The total simulated entry volumes in the EB direction of I-4 is approximately 95 percent of the expected DDHV due to the friction at the I-4 EB off-ramp to the 14th Avenue and the MLK off-ramp. The speed drops to between 25 MPH and 35 MPH between the 50th Street on-ramp to the MLK off-ramp, and between 20 MPH and 25 MPH from US 301/US 92 on-ramp to I-75 off-ramp. Some of the segments cannot process the input demand due to congestion.
2. **I-4 GUL Westbound AM Peak**: The speed drops to less than 25 MPH between McIntosh Road off-ramp to the merge lane from the McIntosh Road on-ramp. The speed drops between 20 MPH to 35 MPH from west of the CD Roadway to the Branch Forbes Road off-ramp. This is due to major friction from the off-ramp CD roadway system west of the Mango Road impacting the I-4 mainline. Also, there is a minor friction between on-ramp from US 301/US 92 CD system to the MLK off-ramp. This is due to merge condition caused by CD system to the I-4 GUL. Similar minor friction is seen between the Park Road off-ramp and the County Line Road off-ramp.
3. **I-4 GUL Eastbound PM Peak**: The total simulated entry volumes in the EB direction of I-4 is approximately 84 percent of the expected DDHV due to the friction at the off-ramp to the US 301/92 CD road. The speed drops to between 15 MPH and 20 MPH between the 50th Street on-ramp to the MLK off ramp. The speed reduces to 25 MPH between US 301/US 92 on-ramp to I-75 off-ramp. This is due to the weaving condition created by the heavy on-ramp traffic from the CD system and the off-ramp traffic to the I-75. In addition, the speed reduces to 20 MPH and 25 MPH between McIntosh Road off-ramp to I-75 SB on-ramp. This is due to heavy off-ramp traffic at the McIntosh Road.
4. **I-4 GUL Westbound PM Peak**: Major friction is seen at the off-ramp CD roadway system reducing the speed to 25 MPH just west of the Mango Road. Minor friction is seen between US 301/US 92 CD on-ramp and the MLK off-ramp.

In summary, the simulation models showed significant speed drops along the I-4 mainline at the following locations:

1. Between 14th Avenue EB off-ramp to the MLK off ramp – EB direction.
2. Between off-ramp CD roadway system just west of the Mango Road to the Branch Forbes Road off-ramp – EB direction.
3. Between McIntosh Road off-ramp to the I-75 SB on-ramp – EB direction.
4. Between US 301/US 92 on-ramp to the I-75 off-ramp – EB direction.

5. Between US 301/US 92 CD system on-ramp to the MLK off-ramp – WB direction.

## 3.10 2040 No-Build Project - Systemwide Network MOE Summary

**Table 3-3** shows the MOEs for the I-4 eastbound and westbound directions at the end of AM and PM peak hours.

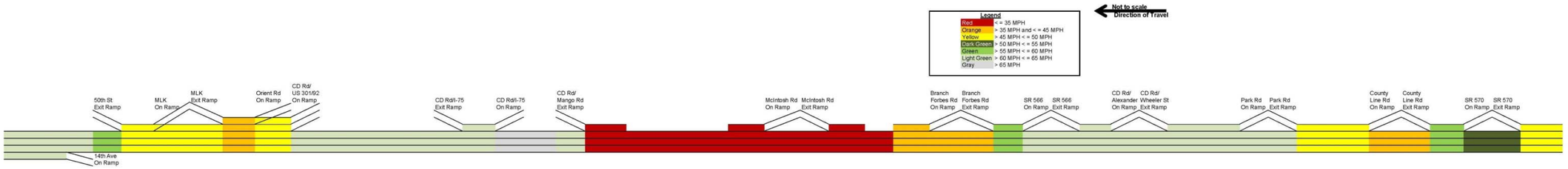
**Table 3-3: 2040 No-Build Project I-4 MOE Summary**

| Measure of Effectiveness | 2040 No-Build Average | |
|---|---|---|
| | AM Peak | PM Peak |
| TOTAL VEHICLE MILES | 653,275 | 715,488 |
| VEHICLE HOURS OF | | |
| MOVE TIME | 9,848 | 10,776 |
| DELAY TIME | 4,924 | 7,265 |
| TOTAL TIME | 14,772 | 18,041 |
| AVERAGE SPEED (MPH) | 44.45 | 39.66 |
| MOVE/TOTAL | 0.67 | 0.60 |
| MINUTES/MILE OF | | |
| DELAY TIME | 0.45 | 0.61 |
| TOTAL TIME | 1.35 | 1.51 |

The MOE results show that the average speed on the I-4 mainline is approximately 44 MPH in the AM peak hour and 39 MPH in the PM peak hour.

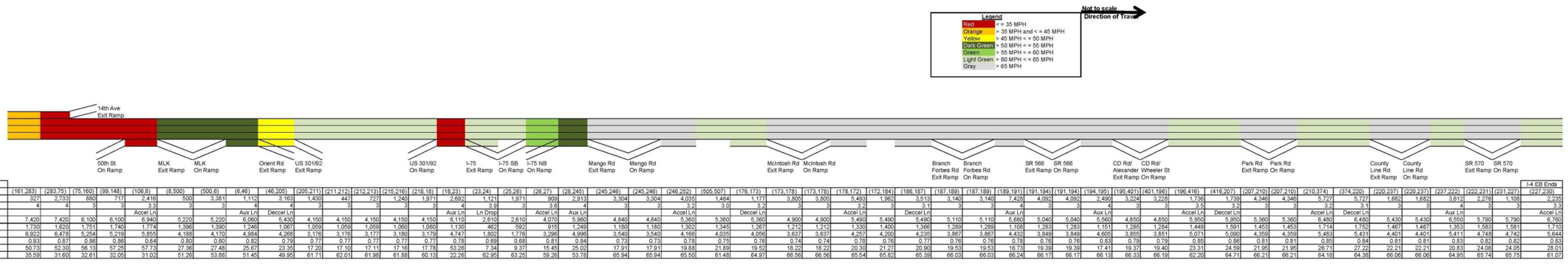
## Figure 3-41: 2040 No-Build Year Speed Temperature Chart – AM Peak

**Average Speed - NoBuild Conditions - Year 2040 - AM Peak Hour - 7:00AM - 8:00AM**
**I-4 Westbound Direction**




| I-4 WB Ends | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | I-4 WB Begins |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (From,to) | (268,502) | (93,268) | (90,101) | (107,87) | (7,107) | (5,7) | (5,7) | (43,5) | (265,43) | (266,265) | (264,266) | (260,261) | (259,260) | (42,257) | (34,35) | (30,34) | (29,30) | (255,247) | (519,255) | (254,519) | (504,254) | (506,504) | (164,163) | (174,175) | (177,174) | (177,174) | (171,177) | (183,171) | (188,185) | (190,188) | (190,188) | (192,190) | (193,192) | (193,192) | (198,193) | (197,198) | (197,198) | (415,197) | (208,415) | (209,208) | (209,208) | (375,209) | (221,375) | (236,221) | (236,221) | (223,236) | (224,223) | (224,223) | (232,224) |
| Link Length (ft) | 3,255 | 2,725 | 1,234 | 2,305 | 3,250 | 3,945 | 3,945 | 1,248 | 3,343 | 1,171 | 607 | 1,078 | 1,158 | 669 | 632 | 3,213 | 1,762 | 3,316 | 871 | 3,412 | 438 | 1,440 | 6,770 | 1,215 | 3,773 | 3,773 | 5,502 | 1,989 | 3,418 | 3,872 | 3,872 | 6,620 | 4,227 | 4,227 | 1,575 | 7,403 | 7,403 | 1,496 | 1,495 | 4,351 | 4,351 | 6,198 | 5,218 | 2,020 | 2,020 | 3,114 | 1,975 | 1,975 | 965 |
| No. of Lanes | 4 | 4 | 3 | 3 | 3.3 | 3.6 | 3.6 | 4.3 | 4.6 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 3.6 | 3 | 3 | 3 | 3.6 | 3 | 3 | 3.1 | 3 | 3.3 | 3 | 3.3 | 4 | 3 | 3 | 4 | 3 | 3 | 3.3 | 3.5 | 3 | 3 | 3.1 | 3.2 | 3 | 3 | 4 | 3 | 3 | 4 |
| Other Lanes | | Aux Ln | | Accel Ln | Ln Drop | Ln Drop | Accel Ln | Aux Ln | | | | | | | | Aux Ln | | | | Decel Ln | | | | Accel Ln | | | Decel Ln | | Accel Ln | | | Aux Ln | | | Aux Ln | | | Decel Ln | Accel Ln | | | Aux Ln | | Aux Ln |
| DDHV | 9,520 | 9,520 | 7,920 | 7,920 | 8,870 | 8,030 | 8,030 | 9,010 | 8,240 | 4,630 | 4,630 | 4,630 | 4,630 | 4,630 | 4,630 | 5,010 | 2,700 | 2,700 | 2,700 | 8,760 | 8,760 | 8,760 | 8,760 | 8,760 | 7,140 | 7,140 | 7,810 | 7,810 | 7,810 | 6,440 | 6,440 | 7,070 | 6,260 | 6,260 | 6,890 | 5,800 | 5,800 | 6,370 | 6,370 | 5,670 | 5,670 | 7,140 | 7,140 | 6,120 | 6,120 | 7,450 | 6,650 | 6,650 | 7,270 |
| Simulated Vol/Lane | 1,869 | 1,871 | 1,944 | 1,946 | 2,180 | 1,714 | 1,714 | 1,721 | 1,453 | 1,082 | 1,084 | 1,089 | 1,091 | 1,095 | 1,104 | 971 | 600 | 602 | 601 | 1,823 | 2,156 | 2,163 | 2,200 | 1,873 | 1,786 | 1,786 | 1,998 | 2,062 | 1,989 | 1,730 | 1,730 | 1,506 | 1,788 | 1,788 | 1,530 | 1,713 | 1,713 | 1,741 | 1,648 | 1,726 | 1,726 | 2,180 | 2,126 | 1,942 | 1,942 | 1,808 | 2,176 | 2,176 | 1,792 |
| Total Simulated Vol | 7,477 | 7,483 | 5,831 | 5,837 | 7,194 | 6,172 | 6,172 | 7,399 | 6,684 | 3,247 | 3,253 | 3,268 | 3,274 | 3,286 | 3,313 | 3,886 | 1,799 | 1,805 | 1,804 | 6,564 | 6,469 | 6,489 | 6,600 | 6,744 | 5,358 | 5,358 | 6,193 | 6,185 | 6,565 | 5,189 | 5,189 | 6,024 | 5,363 | 5,363 | 6,118 | 5,139 | 5,139 | 5,744 | 5,770 | 5,178 | 5,178 | 6,759 | 6,504 | 5,825 | 5,825 | 7,234 | 6,529 | 6,529 | 7,168 |
| % of DDHV | 0.79 | 0.79 | 0.74 | 0.74 | 0.81 | 0.77 | 0.77 | 0.82 | 0.81 | 0.70 | 0.70 | 0.71 | 0.71 | 0.71 | 0.72 | 0.78 | 0.67 | 0.67 | 0.67 | 0.75 | 0.74 | 0.74 | 0.75 | 0.77 | 0.75 | 0.75 | 0.79 | 0.79 | 0.84 | 0.81 | 0.81 | 0.85 | 0.86 | 0.86 | 0.89 | 0.89 | 0.89 | 0.90 | 0.91 | 0.91 | 0.91 | 0.95 | 0.95 | 0.95 | 0.95 | 0.97 | 0.98 | 0.98 | 0.99 |
| Density | 30.80 | 29.78 | 32.23 | 33.02 | 46.78 | 38.87 | 38.87 | 42.63 | 31.53 | 17.49 | 17.50 | 17.55 | 17.53 | 17.18 | 17.72 | 15.84 | 8.81 | 8.86 | 9.52 | 64.02 | 75.64 | 74.79 | 70.08 | 70.04 | 76.56 | 76.56 | 64.16 | 61.01 | 57.30 | 43.76 | 43.76 | 26.03 | 27.70 | 27.70 | 24.46 | 26.36 | 26.36 | 27.78 | 26.68 | 27.13 | 27.13 | 44.66 | 42.75 | 43.90 | 43.90 | 32.75 | 40.38 | 40.38 | 39.17 |
| Speed | 60.82 | 62.91 | 60.48 | 59.19 | 47.59 | 45.87 | 45.87 | 40.57 | 48.47 | 61.75 | 61.81 | 62.00 | 62.16 | 63.69 | 62.23 | 61.29 | 68.02 | 67.90 | 63.13 | 28.51 | 28.69 | 29.14 | 31.69 | 26.86 | 23.54 | 23.54 | 31.49 | 34.25 | 35.06 | 40.35 | 40.35 | 58.34 | 64.55 | 64.55 | 62.53 | 64.99 | 64.99 | 62.66 | 61.78 | 63.62 | 63.62 | 48.96 | 49.84 | 44.35 | 44.35 | 55.35 | 53.92 | 53.92 | 45.76 |

**Average Speed - NoBuild Conditions - Year 2040 - AM Peak Hour - 7:00AM - 8:00AM**
**I-4 Eastbound Direction**



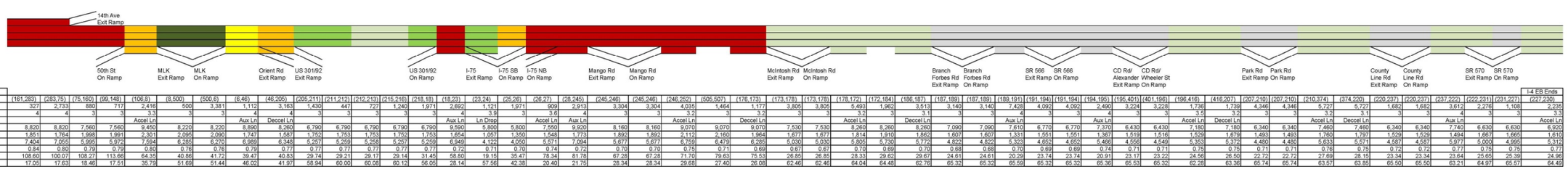

| I-4 EB Begins | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | I-4 EB Ends |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (From,to) | (161,283) | (283,75) | (75,160) | (99,148) | (106,8) | (8,500) | (500,6) | (6,46) | (46,205) | (205,211) | (211,212) | (212,213) | (213,216) | (218,18) | (18,23) | (23,24) | (25,26) | (26,27) | (28,245) | (245,246) | (245,246) | (246,252) | (505,507) | (176,173) | (173,178) | (173,178) | (178,172) | (172,184) | (186,187) | (187,189) | (187,189) | (189,191) | (191,194) | (191,194) | (194,195) | (195,401) | (401,196) | (196,416) | (416,207) | (207,210) | (207,210) | (210,374) | (374,220) | (220,237) | (220,237) | (237,222) | (222,231) | (231,227) | (227,230) |
| Link Length (ft) | 327 | 2,733 | 880 | 717 | 2,416 | 500 | 3,381 | 1,112 | 3,163 | 1,430 | 447 | 727 | 1,240 | 1,971 | 2,692 | 1,121 | 1,971 | 909 | 2,913 | 3,304 | 3,304 | 4,035 | 1,464 | 1,177 | 3,805 | 3,805 | 5,493 | 1,963 | 3,513 | 3,140 | 3,140 | 7,428 | 4,092 | 4,092 | 2,490 | 3,224 | 3,228 | 1,736 | 1,739 | 4,348 | 4,346 | 5,727 | 1,682 | 1,682 | 3,612 | 2,276 | 1,108 | 2,235 |
| No. of Lanes | 4 | 4 | 3 | 3 | 3.3 | 3 | 3 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 3.9 | 3 | 3.6 | 4 | 3 | 3 | 3.2 | 3.0 | 3.2 | 3 | 3 | 3.2 | 3 | 3.1 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 3 | 3.5 | 3.2 | 3 | 3 | 3.2 | 3.1 | 3 | 3 | 4 | 3 | 3 | 3.3 |
| Other Lanes | | | | Accel Ln | | | Aux Ln | Decel Ln | | | | | | | Aux Ln | Ln Drop | | Accel Ln | Aux Ln | | | Accel Ln | | Decel Ln | | | Accel Ln | | Decel Ln | | | Aux Ln | | | Aux Ln | | | Accel Ln | Decel Ln | | | Aux Ln | | Accel Ln |
| DDHV | 7,420 | 7,420 | 6,100 | 6,100 | 6,940 | 5,220 | 5,220 | 6,060 | 5,430 | 4,150 | 4,150 | 4,150 | 4,150 | 4,150 | 6,110 | 2,610 | 2,610 | 4,070 | 5,960 | 4,840 | 4,840 | 5,360 | 5,360 | 5,360 | 4,900 | 4,900 | 5,490 | 5,490 | 5,490 | 5,110 | 5,110 | 5,680 | 5,040 | 5,040 | 5,560 | 4,850 | 4,850 | 5,950 | 5,950 | 5,360 | 5,360 | 6,480 | 6,480 | 5,430 | 5,430 | 6,550 | 5,790 | 5,790 | 6,760 |
| Simulated Vol/Lane | 1,730 | 1,620 | 1,751 | 1,740 | 1,774 | 1,396 | 1,390 | 1,246 | 1,067 | 1,059 | 1,059 | 1,059 | 1,060 | 1,060 | 1,130 | 462 | 592 | 915 | 1,249 | 1,180 | 1,180 | 1,302 | 1,345 | 1,267 | 1,212 | 1,212 | 1,330 | 1,400 | 1,366 | 1,289 | 1,289 | 1,108 | 1,283 | 1,283 | 1,151 | 1,285 | 1,284 | 1,449 | 1,591 | 1,453 | 1,453 | 1,714 | 1,752 | 1,467 | 1,467 | 1,353 | 1,583 | 1,581 | 1,710 |
| Total Simulated Vol | 6,922 | 6,478 | 5,254 | 5,219 | 5,855 | 4,188 | 4,170 | 4,984 | 4,268 | 3,176 | 3,176 | 3,177 | 3,180 | 3,179 | 4,747 | 1,802 | 1,776 | 3,296 | 4,996 | 3,540 | 3,540 | 4,166 | 4,035 | 4,056 | 3,637 | 3,637 | 4,257 | 4,200 | 4,235 | 3,867 | 3,867 | 4,432 | 3,849 | 3,849 | 4,605 | 3,855 | 3,851 | 5,071 | 5,090 | 4,359 | 4,359 | 5,483 | 5,431 | 4,401 | 4,401 | 5,411 | 4,748 | 4,742 | 5,644 |
| % of DDHV | 0.93 | 0.87 | 0.86 | 0.86 | 0.84 | 0.80 | 0.80 | 0.82 | 0.79 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.78 | 0.69 | 0.68 | 0.81 | 0.84 | 0.73 | 0.73 | 0.78 | 0.75 | 0.76 | 0.74 | 0.74 | 0.78 | 0.76 | 0.77 | 0.76 | 0.76 | 0.78 | 0.76 | 0.76 | 0.83 | 0.79 | 0.79 | 0.85 | 0.86 | 0.81 | 0.81 | 0.85 | 0.84 | 0.81 | 0.81 | 0.83 | 0.82 | 0.82 | 0.83 |
| Density | 50.73 | 62.30 | 56.13 | 57.25 | 57.73 | 27.36 | 27.48 | 25.67 | 23.35 | 17.20 | 17.10 | 17.11 | 17.16 | 17.78 | 53.26 | 7.34 | 9.37 | 15.45 | 26.02 | 17.91 | 17.91 | 19.88 | 21.89 | 19.52 | 18.22 | 18.22 | 20.30 | 21.27 | 20.90 | 19.53 | 19.53 | 16.73 | 19.39 | 19.39 | 17.41 | 19.37 | 19.40 | 23.31 | 24.59 | 21.95 | 21.95 | 26.71 | 27.22 | 22.21 | 22.21 | 20.83 | 24.08 | 24.05 | 28.01 |
| Speed | 35.59 | 31.60 | 32.61 | 32.05 | 31.02 | 51.26 | 53.88 | 51.45 | 49.95 | 61.71 | 62.01 | 61.98 | 61.88 | 60.13 | 22.26 | 62.95 | 63.25 | 59.26 | 53.78 | 65.94 | 65.94 | 65.50 | 61.48 | 64.97 | 66.56 | 66.56 | 65.54 | 65.82 | 65.39 | 66.03 | 66.03 | 66.24 | 66.17 | 66.17 | 66.13 | 66.33 | 66.19 | 62.20 | 64.71 | 66.21 | 66.21 | 64.18 | 64.38 | 66.06 | 66.06 | 64.95 | 65.74 | 65.75 | 61.07 |

## Figure 3-42: 2040 No-Build Year Speed Temperature Chart – PM Peak

**Average Speed - NoBuild Conditions - Year 2040 - PM Peak Hour - 5:00PM - 6:00PM**
**I-4 Westbound Direction**


| I-4 WB Ende | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | I-4 WB Begins |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (From,to) | (268,502) | (93,268) | (90,101) | (107,87) | (7,107) | (5,7) | (5,7) | (43,5) | (265,43) | (266,265) | (264,266) | (260,261) | (259,260) | (42,267) | (34,35) | (30,34) | (29,30) | (255,247) | (519,255) | (254,519) | (504,254) | (506,504) | (164,163) | (174,175) | (177,174) | (177,174) | (171,177) | (183,171) | (188,185) | (190,188) | (190,188) | (192,190) | (193,192) | (193,192) | (198,193) | (197,198) | (197,198) | (415,197) | (208,415) | (209,208) | (209,208) | (375,209) | (221,375) | (236,221) | (236,221) | (223,236) | (224,223) | (224,223) | (232,224) |
| Link Length (ft) | 3,255 | 2,725 | 1,234 | 2,305 | 3,250 | 3,945 | 3,945 | 1,248 | 3,343 | 1,171 | 607 | 1,078 | 1,158 | 669 | 632 | 3,213 | 1,762 | 3,316 | 871 | 3,412 | 438 | 1,440 | 6,770 | 1,215 | 3,773 | 3,773 | 5,502 | 1,989 | 3,418 | 3,872 | 3,872 | 8,620 | 4,227 | 4,227 | 1,575 | 7,403 | 7,403 | 1,496 | 1,495 | 4,351 | 4,351 | 6,198 | 5,218 | 2,020 | 2,020 | 3,114 | 1,975 | 1,975 | 965 |
| No. of Lanes | 4 | 4 | 3 | 3 | 3.3 | 3.6 | 3.6 | 4.3 | 4.6 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 3.6 | 3 | 3 | 3 | 3.6 | 3 | 3 | 3.1 | 3 | 3.3 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 3 | 3.3 | 3.5 | 3 | 3 | 3.1 | 3.2 | 3 | 3 | 3 | 4 | 3 | 3 | 4 |
| Other Lanes | | Aux Ln | | | Accel Ln | Ln Drop | Ln Drop | Accel Ln | Aux Ln | | | | | | | Aux Ln | | | | Decel Ln | | | | Accel Ln | | | Decel Ln | | Accel Ln | | | Aux Ln | | | Aux Ln | | | Deccel Ln | Accel Ln | | | Decel Ln | Accel Ln | | | Aux Ln | | | Aux Ln |
| DDHV | 8,110 | 8,110 | 6,160 | 6,160 | 6,850 | 5,660 | 5,660 | 6,220 | 5,630 | 2,600 | 2,600 | 2,600 | 2,600 | 2,600 | 2,600 | 2,990 | 1,280 | 1,280 | 1,280 | 6,390 | 6,390 | 6,390 | 6,390 | 6,390 | 5,590 | 5,590 | 6,370 | 6,370 | 6,370 | 5,530 | 5,530 | 6,060 | 5,500 | 5,500 | 6,000 | 5,230 | 5,230 | 5,830 | 5,830 | 5,270 | 5,270 | 6,530 | 6,530 | 5,440 | 5,440 | 6,770 | 6,380 | 6,380 | 7,220 |
| Simulated Vol/Lane | 1,794 | 1,796 | 1,700 | 1,701 | 1,871 | 1,365 | 1,365 | 1,331 | 1,102 | 748 | 749 | 751 | 752 | 753 | 757 | 753 | 355 | 356 | 357 | 1,648 | 1,955 | 1,961 | 1,977 | 1,654 | 1,723 | 1,723 | 1,960 | 1,986 | 1,860 | 1,707 | 1,707 | 1,426 | 1,716 | 1,716 | 1,444 | 1,672 | 1,672 | 1,726 | 1,633 | 1,710 | 1,710 | 2,111 | 2,034 | 1,778 | 1,778 | 1,671 | 2,099 | 2,099 | 1,784 |
| Total Simulated Vol | 7,177 | 7,183 | 5,101 | 5,102 | 6,175 | 4,913 | 4,913 | 5,722 | 5,068 | 2,245 | 2,247 | 2,253 | 2,256 | 2,260 | 2,271 | 3,014 | 1,064 | 1,069 | 1,070 | 5,934 | 5,864 | 5,882 | 5,931 | 5,955 | 5,168 | 5,168 | 6,077 | 5,958 | 6,138 | 5,122 | 5,122 | 5,704 | 5,149 | 5,149 | 5,777 | 5,016 | 5,016 | 5,697 | 5,716 | 5,130 | 5,130 | 6,546 | 6,510 | 5,334 | 5,334 | 6,685 | 6,296 | 6,296 | 7,135 |
| % of DDHV | 0.88 | 0.89 | 0.83 | 0.83 | 0.90 | 0.87 | 0.87 | 0.92 | 0.90 | 0.86 | 0.86 | 0.87 | 0.87 | 0.87 | 0.87 | 1.01 | 0.83 | 0.83 | 0.84 | 0.93 | 0.92 | 0.92 | 0.93 | 0.93 | 0.92 | 0.92 | 0.95 | 0.94 | 0.96 | 0.93 | 0.93 | 0.94 | 0.94 | 0.94 | 0.96 | 0.96 | 0.96 | 0.98 | 0.98 | 0.97 | 0.97 | 1.00 | 1.00 | 0.98 | 0.98 | 0.99 | 0.99 | 0.99 | 0.99 |
| Density | 29.33 | 28.45 | 27.75 | 27.87 | 34.09 | 22.62 | 22.62 | 24.25 | 18.49 | 11.83 | 11.83 | 11.85 | 11.86 | 11.85 | 11.94 | 12.28 | 5.50 | 5.21 | 5.60 | 64.73 | 59.79 | 49.32 | 34.08 | 27.29 | 26.53 | 26.53 | 31.03 | 30.96 | 30.12 | 26.36 | 26.36 | 21.80 | 26.47 | 26.47 | 22.75 | 25.64 | 25.64 | 27.40 | 26.02 | 26.46 | 26.46 | 34.76 | 35.78 | 27.65 | 27.65 | 26.10 | 34.66 | 34.66 | 31.71 |
| Speed | 61.18 | 63.11 | 61.28 | 61.03 | 54.90 | 60.34 | 60.34 | 54.88 | 59.58 | 63.29 | 63.31 | 63.35 | 63.43 | 63.58 | 63.39 | 61.34 | 64.45 | 68.40 | 63.67 | 25.58 | 34.94 | 44.05 | 59.00 | 60.63 | 64.93 | 64.93 | 63.18 | 64.15 | 61.75 | 64.77 | 64.77 | 65.41 | 64.84 | 64.84 | 63.47 | 65.21 | 65.21 | 63.02 | 62.77 | 64.64 | 64.64 | 60.76 | 56.86 | 64.31 | 64.31 | 64.04 | 60.55 | 60.55 | 56.29 |

**Average Speed - NoBuild Conditions - Year 2040 - PM Peak Hour - 5:00PM - 6:00PM**
**I-4 Eastbound Direction**




| I-4 EB Begins | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | I-4 EB Ends |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (From,to) | (161,283) | (283,75) | (75,160) | (99,148) | (106,8) | (8,500) | (500,6) | (6,46) | (46,205) | (205,211) | (211,212) | (212,213) | (215,216) | (218,18) | (18,23) | (23,24) | (25,26) | (26,27) | (28,245) | (245,246) | (245,246) | (246,252) | (505,507) | (176,173) | (173,178) | (173,178) | (178,172) | (172,184) | (186,187) | (187,189) | (187,189) | (189,191) | (191,194) | (191,194) | (194,195) | (195,401) | (401,196) | (196,416) | (416,207) | (207,210) | (207,210) | (210,374) | (374,220) | (220,237) | (220,237) | (237,222) | (222,231) | (231,227) | (227,230) |
| Link Length (ft) | 327 | 2,733 | 880 | 717 | 2,416 | 500 | 3,381 | 1,112 | 3,163 | 1,430 | 447 | 727 | 1,240 | 1,971 | 2,692 | 1,121 | 1,971 | 909 | 2,913 | 3,304 | 3,304 | 4,035 | 1,464 | 1,177 | 3,805 | 3,805 | 5,493 | 1,962 | 3,513 | 3,140 | 3,140 | 7,428 | 4,092 | 4,092 | 2,490 | 3,224 | 3,228 | 1,736 | 1,739 | 4,346 | 4,346 | 5,727 | 5,727 | 1,682 | 1,682 | 3,612 | 2,276 | 1,108 | 2,235 |
| No. of Lanes | 4 | 4 | 3 | 3 | 3.3 | 3 | 3 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 3.9 | 3 | 3.6 | 4 | 3 | 3 | 3.2 | 3 | 3.2 | 3 | 3 | 3.2 | 3 | 3.1 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 3 | 3.6 | 3.2 | 3 | 3 | 3.2 | 3.1 | 3 | 3 | 4 | 3 | 3 | 3.3 |
| Other Lanes | | | | | Accel Ln | | | Aux Ln | Deccel Ln | | | | | | Aux Ln | Ln Drop | | Accel Ln | Aux Ln | | | Accel Ln | | Deccel Ln | | | Accel Ln | Deccel Ln | | | | Aux Ln | | | Aux Ln | | | Accel Ln | Deccel Ln | | | Accel Ln | Deccel Ln | | | Aux Ln | | | Accel Ln |
| DDHV | 8,820 | 8,820 | 7,560 | 7,560 | 9,450 | 8,220 | 8,220 | 8,890 | 8,260 | 6,790 | 6,790 | 6,790 | 6,790 | 6,790 | 9,590 | 5,800 | 5,800 | 7,550 | 9,920 | 8,160 | 8,160 | 9,070 | 9,070 | 9,070 | 7,530 | 7,530 | 8,260 | 8,260 | 8,260 | 7,090 | 7,090 | 7,610 | 6,770 | 6,770 | 7,370 | 6,430 | 6,430 | 7,180 | 7,180 | 6,340 | 6,340 | 7,460 | 7,460 | 6,340 | 6,340 | 7,740 | 6,630 | 6,630 | 6,920 |
| Simulated Vol/Lane | 1,851 | 1,764 | 1,998 | 1,991 | 2,301 | 2,095 | 2,090 | 1,747 | 1,587 | 1,752 | 1,753 | 1,753 | 1,752 | 1,753 | 1,654 | 1,057 | 1,350 | 1,548 | 1,773 | 1,892 | 1,892 | 2,112 | 2,160 | 1,964 | 1,677 | 1,677 | 1,814 | 1,910 | 1,862 | 1,607 | 1,607 | 1,331 | 1,551 | 1,551 | 1,367 | 1,519 | 1,516 | 1,529 | 1,679 | 1,493 | 1,493 | 1,760 | 1,797 | 1,529 | 1,529 | 1,494 | 1,667 | 1,665 | 1,610 |
| Total Simulated Vol | 7,404 | 7,055 | 5,995 | 5,972 | 7,594 | 6,285 | 6,270 | 6,989 | 6,348 | 5,257 | 5,259 | 5,258 | 5,257 | 5,259 | 6,949 | 4,122 | 4,050 | 5,571 | 7,094 | 5,677 | 5,677 | 6,759 | 6,479 | 6,285 | 5,030 | 5,030 | 5,805 | 5,730 | 5,772 | 4,822 | 4,822 | 5,323 | 4,652 | 4,652 | 5,466 | 4,556 | 4,549 | 5,353 | 5,372 | 4,480 | 4,480 | 5,633 | 5,571 | 4,587 | 4,587 | 5,977 | 5,000 | 4,995 | 5,312 |
| % of DDHV | 0.84 | 0.80 | 0.79 | 0.79 | 0.80 | 0.76 | 0.76 | 0.79 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.72 | 0.71 | 0.70 | 0.74 | 0.72 | 0.70 | 0.70 | 0.75 | 0.71 | 0.69 | 0.67 | 0.67 | 0.70 | 0.69 | 0.70 | 0.68 | 0.68 | 0.70 | 0.69 | 0.69 | 0.74 | 0.71 | 0.71 | 0.75 | 0.75 | 0.71 | 0.71 | 0.76 | 0.75 | 0.72 | 0.72 | 0.77 | 0.75 | 0.75 | 0.77 |
| Density | 108.60 | 100.07 | 108.27 | 113.66 | 64.35 | 40.86 | 41.72 | 39.47 | 40.83 | 29.74 | 29.21 | 29.17 | 29.14 | 31.45 | 58.60 | 19.15 | 35.47 | 78.34 | 81.78 | 67.28 | 67.28 | 71.70 | 79.63 | 75.53 | 26.85 | 26.85 | 28.33 | 29.62 | 29.67 | 24.61 | 24.61 | 20.29 | 23.74 | 23.74 | 20.91 | 23.17 | 23.22 | 24.56 | 26.50 | 22.72 | 22.72 | 27.69 | 28.15 | 23.34 | 23.34 | 23.64 | 25.65 | 25.39 | 24.96 |
| Speed | 17.05 | 17.63 | 18.46 | 17.51 | 35.79 | 51.69 | 51.44 | 46.02 | 41.97 | 58.94 | 60.00 | 60.08 | 60.12 | 56.05 | 28.14 | 57.56 | 42.38 | 20.40 | 21.75 | 28.34 | 28.34 | 29.68 | 27.40 | 26.08 | 62.46 | 62.46 | 64.04 | 64.48 | 62.76 | 65.32 | 65.32 | 65.59 | 65.32 | 65.32 | 65.36 | 65.53 | 65.32 | 62.28 | 63.36 | 65.74 | 65.74 | 63.57 | 63.85 | 65.50 | 65.50 | 63.21 | 64.97 | 65.57 | 64.49 |

## 3.11 Development of 2040 Build (Master Plan) Project Analysis

Apart from the 2040 No-Build Alternative improvements, no additional improvements were provided in the 2040 Build condition other than the connections to the Express Lanes (EL). The 2040 Build condition assumes two (2) Express Lanes in each direction within the study area along with the system to system connection at the I-4 and I-75 interchanges.

The 2040 Build Project Year operational analysis was performed for I-4 GUL and I-4 EL during AM and PM Peak periods. The signal timings and offsets were re-optimized in SYNCHRO to obtain better progression as needed. The revised offsets were updated in the CORSIM network analysis.

## 3.12 2040 Build (Master Plan) Project CORSIM Operational Analysis

**Figure 3-43** shows the 2040 Build Year Condition speed profile along I-4 General Use Lanes (GUL) and Express Lanes (EL) for AM Peak and **Figure 3-44** shows the 2040 Build Year Condition speed profile along I-4 GUL and EL for PM Peak. CORSIM models are provided in **Appendix D (on CD)**.

The following color codes were used to develop these speed profiles.

**Legend**

| | |
|---|---|
| Red | < = 35 MPH |
| Orange | > 35 MPH and < = 45 MPH |
| Yellow | > 45 MPH < = 50 MPH |
| Dark Green | > 50 MPH < = 55 MPH |
| Green | > 55 MPH < = 60 MPH |
| Light Green | > 60 MPH < = 65 MPH |
| Gray | > 65 MPH |

The 2040 Build Year Condition speed profile analyses for the General Use Lanes (GUL) are summarized as below:

1. **I-4 GUL Eastbound AM Peak**: Minor friction is seen where the speed drops to 55 MPH between the 50th Street on-ramp to the MLK off ramp. Also, a minor friction is seen where the speed drops to 50 MPH at the Polk Parkway (SR 570) ramps due to the EL merging into the GUL and the SR 570 on-ramp traffic. Most of the segments have speeds operating between 60 MPH and 65 MPH. Several segments east of the Mango Road off-ramp are operating greater than 65 MPH.
2. **I-4 GUL Westbound AM Peak**: Minor friction is seen where the speed drops to 40 MPH at the beginning section of the EL near SR 570. Most of the segments have speeds operating between 55 MPH and 65 MPH.
3. **I-4 GUL Eastbound PM Peak**: The speeds are around 40 MPH between 50th Street on-ramp and MLK off-ramp, and between the Orient Road off-ramp to the US 301/US 92 off-ramp. The speed reduces to 25 MPH between US 301/US 92 on-ramp and the I-75 off-ramp. This is due to the weaving condition created by the on-ramp traffic from the CD system and off-ramp traffic to the I-75. However, the remaining segments have speeds operating between 60 MPH and 65 MPH.
4. **I-4 GUL Westbound PM Peak**: Minor friction is seen between US 301/US 92 CD system on-ramp and the MLK off-ramp. The remaining segments have speeds operating between 60 MPH and 67 MPH.

Similarly, the 2040 Build Year Condition speed profile analyses for the Express Lanes (EL) are summarized as below:

1. **I-4 EL Eastbound AM Peak**: Most of the segments have speeds operating around 60 MPH within the study limits.
2. **I-4 EL Westbound AM Peak**: Most of the segments have speeds operating greater than 60 MPH with a minor friction at the westbound beginning due to traffic from the GUL to the EL near the SR 570.
3. **I-4 EL Eastbound PM Peak**: Most of the segments have speeds operating around 60 MPH within the study limits.
4. **I-4 EL Westbound PM Peak**: No friction is seen and most of the EL segments are operating between 60 MPH and 65 MPH.

In summary, the simulation models showed speed drops along I-4 at the following locations:

1. Between 50th Street on-ramp to the MLK off ramp (GUL) – EB direction.
2. Between Orient Road off-ramp to the US 301/US 92 off-ramp (GUL) – EB direction.
3. Between US 301/US 92 on-ramp and the I-75 off-ramp (GUL) – EB direction.
4. Minor friction at the westbound beginning due to traffic from the GUL to the EL (EL) – WB direction.

## 3.13 2040 Build (Master Plan) Project - Systemwide Network MOE Summary

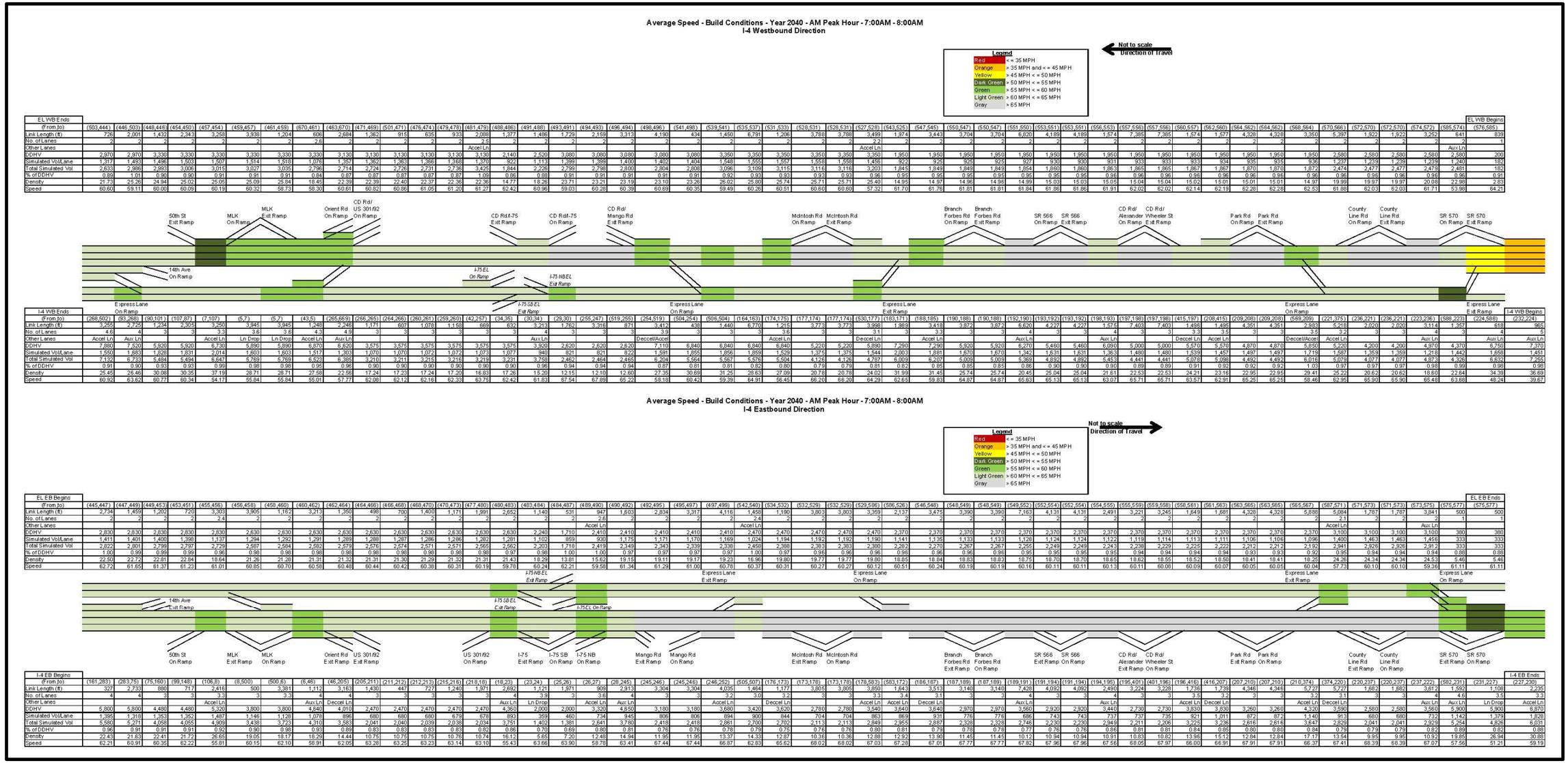
**Table 3-4** shows the MOEs for the I-4 eastbound and westbound directions at the end of AM and PM peak hours.

**Table 3-4: 2040 Build (Master Plan) Project I-4 MOE Summary**

| Measure of Effectiveness | 2040 Build Average | |
|---|---|---|
| | AM Peak | PM Peak |
| **TOTAL VEHICLE MILES** | 808,160 | 788,534 |
| **VEHICLE HOURS OF** | | |
| **MOVE TIME** | 12,332 | 12,000 |
| **DELAY TIME** | 1,404 | 2,091 |
| **TOTAL TIME** | 13,736 | 14,091 |
| **AVERAGE SPEED (MPH)** | 58.84 | 55.96 |
| **MOVE/TOTAL** | 0.90 | 0.85 |
| **MINUTES/MILE OF** | | |
| **DELAY TIME** | 0.10 | 0.16 |
| **TOTAL TIME** | 1.02 | 1.07 |

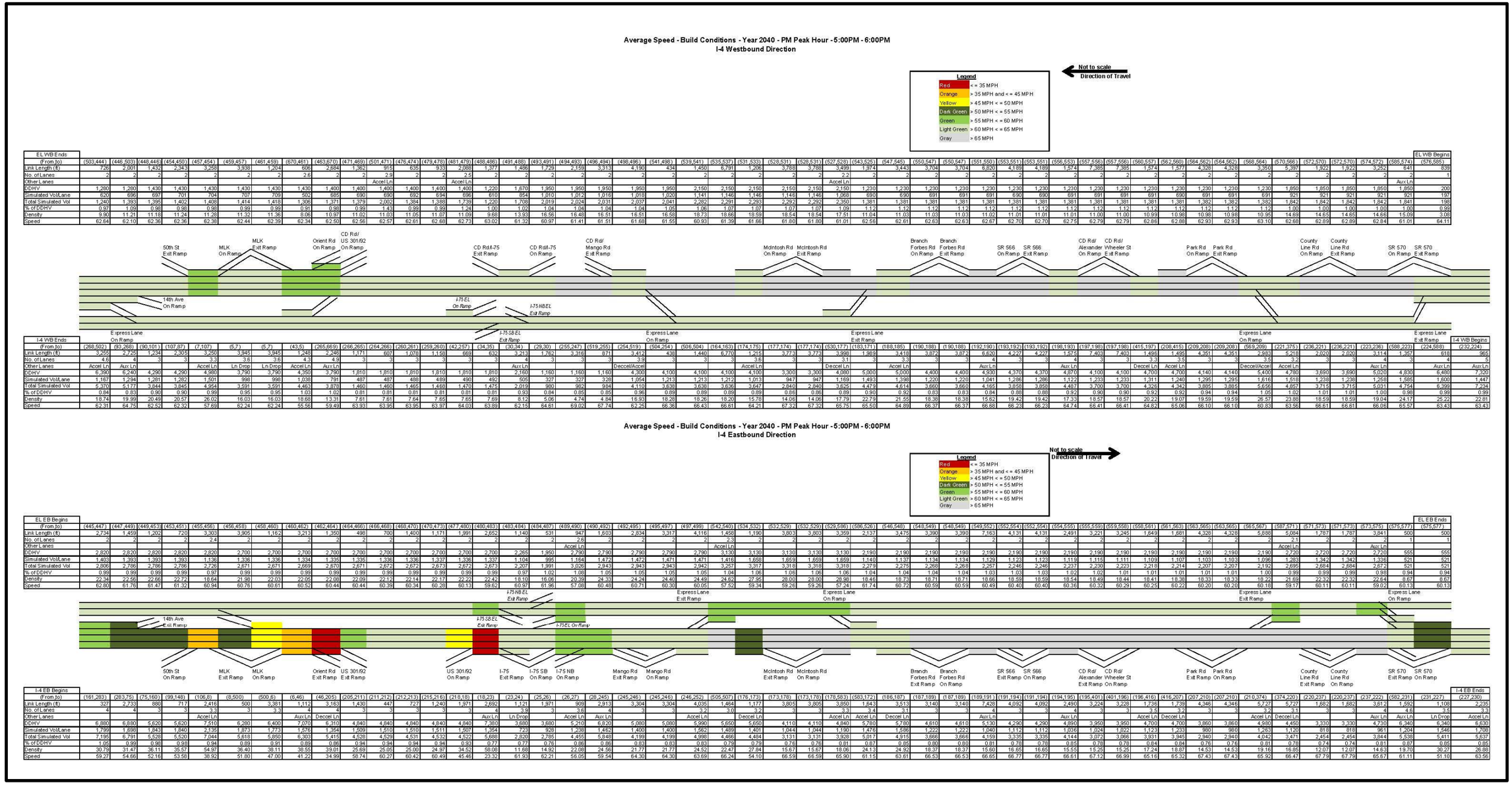
The MOE results show that the average speed on the I-4 mainline is approximately 58 MPH in the AM peak hour and 56 MPH in the PM peak hour.

## Figure 3-43: 2040 Build (Master Plan) Year Speed Temperature Chart – AM Peak




Note: Express Lane Ramps naming convention is relative the I-4 General Use Lanes.

## Figure 3-44: 2040 Build (Master Plan) Year Speed Temperature Chart – PM Peak




Note: Express Lane Ramps naming convention is relative the I-4 General Use Lanes.

# 4.0 CONCLUSIONS

In summary, the existing (2012) simulation models showed speed drops along I-4 at the following locations:

1. Between 50th Street on-ramp and the MLK off ramp – EB direction.
2. Between I-75 on-ramp and the on-ramp to the US 301/US 92 CD system – WB direction.
3. Between US 301/US 92 on-ramp and the I-75 off-ramp – EB direction.
4. Between I-75 SB on-ramp and the I-75 NB on-ramp – EB direction.

With the express lanes consideration for the staged implementation (Starter Project) for 2020 and 2030 and the 2040 build condition (Master Plan), the study indicated significant benefits with better operating speeds and fewer delays along I-4 mainline.

**Table 4-1** shows that the I-4 mainline average speed is 56 MPH in the AM peak hour and an average speed of 53 MPH in the PM peak hour for the 2020 Starter Year Condition. The speed profile analyses show friction at the following locations:

- **I-4 GUL Westbound**: Between US 301/US 92 CD system on-ramp and the MLK off-ramp caused due to the merge condition caused by heavy traffic from the CD system to the I-4.
- **I-4 GUL Eastbound:** Between US 301/US 92 on-ramp and the I-75 off-ramp, due to the weaving condition created by the on-ramp traffic from the CD system and off-ramp traffic to the I-75.

For 2030 Starter Year, **Table 4-1** shows that the I-4 mainline average speed is 52 MPH in the AM peak hour and an average speed of 49 MPH in the PM peak hour. The speed profile analyses show only two additional friction locations apart from the 2020 Starter Project:

- **I-4 GUL Eastbound**: Between the 50th Street on-ramp and the MLK off ramp.
- **I-4 GUL Westbound**: Between the McIntosh Road ramps, and near the off-ramp CD roadway system traffic just west of the Mango Road.

No new friction locations are caused by the Express Lanes (EL) or its connections to and from the General Use Lanes (GUL).

Table 4-1: I-4 Mainline Network MOE Summary

| Measure of Effectiveness | 2020 Starter Average | | 2030 Starter Average | | 2040 No Build Average | | 2040 Build Average | |
|---|---|---|---|---|---|---|---|---|
| | AM Peak | PM Peak | AM Peak | PM Peak | AM Peak | PM Peak | AM Peak | PM Peak |
| TOTAL VEHICLE MILES | 590,387 | 582,422 | 686,930 | 661,874 | 653,275 | 715,488 | 808,160 | 788,534 |
| VEHICLE HOURS OF | | | | | | | | |
| MOVE TIME | 8,908 | 8,794 | 10,360 | 9,988 | 9,848 | 10,776 | 12,332 | 12,000 |
| DELAY TIME | 1,561 | 2,081 | 2,726 | 3,506 | 4,924 | 7,265 | 1,404 | 2,091 |
| TOTAL TIME | 10,469 | 10,875 | 13,086 | 13,494 | 14,772 | 18,041 | 13,736 | 14,091 |
| AVERAGE SPEED (MPH) | 56.39 | 53.56 | 52.50 | 49.05 | 44.45 | 39.66 | 58.84 | 55.96 |
| MOVE/TOTAL | 0.85 | 0.81 | 0.79 | 0.74 | 0.67 | 0.60 | 0.90 | 0.85 |
| MINUTES/MILE OF | | | | | | | | |
| DELAY TIME | 0.16 | 0.21 | 0.24 | 0.32 | 0.45 | 0.61 | 0.10 | 0.16 |
| TOTAL TIME | 1.06 | 1.12 | 1.14 | 1.22 | 1.35 | 1.51 | 1.02 | 1.07 |

The following freeway MOEs are compared for the 2040 Build Alternative and 2040 No Build Alternative at the end of peak hours:

- **VMT**: Total distance traveled on the link by all vehicles since the beginning of the simulation.
- **Move Time in vehicle-hours**: Total theoretical time for discharged vehicles to travel the length of the link if moving unimpeded at the free-flow speed. Calculated as travel distance divided by the free-flow speed on the link.
- **Total Time in vehicle-hours**: Link length divided by the average speed of all vehicles on the link since the beginning of the simulation.
- **Delay in vehicle-hours**: Total Time per vehicle minus Move Time per vehicle.
- **Speed**: Vehicle Miles divided by Vehicle Hours to travel the link.

**Table 4-2** shows the results of the simulation analysis showing significant improvements in the I-4 system MOEs during AM and PM peak hours due to the Express Lanes (EL) implementation within the study area.

The results showed the following benefits due to EL consideration:

1. 24% increase in the freeway throughput for the AM peak hour and 10% increase in the freeway throughput for the PM peak hour.
2. 25% increase in the freeway travel time for the AM peak hour and 11% increase in the freeway travel time for the PM peak hour.
3. 71% reduction in freeway delay for the AM peak hour and 71% reduction in freeway delay for the PM peak hour.
4. 7% reduction in the overall vehicle hours traveled in the freeway for the AM peak hour and 22% reduction in the overall vehicle hours traveled in the freeway for the PM peak hour.
5. 32% increase in the freeway speed for the AM peak hour and 41% increase in the freeway speed for the PM peak hour.

**Table 4-2: Network MOE Comparison - 2040 No-Build and 2040 Build**

| Corridor/Direction | Scenarios | VMT | Move Time (veh-hr) | Delay (veh-hr) | Total Time (veh-hr) | Speed (MPH) | Change in Throughput (VPH) |
|---|---|---|---|---|---|---|---|
| **AM Peak** | | | | | | | |
| I-4 from 50th St to Polk Parkway | 2040 No Build | 653,275 | 9,848 | 4,924 | 14,772 | 44.45 | |
| | 2040 Build | 808,160 | 12,332 | 1,404 | 13,736 | 58.84 | 154,885 |
| | % Change | **24%** | **25%** | **-71%** | **-7%** | **32%** | |
| **PM Peak** | | | | | | | |
| I-4 from 50th St to Polk Parkway | 2040 No Build | 715,488 | 10,776 | 7,265 | 18,041 | 39.66 | |
| | 2040 Build | 788,534 | 12,000 | 2,091 | 14,091 | 55.96 | 73,046 |
| | % Change | **10%** | **11%** | **-71%** | **-22%** | **41%** | |