

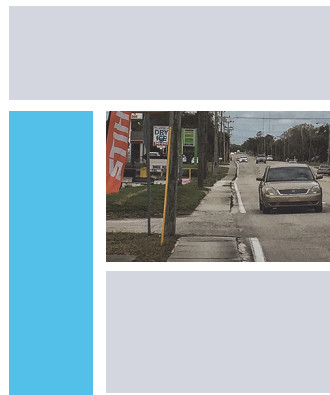
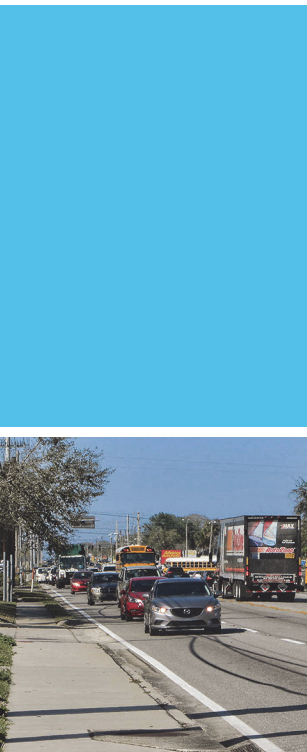
2017

# WICKHAM ROAD

OPERATIONAL ANALYSIS

## Final Report

Eau Gallie Boulevard to Lake Washington Road



Prepared for:  
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## Appendix B Wickham Road Future Conditions Summary



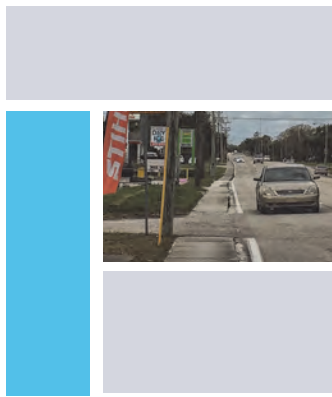
2017

# WICKHAM ROAD

OPERATIONAL ANALYSIS

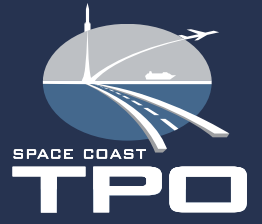
## Future Conditions Summary

Eau Gallie Boulevard to Lake Washington Road



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DRAFT FUTURE NO-BUILD CONDITIONS SUMMARY

# Wickham Road Operational Analysis

From Eau Gallie Boulevard to Lake Washington Road

Melbourne, Florida

Prepared For:  
**Space Coast Transportation Planning Organization**  
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July 2017



## TABLE OF CONTENTS

Introduction .....	1
Project Location .....	1
Traffic Forecasting .....	1
Methodology.....	1
Historic Growth Rates .....	3
Population Projections.....	5
Model Growth Rates.....	5
Growth Rate Summary .....	5
Selection of Applied Growth Rate .....	6
Future No-Build Operational Analysis .....	7
Generalized LOS Evaluation .....	7
HCM 2010 LOS Evaluation .....	11
2040 No-Build Peak Hour Intersection Operations .....	14
Summary .....	18

## LIST OF FIGURES

Figure 1: Study Corridor .....	2
Figure 2: SCTPO Count Station Locations.....	4
Figure 3: Segmentation for Operational Analysis .....	9
Figure 4: 2040 AADTs along Wickham Road .....	10
Figure 5: 2040 AM and PM Peak Hour Segment and Intersection Operations .....	13
Figure 6: 2040 No-Build Intersection Lane Configurations and Traffic Control.....	15
Figure 7: 2040 No-Build Peak Hour Intersection Turning Movement Volumes .....	16

## LIST OF TABLES

Table 1: Summary of Historic Growth Rates.....	3
Table 2: BEBR Population Growth Rates.....	6
Table 3: Model Growth Rate Summary.....	5
Table 4: 2040 No-Build Generalized LOS Evaluation .....	8
Table 5: LOS for Urban Street Segments (HCM 2010) .....	11
Table 6: No-Build HCM LOS Evaluation Results – 2040 AM Peak Hour .....	12
Table 7: No-Build HCM LOS Evaluation Results – 2040 PM Peak Hour .....	12

## LIST OF APPENDICES

Appendix A – Historical AADT Reports

Appendix B – Trends Analyses

Appendix C – Model Plots

Appendix D – BEBR Population Study

Appendix E – Growth Rate Summary

Appendix F – HCM Segment Operational Analysis Inputs/Outputs

Appendix G – HCM Intersection Output Reports

## Introduction

Kittelson & Associates, Inc. (KAI) was retained by the Space Coast Transportation Planning Organization (SCTPO) to conduct an operational analysis of Wickham Road between Eau Gallie Boulevard and Lake Washington Road. Wickham Road is a key north/south arterial in Brevard County, starting at US 192 in the south and ending west of I-95 to the north. This study will focus on the identifying congestion and safety improvements for Wickham Road between Eau Gallie Boulevard and Lake Washington Road in the City of Melbourne. The Future No-Build Conditions Summary includes:

- Determining future growth rates;
- Forecasting traffic volumes for the year 2040; and
- Performing future no-build operational analysis.

The remainder of this document reviews the future traffic projections and no-build operational analysis for the Wickham Road study corridor.

## Project Location

Wickham Road from Eau Gallie Boulevard to Lake Washington Road is classified as an urban principal arterial – other. The annual average daily traffic (AADT) along this section ranges from approximately 32,000 to 35,000 based on the counts collected in late 2016. Wickham Road is in a built-out area and is primarily surrounded by residential land uses and some commercial land uses to the north and south of the study limits. Wickham Road serves primarily commuter traffic. The study corridor is illustrated in **Figure 1**.

## Traffic Forecasting

Traffic volumes were developed for the future year of 2040 to be used in the future conditions operational analysis. This section presents the future-year traffic volumes and the process by which they were developed.

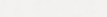
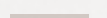
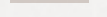

### ***METHODOLOGY***

An annual growth rate was selected based upon a comparison of model growth rates, historical volume trends, and projected area-wide population growth trends. Future intersection turning movements were forecast by applying the selected growth rate to existing (2016) segment and intersection turning movement volumes. One growth rate was selected and applied along the Wickham Road corridor within the project limits. A separate growth rate was applied to the intersection turning movement volumes along Aurora Road (east and west legs of Aurora Road) to provide consistency with the ongoing Aurora Road Corridor Study.





**LEGEND**

-  Study Corridor
-  City of Melbourne
-  Brevard County
-  Signalized Intersection

Scale in Feet  
 0 700 North

## HISTORICAL GROWTH RATES

Historical Annual Average Daily Traffic (AADT) data was obtained from the SCTPO's online traffic count website and the annual State of the System (SOS) report. Historic growth rates were evaluated using a linear trend analysis methodology. Linear trend evaluations were conducted for two SCTPO count stations within the study corridor limits. A linear trend evaluation was also completed for the adjacent SCTPO site to the north and south of the study limits. The locations of the SCTPO count stations reviewed are shown in **Figure 2**. The AADT from 2007 to 2016 and the resulting historic linear growth rate is summarized for each count station in **Table 1**. The SCTPO's historical traffic count reports are provided in **Appendix A**. The historic trend analyses are included in **Appendix B**.

Traffic volumes along Wickham Road have yet to reach historical highs observed in the late 2000's, resulting in a growth trend of approximately negative 0.62 to negative 1.02 percent. The  $R^2$  values (how well the data is correlated to the trend line) range between 4.9 and 52.1 percent. Generally, growth rates with an  $R^2$  value greater than or equal to 75 percent are deemed reliable and should be considered when determining growth factors based on historical trends.

**Table 1: Summary of Historical Growth Rates**

Year	Wickham Rd. South of Eau Gallie Blvd.	Wickham Rd. from Eau Gallie Blvd. to Aurora Rd.	Wickham Rd. from Aurora Rd. to Lake Washington Rd.	Wickham Rd. North of Lake Washington Rd.
	SCTPO Site 409	SCTPO Site 410	SCTPO Site 411	SCTPO Site 412
2016	35,100	32,100	34,200	33,000
2015	36,300	43,100	34,200	30,300
2014	34,400	33,200	33,300	30,500
2013	34,600	34,300	33,300	30,600
2012	37,000	35,800	34,500	31,100
2011	38,000	37,000	35,900	32,300
2010	36,800	37,300	35,600	32,200
2009	39,000	39,700	38,500	35,500
2008	38,700	37,200	36,700	33,100
2007	36,900	36,200	35,400	32,300
Annual Linear Growth Rate	-1.01%	-0.62%	-1.02%	-0.80%
$R^2$	52.08%	4.90%	50.48%	26.42%

\*Note: AADT values were rounded to the nearest 100 vehicles.







## MODEL GROWTH RATES

The most current version of the adopted Central Florida Regional Planning Model (CFRPM) v6.1 with a base year 2010 and forecast year 2040 was utilized to estimate model volume growth rates. A sub-area validation was not completed as part of this study. Model AADT volumes converted from the peak season weekday average daily traffic (PSWADT) volumes using the appropriate model output conversion factor (MOCF). Model growth rates were then calculated for the three study segments and the adjacent segments to the north and south by comparing the base year 2010 model AADT to the projected 2040 model AADT. The linear annual model growth rates for each of the segments are summarized in **Table 2**. Model plots of each model scenario are provided in **Appendix C**.

The model growth rates along Wickham Road within the vicinity of the study limits range between negative 0.65 percent and positive 0.06 percent. The 2040 model AADTs along Wickham Road are generally less than the model AADTs in the 2010 base year model. Further review of the adjacent model network shows some diversion of traffic from Wickham Road due to the extension of Turtle Mound Road to Eau Gallie Boulevard. The extension was completed in late 2013 and was included in the 2040 model network. This new roadway connection explains the drop in model volume from the base year to horizon year along Wickham Road towards the southern end of the study limits.

**Table 2: Model Growth Rate Summary**

Roadway Segment	2010 Model AADT	2040 Model AADT	Annual Volume Growth	Annual Linear Growth Rate
Wickham Rd. south of Eau Gallie Blvd.	26,249	26,357	4	0.02%
Eau Gallie Blvd. to Aurora Rd.	21,683	22,066	13	0.06%
Aurora Rd. to Northgate Plaza	22,009	17,727	-143	-0.65%
Northgate Plaza to Lake Washington Rd.	22,086	17,799	-143	-0.65%
Wickham Rd. north of Lake Washington Rd.	20,539	19,222	-44	-0.21%
<b>Overall Average</b>	<b>22,513</b>	<b>20,634</b>	<b>-63</b>	<b>-0.29%</b>

## POPULATION PROJECTIONS

The University of Florida's Bureau of Business and Economic Research (BEER) population projections were obtained for Brevard County. The population projections show an estimate for 2016 and future projections for 2020 to 2045. The low, medium, and high projections for 2040 (the Design Year) are summarized in **Table 3**. Population growth rates range from approximately 0.21 percent to 1.53 percent. BEER population study data is provided in **Appendix D**.

**Table 3: BEBR Population Growth Rates**

Estimation	2016 Estimate	2040 Projection	Annual Growth Rate, Growth/Year (%)
Brevard County			
Low	568,919	597,700	1,199 (0.21%)
Medium		681,700	4,699 (0.83%)
High		777,800	8,703 (1.53%)

Source – BEBR: Volume 50, Bulletin 177, April 2017

It is important to note that the BEBR data accounts for countywide data and does not necessarily reflect expected population growth on specific roadways or sub-areas of the County. It is useful in reviewing reasonableness of growth rates obtained from other sources such as travel demand models and historical AADT data. For example, the county is expected to grow from a population standpoint, thus, a negative annual growth rate for traffic is unreasonable for use in this study.

### ***GROWTH RATE SUMMARY***

The historical growth rates along Wickham Road range between approximately negative 0.62 to negative 1.02 percent and the correlation of the historic growth rates are lower than the  $R^2$  threshold of 75 percent. A BEBR medium growth rate of approximately 0.83 percent is estimated for Brevard County. The CFRPM growth rates indicate little to no growth anticipated along Wickham Road in the immediate vicinity of the study corridor limits (negative 0.65 percent to positive 0.06 percent).

### **Selection of Applied Growth Rate**

The study team completed a preliminary sensitivity analysis using applied linear growth rates of 0.5, 1.0, 1.5, and 2.0 percent. Segment and intersection operational analyses were completed to gain an understanding of the potential operational implications of each growth rate. The study team, along with members of the SCTPO and Brevard County, concluded that an applied annual linear growth rate of one percent is reasonable for the study corridor based on a review of the historical, population, and model growth rates in addition to the corridor functionality (serving primarily commuter traffic). A summary of the sensitivity analysis and the various growth rates reviewed is included in **Appendix E**.

## Future No-Build Operational Analysis

The following sections summarize the future no-build AM and PM peak hour segment and intersection operations for the future year (2040). A LOS evaluation based on the generalized LOS tables (segments only) and Highway Capacity Manual (HCM) 2010 methodologies (segment and intersection operations) was conducted as part of the future no-build operational analysis. The selected one percent annual linear growth rate was applied to the existing year (2016) volumes to estimate future year 2040 AADTs and turning movement volumes.

For the purpose of the segment analysis, Wickham Road was divided into the same three individual segments between the four signalized intersections as the existing conditions analysis. The three segments are displayed on **Figure 3** and summarized below:

- Segment 1 – Wickham Road from Eau Gallie Boulevard to Aurora Road;
- Segment 2 – Wickham Road from Aurora Road to Northgate Plaza; and
- Segment 3 – Wickham Road from Northgate Plaza to Lake Washington Road.

Two analyses were performed to identify segment deficiencies along the Wickham Road corridor:

1. LOS evaluation based on generalized LOS tables; and
2. LOS evaluation based on HCM (2010) Methodologies.

### **GENERALIZED LOS EVALUATION**

An evaluation of the existing LOS along Wickham Road was performed by comparing segment AADTs versus the LOS volume threshold from the generalized LOS volume thresholds from the SCTPO's 2015 State of the System (SOS) report. The selected one percent annual linear growth rate was applied to the existing year (2016) AADTs to estimate the future 2040 AADTs (shown in **Figure 4**). The LOS standard and volume thresholds are consistent from the Existing Conditions Report.

**Table 4** summarizes the 2040 AADT for each study segment and the results of the generalized LOS evaluation. As summarized in **Table 4**, the three study segments along Wickham Road are not anticipated to meet the LOS standard based future 2040 volumes.

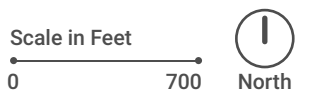


**Table 4: 2040 No-Build Generalized LOS Evaluation**

Segment	2016 AADT	2040 AADT	Area Type	Segment Type	Speed Limit (MPH)	LOS Standard	LOS Volume Standard*	2040 Volumes Exceed LOS Volume Standard?
Eau Gallie Boulevard to Aurora Road	32,000	40,000	Urban	Signalized Arterial	35	E	33,800	Yes
Aurora Road to Northgate Plaza	34,000	42,000	Urban	Signalized Arterial	35	E	33,800	Yes
Northgate Plaza to Lake Washington Road	34,000	42,000	Urban	Signalized Arterial	40	E	33,800	Yes

\*Source: 2015 State of the System Report

The generalized LOS analysis methodology is a sketch-planning level tool developed to provide a quick review of capacity and LOS for the roadway being studied. HCM methodologies are the most widely used for analyzing existing facilities and future improvements to corridors, as discussed in the following sections.







Scale in Feet  
 0 700 North

## HCM 2010 LOS EVALUATION

A HCM 2010 Urban Street Segment analysis was performed for the three Wickham Road study segments previously defined in **Figure 3**. This methodology is applicable for segments less than two miles in length between signalized intersections. The HCM 2010 section 17.1 was referenced to evaluate the segment LOS based on the average travel speed (ATS) as a percentage of the base free flow speed (%BFFS). The LOS thresholds for urban street segments are summarized in **Table 5**.

**Table 5: LOS for Urban Street Segments (HCM 2010)**

LOS	Travel Speed as a Percentage of Free Flow Speed (%)
A	>85
B	>67 – 85
C	>50 – 67
D	>40 – 50
E	>30 – 40
F	≤30

The segment analysis was performed for the 2040 AM and PM peak hours in the northbound and southbound directions for each Wickham Road segment. **Table 6** and **Table 7** display the 2040 no-build peak hour results from the HCM analysis and the LOS for each segment. The bolded rows in the tables represent segments that are anticipated to operate below the LOS E threshold. **Appendix F** includes the HCM inputs and the various outputs/calculations for the segment analysis. The operational results for each segment are illustrated in **Figure 5**.

The following summarizes the operations and anticipated deficiencies (by direction) identified as part of the 2040 AM peak hour HCM segment operations (shown in bold in **Table 6**):

- Northbound –
  - The segments along Wickham Road are anticipated to operate at LOS D.
- Southbound –
  - Wickham Road between Northgate Plaza and Aurora Road is anticipated to operate at LOS F.

The following briefly summarizes the anticipated deficiencies (by direction) identified as part of the 2040 PM peak hour segment operations (shown in **Table 7**):

- Northbound –
  - Wickham Road between Eau Gallie Boulevard and Aurora Road is anticipated to operate at LOS F.
  - Wickham Road between Northgate Plaza and Lake Washington Road is anticipated to operate at LOS F.
- Southbound –
  - Wickham Road between Northgate Plaza and Aurora Road is anticipated to operate at LOS F.



**Table 6: No-Build HCM LOS Evaluation Results – 2040 AM Peak Hour**

Segment	BFFS (MPH)	Average Travel Speed (MPH)	% of BFFS	LOS	Segment LOS Below LOS Standard?
Northbound Direction					
Eau Gallie Boulevard to Aurora Road	41.1	17.0	41%	D	No
Aurora Road to Northgate Plaza	40.6	17.8	44%	D	No
Northgate Plaza to Lake Washington Road	43.1	18.0	42%	D	No
Southbound Direction					
Lake Washington Road to Northgate Plaza	43.1	21.6	50%	C	No
<b>Northgate Plaza to Aurora Road</b>	<b>41.5</b>	<b>9.1</b>	<b>22%</b>	<b>F*</b>	<b>Yes</b>
Aurora Road to Eau Gallie Boulevard	40.7	17.7	43%	D	No

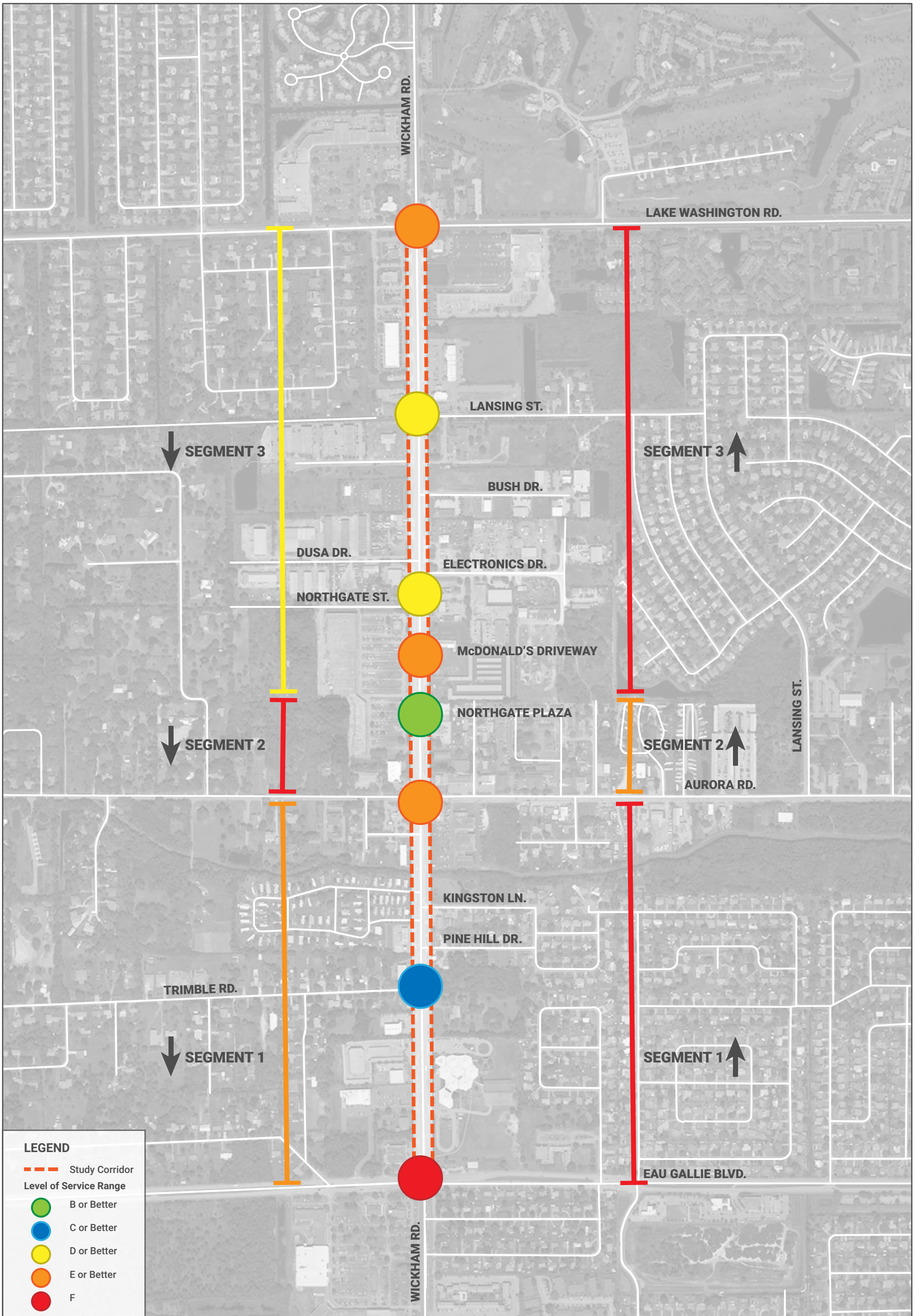
\*Note: Segment was below LOS standard under 2016 volumes

**Table 7: No-Build HCM LOS Evaluation Results – 2040 PM Peak Hour**

Segment	BFFS (MPH)	Average Travel Speed (MPH)	% of BFFS	LOS	Segment LOS Below LOS Standard?
Northbound Direction					
<b>Eau Gallie Boulevard to Aurora Road</b>	<b>41.1</b>	<b>12.9</b>	<b>31%</b>	<b>F</b>	<b>Yes</b>
Aurora Road to Northgate Plaza	40.6	15.9	39%	E	No
<b>Northgate Plaza to Lake Washington Road</b>	<b>43.1</b>	<b>12.6</b>	<b>29%</b>	<b>F</b>	<b>Yes</b>
Southbound Direction					
Lake Washington Road to Northgate Plaza	43.1	21.4	50%	D	No
<b>Northgate Plaza to Aurora Road</b>	<b>41.5</b>	<b>9.7</b>	<b>23%</b>	<b>F*</b>	<b>Yes</b>
Aurora Road to Eau Gallie Boulevard	40.7	15.1	37%	E	No

\*Note: Segment was below LOS standard under 2016 volumes





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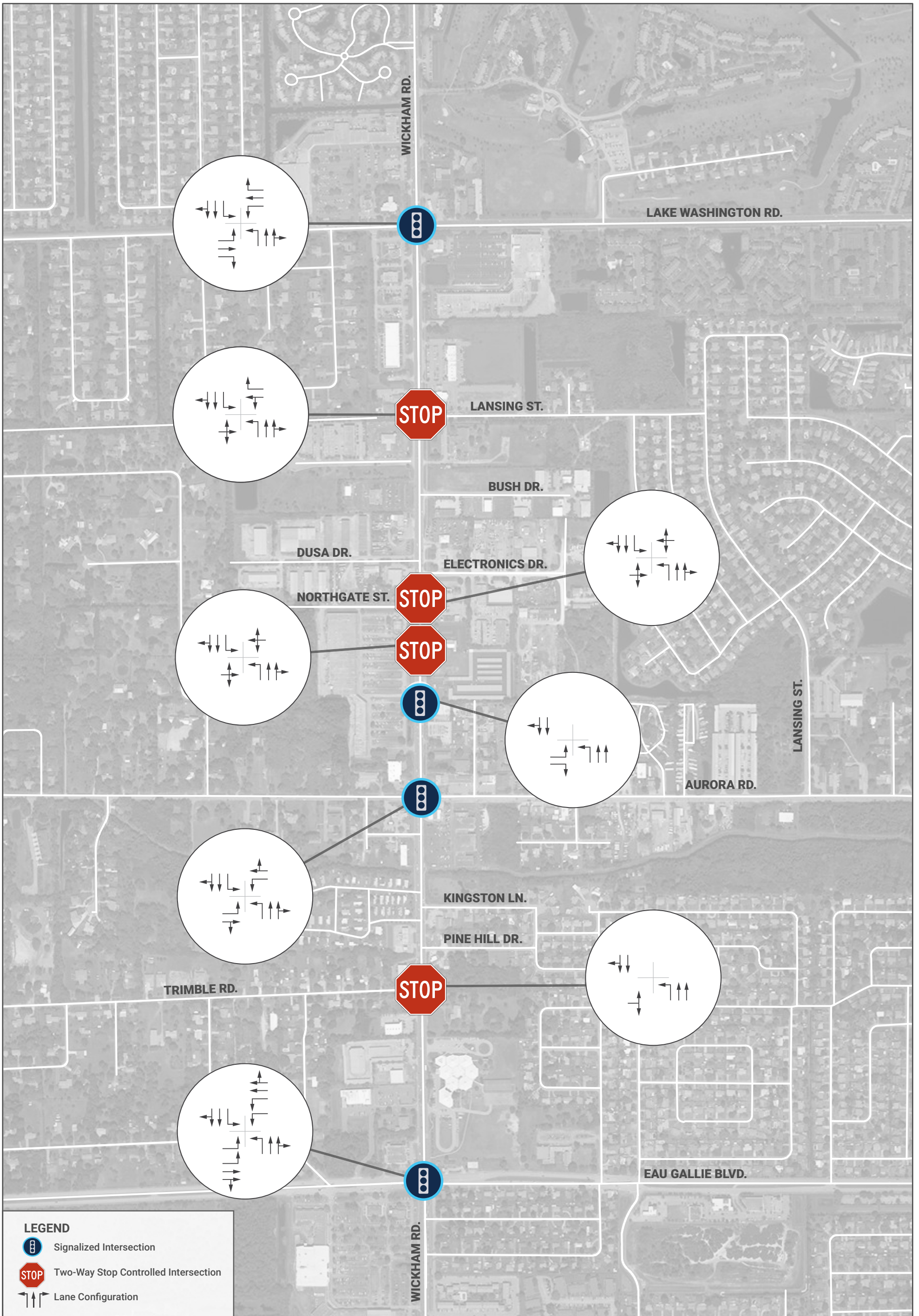
## **2040 No-Build Peak Hour Intersection Operations**

Eight (8) intersections were evaluated as part of the 2040 no-build peak hour intersection operational analysis. Of the eight study intersections, four are signalized and four are unsignalized with stop-control along the minor street. The future 2040 no-build intersection lane configurations are summarized in **Figure 6**. No changes in lane configurations or traffic control were assumed in the no-build intersection analysis.

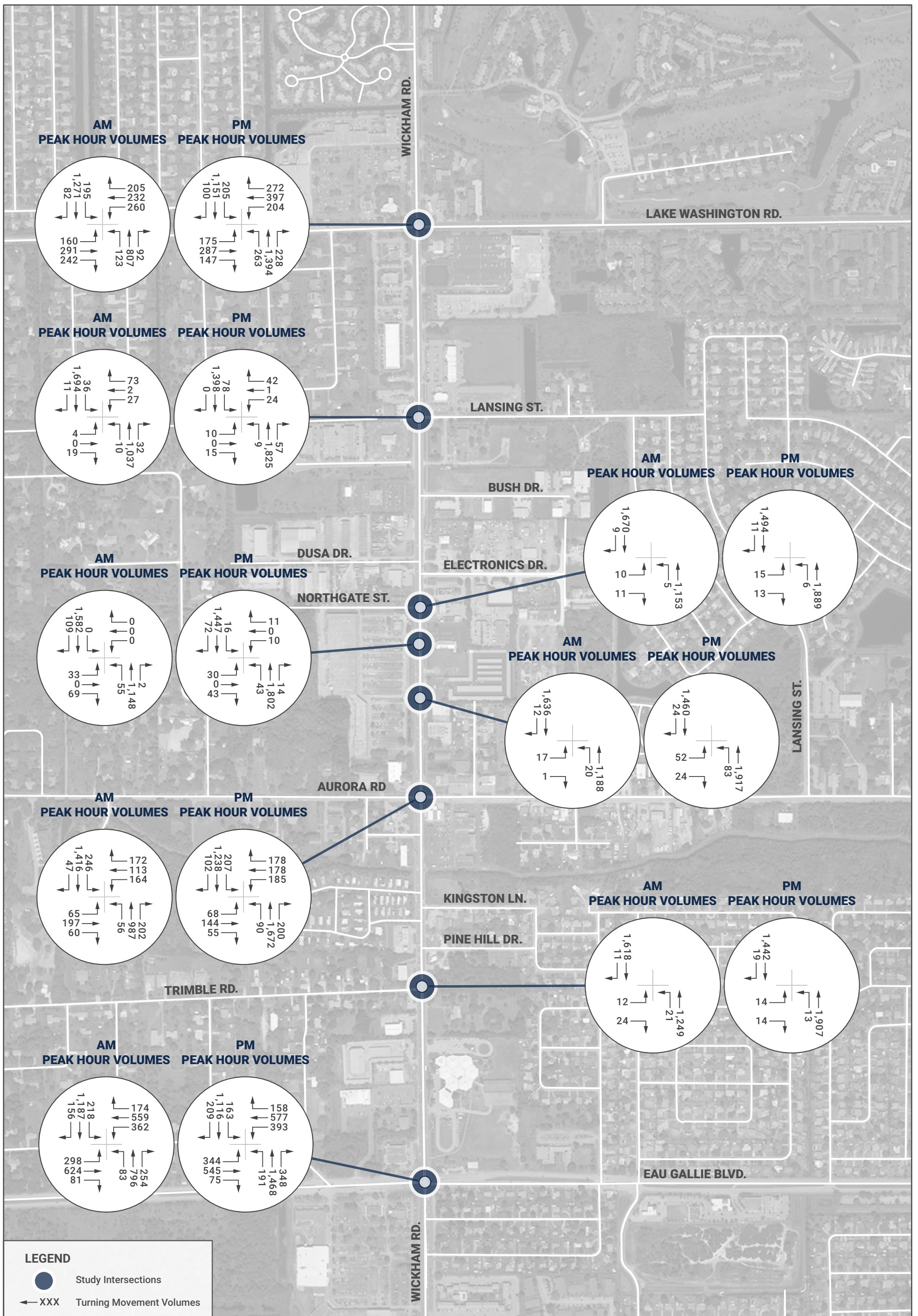
The selected one percent annual linear growth rate on Wickham Road was applied to the existing turning movement volumes with the exception of the turning movement volumes along Aurora Road. The ongoing Aurora Road Corridor Study is utilizing a 0.5 percent annual linear growth rate for future traffic volume forecasting purposes. Therefore, a 0.5 percent growth rate was applied to the eastbound and westbound turning movements along Aurora Road at the Wickham Road intersection. **Figure 7** summarizes the turning movement volumes for the 2040 no-build scenario. Signal timing improvements (signal splits and coordination offset updates) were made to the existing timings. No changes to the overall cycle lengths were made.

The intersection LOS was analyzed using HCM 2010 methodologies as implemented by Synchro Version 9 for the 2040 AM and PM peak hours. The peak hour intersection operations were shown alongside the segment operations in **Figure 5**. Detailed HCM output reports are located in **Appendix G**.









Scale in Feet  
 0 700 North

Overall Intersection LOS Deficiencies

During the 2040 AM peak hour, the intersections are anticipated to operate at an overall LOS D or better. For the unsignalized intersections, the minor street movements are anticipated to operate at LOS C or better.

During the 2040 PM peak hour, the intersections below are anticipated to operate at a LOS E or worse:

- Eau Gallie Boulevard (LOS F);
- Aurora Road;
- McDonald's Driveway – eastbound left-turn critical movement (unsignalized intersection);  
and
- Lake Washington Road.

Intersection Turning Movement Deficiencies

The following summarizes intersection movement deficiencies (v/c ratio greater than 1.0) at the study signalized intersections during the 2040 PM peak hour:

**PM Peak Hour**

- Eau Gallie Blvd
  - Eastbound left-turn (v/c ratio of 1.12)
  - Eastbound through (v/c ratio of 1.10)
  - Eastbound right-turn (v/c ratio of 1.11)
  - Westbound left-turn (v/c ratio of 1.12)
  - Westbound through (v/c ratio of 1.21)
  - Westbound right-turn (v/c ratio of 1.21)
  - Northbound through (v/c ratio of 1.04)
  - Northbound right-turn (v/c ratio of 1.09)
  - Southbound left-turn (v/c ratio of 1.24)
- Aurora Road
  - Westbound right-turn (v/c ratio of 1.16)
  - Northbound through (v/c ratio of 1.05)
  - Northbound right-turn (v/c ratio of 1.08)
  - Southbound left-turn (v/c ratio of 1.05)
- Lake Washington Road
  - Eastbound left-turn (v/c ratio of 1.05)
  - Westbound through (v/c ratio of 1.02)
  - Northbound through (v/c ratio of 1.03)
  - Northbound right-turn (v/c ratio of 1.05)
  - Southbound left-turn (v/c ratio of 1.01)



When identifying potential improvements at the study intersections, the study team will attempt to improve the operations at each intersection so that each individual turning movement is under capacity (v/c ratio less than 1.0) and the overall intersection LOS is no worse than LOS E.

## Summary

The future conditions summary evaluated the design year (2040) no-build operations of the study segments and intersections based upon a one percent annual linear growth rate. The no-build operational analysis identified capacity constraints and deficiencies along the study segments from a daily perspective (generalized SOS volume thresholds) and during the AM and PM peak hours. The southbound segment between Northgate Plaza and Aurora Road is anticipated to exceed the LOS E threshold during the 2040 AM peak hour, while half of the segments are anticipated to experience operations below the LOS E threshold during the 2040 PM peak hour.

The intersection of Wickham Road and Eau Gallie Boulevard is anticipated to operate at an overall intersection LOS F during the 2040 PM peak hour. While the intersections of Wickham Road/Aurora Road and Wickham Road/Lake Washington Road are not expected to exceed LOS E thresholds from an overall intersection perspective, several movements are anticipated to operate at over capacity conditions. The forthcoming Alternatives and Corridor Strategies Summary Report will evaluate improvements to mitigate deficiencies (operational, drainage, utility, and multi-modal) identified in the Existing Conditions Summary and the Future Conditions Summary.