

DRAFT
SR 429 & CR 435
INTERCHANGE STUDY

Prepared For:

Florida Department of Transportation – District Five



September 2, 2014

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1 Introduction

Florida Department of Transportation (FDOT) District Five has requested GMB Engineers & Planners, Inc. to conduct a traffic operational analysis study for the proposed CR 435 and SR 429 partial interchange, in Orange County, Florida. The anticipated influence area for this study includes CR 435 (north and south of SR 429) and SR 429 (east and west of the CR 435) segments. Section 4A of SR 429 includes construction of a temporary connection to CR 435. Based on the available design plans, this temporary connection is scheduled to be removed with the completion of section 2A of SR 429 (north of Kelly Road to east of CR 435). The objective of this memorandum is to assess the traffic operational conditions (of the roadways within the study influence area) through the Year 2035 with the addition of a partial interchange at SR 429 and CR 435. **Figure 1** illustrates the project location.

The current design plans for sections 4A, 4B and 2A are provided in **Appendix A**.

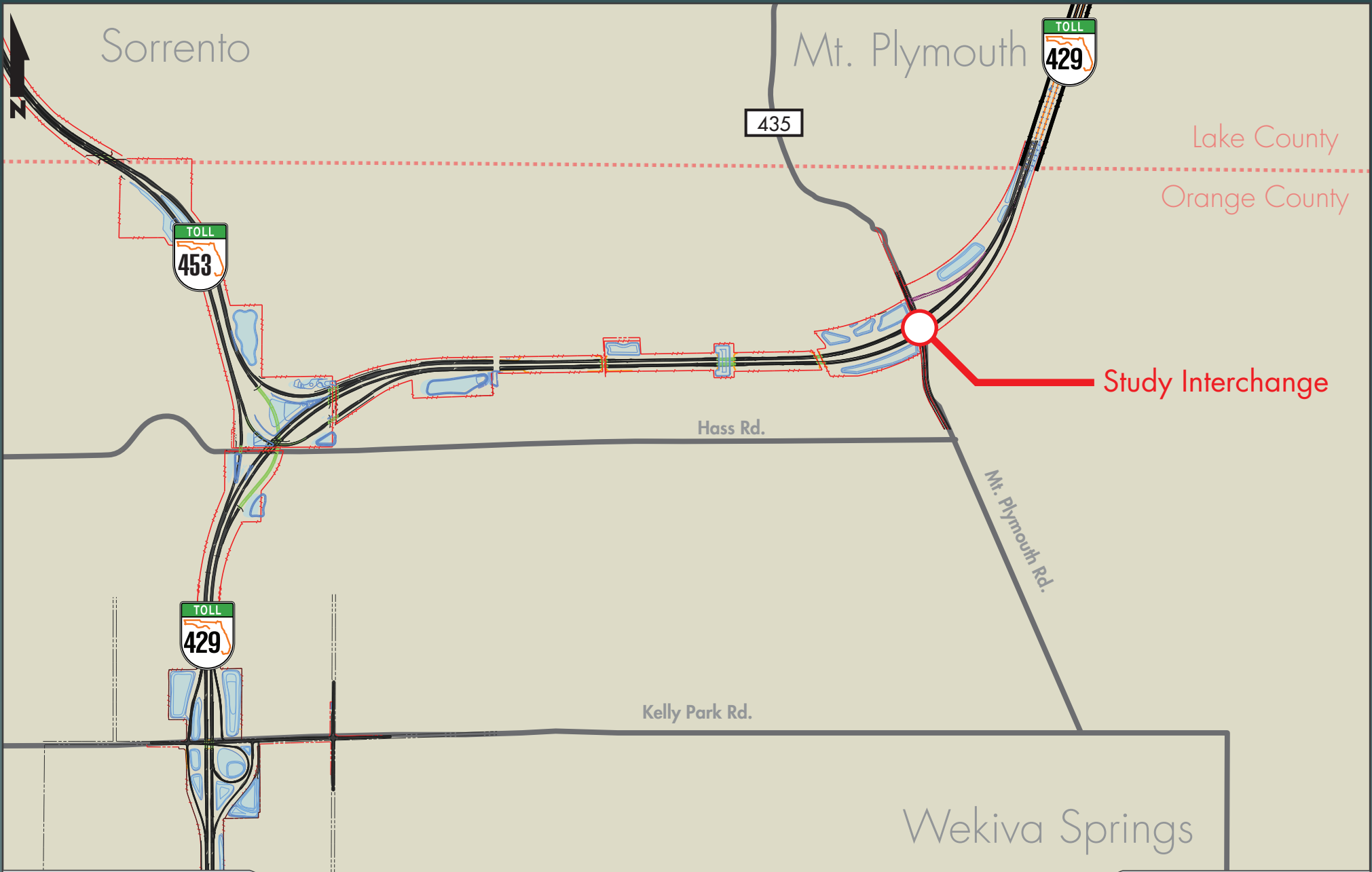
2 Future Design Traffic Characteristics

For the purpose of this study, the design traffic characteristics, “K”, “D”, “T₂₄” and “T_f” factors for the SR 429 corridor were obtained from the SR 429 and SR 46 Design Traffic Technical Memorandum (DTTM) study (FM# 238275-1) dated July 2013. The design traffic characteristics for CR 435 are based on the information obtained from the Florida Traffic Information (FTI) 2013 DVD for count site 118031 (located on CR 435, 150 feet north of Orange County Line). The “D” factor was compared against the historical average and is found to be consistent with the recommended value. A copy of the recommended design traffic characteristics from SR 429/SR 46 DTTM and 2013 historical Annual Average Daily Traffic (AADT) report for count site 118031 are provided in **Appendix B. Table 1** below summarizes the recommended design traffic characteristics for SR 429 and CR 435.

Table 1: Recommended Design Traffic Characteristics

Roadway/Segment	Standard K Factor	“D” Factor	“T ₂₄ ” Factor	“T _f ” Factor
SR 429	9.0%	56.4%	10.1%	5%
CR 435	9.0%	54.7%	10.9%	6%

These recommended design traffic characteristics were used to determine the Directional Design Hour Volumes (DDHV) for the future conditions.



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Florida Department of Transportation - District Five
SR 429/CR 435

FIGURE 1
 Project Location Map

3 Future Traffic Forecasts

For the purpose of determining the future traffic projections along SR 429 and CR 435 corridor, Central Florida Regional Planning Model (CFRPM) version 5.01 was used. The Year 2011 validated model developed as a part of SR 429 and SR 46 DTTM, designated State Financial Project Number (238275-7) was used as a base for forecasting the future traffic projections.

The model runs were performed for two scenarios:

- 1) No Build Scenario
- 2) Build Scenario

The No Build Scenario will not have a partial interchange at SR 429 and CR 435, and SR 429 is constructed as currently planned. The Build scenario assumes a partial interchange at SR 429 and CR 435, with SR 429 being constructed as planned. Since a temporary connector is currently being added to CR 435, a No Build scenario is not assumed for Year 2015. During Year 2015 two build alternatives were analyzed 1) SR 429 operating as a tolled facility 2) SR 429 operating as a non-tolled facility. However, for Year 2021 and Year 2035, as the CFRPM 5.01 model has the tolls coded for SR 429 in its entirety, no modifications were made.

The model runs were performed for the years 2015, 2021 and 2035. The Year 2035 cost feasible network of CFRPM 5.01 model was updated to reflect the MetroPlan Orlando's 2040 cost feasible network (part of the Draft MetroPlan Orlando 2040 LRTP) within the vicinity of project location. The 2035 network changes are listed below.

Following corridors were changed from a four lane facility to a two lane facility:

- 1) Round Lake Road (Ponkan Road to Lake County Line)
- 2) Plymouth Sorrento Road (US 441 to Lake County Line)
- 3) Thompson Road (Welch Road to Semoran Boulevard)
- 4) Welch Road (Rock Springs Road to N Wekiwa Springs Road)
- 5) Sadler Avenue (Dora Drive to Round Lake Road)
- 6) Kelly Park Road (Round Lake Road to West of Rock Springs Road)
- 7) CR 435 (Kelly Park Road to Lake County Line)

In addition to the above corridors, Rock Springs Road (Mt. Plymouth Road to US 441) was changed from a six lane facility to a four lane facility. A copy of the Draft 2040 Long Range Transportation Plan (LRTP) can be found in **Appendix "C"**.

A Model Output Correction factor of 0.99, obtained from Florida Traffic Information (FTI) 2013 DVD was used to convert the Peak Season Weekday Average Daily Traffic (PSWADT) to AADT. A copy of the 2013 Peak season factor category report for Orange County can be found in **Appendix “C”**. The future AADT’s were balanced and summarized in **Tables 2** and **3** for the No Build and Build scenarios, respectively. A summary of unbalanced future AADT’s along with the CFRPM 5.1 model plots can be found in **Appendix “C”**.

Table 2: No Build Scenario Future AADT Volumes

Roadway Segment	Year 2021 AADT*	Year 2035 AADT*
SR 429		
West of CR 435	31,000	60,000
East of CR 435	31,000	60,000
CR 435		
South of SR 429	7,600	9,700
North of SR 429	7,600	9,700

* Year 2021 and Year 2035 model used had tolls on SR 429 and were not modified.

Table 3: Build Scenario Future AADT Volumes

Roadway Segment	Year 2015 (With Toll) AADT	Year 2015 (Without Toll) AADT	Year 2021 AADT*	Year 2035 AADT*
SR 429				
West of CR 435			31,000	57,000
East of CR 435	2,200	8,200	37,200	66,200
CR 435				
South of SR 429	12,000	16,000	12,000	16,000
North of SR 429	9,800	8,100	5,900	6,800
SR 429 Ramps at CR 435				
SR 429 NB On Ramp	1,100	4,100	3,100	4,600
SR 429 SB Off Ramp	1,100	4,100	3,100	4,600

* Year 2021 and Year 2035 model used had tolls on SR 429 and were not modified.

Figures 2 depicts the future AADT volumes for the build scenario. As shown in **Table 3**, the AADT along CR 435 and SR 429 ramps at CR 435 in Year 2021 are lower compared to Year 2015 (without toll). This can be attributed to the completion of SR 429 (Wekiva Parkway) by Year 2021 and the traffic re-distribution within the vicinity of study area. It is evident from the above table that SR 429 as a tolled facility is projected to have less traffic compared to SR 429 operating as a non-tolled facility during Year 2015.

4 Build Scenario Analysis

The proposed Build geometry for the SR 429 (Wekiva Parkway) corridor includes the construction of partial interchange at CR 435 providing access to and from SR 429 East of CR 435. For the purpose of this study, traffic

operational analysis was conducted only for the Build scenario. As mentioned previously, for Year 2015 two alternatives were analyzed 1) SR 429 as tolled facility 2) SR 429 as a non-tolled facility.

4.1 Future Intersection Design Hour Volumes

The future year AADTs for the Build scenario along with the recommended traffic characteristics were used to develop the design hour volumes (DHVs) for both the A.M. and P.M. design hours at the interchange for the years 2015 (SR 429 as tolled facility and SR 429 as a non-tolled facility), 2021 and 2035.

The intersection design hour volumes (DHVs) were developed using FDOT's TURNS5 spreadsheet, which balances AADTs and calculates DHVs based on the K and D factors used as input into the program. The estimated DHVs for the design hour from the TURNS5 spreadsheet were assessed and adjusted for reasonableness. These adjustments are necessary because accepting an estimated volume that is unrealistically large may lead to over design and accepting an estimated volume that is too small may result in an inadequate design. The adjustments that were made are reported in the TURNS5 output sheets included in **Appendix "D"**. For the purpose of this study, the P.M. peak hour is assumed as the critical design hour. The complementary movements (to the P.M.) were used as the A.M. design hour volumes.

The future intersection geometries (build scenario) and A.M. and P.M. design hour turning movement volumes for the Build scenario are shown in **Figures 3, 4 and 5** for Year 2015, Year 2021 and Year 2035 respectively.

4.2 Future Build Scenario Operational Analysis

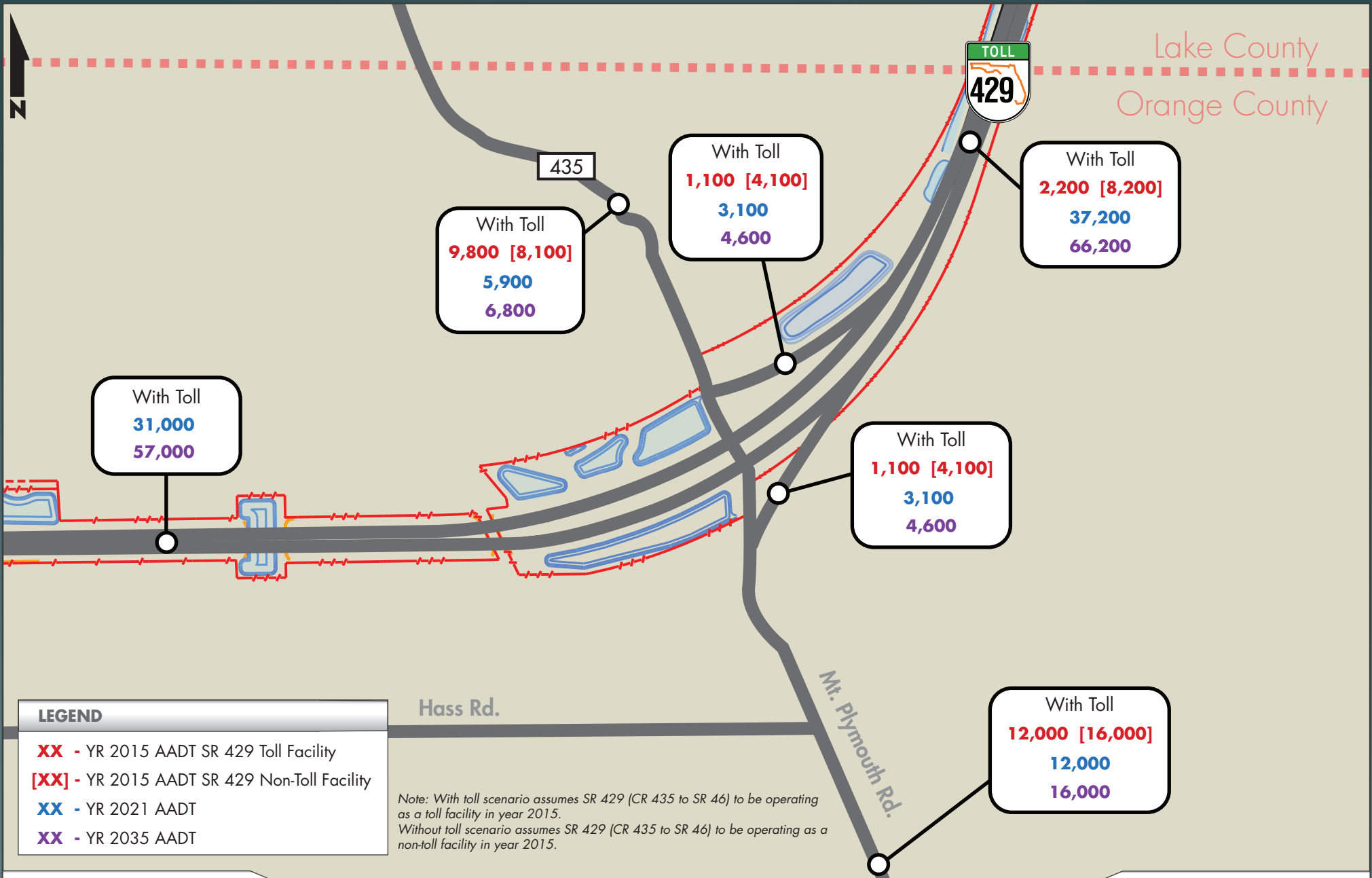
This section presents the results of the LOS operational analyses for the Build Scenario. In the Build Scenario, the traffic operations of the partial interchange at SR 429 and CR 435 (including intersections, ramps and freeway) and arterial analysis of CR 435. Synchro 8 was used to study the interchange operational conditions and the latest HCS 2010 software's Freeway module was used to study the operating conditions of SR 429. The DDHVs along CR 435 were compared against the latest Generalized Peak Hour Directional Volumes from the 2013 FDOT Quality/Level of Service Handbook (dated: 12/18/2012) to determine the arterial LOS.

4.2.1 Intersection LOS Analysis

Interchange operational analyses was performed for the Year 2015, Year 2021 and Year 2035 for the build scenario for the A.M. and P.M. design hours. The results of the interchange analyses are summarized in Table 5. The Synchro analysis outputs for the build scenario can be found in **Appendix E**.

Table 4: Intersection LOS Summary

Intersection	A.M. Peak Hour		P.M. Peak Hour	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS
SR 429 and CR 435				
Year 2015 (SR 429 Non-Tolled Facility)	10.9	B	13.6	B
Year 2015 (SR 429 Tolled Facility)	4.8	A	5.4	A
SR 429 NB On Ramp and CR 435				
Year 2021	0.4	A	0.4	A
Year 2035	0.6	A	0.5	A
SR 429 SB Off Ramp and CR 435				
Year 2021	9.1	A	10.0	B
Year 2035	9.4	A	9.9	A

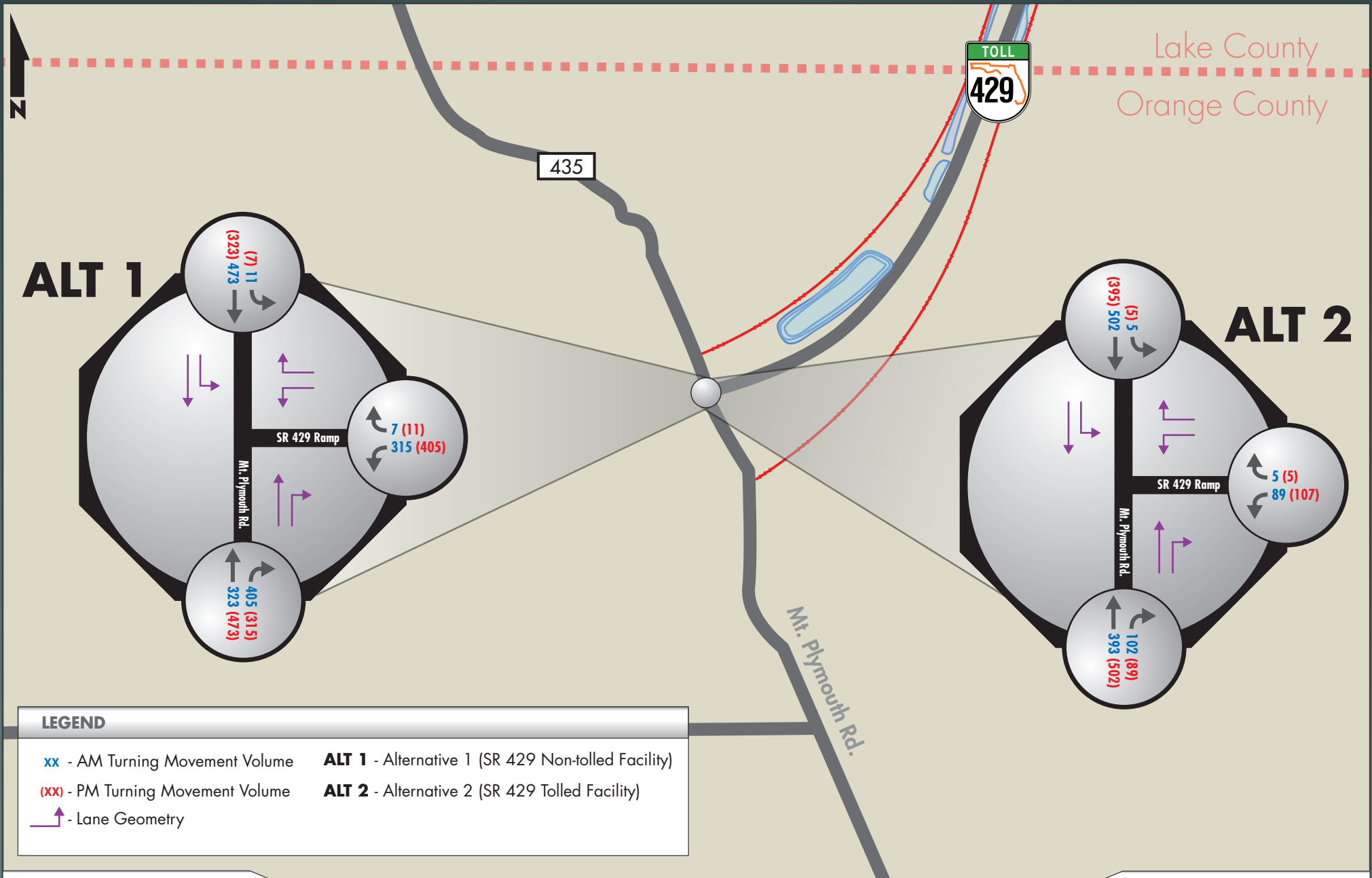


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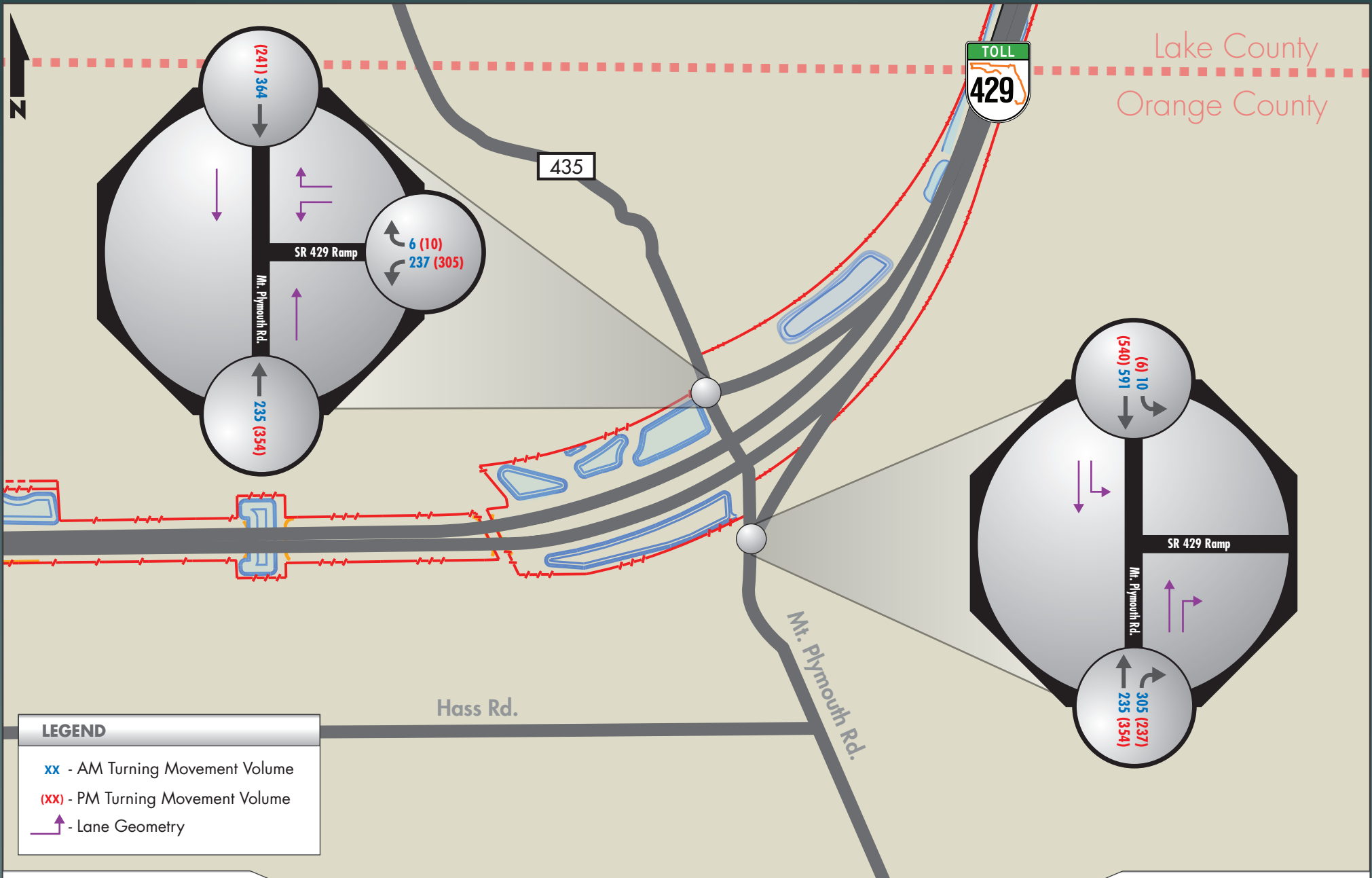
Florida Department of Transportation - District Five
SR 429/CR 435

FIGURE 2
 Future AADT Volumes



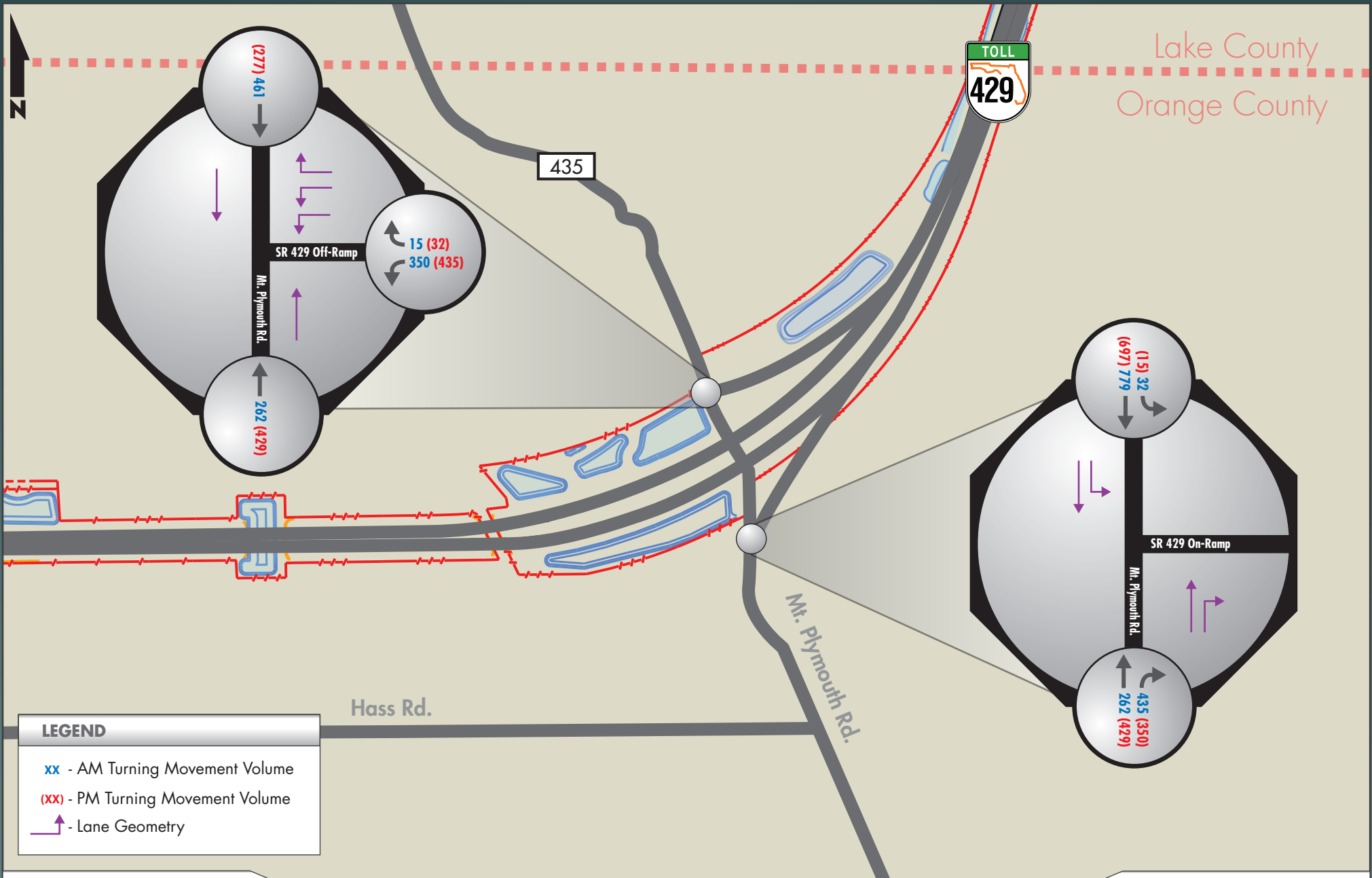
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DATE CREATED: 7/17/2014

PROJECT NUMBER: 11-016.48D



DATE CREATED: 7/17/2014

PROJECT NUMBER: 11-016.48D

4.2.2 Ramp LOS Analysis

Ramp operational analyses were performed for the Year 2021 and Year 2035 for the Build Scenario for the A.M. and P.M. peak hour. By Year 2015, only sections 4A and 4B of SR 429 are anticipated to be built. Thus, ramp analysis for Year 2015 was not performed.

The ramps at SR 429 and CR 435 were analyzed using the HCS 2010 software’s Ramp module.

Table 5: Future Ramp LOS Analysis Summary

SR 429 at CR 435	FDOT LOS Standard	Year 2021		Year 2035	
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS
A.M. Peak Hour					
NB On Ramp	C	14.7	B	27.3	C
SB Off Ramp	C	8.2	A	19.0	B
P.M. Peak Hour					
NB On Ramp	C	11.1	B	21.5	C
SB Off Ramp	C	12.3	B	26.3	C

The SR 429 ramps at CR 435 are anticipated to operate well within the acceptable FDOT’s adopted LOS standard. HCS ramp summary reports are provided in **Appendix “F”**.

4.2.3 Weaving Analysis

Based on the existing design plans for SR 429, it is anticipated that the distance between the CR 435 ramps and the planned SR 46 ramps will be approximately 2.0 miles and hence would not have any weaving issues.

4.2.4 Future Arterial LOS Analysis – Build Scenario

The DDHV’s for CR 435 were compared against the latest Generalized Peak Hour Direction Service Volumes from 2013 FDOT Quality/Level of Service Handbook to obtain the arterial LOS. As only sections 4A and 4B of SR 429 (between CR 435 and SR 46) are anticipated to be built by Year 2015, SR 429 is analyzed as an arterial facility for Year 2015 and freeway facility for Year 2021 and Year 2035. A copy Generalized LOS table can be found in **Appendix “G”**. **Table 6** summarizes the arterial LOS analyses.

Table 6: Future Arterial LOS Analysis Summary

Roadway Segment	# Lanes	FDOT LOS Standard	Maximum Service Volume*	AADT	Standard K factor	D Factor	DDHV	LOS
Year 2015 (SR 429 Non-Tolled Facility)								
SR 429, CR 435 to SR 46	4	C	1,530	8,200	0.09	0.564	420	C
CR 435, S. of SR 429	2	C	603	16,000	0.09	0.547	790	F
CR 435, N. of SR 429	2	C	603	8,100	0.09	0.547	400	C
Year 2015 (SR 429 Tolled Facility)								
SR 429, CR 435 to SR 46	4	C	1,530	2,200	0.09	0.564	110	C
CR 435, S. of SR 429	2	C	603	12,000	0.09	0.547	590	C
CR 435, N. of SR 429	2	C	603	9,800	0.09	0.547	480	C
Year 2021								
CR 435, S. of SR 429	2	C	603	12,000	0.09	0.547	590	C
CR 435, N. of SR 429	2	C	603	5,900	0.09	0.547	290	C
Year 2035								
CR 435, S. of SR 429	2	C	603	16,000	0.09	0.547	790	F
CR 435, N. of SR 429	2	C	603	6,800	0.09	0.547	330	C

* Maximum Service Volumes for LOS “C” – FDOT LOS Standard

As shown in **Table 6**, CR 435, S. of SR 429 is anticipated to operate at LOS “F” during Year 2015 with SR 429 operating as a non-tolled facility. Also CR 435, South of SR 429 is anticipated to operate at LOS “C” with SR 429 operating as a tolled facility in Year 2015. However, with SR 429 being completed by Year 2021 and change in the traffic distribution within the vicinity of the area, CR 435 is anticipated to operate at acceptable LOS through the Year 2021. By Year 2035, CR 435 S. of SR 429 is anticipated to operate at adverse conditions.

4.2.5 Future Freeway LOS Analysis – Build Scenario

The SR 429 operation analyses were performed for the Year 2021 and Year 2035 for the Build Scenario for the peak hour peak direction conditions using the HCS 2010 software’s Freeway module. The Freeway analyses results are shown in **Table 7** below. A copy of HCS Freeway outputs can be found in **Appendix “H”**.

Table 7: Future Freeway LOS Analysis Summary

Freeway Segment	FDOT LOS Standard	Year 2021		Year 2035	
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS
SR 429, CR 435 to SR 46	C	14.7	B	27.6	D
SR 429, SR 453 to CR 435	C	12.1	B	22.8	C

As shown in **Table 7**, the segment of SR 429 between CR 435 and SR 46 is anticipated to operate at acceptable LOS during Year 2021 and is projected to operate at an LOS worse than the adopted LOS “C” during Year 2035 conditions. It should be noted that due to the Wekiva Parkway project, the current study area which is currently classified as a rural area is expected to be reclassified as urban area, which would raise the acceptable LOS standard to “D”. Thus it is anticipated the section of SR 429 between CR 435 and SR 46 will be operating at an acceptable LOS.

5 Select Link Analysis

Select link analyses were performed for the SR 429 (East of CR 435) for years 2015, 2021 and 2035 under the Build scenario. The purpose of a select link analysis is to identify where trips start and end that use a specific section of a roadway. The select link analyses bandwidth plots are provided in in **Appendix “I”**.

The select link analyses for the Build scenario revealed the following:

- The majority of trips that use the proposed ramps travel between Apopka and Sanford.
- There are minimal trips that use the proposed ramps from/to CR 435 (north of SR 429).

6 Conclusions

With the inclusion of partial interchange at SR 429 and CR 435, it is anticipated that the segment of CR 435, south of SR 429 will operate at an LOS “F” during the Years 2015 and 2035. However, all other study components (including intersections, ramps and freeway segments) are projected to operate well within the acceptable LOS through the year 2035.

7 Appendices

Appendix A – Design Plans for Sections 2A, 4A and 4B of SR 429

Appendix B – Historical Traffic Count Information for CR 435 and Recommended Design Traffic Characteristics for SR 429 & SR 46 DTTM

Appendix C – Draft 2040 LRTP, Peak Season Factor Report, Unbalanced Future AADT's & CFRPM 5.1 Model Plots for no build and build scenario.

Appendix D – TURNS5 Sheets

Appendix E – SYNCHRO Intersection Analysis Outputs

Appendix F – HCS Ramp Analysis Outputs

Appendix G – FDOT Generalized LOS Table

Appendix H – HCS Freeway Analysis Outputs

Appendix I – Select Link Analysis Model Plots

Appendix A – Design Plans for Sections 2A, 4A and 4B of SR 429



WEKIVA PARKWAY


Orange, Lake & Seminole Counties

Updated April 2014

SECTION 429-205 (2A)

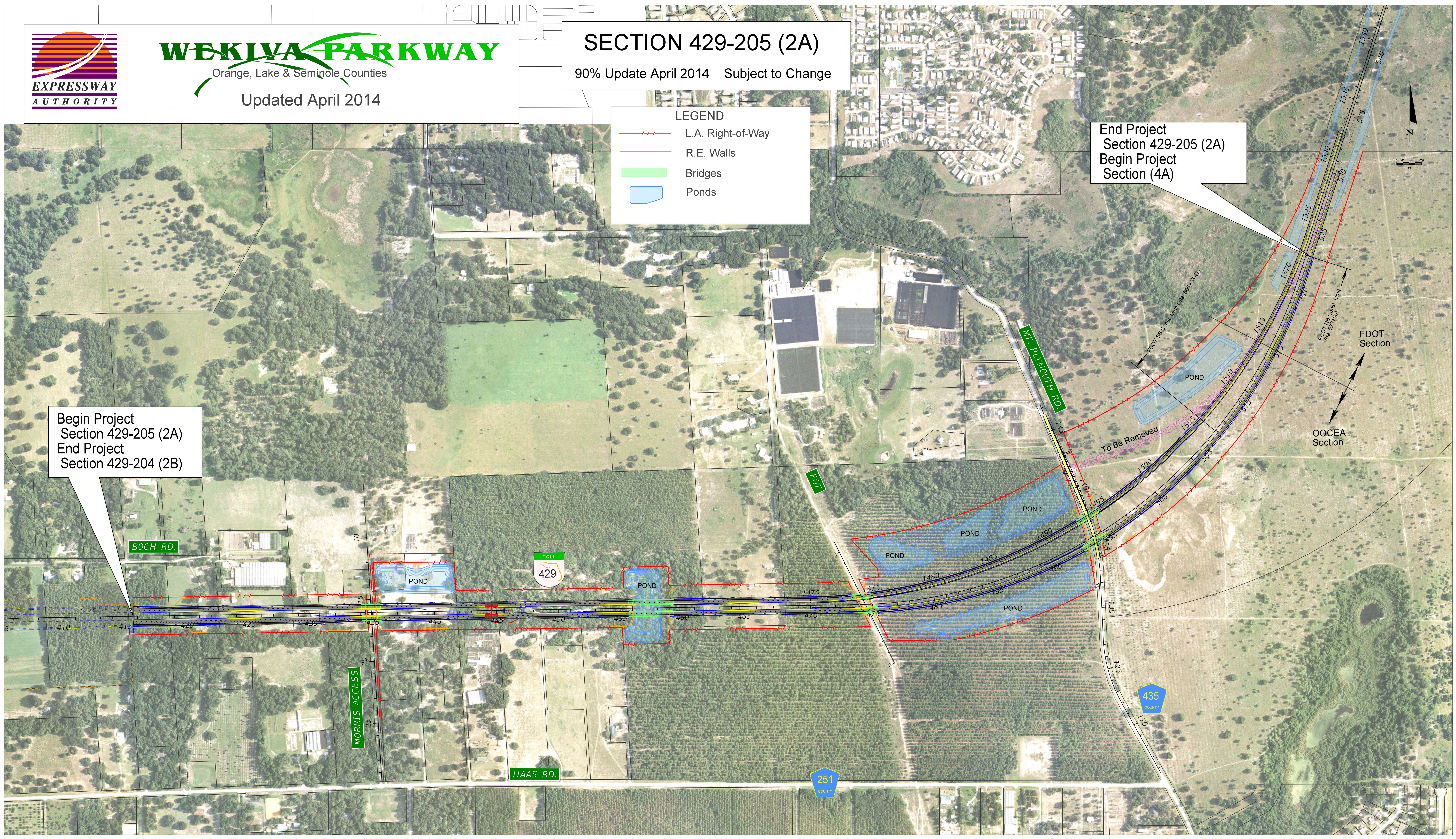
90% Update April 2014 Subject to Change

LEGEND

-  L.A. Right-of-Way
-  R.E. Walls
-  Bridges
-  Ponds

End Project
Section 429-205 (2A)
Begin Project
Section (4A)

Begin Project
Section 429-205 (2A)
End Project
Section 429-204 (2B)



FDOT Section

OOCEA Section

435 COUNTY

251 COUNTY

TOLL
429

BOCH RD.

MORRIS ACCESS

HAAS RD.

MT. PLYMOUTH RD.

POND

POND

POND

POND

POND

POND

To Be Removed

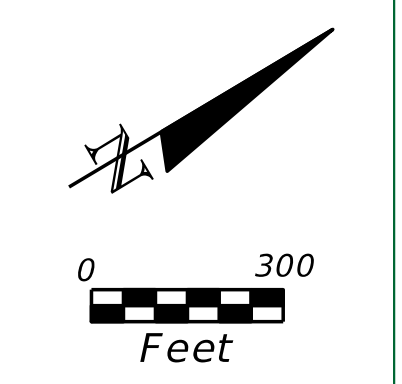
FOOTING CONST. LIMIT (Sta. 466+93.47)

FOOTING CONST. LIMIT (Sta. 520+00)



SECTION 4

Preliminary Concept - Subject to Change



LEGEND	
	L.A. RIGHT-OF-WAY
	BRIDGES
	PONDS
	ROADWAY

WEKIVA PARKWAY
Completing Central Florida's Beltway
Orange, Lake & Seminole Counties
December 2012

Appendix B – Historical Traffic Count Information for CR 435 and
Recommended Design Traffic Characteristics form SR 429 & SR 46
DTTM

FLORIDA DEPARTMENT OF TRANSPORTATION
 TRANSPORTATION STATISTICS OFFICE
 2013 HISTORICAL AADT REPORT

COUNTY: 11 - LAKE

SITE: 8031 - CR-435, 500 FT N OF ORANGE CO/L - OFF SYSTEM

YEAR	AADT	DIRECTION 1		DIRECTION 2		*K FACTOR	D FACTOR	T FACTOR
2013	5800 F	N	2700	S	3100	9.00	54.70	10.90
2012	5800 C	N	2700	S	3100	9.00	55.10	11.00
2011	4800 C	N	0	S	0	9.00	54.20	10.20

AADT FLAGS: C = COMPUTED; E = MANUAL ESTIMATE; F = FIRST YEAR ESTIMATE
 S = SECOND YEAR ESTIMATE; T = THIRD YEAR ESTIMATE; F = FOURTH YEAR ESTIMATE
 V = FIFTH YEAR ESTIMATE; 6 = SIXTH YEAR ESTIMATE; X = UNKNOWN

*K FACTOR: STARTING WITH YEAR 2011 IS STANDARDK, PRIOR YEARS ARE K30 VALUES

Table 10: Recommended Design Traffic Characteristics

Roadway / Segment	Recommended Design Characteristics			
	Standard "K" Factor	"D" Factor	"T ₂₄ " Factor	"T _f " Factor
Mainline Characteristics				
SR 429/SR 46 (Wekiva Parkway) and Service Road	9.0%	56.4%	10.1%	6.6%
Side Street Characteristics				
CR 46A	9.0%	58.1%	8.4%	5.3%
Side Streets	9.0%	56.4%	2.0%	1.0%

Appendix C – Draft 2040 LRTP, Peak Season Factor Report,
Unbalanced Future AADT's & CFRPM 5.1 Model Plots for no build and
build scenario.



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2040

Long Range Transportation Plan

DRAFT

June 9, 2014

2040 LONG RANGE TRANSPORTATION PLAN: COST FEASIBLE PROJECT LIST

Strategic Intermodal System (SIS) Projects

Rank	Roadway	From	To	Improvement	Funded by
1	I-4	Polk/Osceola County Line	SR 435/Kirkman Rd	Ultimate Configuration for General Use & Managed Lanes	2025
2	I-4	SR 434	Seminole/Volusia Co. Line	Ultimate Configuration for General Use & Managed Lanes	2025
3*	Wekiva Parkway	US 441	I-4	New Expressway	2025

* Refer to Prioritized Project List (PPL)

Federal and State Funded Cost Feasible Priorities (DDR/SU)

Rank	Roadway	From	To	Improvement	Funded by
1	SR 46	Mellonville Ave.	SR 415	Widen to 4 Lanes	2020
2	SR 434/Forest City Rd.	Edgewater Dr.	Orange/Seminole Co. Line	Widen to 6 Lanes	2020
2	SR 423/John Young Pkwy.	SR 50	Shader Rd.	Widen to 6 Lanes	2020
3	SR 434	at CR 427		Improve Intersection	2020
3	SR 434	Range Line Rd.	US 17/92	Multimodal/Context Sensitive Improvements	2020
4	Hoagland Blvd. Phase 2	US 17/92	5th St.	Widen to 4 Lanes/Realign	2020
5	SR 414/Maitland Blvd.	I-4	Maitland Ave.	Widen to 6 Lanes	2020
6	SR 434	Smith St.	Franklin St.	Widen to 4 Lanes - Phase 1	2020
6	SR 426/CR 419	Pine Ave.	Avenue B	Widen to 4 Lanes - Phase 2	2025
6	CR 419	Avenue B	W of Lockwood Blvd.	Widen to 4 Lanes - Phase 3	2025
7	SR 50	E. Old Cheney Hwy.	SR 520	Widen to 6 Lanes	2025
8	SR 527/Orange Ave.	SR 482/Sand Lake Rd.	SR 15/Hoffner Ave.	Multimodal/Context Sensitive Improvements - PD&E Only	2025
9	SR 434/Alafaya Tr.	SR 50	McCulloch Rd.	Multimodal/Context Sensitive Improvements - PD&E Only	2025
10	SR 15/600/US 17/92 & Lee Rd Ext	Norfolk Ave SR15/600/US 17/92	Monroe St./Denning Dr	Construct medians/improve Intersection/Extend Road	2025
11	SR 46	SR 415	CR 426	Safety Improvements - Phase 1	2025
11	SR 46	SR 415	CR 426	Widen to 4 Lanes - Phase 2	2025
12	John Young Pkwy.	Pleasant Hill Rd.	Portage St.	Widen to 6 Lanes	2025
13	SR 535	Orange/Osceola Co. Line	I-4	Widen to 6 Lanes (2 miles) and 8 Lanes (1.5 miles) - PD&E Only	2025
14	SR 438/Silver Star Rd	SR 429	Bluford Ave	Widen to 4 Lanes - PD&E Only	2025
15	SR 527/Orange Ave	Pineloch Ave	Anderson St	Multimodal Context/Sensitive Improvements - PD&E Only	2025
16	SR 436	US 17/92	Wilshire Dr.	Widen to 8 Lanes/Multimodal/Context Sensitive Improvements - PD&E Only	2025
17	SR 436	Newburyport Ave	CR 427/Ronald Reagan Blvd.	Intersection Improvements - PD&E Only	2025
18	SR 434	SR 417	Mitchell Hammock Rd	Widen to 4 Lanes - PD&E Only	2025
19	US 17/92	at Pleasant Hill Rd		Inters Improv/Potent. Flyover/Crossover/Diverted Left turn lanes - PD&E Only	2025
20	US 17/92	SR 417	SR 46/1st St	Multimodal/Context Sensitive Improvements - PD&E Only	2025
21	SR 436	Orlando International Airport	Orange/Seminole Co. Line	Multimodal/Context Sensitive Improvements to incl BRT - PD&E Only	2025
22	SR 527/Orange Ave	SR 50	Princeton St	Multimodal/Context Sensitive Improvements - PD&E Only	2025
23	US 17/92	SR 50	Princeton St	Multimodal/Context Sensitive Improvements - PD&E Only	2025

Rank	Roadway	From	To	Improvement	Funded by
24	SR 15/Conway Rd	at Gatlin Ave		Add Turn Lanes - PD&E Only	2025
25	SR 436	I-4	US 17/92	Multimodal/Context Sensitive Improvements - PD&E Only	2025
26	SR 424/Edgewater Dr.	at SR 426/Fairbanks Ave		Add Turn Lanes - PD&E Only	2025
27	SR 500/US 441	at Piedmont Wekiva Rd		Add Turn Lanes - PD&E Only	2025
28	SR 551/Goldenrod Rd	SR 408	SR 50	Multimodal/Context Sensitive Improvements - PD&E Only	2025
29	SR 50	Orange Ave	Bumby Ave	Multimodal/Context Sensitive Improvements - PD&E Only	2025
30	SR 424/Edgewater Dr.	at SR 423/Lee Rd		Add Turn Lanes - PD&E Only	2025
31	US 17/92	Shepard Rd	Dog Track Rd	Multimodal/Context Sensitive Improvements - PD&E Only	2025
32	SR 436	Orlando International Airport	Orange/Seminole Co. Line	Multimodal/Context Sensitive Improvements - PD&E Only	2025
33	SR 436	Wilshire Dr.	Orange/Seminole Co. Line	Multimodal/Context Sensitive Improvements - PD&E Only	2025
34	SR 426/Aloma Ave	SR 436	Orange/Seminole Co. Line	Multimodal/Context Sensitive Improvements - PD&E Only	2025
35	SR 482/Sand Lake Rd	SR 500/US 441	SR 527/Orange Ave	Multimodal/Context Sensitive Improvements - PD&E Only	2025
36	SR 50	Bumby Ave	Old Cheney Hwy.	Multimodal/Context Sensitive Improvements - PD&E Only	2025
37	SR 500/US 441	I-4	SR 50	Multimodal/Context Sensitive Improvements - PD&E Only	2025
38	SR 423/Lee Rd	at I-4		Add Turn Lanes - PD&E Only	2025
39	SR 435/Kirkman Rd	SR 482/Sand Lake Rd	SR 50	Multimodal/Context Sensitive Improvements - PD&E Only	2025
40	SR 434	Maitland Blvd.	SR 436	Multimodal/Context Sensitive Improvements - PD&E Only	2025
41	US 17/92	Lake Mary Blvd	SR 417	Widen to 6 Lanes - PD&E Only	2025
42	SR 500/US 441	at Plymouth Sorrento Rd		Add Turn Lanes - PD&E Only	2025
43	SR 50	N. Tampa Ave	Hughey Ave	Multimodal/Context Sensitive Improvements - PD&E Only	2025
44	SR 500/US 441	SR 50	Clarcona-Ocoee Rd	Convert roadway segment from rural to urban - PD&E Only	2025
45	SR 50	SR 435/Kirkman Rd	N. Tampa Ave	Multimodal/Context Sensitive Improvements - PD&E Only	2025
46	SR 434	SR 436	Montgomery Rd	Widen to 6 Lanes - PD&E Only	2025
47	SR 500/US 441	US 192	Osceola Pkwy	Multimodal/Context Sensitive Improvements - PD&E Only	2025

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Orange County - Funded Projects

Rank	Roadway	From	To	Improvement	Funded by
1	Apopka-Vineland Road (SR 535)	SR 536	I-4 WB Ramp	Widen to 8 Lanes	2020
2	SR 15 (Narcoossee Road)	SR 528 (BeachLine Expressway)	Lee Vista Boulevard	Widen to 6 Lanes	2020
3	Apopka-Vineland Road (SR 535)	Osceola County Line	SR 536	Widen to 6 Lanes	2020
4	Central Florida Parkway	International Drive	SR 423 (John Young Parkway)	Widen to 6 Lanes	2020
5*	SR 423 (John Young Parkway)	SR 50 (Colonial Drive)	Shader Road	Widen to 6 Lanes	2020
6	International Drive	Hawaian Court	SR 482	Widen to 6 Lanes	2025
7	Apopka-Vineland Road	CR 535	Fenton Avenue	Widen to 6 Lanes	2025
8	Landstar Boulevard	Osceola County Line	SR 417	Widen to 6 Lanes	2025
9	Destination Parkway	Universal Boulevard	John Young Parkway	Widen to 6 Lanes	2025
10	Conway Road	Hoffner Road	Michigan Street	Widen to 6 Lanes	2025
11	Apopka-Vineland Road	Darlene Road	Kilgore Road	Widen to 6 Lanes	2025
12	US 441 (Orange Blossom Trail)	SR 50 (Colonial Drive)	John Young Parkway	Widen to 6 Lanes	2025
13	Jeff Fuqua Boulevard	.13 miles South of Boggy Creek Road	Heintzelman Boulevard	Widen to 4 Lanes	2025
14	Conway Road	Judge Road	Hoffner Road	Widen to 6 Lanes	2030
15	New Independence Pkwy/Wellness Wy	Lake County Line	SR 429	New/Widen 4 Lanes	2030
16	Alafaya Trail	Huckleberry Finn Drive	Lake Underhill Road	Widen to 6 Lanes	2030
17	Apopka-Vineland Road	Kilgore Road	SR 482	Widen to 6 Lanes	2030
18	Hiwassee Road	SR 50	Silver Star Road	Widen to 6 Lanes	2030
19	Apopka-Vineland Road	Fenton Avenue	Darlene Road	Widen to 6 Lanes	2030
20	Lake Nona Boulevard	Tavistock Lakes Boulevard	SR 417 (Greenway)	Widen to 6 Lanes	2030
21	Universal Boulevard	SR 482	Pointe Plaza Avenue	Widen to 6 Lanes	2030
22	Central Florida Parkway	SR 423 (John Young Parkway)	Orange Blossom Trail	Widen to 6 Lanes	2030
23	International Drive	SR 482	Kirkman Road	Widen to 6 Lanes	2030
24	International Drive South	Westwood Boulevard	Hawaian Court	Widen to 6 Lanes	2040
25	Turkey Lake Road	Sand Lake Commons Boulevard	SR 482	Widen to 6 Lanes	2040
26	Conway Road	McCoy Road	Judge Road	Widen to 6 Lanes	2040
27	Boggy Creek Road	Beacon Park Boulevard	SR 417	Widen to 6 Lanes	2040
28	Clarke Road	White Road	SR 50	Widen to 6 Lanes	2040
29	Universal Boulevard	SR 482	Carrier Drive	Widen to 6 Lanes	2040
30	Conroy Road	Millenia Boulevard	Eastgate Drive	Widen to 6 Lanes	2040
31	Turkey Lake Road	Central Florida Parkway	Sand Lake Commons Boulevard	Widen to 6 Lanes	2040
32	Apopka-Vineland Road	Conroy-Windermere Road	Westover Roberts Road	Widen to 6 Lanes	2040

* Refer to Prioritized Project List (PPL)

Rank	Roadway	From	To	Improvement	Funded by
33	Town Center Boulevard	US 441	Landstar Boulevard	Widen to 6 Lanes	2040
34	Avalon Road (CR 545)	Seidel Road	McKinney Road	Widen to 4 Lanes	2040
35	Oakland Avenue	Tubb Street	Avalon Road	Widen to 4 Lanes	2040
36	Avalon Road (CR 545)	Tilden Road	Marsh Road	Widen to 4 Lanes	2040
37	Deer Isle Drive	SR 50	West Oakland Avenue	Widen to 4 Lanes	2040

Orange County - Unfunded Needs

38	Avalon Road (CR 545)	McKinney Road	Tilden Road	Widen to 4 Lanes	-
39	Hiwassee Road	Clarcona-Ocoee Road	John Land Apopka Expressway	Widen to 6 Lanes	-
40	Apopka-Vineland Road	SR 482	Conroy-Windermere Road	Widen to 6 Lanes	-
41	Avalon Road (CR 545)	Flamingo Crossings Boulevard	Seidel Road	Widen to 4 Lanes	-
42	Plant Street (SR 438)	9th Street	West Crown Point Road	Widen to 4 Lanes	-
43	Avalon Road (CR 545)	US 192	Hartzog Road	Widen to 4 Lanes	-
44	Clarcona-Ocoee Road	Apopka-Vineland Road	Hiwassee Road	Widen to 6 Lanes	-
45	Clarcona-Ocoee Road	Clarke Road	Apopka-Vineland Road	Widen to 6 Lanes	-
46	Young Pine Road	Curry Ford Road	Cypress Springs Parkway	Widen to 4 Lanes	-
47	Lake Underhill Road (CR 15)	E Anderson Street (CR 15)	Gaston Foster Road	Widen to 4 Lanes	-
48	Ocoee-Apopka Road	SR 438	Fullers Cross Road	Widen to 4 Lanes	-
49	Wymore Road	Lee Road	Kennedy Boulevard	Widen to 4 Lanes	-
50	Ocoee-Apopka Road	McCormick Road	Binion Road	Widen to 4 Lanes	-
51	Glenridge Way	Winter Park Road	Lakemont Avenue	Widen to 4 Lanes	-
52	Bluford Avenue	SR 50	Geneva Street	Widen to 4 Lanes	-
53	Taft-Vineland Road	American Eagle Way	US 441	Widen to 4 Lanes	-
54	Boggy Creek Road	Wetherbee Road	Tradeport Drive	Widen to 4 Lanes	-
55	Avalon Road (CR 545)	SR 50	Oakland Avenue	Widen to 4 Lanes	-
56	Holden Avenue	Rio Grande Avenue	US 441	Widen to 4 Lanes	-
57	S Division Avenue	Raleigh Street	W Gore Street	Widen to 4 Lanes	-
58	Econlockhatchee Trail	Lee Vista Boulevard	Curry Ford Road	Widen to 4 Lanes	-
59	Mercy Drive	Old Winter Garden Road	W Princeton Street	Widen to 4 Lanes	-
60	W Church Street	SR 423 (John Young Parkway)	S Tampa Avenue	Widen to 4 Lanes	-
61	Reams Road	Summerlake Park Boulevard	Center Drive	Widen to 4 Lanes	-
62	Taft-Vineland Road	General Boulevard	Orange Avenue	Widen to 4 Lanes	-
63	McKinnon Road	Lake Butler Road	West Lake Butler Boulevard	Widen to 4 Lanes	-

Rank	Roadway	From	To	Improvement	Funded by
64	Boggy Creek Road	SR 417 (Greenway)	Wetherbee Road	Widen to 4 Lanes	-
65	Sadler Avenue	Lake County Line	US 441	Widen to 4 Lanes	-
66	Fullers Cross Road	East Crown Point Road	Clarcona-Ocoee Road	Widen to 4 Lanes	-
67	Geneva Street	Bluford Avenue	Bowness Road	Widen to 4 Lanes	-
68	Clarke Road	Hackney-Prairie Road	AD Mims Road	Widen to 6 Lanes	-
69	Clarcona Road	McCormick Road	Keene Road	Widen to 4 Lanes	-
70	Round Lake Road	Sadler Avenue	Kelly Park Road	Widen to 4 Lanes	-
71	Boggy Creek Road	Dowden Road	Landstreet Road	Widen to 4 Lanes	-
72	Wetherbee Road	Wetherbee Road	Orange Avenue	Widen to 4 Lanes	-
73	Ocoee-Apopka Road	West Road	McCormick Road	Widen to 4 Lanes	-
74	Thompson Road	US 441	SR 436	Widen to 4 Lanes	-
75	Ocoee-Apopka Road	Binion Road	Keene Road	Widen to 4 Lanes	-
76	W Robinson Street	N Hughey Avenue	N Garland Avenue	Widen to 4 Lanes	-
77	Jones Avenue	US 441	Lake County Line	Widen to 4 Lanes	-
78	Chuluota Road (CR 419)	Lake Pickett Road	SR 50	Widen to 4 Lanes	-
79	Young Pine Road	Lee Vista Boulevard	Curry Ford Road	Widen to 4 Lanes	-
80	Story Road	9th Street	Carter Road	Widen to 4 Lanes	-
81	Roberson Road	Windermere Road	Maguire Road	Widen to 4 Lanes	-
82	Ingram Road	McCormick Road	Clarcona-Ocoee Road	Widen to 4 Lanes	-
83	Clarke Road	Clarcona-Ocoee Road	Hackney-Prairie Road	Widen to 4 Lanes	-
84	Park Ridge Gotha Road	Maguire Road	Hempel Avenue	Widen to 4 Lanes	-
85	Reams Road	Center Drive	CR 535	Widen to 4 Lanes	-
86	Story Road	Carter Road	Bowness Road	Widen to 4 Lanes	-
87	Bluford Avenue	Geneva Street	Orlando Avenue	Widen to 4 Lanes	-
88	West Road	SR 429	Pat's Lane	Widen to 4 Lanes	-
89	Cargo Road	Casa Verde Road	Heintzelman Boulevard	Widen to 4 Lanes	-
90	Errol Parkway	US 441	Old Dixie Highway	Widen to 4 Lanes	-
91	Humphries Avenue	Fairgreen Street	SR 50 (E Colonial Drive)	Widen to 4 Lanes	-
92	Wallace Road	Apopka-Vineland Road	Dr. Phillips Boulevard	Widen to 4 Lanes	-
93	Plymouth-Sorrento Road	Schopke Road	SR 429	Widen to 4 Lanes	-
94	Lake Pickett Road	Percival Road	South Tanner Road	Widen to 4 Lanes	-
95	Ponkan Road	Round Lake Road	Plymouth-Sorrento Road	Widen to 4 Lanes	-
96	Grand National Drive	Vanguard Street	Fun Spot Way	Widen to 4 Lanes	-

Rank	Roadway	From	To	Improvement	Funded by
97	Landstar Boulevard	Fairway Woods Boulevard	Wetherbee Road	Widen to 4 Lanes	-
98	Ocoee-Apopka Road	Fullers Cross Road	West Road	Widen to 4 Lanes	-
99	Taft-Vineland Road	US 441	General Boulevard	Widen to 4 Lanes	-
100	9th Street	Bay Street	Plant Street	Widen to 4 Lanes	-
101	Tubb Street	Florida's Turnpike (SR 91)	SR 50	Widen to 4 Lanes	-
102	Chuluota Road (CR 419)	Seminole County	Lake Pickett Road	Widen to 4 Lanes	-
103	Kelly Park Road	Round Lake Road	Plymouth-Sorrento Road	Widen to 4 Lanes	-
104	Lancaster Road	US 441	Winegard Road	Widen to 4 Lanes	-
105	Raleigh Street	Poppy Avenue	Willie Mays Parkway	Widen to 4 Lanes	-
106	Lake Pickett Road	SR 50	Percival Road	Widen to 4 Lanes	-
107	Lakewood Avenue	Fullers Cross Road	Pat's Lane	Widen to 4 Lanes	-
108	Pope Street	Young Pine Road	Innovation Road	Widen to 4 Lanes	-
109	Young Pine Road	Pope Road	Lee Vista Boulevard	Widen to 4 Lanes	-
110	TPC Drive	Hazeltine National Drive	Lee Vista Boulevard	Widen to 4 Lanes	-
111	Bowness Road/Kissimmee Avenue	Story Road/Geneva Street	Kissimmee Avenue	Widen to 4 Lanes	-
112	Rose Avenue	Beggs Road	Maitland Boulevard	Widen to 4 Lanes	-
113	Valencia College Lane	Frontage Road	Econlockhatchee Trail	Widen to 4 Lanes	-
114	Wallace Road	Dr. Phillips Boulevard	Turkey Lake Road	Widen to 4 Lanes	-
115	White Road	Montgomery Avenue	Clarke Road	Widen to 4 Lanes	-
116	Windermere Road	Roberson Road	Maguire Road	Widen to 4 Lanes	-
117	Apopka-Vineland Road	AD Mims Road	Clarcona-Ocoee Road	Widen to 4 Lanes	-
118	Boggy Creek Road	Tradeport Drive	Dowden Road	Widen to 4 Lanes	-
119	Lake Margaret Drive	Bumby Avenue	Semorran Boulevard	Widen to 4 Lanes	-
120	Gaston Foster Road	Andrea Boulevard	Lake Underhill Road	Widen to 4 Lanes	-
121	Winegard Road	Sand Lake Road	Lancaster Road	Widen to 4 Lanes	-
122	Lakeville Road	Beggs Road	Apopka Boulevard	Widen to 4 Lanes	-
123	Pershing Avenue	Bumby Avenue	Conway Gardens Road	Widen to 4 Lanes	-
124	WD Judge Drive	.25 miles West of SR 423 (JYP)	SR 423 (John Young Parkway)	Widen to 4 Lanes	-
125	Lakeville Road	Clarcona-Ocoee Road	Beggs Road	Widen to 4 Lanes	-
126	Commander Drive	CR 15 (Hoffner Avenue)	Pershing Avenue	Widen to 4 Lanes	-
127	S Rio Grande Avenue	Long Street	W Anderson Street	Widen to 4 Lanes	-
128	Apopka-Vineland Road	I-4 WB Ramp	CR 535	Widen to 8 Lanes	-

Rank	Roadway	From	To	Improvement	Funded by
129	Boggy Creek Road	Jeff Fuqua Boulevard	Wetherbee Road	Widen to 4 Lanes	-
130	CR 15 (Narcoossee Road)	SR 528 (BeachLine Expressway)	Dowden Road	Widen to 6 Lanes	-
131	CR 535	Apopka-Vineland Road	Buena Vista Drive	Widen to 4 Lanes	-
132	CR 535	Buena Vista Drive	Equestrian Drive	Widen to 6 Lanes	-
133	CR 535	Ficquette Road	Tilden Road	Already 4 Lanes	-
134	CR 535	Tilden Road	SR 429	Already 4 Lanes	-
135	Curry Ford Road	SR 436	Goldenrod Road	Widen to 6 Lanes	-
136	Curry Ford Road	Goldenrod Road	Dean Road	Widen to 6 Lanes	-
137	Dean Road	University Boulevard	McCulloch Road	Widen to 4 Lanes	-
138	Goldenrod Road	Lee Vista Boulevard	.29 mi. North of Lee Vista Blvd	Widen to 6 Lanes	-
139	John Young Parkway	Osceola County Line	Town Center Boulevard	Widen to 8 Lanes	-
140	John Young Parkway	Town Center Boulevard	Deerfield Boulevard	Widen to 8 Lanes	-
141	John Young Parkway	Central Florida Parkway	Interstate 4	Widen to 8 Lanes	-
142	John Young Parkway	Interstate 4	SR 50	Widen to 8 Lanes	-
143	Kennedy Boulevard	Forest City Road	Keller Road	Widen to 4 Lanes	-
144	Kennedy Boulevard	Keller Road	Wymore Road	Widen to 4 Lanes	-
145	Lake Margaret Drive	Bumby Avenue	Semorran Boulevard	Widen to 4 Lanes	-
146	North-South Road	Osceola County Line	Wewahookee Road	Widen to 4 Lanes	-
147	Nova Road (CR 532)	Osceola County Line	SR 520	Widen to 4 Lanes	-
148	Orange Avenue	Osceola County Line	Town Center Boulevard	Widen to 4 Lanes	-
149	Orange Avenue	Taft-Vineland Road	Landstreet Road	Widen to 6 Lanes	-
150	Orange Avenue	Landstreet Road	SR 482	Widen to 6 Lanes	-
151	Palm Parkway/Turkey Lake Road	SR 535	Central Florida Parkway	Widen to 6 Lanes	-
152	Sand Lake Road	Apopka-Vineland Road	Turkey Lake Road	Widen to 6 Lanes	-
153	Silver Star Road	Mercy Drive	SR 441 (Orange Blossom Trail)	Widen to 4 Lanes	-
154	Tradeport Drive	Earhart Drive	SR 528 (BeachLine Expressway)	Widen to 6 Lanes	-
155	West Lake Butler Road	Winter Garden-Vineland Road	McKinnon Road	Widen to 4 Lanes	-

* Refer to Prioritized Project List (PPL)

2013 PEAK SEASON FACTOR CATEGORY REPORT - REPORT TYPE: ALL
 CATEGORY: 7500 ORANGE COUNTYWIDE

WEEK	DATES	SF	MOCF: 0.99 PSCF
1	01/01/2013 - 01/05/2013	1.01	1.02
2	01/06/2013 - 01/12/2013	1.03	1.04
3	01/13/2013 - 01/19/2013	1.04	1.05
4	01/20/2013 - 01/26/2013	1.03	1.04
5	01/27/2013 - 02/02/2013	1.02	1.03
6	02/03/2013 - 02/09/2013	1.01	1.02
7	02/10/2013 - 02/16/2013	1.00	1.01
8	02/17/2013 - 02/23/2013	0.99	1.00
* 9	02/24/2013 - 03/02/2013	0.99	1.00
*10	03/03/2013 - 03/09/2013	0.98	0.99
*11	03/10/2013 - 03/16/2013	0.98	0.99
*12	03/17/2013 - 03/23/2013	0.98	0.99
*13	03/24/2013 - 03/30/2013	0.98	0.99
*14	03/31/2013 - 04/06/2013	0.98	0.99
*15	04/07/2013 - 04/13/2013	0.98	0.99
*16	04/14/2013 - 04/20/2013	0.99	1.00
*17	04/21/2013 - 04/27/2013	0.99	1.00
*18	04/28/2013 - 05/04/2013	0.99	1.00
*19	05/05/2013 - 05/11/2013	0.99	1.00
*20	05/12/2013 - 05/18/2013	0.99	1.00
*21	05/19/2013 - 05/25/2013	0.99	1.00
22	05/26/2013 - 06/01/2013	1.00	1.01
23	06/02/2013 - 06/08/2013	1.00	1.01
24	06/09/2013 - 06/15/2013	1.00	1.01
25	06/16/2013 - 06/22/2013	1.01	1.02
26	06/23/2013 - 06/29/2013	1.01	1.02
27	06/30/2013 - 07/06/2013	1.02	1.03
28	07/07/2013 - 07/13/2013	1.02	1.03
29	07/14/2013 - 07/20/2013	1.03	1.04
30	07/21/2013 - 07/27/2013	1.02	1.03
31	07/28/2013 - 08/03/2013	1.01	1.02
32	08/04/2013 - 08/10/2013	1.00	1.01
33	08/11/2013 - 08/17/2013	1.00	1.01
34	08/18/2013 - 08/24/2013	0.99	1.00
35	08/25/2013 - 08/31/2013	1.00	1.01
36	09/01/2013 - 09/07/2013	1.00	1.01
37	09/08/2013 - 09/14/2013	1.01	1.02
38	09/15/2013 - 09/21/2013	1.01	1.02
39	09/22/2013 - 09/28/2013	1.01	1.02
40	09/29/2013 - 10/05/2013	1.01	1.02
41	10/06/2013 - 10/12/2013	1.00	1.01
42	10/13/2013 - 10/19/2013	1.00	1.01
43	10/20/2013 - 10/26/2013	1.00	1.01
44	10/27/2013 - 11/02/2013	1.01	1.02
45	11/03/2013 - 11/09/2013	1.01	1.02
46	11/10/2013 - 11/16/2013	1.01	1.02
47	11/17/2013 - 11/23/2013	1.02	1.03
48	11/24/2013 - 11/30/2013	1.01	1.02
49	12/01/2013 - 12/07/2013	1.01	1.02
50	12/08/2013 - 12/14/2013	1.01	1.02
51	12/15/2013 - 12/21/2013	1.01	1.02
52	12/22/2013 - 12/28/2013	1.03	1.04
53	12/29/2013 - 12/31/2013	1.04	1.05

* PEAK SEASON

Table 1: Traffic Volume Summary - No Build Scenario

Roadway Segment	Year 2013	2015 No Build With Toll			2015 No Build Without Toll			2021 No Build			2035 No Build		
	AADT	PSWADT	MOCF	AADT	PSWADT	MOCF	AADT	PSWADT	MOCF	AADT	PSWADT	MOCF	AADT
CR 435 N of SR 429	5,800	-	-	-	-	-	-	7,680	0.99	7,600	10,248	0.99	10,000
CR 435 S. of SR 429	6,755	-	-	-	-	-	-	7,680	0.99	7,600	10,248	0.99	10,000
SR 429 W. of CR 435	-	-	-	-	-	-	-	30,838	0.99	31,000	63,195	0.99	63,000
SR 429 E. of CR 435	-	-	-	-	-	-	-	30,838	0.99	31,000	63,195	0.99	63,000

PSWADT - Peak Season Weekday Average Daily Traffic

MOCF - Model Output Correction Factor value of 0.99 for Orange County is obtained from FTI 2013.

AADT - Annual Average Daily Traffic

Table 2: Traffic Volume Summary - Build Scenario

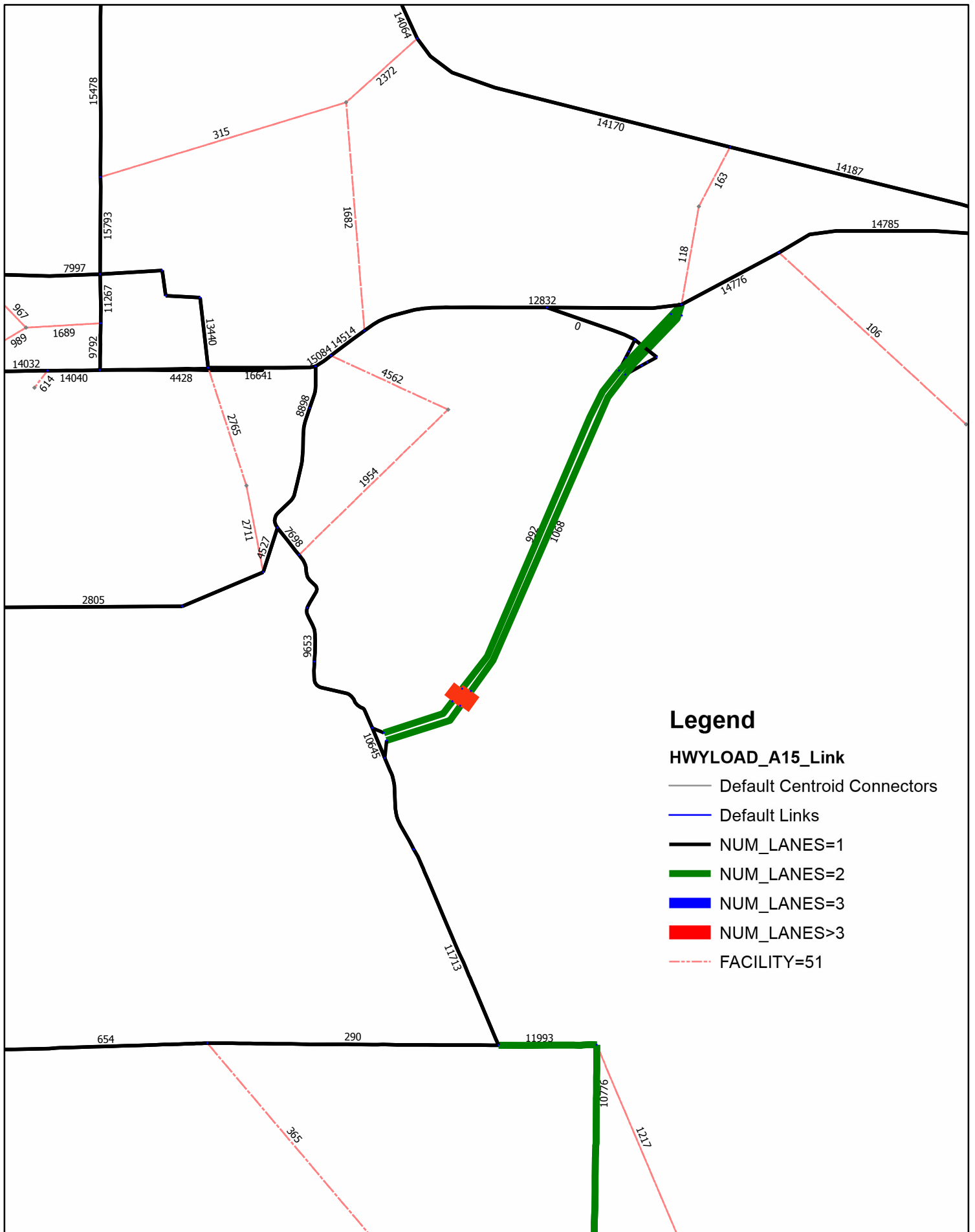
Roadway Segment	Year 2013	2015 Build With Toll			2015 Build Without Toll			2021 Build			2035 Build		
	AADT	PSWADT	MOCF	AADT	PSWADT	MOCF	AADT	PSWADT	MOCF	AADT	PSWADT	MOCF	AADT
SR 429 NB On Ramp	-	1,068	0.99	1,100	4,112	0.99	4,100	3,127	0.99	3,100	4,625	0.99	4,600
SR 429 SB Off Ramp	-	992	0.99	1,000	4,037	0.99	4,000	2,675	0.99	2,600	4,553	0.99	4,500
CR 435 N of SR 429	5,800	9,653	0.99	9,600	8,147	0.99	8,100	5,940	0.99	5,900	6,631	0.99	6,600
CR 435 S. of SR 429	6,755	11,713	0.99	12,000	16,296	0.99	16,000	11,741	0.99	12,000	15,809	0.99	16,000
SR 429 W. of CR 435	-	-	-	-	-	-	-	31,155	0.99	31,000	57,388	0.99	57,000
SR 429 E. of CR 435	-	2,060	0.99	2,000	8,149	0.99	8,100	36,957	0.99	37,000	66,594	0.99	66,000

PSWADT - Peak Season Weekday Average Daily Traffic

MOCF - Model Output Correction Factor value of 0.99 for Orange County is obtained from FTI 2013.

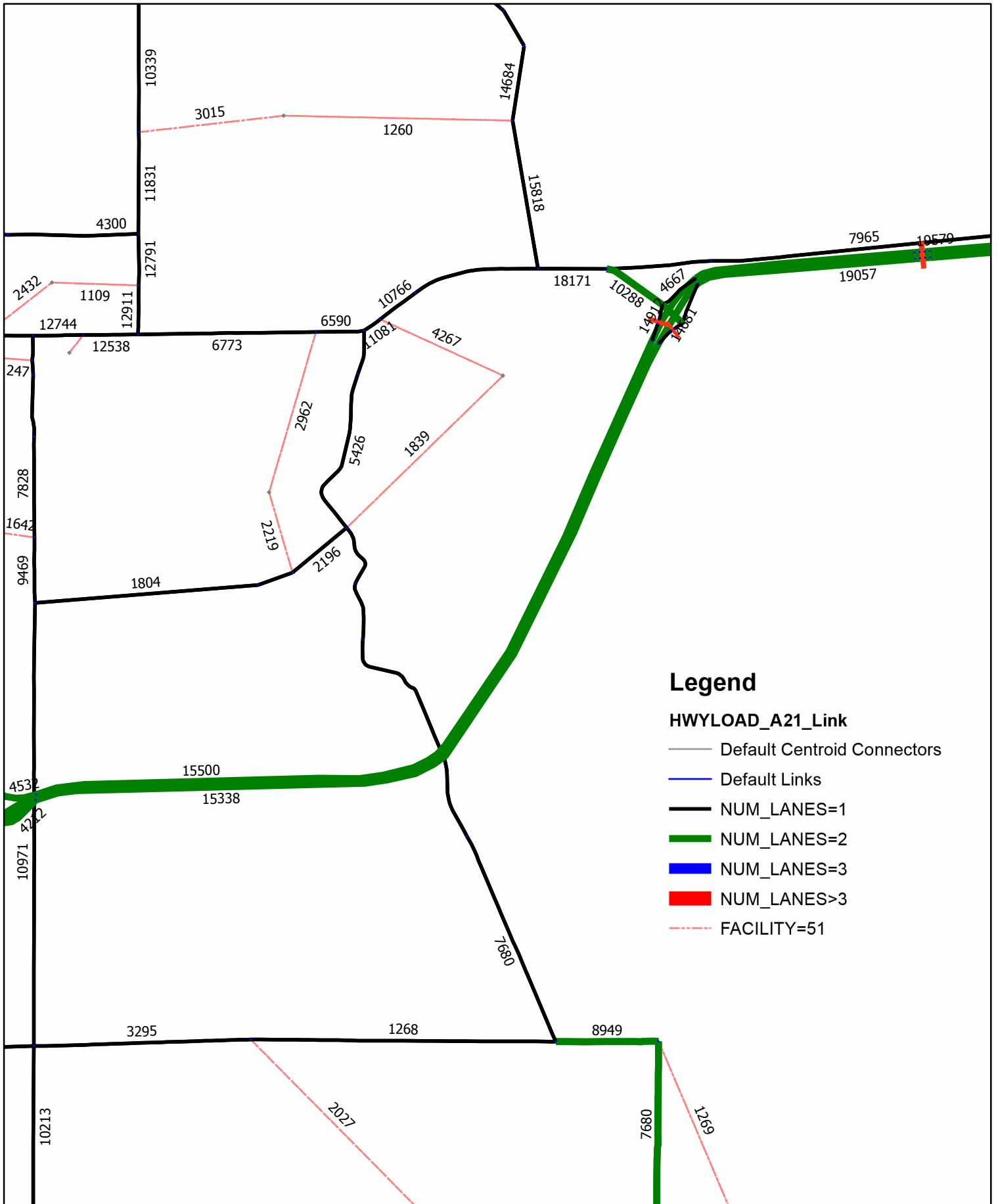
AADT - Annual Average Daily Traffic

SR 429 & CR 435 Interchange Study - Year 2015 (PSWADT)- Build Scenario with Toll



SR 429 & CR 435 Interchange Study - No Build Scenario

Year 2021 CFRPM501 - Total Traffic Volumes (PSWADT)



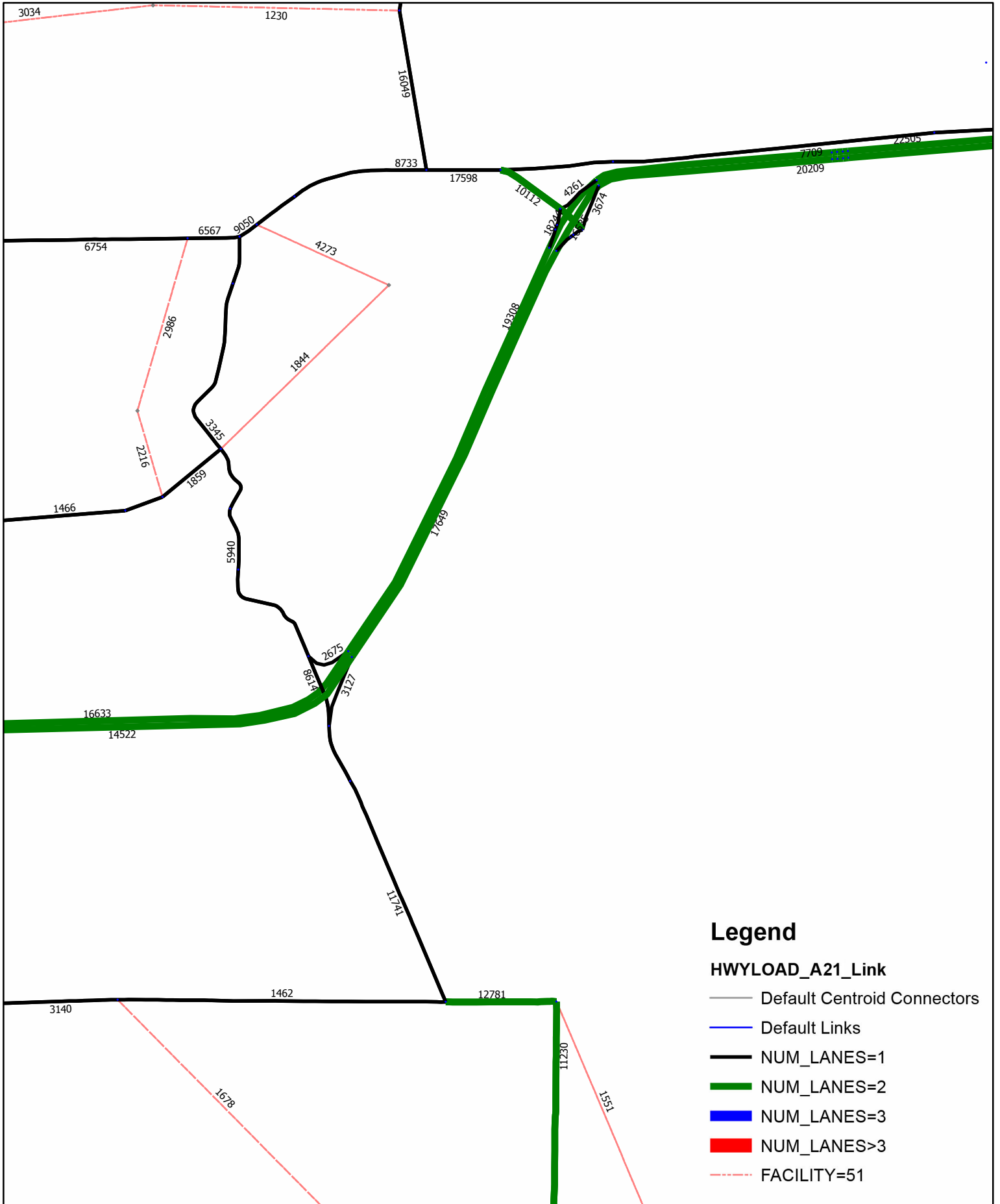
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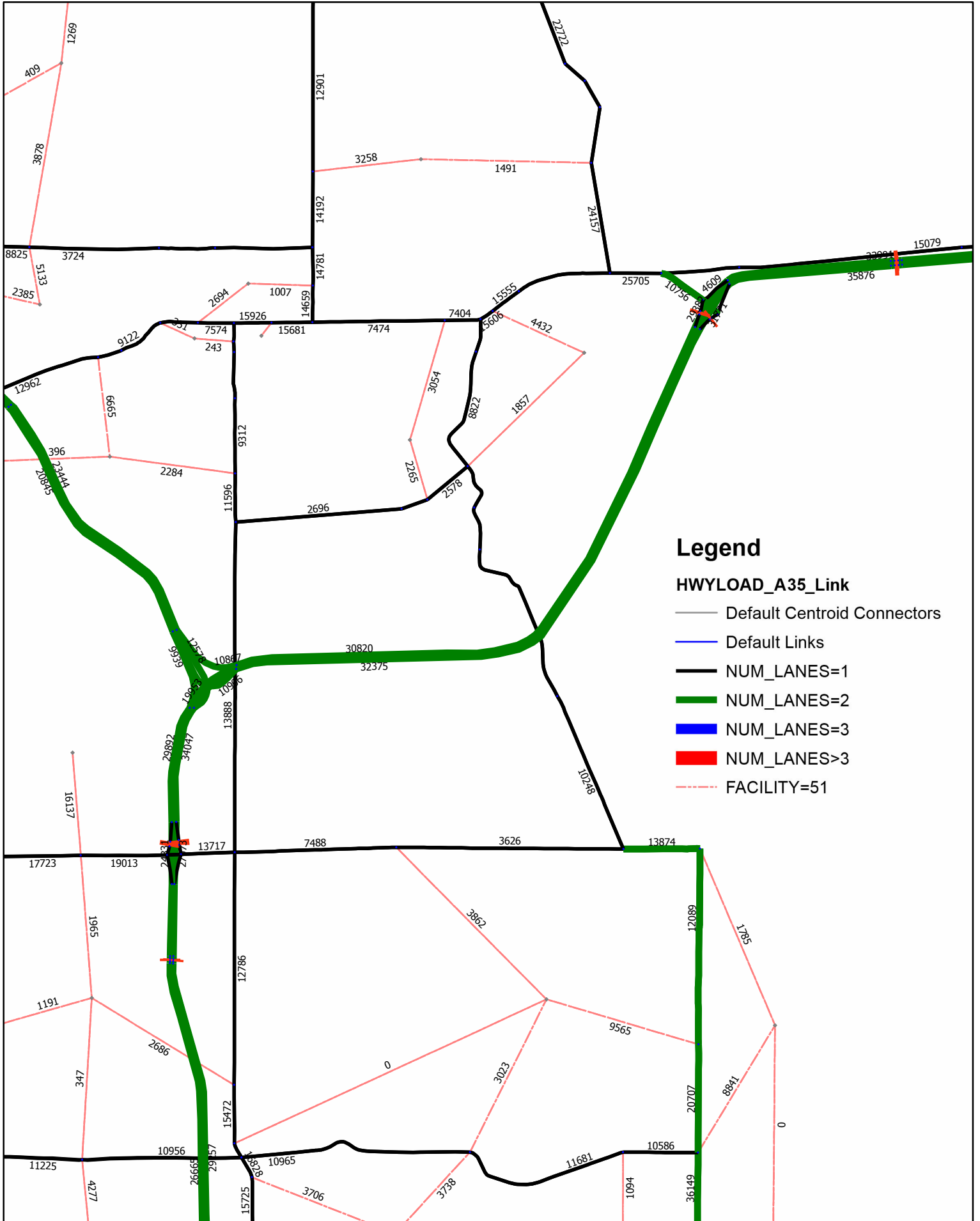
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SR 429 & CR 435 Interchange Study - Build Scenario

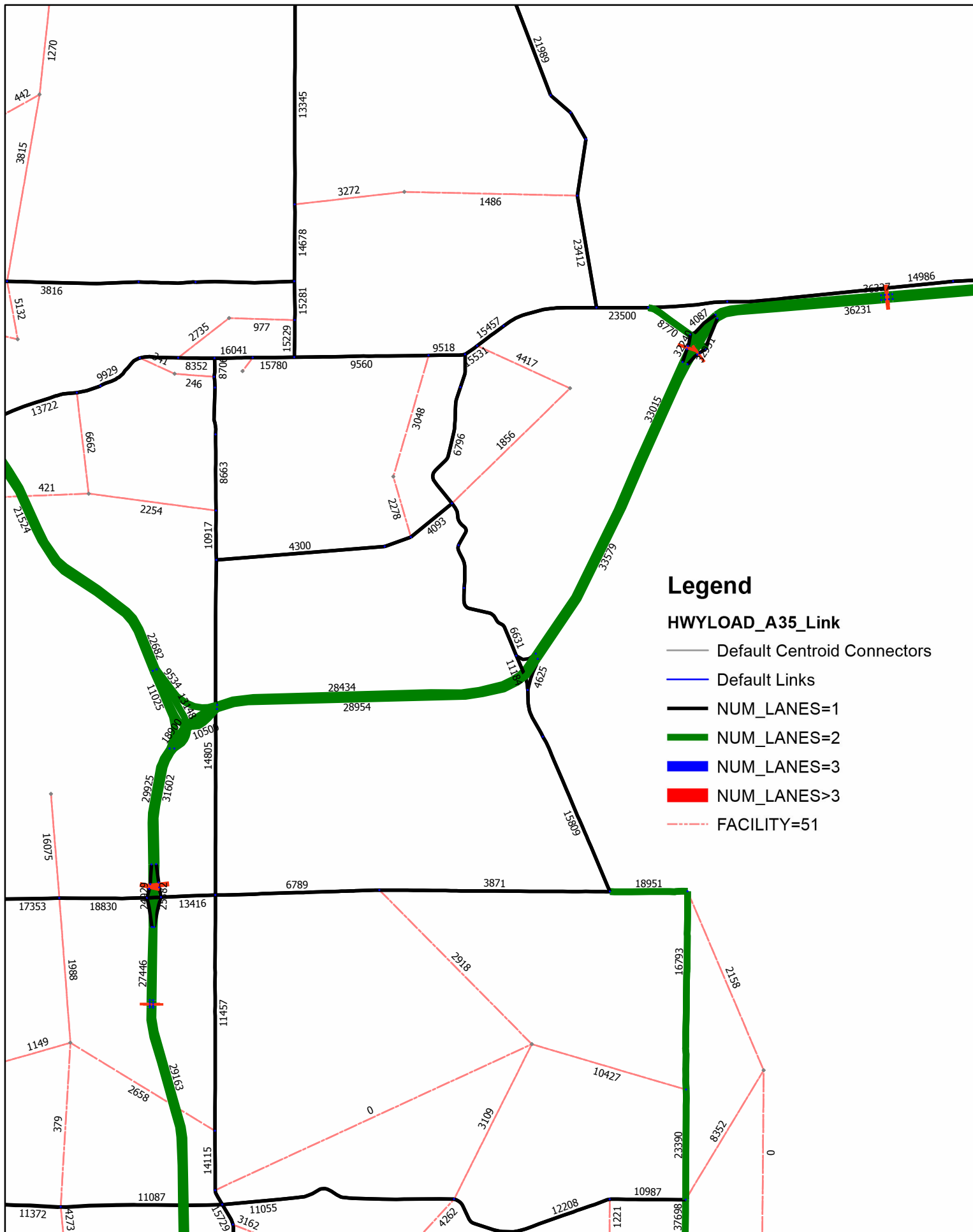
Year 2021 CFRPM501 - Total Traffic Volumes (PSWADT)



SR 429 & CR 435 Study - Year 2035 CFRPM5.1 PSWADT - No Build Scenario



SR 429 & CR 435 Study - Year 2035 CFRPM5.1 PSWADT - Build Scenario



Appendix D – TURNS5 Sheets

TURNS5 ANALYSIS SHEET - INPUT

Analyst:
Date:
Highway:
Intersection:
Project:
County:

Is this a 4 way intersection?

Yes, my intersection has four approaches

If not, which 3 approaches exist in the intersection?

EB, WB, and SB
 EB, WB, and NB
 EB, SB, and NB
 WB, SB, and NB

Is the Mainline Oriented North/South?

Yes
 No

K Factors	Mainline	D Factors	Mainline
	<input type="text" value="9.00%"/>	Northbound (NB)	<input type="text" value="54.7%"/>
	<input type="text" value="9.00%"/>	Southbound (SB)	<input type="text" value="45.3%"/>
		Westbound (WB)	<input type="text" value="56.4%"/>
		Eastbound (EB)	<input type="text" value="0.0%"/>

Do you have FTSUTMS Model Year traffic from which you would like to interpolate/extrapolate for project years? (Y/N)

Yes
 No

If "Yes" go to cell C47 If "No" go to cell C31

Enter Year and Growth Rates from Base Year:

Year	Rate (1.0% = 0.01)
Base 2015	Mainline Side Street
Opening 2015	
Mid 2019	
Design 2021	

Mainline Growth Function:
 Linear
 Exponential
 Decaying

Side Street Growth Function:
 Linear
 Exponential
 Decaying

Enter Base Year AADTs for Volume Comparison:
(growth rates are used to calculate other project years)

From West:	From East:	From North:	From South:	TOTAL
EB Approach	WB Approach	SB Approach	NB Approach	
<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>

Enter Project and Model Years

Year
Base 2015
Opening 2015
Mid 2018
Design 2021
Model 2021

Enter Base and Model Year AADTs for Volume Comparison:
(volumes for other project years are calculated by interpolation)

	From West:	From East:	From North:	From South:	TOTAL
	EB Approach	WB Approach	SB Approach	NB Approach	
2015	<input type="text" value="0"/>	<input type="text" value="2200"/>	<input type="text" value="9800"/>	<input type="text" value="12000"/>	<input type="text" value="24000"/>
2021	<input type="text" value="0"/>	<input type="text" value="6200"/>	<input type="text" value="5900"/>	<input type="text" value="12000"/>	<input type="text" value="24100"/>

1st Guess Actual/Counted Turning %'s for Traffic AADT Balancing for 2015				Existing Year AADTs	First Guess Turning % Option Used FSUTMS Model Year AADTs
(EB LT)	West-to-North	<input type="text" value="0.0%"/>	<input type="text" value="0"/>	Existing Year AADTs	Only the existing year total departure volumes [AADT*K*(1-D)] will be used to calculate the turning percentages first guess.
(EB THRU)	West-to-East	<input type="text" value="0.0%"/>	<input type="text" value="0"/>		
(EB RT)	West-to-South	<input type="text" value="0.0%"/>	<input type="text" value="0"/>		
(WB LT)	East-to-South	<input type="text" value="62.7%"/>	<input type="text" value="0"/>	Existing Turning Movement Counts	The turning percentages first guess is the same as the actual distribution of turning volumes entered . No balancing technique is used.
(WB THRU)	East-to-West	<input type="text" value="0.0%"/>	<input type="text" value="0"/>		
(WB RT)	East-to-North	<input type="text" value="37.3%"/>	<input type="text" value="0"/>		
(SB LT)	North-to-East	<input type="text" value="33.2%"/>	<input type="text" value="0"/>	FSUTMS Model Year AADTs	Only the FSUTMS model year departure volumes [AADT*K*(1-D)] will be used to calculate the turning percentages first guess.
(SB THRU)	North-to-South	<input type="text" value="66.8%"/>	<input type="text" value="0"/>		
(SB RT)	North-to-West	<input type="text" value="0.0%"/>	<input type="text" value="0"/>		
(NB LT)	South-to-West	<input type="text" value="0.0%"/>	<input type="text" value="0"/>		
(NB THRU)	South-to-North	<input type="text" value="54.4%"/>	<input type="text" value="0"/>		
(NB RT)	South-to-East	<input type="text" value="45.6%"/>	<input type="text" value="0"/>		
Desired Closure:		<input type="text" value="0.01"/>			

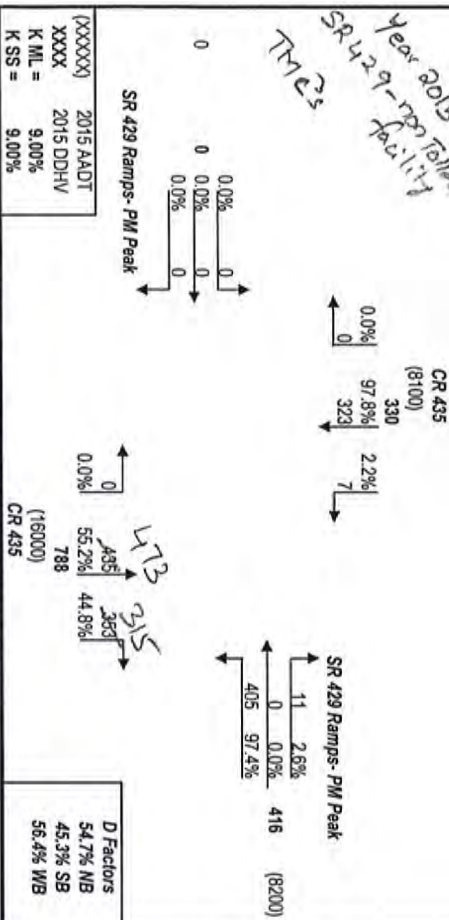
PROJECT TRAFFIC FOR CR 435 AT SR 429 Ramps - Tolloed (PM)

	DESIGN HOUR TURNING MOVEMENTS IN YEAR 2015		DESIGN HOUR TURNING MOVEMENTS IN YEAR 2015
<p>SR 429 Ramps - Tolloed (PM)</p> <p>(XXXXXX) 2015 AADT XXXXX 2015 DDHV K M.L. = 9.00% K S.S. = 9.00%</p>	<p style="text-align: center;">CR 435 (9900)</p> <p style="text-align: center;">400</p> <p style="text-align: center;">0.0% 99.8% 0.2% 0 399 1</p> <p style="text-align: center;">SR 429 Ramps - Tolloed (PM)</p> <p style="text-align: center;">5 (PM) 1.1% 147 98.9% 112 (2200) 0 0.0% 1.1% 107</p> <p style="text-align: center;">D Factors 54.7% NB 45.3% SB 56.4% WB</p>	<p>SR 429 Ramps - Tolloed (PM)</p> <p>(XXXXXX) 2015 AADT XXXXX 2015 DDHV K M.L. = 9.00% K S.S. = 9.00%</p>	<p style="text-align: center;">CR 435 (9900)</p> <p style="text-align: center;">400</p> <p style="text-align: center;">0.0% 99.8% 0.2% 0 399 1</p> <p style="text-align: center;">SR 429 Ramps - Tolloed (PM)</p> <p style="text-align: center;">1 (PM) 1.1% 111 98.9% 112 (2200) 0 0.0% 1.1% 111</p> <p style="text-align: center;">D Factors 54.7% NB 45.3% SB 56.4% WB</p>
<p>SR 429 Ramps - Tolloed (PM)</p> <p>(XXXXXX) 2018 AADT XXXXX 2018 DDHV K M.L. = 9.00% K S.S. = 9.00%</p>	<p style="text-align: center;">CR 435 (7900)</p> <p style="text-align: center;">320</p> <p style="text-align: center;">0.0% 99.5% 0.5% 0 318 2</p> <p style="text-align: center;">SR 429 Ramps - Tolloed (PM)</p> <p style="text-align: center;">3 (PM) 1.2% 210 98.8% 213 (4200) 0 0.0% 1.2% 3</p> <p style="text-align: center;">D Factors 54.7% NB 45.3% SB 56.4% WB</p>	<p>SR 429 Ramps - Tolloed (PM)</p> <p>(XXXXXX) 2021 AADT XXXXX 2021 DDHV K M.L. = 9.00% K S.S. = 9.00%</p>	<p style="text-align: center;">CR 435 (5900)</p> <p style="text-align: center;">241</p> <p style="text-align: center;">0.0% 98.9% 1.1% 0 238 6</p> <p style="text-align: center;">SR 429 Ramps - Tolloed (PM)</p> <p style="text-align: center;">10 (PM) 1.4% 347 98.6% 315 (6200) 0 0.0% 1.4% 305</p> <p style="text-align: center;">D Factors 54.7% NB 45.3% SB 56.4% WB</p>
DESIGN HOUR TURNING MOVEMENTS IN YEAR 2018			
<p>SR 429 Ramps - Tolloed (PM)</p> <p>(XXXXXX) 2018 AADT XXXXX 2018 DDHV K M.L. = 9.00% K S.S. = 9.00%</p>	<p style="text-align: center;">CR 435 (12000)</p> <p style="text-align: center;">591</p> <p style="text-align: center;">0.0% 84.9% 15.1% 0 502 89</p> <p style="text-align: center;">SR 429 Ramps - Tolloed (PM)</p> <p style="text-align: center;">502 (PM) 15.1% 591 84.9% 89 (12000) 0 0.0% 15.1% 89</p> <p style="text-align: center;">D Factors 54.7% NB 45.3% SB 56.4% WB</p>	<p>SR 429 Ramps - Tolloed (PM)</p> <p>(XXXXXX) 2015 AADT XXXXX 2015 DDHV K M.L. = 9.00% K S.S. = 9.00%</p>	<p style="text-align: center;">CR 435 (12000)</p> <p style="text-align: center;">591</p> <p style="text-align: center;">0.0% 84.9% 15.1% 0 502 89</p> <p style="text-align: center;">SR 429 Ramps - Tolloed (PM)</p> <p style="text-align: center;">89 (PM) 15.1% 591 84.9% 89 (12000) 0 0.0% 15.1% 89</p> <p style="text-align: center;">D Factors 54.7% NB 45.3% SB 56.4% WB</p>
DESIGN HOUR TURNING MOVEMENTS IN YEAR 2021			

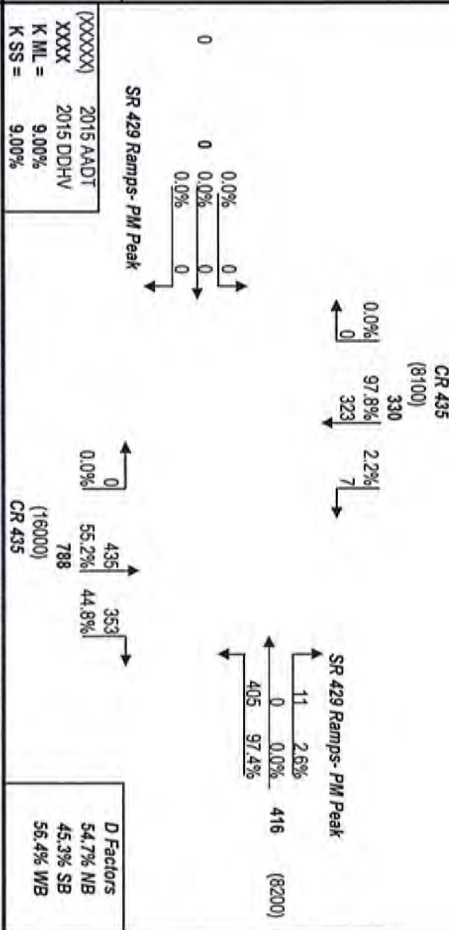
PROJECT TRAFFIC FOR CR 435 AT SR 429 Ramps- PM Peak

*Year 2015
SR 429 - ramp facility
TMC's*

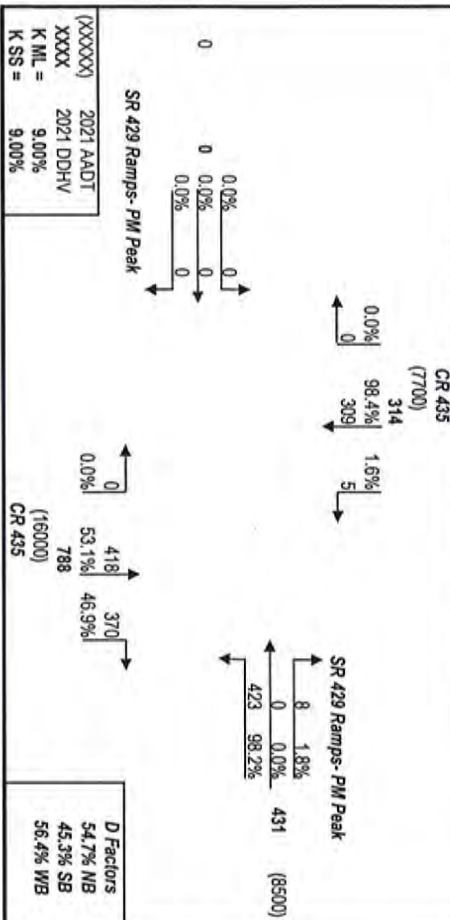
DESIGN HOUR TURNING MOVEMENTS IN YEAR 2015



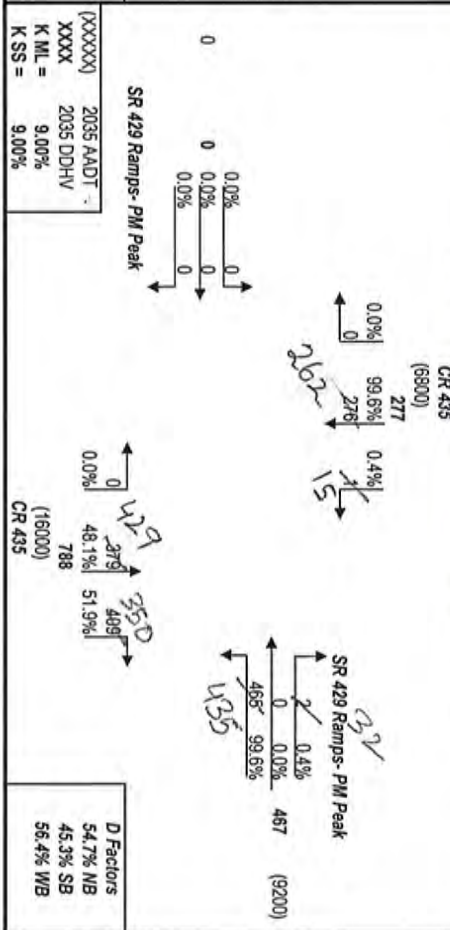
DESIGN HOUR TURNING MOVEMENTS IN YEAR 2035















DESIGN HOUR TURNING MOVEMENTS IN YEAR 2021















DESIGN HOUR TURNING MOVEMENTS IN YEAR 2035















Appendix E – SYNCHRO Intersection Analysis Outputs













								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations								
Volume (veh/h)	315	7	323	405	11	473		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	332	7	340	426	12	498		
Adj No. of Lanes	1	1	1	1	1	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	397	355	1219	1036	513	1219		
Arrive On Green	0.22	0.22	0.65	0.65	0.65	0.65		
Sat Flow, veh/h	1774	1583	1863	1583	699	1863		
Grp Volume(v), veh/h	332	7	340	426	12	498		
Grp Sat Flow(s),veh/h/ln	1774	1583	1863	1583	699	1863		
Q Serve(g_s), s	11.7	0.2	5.1	8.4	0.5	8.3		
Cycle Q Clear(g_c), s	11.7	0.2	5.1	8.4	5.6	8.3		
Prop In Lane	1.00	1.00		1.00	1.00			
Lane Grp Cap(c), veh/h	397	355	1219	1036	513	1219		
V/C Ratio(X)	0.84	0.02	0.28	0.41	0.02	0.41		
Avail Cap(c_a), veh/h	1053	940	1219	1036	513	1219		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	24.3	19.9	4.8	5.4	6.0	5.4		
Incr Delay (d2), s/veh	4.7	0.0	0.6	1.2	0.1	1.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	6.2	0.1	2.7	3.9	0.1	4.5		
LnGrp Delay(d),s/veh	29.0	19.9	5.4	6.6	6.1	6.4		
LnGrp LOS	C	B	A	A	A	A		
Approach Vol, veh/h	339		766			510		
Approach Delay, s/veh	28.8		6.0			6.4		
Approach LOS	C		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		47.0				47.0		18.7
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		43.0				43.0		39.0
Max Q Clear Time (g_c+I1), s		10.4				10.3		13.7
Green Ext Time (p_c), s		7.4				7.4		1.0
Intersection Summary								
HCM 2010 Ctrl Delay			10.9					
HCM 2010 LOS			B					











								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations								
Volume (veh/h)	405	11	473	315	7	323		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	426	12	498	332	7	340		
Adj No. of Lanes	1	1	1	1	1	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	489	437	1137	967	410	1137		
Arrive On Green	0.28	0.28	0.61	0.61	0.61	0.61		
Sat Flow, veh/h	1774	1583	1863	1583	658	1863		
Grp Volume(v), veh/h	426	12	498	332	7	340		
Grp Sat Flow(s),veh/h/ln	1774	1583	1863	1583	658	1863		
Q Serve(g_s), s	16.1	0.4	10.0	7.3	0.4	6.1		
Cycle Q Clear(g_c), s	16.1	0.4	10.0	7.3	10.4	6.1		
Prop In Lane	1.00	1.00		1.00	1.00			
Lane Grp Cap(c), veh/h	489	437	1137	967	410	1137		
V/C Ratio(X)	0.87	0.03	0.44	0.34	0.02	0.30		
Avail Cap(c_a), veh/h	982	877	1137	967	410	1137		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	24.3	18.6	7.3	6.8	10.1	6.5		
Incr Delay (d2), s/veh	4.9	0.0	1.2	1.0	0.1	0.7		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	8.5	0.2	5.5	3.4	0.1	3.3		
LnGrp Delay(d),s/veh	29.2	18.6	8.5	7.7	10.1	7.2		
LnGrp LOS	C	B	A	A	B	A		
Approach Vol, veh/h	438		830			347		
Approach Delay, s/veh	28.9		8.2			7.3		
Approach LOS	C		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		47.0				47.0		23.4
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		43.0				43.0		39.0
Max Q Clear Time (g_c+I1), s		12.0				12.4		18.1
Green Ext Time (p_c), s		7.4				7.3		1.3
Intersection Summary								
HCM 2010 Ctrl Delay			13.6					
HCM 2010 LOS			B					











HCM 2010 Signalized Intersection Summary
Timing Plan: AM

2015 SR 429 Tolloed Facility
8/29/2014

								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations								
Volume (veh/h)	89	5	395	107	5	502		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	94	5	416	113	5	528		
Adj No. of Lanes	1	1	1	1	1	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	129	115	1457	1238	757	1457		
Arrive On Green	0.07	0.07	0.78	0.78	0.78	0.78		
Sat Flow, veh/h	1774	1583	1863	1583	871	1863		
Grp Volume(v), veh/h	94	5	416	113	5	528		
Grp Sat Flow(s),veh/h/ln	1774	1583	1863	1583	871	1863		
Q Serve(g_s), s	2.9	0.2	3.4	0.9	0.1	4.7		
Cycle Q Clear(g_c), s	2.9	0.2	3.4	0.9	3.5	4.7		
Prop In Lane	1.00	1.00		1.00	1.00			
Lane Grp Cap(c), veh/h	129	115	1457	1238	757	1457		
V/C Ratio(X)	0.73	0.04	0.29	0.09	0.01	0.36		
Avail Cap(c_a), veh/h	1258	1123	1457	1238	757	1457		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	25.0	23.7	1.7	1.4	2.2	1.8		
Incr Delay (d2), s/veh	7.7	0.2	0.5	0.1	0.0	0.7		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.7	0.1	1.9	0.4	0.0	2.6		
LnGrp Delay(d),s/veh	32.7	23.9	2.2	1.6	2.2	2.5		
LnGrp LOS	C	C	A	A	A	A		
Approach Vol, veh/h	99		529			533		
Approach Delay, s/veh	32.3		2.0			2.5		
Approach LOS	C		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		47.0				47.0		8.0
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		43.0				43.0		39.0
Max Q Clear Time (g_c+I1), s		5.4				6.7		4.9
Green Ext Time (p_c), s		6.8				6.8		0.3
Intersection Summary								
HCM 2010 Ctrl Delay			4.8					
HCM 2010 LOS			A					











								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations								
Volume (veh/h)	107	5	502	89	5	395		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	113	5	528	94	5	416		
Adj No. of Lanes	1	1	1	1	1	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	154	138	1434	1219	671	1434		
Arrive On Green	0.09	0.09	0.77	0.77	0.77	0.77		
Sat Flow, veh/h	1774	1583	1863	1583	799	1863		
Grp Volume(v), veh/h	113	5	528	94	5	416		
Grp Sat Flow(s),veh/h/ln	1774	1583	1863	1583	799	1863		
Q Serve(g_s), s	3.5	0.2	5.1	0.8	0.1	3.7		
Cycle Q Clear(g_c), s	3.5	0.2	5.1	0.8	5.2	3.7		
Prop In Lane	1.00	1.00		1.00	1.00			
Lane Grp Cap(c), veh/h	154	138	1434	1219	671	1434		
V/C Ratio(X)	0.73	0.04	0.37	0.08	0.01	0.29		
Avail Cap(c_a), veh/h	1239	1106	1434	1219	671	1434		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	24.9	23.4	2.1	1.6	2.9	1.9		
Incr Delay (d2), s/veh	6.6	0.1	0.7	0.1	0.0	0.5		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	2.0	0.1	2.8	0.4	0.0	2.1		
LnGrp Delay(d),s/veh	31.4	23.5	2.8	1.7	2.9	2.4		
LnGrp LOS	C	C	A	A	A	A		
Approach Vol, veh/h	118		622			421		
Approach Delay, s/veh	31.1		2.6			2.4		
Approach LOS	C		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		47.0				47.0		8.9
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		43.0				43.0		39.0
Max Q Clear Time (g_c+I1), s		7.1				7.2		5.5
Green Ext Time (p_c), s		7.4				7.4		0.3
Intersection Summary								
HCM 2010 Ctrl Delay			5.4					
HCM 2010 LOS			A					

								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations								
Volume (veh/h)	237	6	235	0	0	364		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	0	0	1863		
Adj Flow Rate, veh/h	249	6	247	0	0	383		
Adj No. of Lanes	1	1	1	0	0	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	2	2	2	0	0	2		
Cap, veh/h	321	286	1248	0	0	1248		
Arrive On Green	0.18	0.18	1.00	0.00	0.00	0.67		
Sat Flow, veh/h	1774	1583	1863	0	0	1863		
Grp Volume(v), veh/h	249	6	247	0	0	383		
Grp Sat Flow(s),veh/h/ln	1774	1583	1863	0	0	1863		
Q Serve(g_s), s	7.2	0.2	0.0	0.0	0.0	4.6		
Cycle Q Clear(g_c), s	7.2	0.2	0.0	0.0	0.0	4.6		
Prop In Lane	1.00	1.00		0.00	0.00			
Lane Grp Cap(c), veh/h	321	286	1248	0	0	1248		
V/C Ratio(X)	0.78	0.02	0.20	0.00	0.00	0.31		
Avail Cap(c_a), veh/h	1519	1356	1248	0	0	1248		
HCM Platoon Ratio	1.00	1.00	2.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	0.00	0.00	1.00		
Uniform Delay (d), s/veh	21.0	18.1	0.0	0.0	0.0	3.7		
Incr Delay (d2), s/veh	4.0	0.0	0.4	0.0	0.0	0.6		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	3.9	0.1	0.1	0.0	0.0	2.6		
LnGrp Delay(d),s/veh	25.0	18.1	0.4	0.0	0.0	4.3		
LnGrp LOS	C	B	A			A		
Approach Vol, veh/h	255		247			383		
Approach Delay, s/veh	24.8		0.4			4.3		
Approach LOS	C		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		76.3				76.3		13.7
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		36.0				36.0		46.0
Max Q Clear Time (g_c+I1), s		2.0				6.6		9.2
Green Ext Time (p_c), s		4.1				4.0		0.8
Intersection Summary								
HCM 2010 Ctrl Delay			9.1					
HCM 2010 LOS			A					

								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations								
Volume (veh/h)	0	0	235	305	10	591		
Number			2	12	1	6		
Initial Q (Qb), veh			0	0	0	0		
Ped-Bike Adj(A_pbT)				1.00	1.00			
Parking Bus, Adj			1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln			1863	1863	1863	1863		
Adj Flow Rate, veh/h			247	321	11	622		
Adj No. of Lanes			1	1	1	1		
Peak Hour Factor			0.95	0.95	0.95	0.95		
Percent Heavy Veh, %			2	2	2	2		
Cap, veh/h			1780	1513	877	1780		
Arrive On Green			0.96	0.96	1.00	1.00		
Sat Flow, veh/h			1863	1583	840	1863		
Grp Volume(v), veh/h			247	321	11	622		
Grp Sat Flow(s),veh/h/ln			1863	1583	840	1863		
Q Serve(g_s), s			0.6	1.0	0.0	0.0		
Cycle Q Clear(g_c), s			0.6	1.0	0.6	0.0		
Prop In Lane				1.00	1.00			
Lane Grp Cap(c), veh/h			1780	1513	877	1780		
V/C Ratio(X)			0.14	0.21	0.01	0.35		
Avail Cap(c_a), veh/h			1780	1513	877	1780		
HCM Platoon Ratio			1.00	1.00	2.00	2.00		
Upstream Filter(I)			1.00	1.00	0.89	0.89		
Uniform Delay (d), s/veh			0.1	0.1	0.0	0.0		
Incr Delay (d2), s/veh			0.2	0.3	0.0	0.5		
Initial Q Delay(d3),s/veh			0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln			0.4	0.5	0.0	0.2		
LnGrp Delay(d),s/veh			0.3	0.4	0.0	0.5		
LnGrp LOS			A	A	A	A		
Approach Vol, veh/h			568			633		
Approach Delay, s/veh			0.4			0.5		
Approach LOS			A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		
Phs Duration (G+Y+Rc), s		90.0				90.0		
Change Period (Y+Rc), s		4.0				4.0		
Max Green Setting (Gmax), s		86.0				86.0		
Max Q Clear Time (g_c+I1), s		3.0				2.6		
Green Ext Time (p_c), s		7.7				7.7		
Intersection Summary								
HCM 2010 Ctrl Delay			0.4					
HCM 2010 LOS			A					


HCM 2010 Signalized Intersection Summary
 3: CR 435 & SR 429 SB Off Ramp

2021 PM Peak
 8/29/2014

								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations								
Volume (veh/h)	305	10	354	0	0	241		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	0	0	1863		
Adj Flow Rate, veh/h	321	11	373	0	0	254		
Adj No. of Lanes	1	1	1	0	0	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	2	2	2	0	0	2		
Cap, veh/h	396	354	1184	0	0	1184		
Arrive On Green	0.22	0.22	1.00	0.00	0.00	0.64		
Sat Flow, veh/h	1774	1583	1863	0	0	1863		
Grp Volume(v), veh/h	321	11	373	0	0	254		
Grp Sat Flow(s),veh/h/ln	1774	1583	1863	0	0	1863		
Q Serve(g_s), s	9.7	0.3	0.0	0.0	0.0	3.3		
Cycle Q Clear(g_c), s	9.7	0.3	0.0	0.0	0.0	3.3		
Prop In Lane	1.00	1.00		0.00	0.00			
Lane Grp Cap(c), veh/h	396	354	1184	0	0	1184		
V/C Ratio(X)	0.81	0.03	0.32	0.00	0.00	0.21		
Avail Cap(c_a), veh/h	1440	1285	1184	0	0	1184		
HCM Platoon Ratio	1.00	1.00	2.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	0.99	0.00	0.00	1.00		
Uniform Delay (d), s/veh	20.9	17.2	0.0	0.0	0.0	4.4		
Incr Delay (d2), s/veh	4.0	0.0	0.7	0.0	0.0	0.4		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	5.2	0.1	0.2	0.0	0.0	1.8		
LnGrp Delay(d),s/veh	24.8	17.2	0.7	0.0	0.0	4.8		
LnGrp LOS	C	B	A			A		
Approach Vol, veh/h	332		373			254		
Approach Delay, s/veh	24.6		0.7			4.8		
Approach LOS	C		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		73.3				73.3		16.7
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		36.0				36.0		46.0
Max Q Clear Time (g_c+I1), s		2.0				5.3		11.7
Green Ext Time (p_c), s		3.7				3.6		1.0
Intersection Summary								
HCM 2010 Ctrl Delay			10.0					
HCM 2010 LOS			B					












HCM 2010 Signalized Intersection Summary
5: CR 435 & SR 429 NB On Ramp

2021 PM Peak
8/29/2014

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations			↑	↗	↖	↑			
Volume (veh/h)	0	0	354	237	6	540			
Number			2	12	1	6			
Initial Q (Qb), veh			0	0	0	0			
Ped-Bike Adj(A_pbT)				1.00	1.00				
Parking Bus, Adj			1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln			1863	1863	1863	1863			
Adj Flow Rate, veh/h			373	249	6	568			
Adj No. of Lanes			1	1	1	1			
Peak Hour Factor			0.95	0.95	0.95	0.95			
Percent Heavy Veh, %			2	2	2	2			
Cap, veh/h			1780	1513	835	1780			
Arrive On Green			0.96	0.96	1.00	1.00			
Sat Flow, veh/h			1863	1583	799	1863			
Grp Volume(v), veh/h			373	249	6	568			
Grp Sat Flow(s),veh/h/ln			1863	1583	799	1863			
Q Serve(g_s), s			1.0	0.7	0.0	0.0			
Cycle Q Clear(g_c), s			1.0	0.7	1.0	0.0			
Prop In Lane				1.00	1.00				
Lane Grp Cap(c), veh/h			1780	1513	835	1780			
V/C Ratio(X)			0.21	0.16	0.01	0.32			
Avail Cap(c_a), veh/h			1780	1513	835	1780			
HCM Platoon Ratio			1.00	1.00	2.00	2.00			
Upstream Filter(I)			1.00	1.00	0.86	0.86			
Uniform Delay (d), s/veh			0.1	0.1	0.0	0.0			
Incr Delay (d2), s/veh			0.3	0.2	0.0	0.4			
Initial Q Delay(d3),s/veh			0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln			0.5	0.4	0.0	0.2			
LnGrp Delay(d),s/veh			0.4	0.3	0.0	0.4			
LnGrp LOS			A	A	A	A			
Approach Vol, veh/h			622			574			
Approach Delay, s/veh			0.4			0.4			
Approach LOS			A			A			
Timer	1	2	3	4	5	6	7	8	
Assigned Phs		2				6			
Phs Duration (G+Y+Rc), s		90.0				90.0			
Change Period (Y+Rc), s		4.0				4.0			
Max Green Setting (Gmax), s		86.0				86.0			
Max Q Clear Time (g_c+I1), s		3.0				3.0			
Green Ext Time (p_c), s		7.8				7.8			
Intersection Summary									
HCM 2010 Ctrl Delay			0.4						
HCM 2010 LOS			A						

HCM 2010 Signalized Intersection Summary
 3: CR 435 & SR 429 SB Off Ramp

2035 AM Peak
 8/29/2014

								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations	 							
Volume (veh/h)	350	15	262	0	0	461		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	0	0	1863		
Adj Flow Rate, veh/h	368	16	276	0	0	485		
Adj No. of Lanes	2	1	1	0	0	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	2	2	2	0	0	2		
Cap, veh/h	564	259	1274	0	0	1274		
Arrive On Green	0.16	0.16	0.91	0.00	0.00	0.68		
Sat Flow, veh/h	3442	1583	1863	0	0	1863		
Grp Volume(v), veh/h	368	16	276	0	0	485		
Grp Sat Flow(s),veh/h/ln	1721	1583	1863	0	0	1863		
Q Serve(g_s), s	5.3	0.4	0.9	0.0	0.0	5.9		
Cycle Q Clear(g_c), s	5.3	0.4	0.9	0.0	0.0	5.9		
Prop In Lane	1.00	1.00		0.00	0.00			
Lane Grp Cap(c), veh/h	564	259	1274	0	0	1274		
V/C Ratio(X)	0.65	0.06	0.22	0.00	0.00	0.38		
Avail Cap(c_a), veh/h	3008	1384	1274	0	0	1274		
HCM Platoon Ratio	1.00	1.00	1.33	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	0.99	0.00	0.00	1.00		
Uniform Delay (d), s/veh	20.6	18.6	0.8	0.0	0.0	3.5		
Incr Delay (d2), s/veh	1.3	0.1	0.4	0.0	0.0	0.9		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	2.6	0.2	0.5	0.0	0.0	3.3		
LnGrp Delay(d),s/veh	21.9	18.7	1.2	0.0	0.0	4.4		
LnGrp LOS	C	B	A			A		
Approach Vol, veh/h	384		276			485		
Approach Delay, s/veh	21.7		1.2			4.4		
Approach LOS	C		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		77.4				77.4		12.6
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		36.0				36.0		46.0
Max Q Clear Time (g_c+I1), s		2.9				7.9		7.3
Green Ext Time (p_c), s		4.7				4.6		1.4
Intersection Summary								
HCM 2010 Ctrl Delay			9.4					
HCM 2010 LOS			A					












HCM 2010 Signalized Intersection Summary
 15: CR 435 & SR 429 NB On Ramp

2035 AM Peak
 8/29/2014

Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations			↑	↗	↘	↑		
Volume (veh/h)	0	0	262	435	32	779		
Number			2	12	1	6		
Initial Q (Qb), veh			0	0	0	0		
Ped-Bike Adj(A_pbT)				1.00	1.00			
Parking Bus, Adj			1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln			1863	1863	1863	1863		
Adj Flow Rate, veh/h			276	458	34	820		
Adj No. of Lanes			1	1	1	1		
Peak Hour Factor			0.95	0.95	0.95	0.95		
Percent Heavy Veh, %			2	2	2	2		
Cap, veh/h			1780	1513	762	1780		
Arrive On Green			0.96	0.96	1.00	1.00		
Sat Flow, veh/h			1863	1583	720	1863		
Grp Volume(v), veh/h			276	458	34	820		
Grp Sat Flow(s),veh/h/ln			1863	1583	720	1863		
Q Serve(g_s), s			0.7	1.6	0.0	0.0		
Cycle Q Clear(g_c), s			0.7	1.6	0.7	0.0		
Prop In Lane				1.00	1.00			
Lane Grp Cap(c), veh/h			1780	1513	762	1780		
V/C Ratio(X)			0.16	0.30	0.04	0.46		
Avail Cap(c_a), veh/h			1780	1513	762	1780		
HCM Platoon Ratio			1.00	1.00	2.00	2.00		
Upstream Filter(I)			1.00	1.00	0.88	0.88		
Uniform Delay (d), s/veh			0.1	0.1	0.0	0.0		
Incr Delay (d2), s/veh			0.2	0.5	0.1	0.8		
Initial Q Delay(d3),s/veh			0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln			0.4	0.9	0.0	0.4		
LnGrp Delay(d),s/veh			0.3	0.6	0.1	0.8		
LnGrp LOS			A	A	A	A		
Approach Vol, veh/h			734			854		
Approach Delay, s/veh			0.5			0.7		
Approach LOS			A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		
Phs Duration (G+Y+Rc), s		90.0				90.0		
Change Period (Y+Rc), s		4.0				4.0		
Max Green Setting (Gmax), s		86.0				86.0		
Max Q Clear Time (g_c+I1), s		3.6				2.7		
Green Ext Time (p_c), s		12.7				12.7		
Intersection Summary								
HCM 2010 Ctrl Delay			0.6					
HCM 2010 LOS			A					

HCM 2010 Signalized Intersection Summary
3: CR 435 & SR 429 SB Off Ramp

2035 PM Peak
8/29/2014

								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations	 							
Volume (veh/h)	435	32	429	0	0	277		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	0	0	1863		
Adj Flow Rate, veh/h	458	34	452	0	0	292		
Adj No. of Lanes	2	1	1	0	0	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	2	2	2	0	0	2		
Cap, veh/h	666	306	1229	0	0	1229		
Arrive On Green	0.19	0.19	1.00	0.00	0.00	0.66		
Sat Flow, veh/h	3442	1583	1863	0	0	1863		
Grp Volume(v), veh/h	458	34	452	0	0	292		
Grp Sat Flow(s),veh/h/ln	1721	1583	1863	0	0	1863		
Q Serve(g_s), s	6.8	1.0	0.0	0.0	0.0	3.4		
Cycle Q Clear(g_c), s	6.8	1.0	0.0	0.0	0.0	3.4		
Prop In Lane	1.00	1.00		0.00	0.00			
Lane Grp Cap(c), veh/h	666	306	1229	0	0	1229		
V/C Ratio(X)	0.69	0.11	0.37	0.00	0.00	0.24		
Avail Cap(c_a), veh/h	2902	1335	1229	0	0	1229		
HCM Platoon Ratio	1.00	1.00	2.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	0.98	0.00	0.00	1.00		
Uniform Delay (d), s/veh	20.5	18.1	0.0	0.0	0.0	3.7		
Incr Delay (d2), s/veh	1.3	0.2	0.8	0.0	0.0	0.5		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	3.3	0.4	0.3	0.0	0.0	1.9		
LnGrp Delay(d),s/veh	21.7	18.3	0.8	0.0	0.0	4.2		
LnGrp LOS	C	B	A			A		
Approach Vol, veh/h	492		452			292		
Approach Delay, s/veh	21.5		0.8			4.2		
Approach LOS	C		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		75.4				75.4		14.6
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		36.0				36.0		46.0
Max Q Clear Time (g_c+I1), s		2.0				5.4		8.8
Green Ext Time (p_c), s		4.5				4.5		1.8
Intersection Summary								
HCM 2010 Ctrl Delay			9.9					
HCM 2010 LOS			A					

HCM 2010 Signalized Intersection Summary
 5: CR 435 & SR 429 NB On Ramp

2035 PM Peak
 8/29/2014

Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations			↑	↗	↖	↑			
Volume (veh/h)	0	0	429	350	15	697			
Number			2	12	1	6			
Initial Q (Qb), veh			0	0	0	0			
Ped-Bike Adj(A_pbT)				1.00	1.00				
Parking Bus, Adj			1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln			1863	1863	1863	1863			
Adj Flow Rate, veh/h			452	368	16	734			
Adj No. of Lanes			1	1	1	1			
Peak Hour Factor			0.95	0.95	0.95	0.95			
Percent Heavy Veh, %			2	2	2	2			
Cap, veh/h			1780	1513	705	1780			
Arrive On Green			0.96	0.96	1.00	1.00			
Sat Flow, veh/h			1863	1583	664	1863			
Grp Volume(v), veh/h			452	368	16	734			
Grp Sat Flow(s),veh/h/ln			1863	1583	664	1863			
Q Serve(g_s), s			1.3	1.2	0.0	0.0			
Cycle Q Clear(g_c), s			1.3	1.2	1.3	0.0			
Prop In Lane				1.00	1.00				
Lane Grp Cap(c), veh/h			1780	1513	705	1780			
V/C Ratio(X)			0.25	0.24	0.02	0.41			
Avail Cap(c_a), veh/h			1780	1513	705	1780			
HCM Platoon Ratio			1.00	1.00	2.00	2.00			
Upstream Filter(I)			1.00	1.00	0.86	0.86			
Uniform Delay (d), s/veh			0.1	0.1	0.0	0.0			
Incr Delay (d2), s/veh			0.3	0.4	0.1	0.6			
Initial Q Delay(d3),s/veh			0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln			0.7	0.6	0.0	0.3			
LnGrp Delay(d),s/veh			0.5	0.5	0.1	0.6			
LnGrp LOS			A	A	A	A			
Approach Vol, veh/h			820			750			
Approach Delay, s/veh			0.5			0.6			
Approach LOS			A			A			
Timer	1	2	3	4	5	6	7	8	
Assigned Phs		2				6			
Phs Duration (G+Y+Rc), s		90.0				90.0			
Change Period (Y+Rc), s		4.0				4.0			
Max Green Setting (Gmax), s		86.0				86.0			
Max Q Clear Time (g_c+I1), s		3.3				3.3			
Green Ext Time (p_c), s		12.4				12.4			
Intersection Summary									
HCM 2010 Ctrl Delay			0.5						
HCM 2010 LOS			A						

Appendix F – HCS Ramp Analysis Outputs

RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Information					Site Information				
Analyst	VV	Freeway/Dir of Travel	SR 429 E-W		Agency or Company	GMB Engineers & Planners, Inc.	Junction	CR 435 NB On Ramp	
Date Performed	7/16/2014	Jurisdiction	Orange County		Analysis Time Period	AM Peak Period	Analysis Year	2021	
Project Description					SR 429 at CR 435				
Inputs									
Upstream Adj Ramp	Freeway Number of Lanes, N		2		Downstream Adj Ramp				
<input type="checkbox"/> Yes <input type="checkbox"/> On	Ramp Number of Lanes, N		1		<input type="checkbox"/> Yes <input type="checkbox"/> On				
<input checked="" type="checkbox"/> No <input type="checkbox"/> Off	Acceleration Lane Length, L _A		1100		<input checked="" type="checkbox"/> No <input type="checkbox"/> Off				
L _{up} = ft	Deceleration Lane Length L _D				L _{down} = ft				
V _u = veh/h	Freeway Volume, V _F		1573		V _D = veh/h				
	Ramp Volume, V _R		315						
	Freeway Free-Flow Speed, S _{FF}		70.0						
	Ramp Free-Flow Speed, S _{FR}		40.0						
Conversion to pc/h Under Base Conditions									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p	
Freeway	1573	0.95	Level	10	0	0.952	1.00	1739	
Ramp	315	0.95	Level	11	0	0.948	1.00	350	
UpStream									
DownStream									
Merge Areas					Diverge Areas				
Estimation of v ₁₂					Estimation of v ₁₂				
$V_{12} = V_F (P_{FM})$ (Equation 13-6 or 13-7) P _{FM} = 1.000 using Equation (Exhibit 13-6) V ₁₂ = 1739 pc/h V ₃ or V _{av34} = 0 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)					$V_{12} = V_R + (V_F - V_R)P_{FD}$ (Equation 13-12 or 13-13) P _{FD} = using Equation (Exhibit 13-7) V ₁₂ = pc/h V ₃ or V _{av34} = pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)				
Capacity Checks					Capacity Checks				
	Actual	Capacity		LOS F?		Actual	Capacity		LOS F?
V _{FO}	2089	Exhibit 13-8		No	V _F		Exhibit 13-8		
					V _{FO} = V _F - V _R		Exhibit 13-8		
					V _R		Exhibit 13-10		
Flow Entering Merge Influence Area					Flow Entering Diverge Influence Area				
	Actual	Max Desirable		Violation?		Actual	Max Desirable		Violation?
V _{R12}	2089	Exhibit 13-8	4600:All	No	V ₁₂		Exhibit 13-8		
Level of Service Determination (if not F)					Level of Service Determination (if not F)				
$D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ D _R = 14.7 (pc/mi/ln) LOS = B (Exhibit 13-2)					$D_R = 4.252 + 0.0086 v_{12} - 0.009 L_D$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)				
Speed Determination					Speed Determination				
M _S =	0.264 (Exhibit 13-11)				D _S =	(Exhibit 13-12)			
S _R =	62.6 mph (Exhibit 13-11)				S _R =	mph (Exhibit 13-12)			
S ₀ =	N/A mph (Exhibit 13-11)				S ₀ =	mph (Exhibit 13-12)			
S =	62.6 mph (Exhibit 13-13)				S =	mph (Exhibit 13-13)			

RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Information					Site Information				
Analyst	VV	Freeway/Dir of Travel	SR 429 E-W						
Agency or Company	GMB Engineers & Planners, Inc.	Junction	CR 435 NB On Ramp						
Date Performed	7/16/2014	Jurisdiction	Orange County						
Analysis Time Period	PM Peak Period	Analysis Year	2021						
Project Description SR 429 at CR 435									
Inputs									
Upstream Adj Ramp	Freeway Number of Lanes, N	2	Downstream Adj Ramp						
<input type="checkbox"/> Yes <input type="checkbox"/> On	Ramp Number of Lanes, N	1	<input type="checkbox"/> Yes <input type="checkbox"/> On						
<input checked="" type="checkbox"/> No <input type="checkbox"/> Off	Acceleration Lane Length, L _A	1100	<input checked="" type="checkbox"/> No <input type="checkbox"/> Off						
L _{up} = ft	Deceleration Lane Length L _D		L _{down} = ft						
V _u = veh/h	Freeway Volume, V _F	1217	V _D = veh/h						
	Ramp Volume, V _R	243							
	Freeway Free-Flow Speed, S _{FF}	70.0							
	Ramp Free-Flow Speed, S _{FR}	40.0							
Conversion to pc/h Under Base Conditions									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p	
Freeway	1217	0.95	Level	10	0	0.952	1.00	1345	
Ramp	243	0.95	Level	11	0	0.948	1.00	270	
UpStream									
DownStream									
Merge Areas					Diverge Areas				
Estimation of v ₁₂					Estimation of v ₁₂				
$V_{12} = V_F (P_{FM})$ (Equation 13-6 or 13-7) L _{EQ} = P _{FM} = 1.000 using Equation (Exhibit 13-6) V ₁₂ = 1345 pc/h V ₃ or V _{av34} = 0 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)					$V_{12} = V_R + (V_F - V_R)P_{FD}$ (Equation 13-12 or 13-13) L _{EQ} = P _{FD} = using Equation (Exhibit 13-7) V ₁₂ = pc/h V ₃ or V _{av34} = pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)				
Capacity Checks					Capacity Checks				
	Actual	Capacity		LOS F?		Actual	Capacity		LOS F?
V _{FO}	1615	Exhibit 13-8		No	V _F		Exhibit 13-8		
					V _{FO} = V _F - V _R		Exhibit 13-8		
					V _R		Exhibit 13-10		
Flow Entering Merge Influence Area					Flow Entering Diverge Influence Area				
	Actual	Max Desirable		Violation?		Actual	Max Desirable		Violation?
V _{R12}	1615	Exhibit 13-8	4600:All	No	V ₁₂		Exhibit 13-8		
Level of Service Determination (if not F)					Level of Service Determination (if not F)				
$D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ D _R = 11.1 (pc/mi/ln) LOS = B (Exhibit 13-2)					$D_R = 4.252 + 0.0086 v_{12} - 0.009 L_D$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)				
Speed Determination					Speed Determination				
M _S =	0.253 (Exhibit 13-11)				D _S =	(Exhibit 13-12)			
S _R =	62.9 mph (Exhibit 13-11)				S _R =	mph (Exhibit 13-12)			
S ₀ =	N/A mph (Exhibit 13-11)				S ₀ =	mph (Exhibit 13-12)			
S =	62.9 mph (Exhibit 13-13)				S =	mph (Exhibit 13-13)			

RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Information					Site Information				
Analyst	VV	Freeway/Dir of Travel	SR 429 E-W						
Agency or Company	GMB Engineers & Planners, Inc.	Junction	CR 435 SB Off Ramp						
Date Performed	7/17/2014	Jurisdiction	Orange County						
Analysis Time Period	AM	Analysis Year	Year 2021						
Project Description SR 429 and CR 435									
Inputs									
Upstream Adj Ramp		Freeway Number of Lanes, N	2		Downstream Adj Ramp				
<input type="checkbox"/> Yes <input type="checkbox"/> On		Ramp Number of Lanes, N	1		<input type="checkbox"/> Yes <input type="checkbox"/> On				
<input checked="" type="checkbox"/> No <input type="checkbox"/> Off		Acceleration Lane Length, L _A			<input checked="" type="checkbox"/> No <input type="checkbox"/> Off				
L _{up} =	ft	Deceleration Lane Length L _D	1100		L _{down} =	ft			
V _u =	veh/h	Freeway Volume, V _F	1460		V _D =	veh/h			
		Ramp Volume, V _R	243						
		Freeway Free-Flow Speed, S _{FF}	70.0						
		Ramp Free-Flow Speed, S _{FR}	40.0						
Conversion to pc/h Under Base Conditions									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p	
Freeway	1460	0.95	Level	10	0	0.952	1.00	1614	
Ramp	243	0.95	Level	11	0	0.948	1.00	270	
UpStream									
DownStream									
Merge Areas					Diverge Areas				
Estimation of v ₁₂					Estimation of v ₁₂				
$V_{12} = V_F (P_{FM})$ (Equation 13-6 or 13-7) L _{EQ} = using Equation (Exhibit 13-6) P _{FM} = V ₁₂ = pc/h V ₃ or V _{av34} pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)					$V_{12} = V_R + (V_F - V_R)P_{FD}$ (Equation 13-12 or 13-13) L _{EQ} = P _{FD} = 1.000 using Equation (Exhibit 13-7) V ₁₂ = 1614 pc/h V ₃ or V _{av34} 0 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)				
Capacity Checks					Capacity Checks				
	Actual	Capacity		LOS F?		Actual	Capacity		LOS F?
V _{FO}		Exhibit 13-8			V _F	1614	Exhibit 13-8	4800	No
					V _{FO} = V _F - V _R	1344	Exhibit 13-8	4800	No
					V _R	270	Exhibit 13-10	2100	No
Flow Entering Merge Influence Area					Flow Entering Diverge Influence Area				
	Actual	Max Desirable		Violation?		Actual	Max Desirable		Violation?
V _{R12}		Exhibit 13-8			V ₁₂	1614	Exhibit 13-8	4400:All	No
Level of Service Determination (if not F)					Level of Service Determination (if not F)				
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)					$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$ D _R = 8.2 (pc/mi/ln) LOS = A (Exhibit 13-2)				
Speed Determination					Speed Determination				
M _S = (Exhibit 13-11) S _R = mph (Exhibit 13-11) S ₀ = mph (Exhibit 13-11) S = mph (Exhibit 13-13)					D _S = 0.387 (Exhibit 13-12) S _R = 59.2 mph (Exhibit 13-12) S ₀ = N/A mph (Exhibit 13-12) S = 59.2 mph (Exhibit 13-13)				

RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Information					Site Information					
Analyst	VV				Freeway/Dir of Travel	SR 429 E-W				
Agency or Company	GMB Engineers & Planners, Inc.				Junction	CR 435 SB Off Ramp				
Date Performed	7/17/2014				Jurisdiction	Orange County				
Analysis Time Period	PM				Analysis Year	Year 2021				
Project Description SR 429 and CR 435										
Inputs										
Upstream Adj Ramp		Freeway Number of Lanes, N				2		Downstream Adj Ramp		
<input type="checkbox"/> Yes <input type="checkbox"/> On		Ramp Number of Lanes, N				1		<input type="checkbox"/> Yes <input type="checkbox"/> On		
<input checked="" type="checkbox"/> No <input type="checkbox"/> Off		Acceleration Lane Length, L _A						<input checked="" type="checkbox"/> No <input type="checkbox"/> Off		
L _{up} = ft		Deceleration Lane Length L _D				1100		L _{down} = ft		
V _u = veh/h		Freeway Volume, V _F				1888		V _D = veh/h		
		Ramp Volume, V _R				315				
		Freeway Free-Flow Speed, S _{FF}				70.0				
		Ramp Free-Flow Speed, S _{FR}				40.0				
Conversion to pc/h Under Base Conditions										
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p		
Freeway	1888	0.95	Level	10	0	0.952	1.00	2087		
Ramp	315	0.95	Level	11	0	0.948	1.00	350		
UpStream										
DownStream										
Merge Areas					Diverge Areas					
Estimation of v ₁₂					Estimation of v ₁₂					
$V_{12} = V_F (P_{FM})$ (Equation 13-6 or 13-7) L _{EQ} = using Equation (Exhibit 13-6) P _{FM} = V ₁₂ = pc/h V ₃ or V _{av34} pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)					$V_{12} = V_R + (V_F - V_R)P_{FD}$ (Equation 13-12 or 13-13) L _{EQ} = P _{FD} = 1.000 using Equation (Exhibit 13-7) V ₁₂ = 2087 pc/h V ₃ or V _{av34} 0 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)					
Capacity Checks					Capacity Checks					
	Actual	Capacity		LOS F?		Actual	Capacity		LOS F?	
V _{FO}		Exhibit 13-8			V _F	2087	Exhibit 13-8	4800	No	
					V _{FO} = V _F - V _R	1737	Exhibit 13-8	4800	No	
					V _R	350	Exhibit 13-10	2100	No	
Flow Entering Merge Influence Area					Flow Entering Diverge Influence Area					
	Actual	Max Desirable		Violation?		Actual	Max Desirable		Violation?	
V _{R12}		Exhibit 13-8			V ₁₂	2087	Exhibit 13-8	4400:All	No	
Level of Service Determination (if not F)					Level of Service Determination (if not F)					
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)					$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$ D _R = 12.3 (pc/mi/ln) LOS = B (Exhibit 13-2)					
Speed Determination					Speed Determination					
M _S = (Exhibit 13-11)					D _S = 0.395 (Exhibit 13-12)					
S _R = mph (Exhibit 13-11)					S _R = 59.0 mph (Exhibit 13-12)					
S ₀ = mph (Exhibit 13-11)					S ₀ = N/A mph (Exhibit 13-12)					
S = mph (Exhibit 13-13)					S = 59.0 mph (Exhibit 13-13)					

RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Information					Site Information				
Analyst	VV	Freeway/Dir of Travel	SR 429 E-W						
Agency or Company	GMB Engineers & Planners, Inc.	Junction	CR 435 NB On Ramp						
Date Performed	7/16/2014	Jurisdiction	Orange County						
Analysis Time Period	AM Peak Period	Analysis Year	2035						
Project Description SR 429 at CR 435									
Inputs									
Upstream Adj Ramp		Freeway Number of Lanes, N	2		Downstream Adj Ramp				
<input type="checkbox"/> Yes <input type="checkbox"/> On		Ramp Number of Lanes, N	1		<input type="checkbox"/> Yes <input type="checkbox"/> On				
<input checked="" type="checkbox"/> No <input type="checkbox"/> Off		Acceleration Lane Length, L _A	1100		<input checked="" type="checkbox"/> No <input type="checkbox"/> Off				
L _{up} =	ft	Deceleration Lane Length L _D			L _{down} =	ft			
V _u =	veh/h	Freeway Volume, V _F	2893		V _D =	veh/h			
		Ramp Volume, V _R	467						
		Freeway Free-Flow Speed, S _{FF}	70.0						
		Ramp Free-Flow Speed, S _{FR}	40.0						
Conversion to pc/h Under Base Conditions									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p	
Freeway	2893	0.95	Level	10	0	0.952	1.00	3198	
Ramp	467	0.95	Level	11	0	0.948	1.00	519	
UpStream									
DownStream									
Merge Areas					Diverge Areas				
Estimation of v₁₂					Estimation of v₁₂				
$V_{12} = V_F (P_{FM})$ (Equation 13-6 or 13-7) L _{EQ} = P _{FM} = 1.000 using Equation (Exhibit 13-6) V ₁₂ = 3198 pc/h V ₃ or V _{av34} = 0 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)					$V_{12} = V_R + (V_F - V_R)P_{FD}$ (Equation 13-12 or 13-13) L _{EQ} = P _{FD} = using Equation (Exhibit 13-7) V ₁₂ = pc/h V ₃ or V _{av34} = pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)				
Capacity Checks					Capacity Checks				
	Actual	Capacity		LOS F?		Actual	Capacity		LOS F?
V _{FO}	3717	Exhibit 13-8		No	V _F		Exhibit 13-8		
					V _{FO} = V _F - V _R		Exhibit 13-8		
					V _R		Exhibit 13-10		
Flow Entering Merge Influence Area					Flow Entering Diverge Influence Area				
	Actual	Max Desirable		Violation?		Actual	Max Desirable		Violation?
V _{R12}	3717	Exhibit 13-8	4600:All	No	V ₁₂		Exhibit 13-8		
Level of Service Determination (if not F)					Level of Service Determination (if not F)				
$D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ D _R = 27.3 (pc/mi/ln) LOS = C (Exhibit 13-2)					$D_R = 4.252 + 0.0086 v_{12} - 0.009 L_D$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)				
Speed Determination					Speed Determination				
M _S = 0.393 (Exhibit 13-11) S _R = 59.0 mph (Exhibit 13-11) S ₀ = N/A mph (Exhibit 13-11) S = 59.0 mph (Exhibit 13-13)					D _S = (Exhibit 13-12) S _R = mph (Exhibit 13-12) S ₀ = mph (Exhibit 13-12) S = mph (Exhibit 13-13)				

RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Information					Site Information				
Analyst	VV		Freeway/Dir of Travel	SR 429 E-W					
Agency or Company	GMB Engineers & Planners, Inc.		Junction	CR 435 NB On Ramp					
Date Performed	7/16/2014		Jurisdiction	Orange County					
Analysis Time Period	PM Peak Period		Analysis Year	2035					
Project Description SR 429 at CR 435									
Inputs									
Upstream Adj Ramp		Freeway Number of Lanes, N			2			Downstream Adj Ramp	
<input type="checkbox"/> Yes <input type="checkbox"/> On		Ramp Number of Lanes, N			1			<input type="checkbox"/> Yes <input type="checkbox"/> On	
<input checked="" type="checkbox"/> No <input type="checkbox"/> Off		Acceleration Lane Length, L _A			1100			<input checked="" type="checkbox"/> No <input type="checkbox"/> Off	
L _{up} = ft		Deceleration Lane Length L _D						L _{down} = ft	
V _u = veh/h		Freeway Volume, V _F			2237			V _D = veh/h	
		Ramp Volume, V _R							
		Freeway Free-Flow Speed, S _{FF}			70.0				
		Ramp Free-Flow Speed, S _{FR}			40.0				
Conversion to pc/h Under Base Conditions									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p	
Freeway	2237	0.95	Level	10	0	0.952	1.00	2472	
Ramp		0.95	Level	11	0	0.948	1.00	496	
UpStream									
DownStream									
Merge Areas					Diverge Areas				
Estimation of v ₁₂					Estimation of v ₁₂				
$V_{12} = V_F (P_{FM})$ (Equation 13-6 or 13-7) P _{FM} = 1.000 using Equation (Exhibit 13-6) V ₁₂ = 2472 pc/h V ₃ or V _{av34} = 0 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)					$V_{12} = V_R + (V_F - V_R)P_{FD}$ (Equation 13-12 or 13-13) P _{FD} = using Equation (Exhibit 13-7) V ₁₂ = pc/h V ₃ or V _{av34} = pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)				
Capacity Checks					Capacity Checks				
	Actual	Capacity		LOS F?		Actual	Capacity		LOS F?
V _{FO}	2968	Exhibit 13-8		No	V _F		Exhibit 13-8		
					V _{FO} = V _F - V _R		Exhibit 13-8		
					V _R		Exhibit 13-10		
Flow Entering Merge Influence Area					Flow Entering Diverge Influence Area				
	Actual	Max Desirable		Violation?		Actual	Max Desirable		Violation?
V _{R12}	2968	Exhibit 13-8	4600:All	No	V ₁₂		Exhibit 13-8		
Level of Service Determination (if not F)					Level of Service Determination (if not F)				
$D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ D _R = 21.5 (pc/mi/ln) LOS = C (Exhibit 13-2)					$D_R = 4.252 + 0.0086 v_{12} - 0.009 L_D$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)				
Speed Determination					Speed Determination				
M _S = 0.309 (Exhibit 13-11) S _R = 61.4 mph (Exhibit 13-11) S ₀ = N/A mph (Exhibit 13-11) S = 61.4 mph (Exhibit 13-13)					D _S = (Exhibit 13-12) S _R = mph (Exhibit 13-12) S ₀ = mph (Exhibit 13-12) S = mph (Exhibit 13-13)				

RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Information					Site Information					
Analyst	VV				Freeway/Dir of Travel	SR 429 E-W				
Agency or Company	GMB Engineers & Planners, Inc.				Junction	CR 435 SB Off Ramp				
Date Performed	7/17/2014				Jurisdiction	Orange County				
Analysis Time Period	AM				Analysis Year	Year 2035				
Project Description SR 429 and CR 435										
Inputs										
Upstream Adj Ramp		Freeway Number of Lanes, N				2		Downstream Adj Ramp		
<input type="checkbox"/> Yes <input type="checkbox"/> On		Ramp Number of Lanes, N				1		<input type="checkbox"/> Yes <input type="checkbox"/> On		
<input checked="" type="checkbox"/> No <input type="checkbox"/> Off		Acceleration Lane Length, L _A						<input checked="" type="checkbox"/> No <input type="checkbox"/> Off		
L _{up} = ft		Deceleration Lane Length L _D				1100		L _{down} = ft		
V _u = veh/h		Freeway Volume, V _F				2598		V _D = veh/h		
		Ramp Volume, V _R								
		Freeway Free-Flow Speed, S _{FF}				70.0				
		Ramp Free-Flow Speed, S _{FR}				40.0				
Conversion to pc/h Under Base Conditions										
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p		
Freeway	2598	0.95	Level	10	0	0.952	1.00	2871		
Ramp		0.95	Level	11	0	0.948	1.00	496		
UpStream										
DownStream										
Merge Areas					Diverge Areas					
Estimation of v ₁₂					Estimation of v ₁₂					
$V_{12} = V_F (P_{FM})$ (Equation 13-6 or 13-7) L _{EQ} = using Equation (Exhibit 13-6) P _{FM} = V ₁₂ = pc/h V ₃ or V _{av34} pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)					$V_{12} = V_R + (V_F - V_R)P_{FD}$ (Equation 13-12 or 13-13) L _{EQ} = P _{FD} = 1.000 using Equation (Exhibit 13-7) V ₁₂ = 2871 pc/h V ₃ or V _{av34} 0 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)					
Capacity Checks					Capacity Checks					
	Actual	Capacity		LOS F?		Actual	Capacity		LOS F?	
V _{FO}		Exhibit 13-8			V _F	2871	Exhibit 13-8	4800	No	
					V _{FO} = V _F - V _R	2375	Exhibit 13-8	4800	No	
					V _R	496	Exhibit 13-10	2100	No	
Flow Entering Merge Influence Area					Flow Entering Diverge Influence Area					
	Actual	Max Desirable		Violation?		Actual	Max Desirable		Violation?	
V _{R12}		Exhibit 13-8			V ₁₂	2871	Exhibit 13-8	4400:All	No	
Level of Service Determination (if not F)					Level of Service Determination (if not F)					
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)					$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$ D _R = 19.0 (pc/mi/ln) LOS = B (Exhibit 13-2)					
Speed Determination					Speed Determination					
M _S = (Exhibit 13-11)					D _S = 0.408 (Exhibit 13-12)					
S _R = mph (Exhibit 13-11)					S _R = 58.6 mph (Exhibit 13-12)					
S ₀ = mph (Exhibit 13-11)					S ₀ = N/A mph (Exhibit 13-12)					
S = mph (Exhibit 13-13)					S = 58.6 mph (Exhibit 13-13)					

RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Information					Site Information				
Analyst	VV				Freeway/Dir of Travel	SR 429 E-W			
Agency or Company	GMB Engineers & Planners, Inc.				Junction	CR 435 SB Off Ramp			
Date Performed	7/17/2014				Jurisdiction	Orange County			
Analysis Time Period	PM				Analysis Year	Year 2035			
Project Description SR 429 and CR 435									
Inputs									
Upstream Adj Ramp		Freeway Number of Lanes, N				2		Downstream Adj Ramp	
<input type="checkbox"/> Yes <input type="checkbox"/> On		Ramp Number of Lanes, N				1		<input type="checkbox"/> Yes <input type="checkbox"/> On	
<input checked="" type="checkbox"/> No <input type="checkbox"/> Off		Acceleration Lane Length, L _A						<input checked="" type="checkbox"/> No <input type="checkbox"/> Off	
L _{up} = ft		Deceleration Lane Length L _D				1100		L _{down} = ft	
V _u = veh/h		Freeway Volume, V _F				3360		V _D = veh/h	
		Ramp Volume, V _R							
		Freeway Free-Flow Speed, S _{FF}				70.0			
		Ramp Free-Flow Speed, S _{FR}				40.0			
Conversion to pc/h Under Base Conditions									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF x f _{HV} x f _p	
Freeway	3360	0.95	Level	10	0	0.952	1.00	3714	
Ramp		0.95	Level	11	0	0.948	1.00	643	
UpStream									
DownStream									
Merge Areas					Diverge Areas				
Estimation of v ₁₂					Estimation of v ₁₂				
$V_{12} = V_F (P_{FM})$ (Equation 13-6 or 13-7) L _{EQ} = using Equation (Exhibit 13-6) P _{FM} = V ₁₂ = pc/h V ₃ or V _{av34} pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)					$V_{12} = V_R + (V_F - V_R)P_{FD}$ (Equation 13-12 or 13-13) L _{EQ} = P _{FD} = 1.000 using Equation (Exhibit 13-7) V ₁₂ = 3714 pc/h V ₃ or V _{av34} 0 pc/h (Equation 13-14 or 13-17) Is V ₃ or V _{av34} > 2,700 pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, V _{12a} = pc/h (Equation 13-16, 13-18, or 13-19)				
Capacity Checks					Capacity Checks				
	Actual	Capacity		LOS F?		Actual	Capacity		LOS F?
V _{FO}		Exhibit 13-8			V _F	3714	Exhibit 13-8	4800	No
			V _{FO} = V _F - V _R	3071	Exhibit 13-8	4800	No		
			V _R	643	Exhibit 13-10	2100	No		
Flow Entering Merge Influence Area					Flow Entering Diverge Influence Area				
	Actual	Max Desirable		Violation?		Actual	Max Desirable		Violation?
V _{R12}		Exhibit 13-8			V ₁₂	3714	Exhibit 13-8 4400:All		No
Level of Service Determination (if not F)					Level of Service Determination (if not F)				
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ D _R = (pc/mi/ln) LOS = (Exhibit 13-2)					$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$ D _R = 26.3 (pc/mi/ln) LOS = C (Exhibit 13-2)				
Speed Determination					Speed Determination				
M _S = (Exhibit 13-11)					D _S = 0.421 (Exhibit 13-12)				
S _R = mph (Exhibit 13-11)					S _R = 58.2 mph (Exhibit 13-12)				
S ₀ = mph (Exhibit 13-11)					S ₀ = N/A mph (Exhibit 13-12)				
S = mph (Exhibit 13-13)					S = 58.2 mph (Exhibit 13-13)				

Appendix G – FDOT Generalized LOS Table

Generalized **Peak Hour Directional** Volumes for Florida's
Rural Undeveloped Areas and
Developed Areas Less Than 5,000 Population¹

TABLE 9

12/18/12

INTERRUPTED FLOW FACILITIES						UNINTERRUPTED FLOW FACILITIES					
STATE SIGNALIZED ARTERIALS						FREEWAYS					
Lanes	Median	B	C	D	E	Lanes	B	C	D	E	
1	Undivided	*	670	740	**	2	1,680	2,500	3,040	3,500	
2	Divided	*	1,530	1,580	**	3	2,500	3,720	4,560	5,400	
3	Divided	*	2,360	2,400	**	4	3,360	4,980	6,080	7,200	
Non-State Signalized Roadway Adjustments (Alter corresponding state volumes by the indicated percent.) Non-State Signalized Roadways - 10%						Freeway Adjustments Auxiliary Lanes Present in Both Directions + 1,000					
Median & Turn Lane Adjustments						UNINTERRUPTED FLOW HIGHWAYS					
Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors		Rural Undeveloped					
1	Divided	Yes	No	+5%		Lanes	Median	B	C	D	E
1	Undivided	No	No	-20%		1	Undivided	240	430	740	1,490
Multi	Undivided	Yes	No	-5%		2	Divided	1,340	2,100	2,660	3,020
Multi	Undivided	No	No	-25%		3	Divided	2,020	3,150	4,000	4,530
-	-	-	Yes	+ 5%		Developed Areas					
One-Way Facility Adjustment Multiply the corresponding directional volumes in this table by 1.2						Lanes	Median	B	C	D	E
BICYCLE MODE ² (Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)						1	Undivided	450	850	1,200	1,640
Rural Undeveloped						2	Divided	1,350	2,120	2,730	3,110
Paved Shoulder/Bicycle	Lane Coverage	B	C	D	E	3	Divided	2,020	3,180	4,090	4,670
	0-49%	*	70	110	170	Passing Lane Adjustments Alter LOS B-D volumes in proportion to the passing lane length to the highway segment length					
	50-84%	60	120	180	580	Uninterrupted Flow Highway Adjustments					
	85-100%	140	210	1,000	>1,000	Lanes	Median	Exclusive left lanes	Adjustment factors		
Developed Areas						1	Divided	Yes	+5%		
Paved Shoulder/Bicycle	Lane Coverage	B	C	D	E	Multi	Undivided	Yes	-5%		
	0-49%	*	120	260	840	Multi	Undivided	No	-25%		
	50-84%	100	240	720	1,000	¹ Values shown are presented as peak hour directional volumes for levels of service and are for the automobile/truck modes unless specifically stated. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual and the Transit Capacity and Quality of Service Manual.					
	85-100%	320	1,000	>1,000	**	² Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.					
PEDESTRIAN MODE ² (Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)						* Cannot be achieved using table input value defaults.					
Sidewalk Coverage	Lane Coverage	B	C	D	E	** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.					
	0-49%	*	*	120	460	Source:					
	50-84%	*	80	430	770	Florida Department of Transportation Systems Planning Office www.dot.state.fl.us/planning/systems/sm/los/default.shtm					
	85-100%	180	520	860	>1,000						

Appendix H – HCS Freeway Analysis Outputs

BASIC FREEWAY SEGMENTS WORKSHEET			
General Information		Site Information	
Analyst	VV	Highway/Direction of Travel	SR 429 E-W
Agency or Company	GMB Engineers & Planners	From/To	CR 435 to SR 46
Date Performed	7/17/2014	Jurisdiction	Orange County
Analysis Time Period	PM - WB	Analysis Year	2021
Project Description SR 429 and CR 435			
<input checked="" type="checkbox"/> Oper.(LOS)		<input type="checkbox"/> Des.(N)	
<input type="checkbox"/> Planning Data			
Flow Inputs			
Volume, V	1888	veh/h	Peak-Hour Factor, PHF 0.95
AADT		veh/day	%Trucks and Buses, P _T 5
Peak-Hr Prop. of AADT, K			%RVs, P _R 0
Peak-Hr Direction Prop, D			General Terrain: Level
DDHV = AADT x K x D		veh/h	Grade % Length mi Up/Down %
Calculate Flow Adjustments			
f _p	1.00	E _R	1.2
E _T	1.5	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.976	
Speed Inputs		Calc Speed Adj and FFS	
Lane Width	ft		
Rt-Side Lat. Clearance	ft	f _{LW}	mph
Number of Lanes, N	2	f _{LC}	mph
Total Ramp Density, TRD	ramps/mi	TRD Adjustment	mph
FFS (measured)	70.0	FFS	70.0
Base free-flow Speed, BFFS	mph		
LOS and Performance Measures		Design (N)	
<u>Operational (LOS)</u>		<u>Design (N)</u>	
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)	1019 pc/h/ln	Design LOS	
S	70.0 mph	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)	pc/h/ln
D = v _p / S	14.6 pc/mi/ln	S	mph
LOS	B	D = v _p / S	pc/mi/ln
		Required Number of Lanes, N	
Glossary		Factor Location	
N - Number of lanes	S - Speed	E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9
v _p - Flow rate	FFS - Free-flow speed	f _p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v _p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

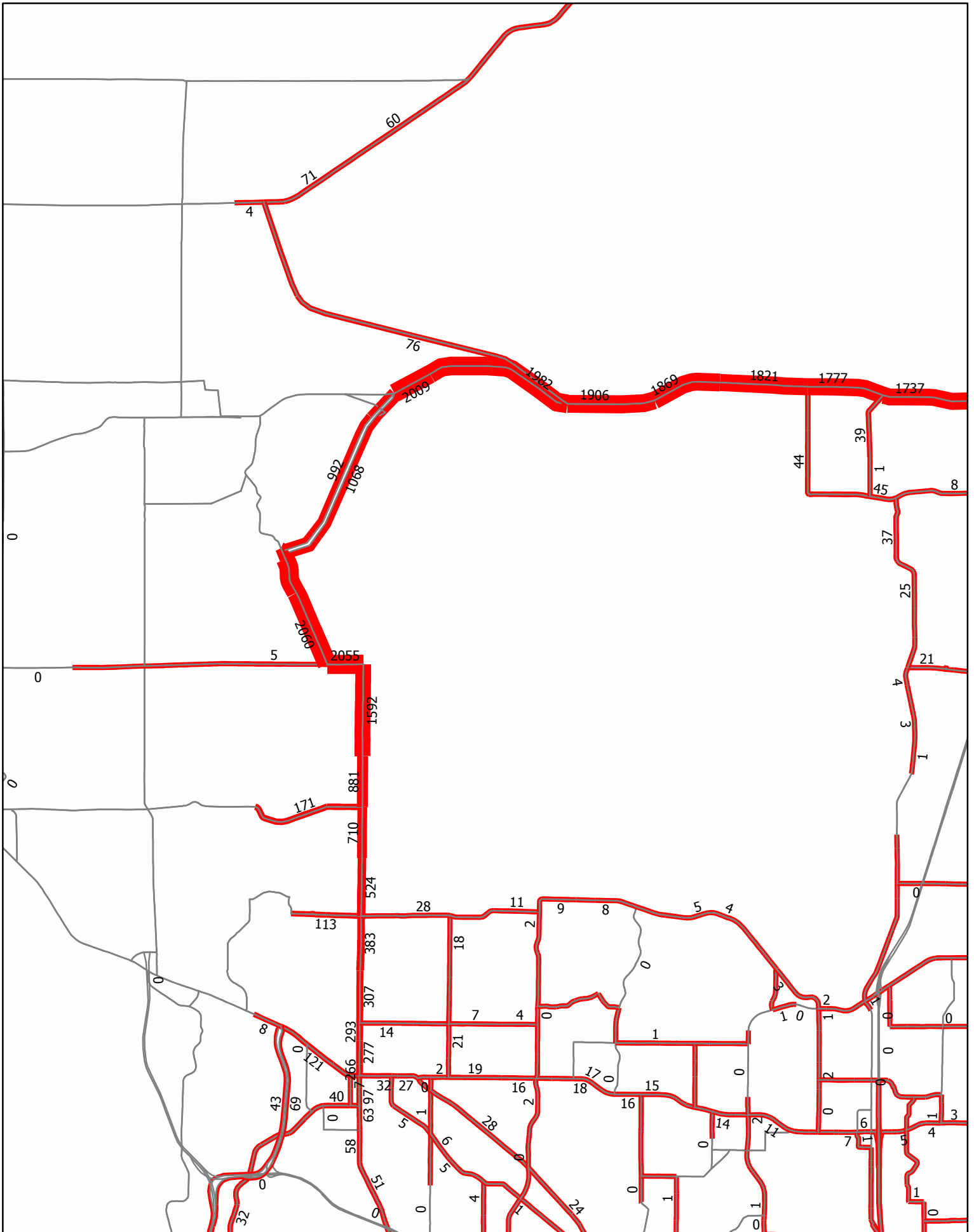
BASIC FREEWAY SEGMENTS WORKSHEET			
General Information		Site Information	
Analyst	VV	Highway/Direction of Travel	SR 429 E-W
Agency or Company	GMB Engineers & Planners	From/To	CR 435 to SR 453
Date Performed	7/17/2014	Jurisdiction	Orange County
Analysis Time Period	PM - WB	Analysis Year	2021
Project Description SR 429 and CR 435			
<input checked="" type="checkbox"/> Oper.(LOS)		<input type="checkbox"/> Des.(N)	
<input type="checkbox"/> Planning Data			
Flow Inputs			
Volume, V	1573	veh/h	Peak-Hour Factor, PHF 0.95
AADT		veh/day	%Trucks and Buses, P _T 5
Peak-Hr Prop. of AADT, K			%RVs, P _R 0
Peak-Hr Direction Prop, D			General Terrain: Level
DDHV = AADT x K x D		veh/h	Grade % Length mi
			Up/Down %
Calculate Flow Adjustments			
f _p	1.00	E _R	1.2
E _T	1.5	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.976
Speed Inputs		Calc Speed Adj and FFS	
Lane Width	ft		
Rt-Side Lat. Clearance	ft	f _{LW}	mph
Number of Lanes, N	2	f _{LC}	mph
Total Ramp Density, TRD	ramps/mi	TRD Adjustment	mph
FFS (measured)	70.0	FFS	70.0
Base free-flow Speed, BFFS	mph		mph
LOS and Performance Measures		Design (N)	
<u>Operational (LOS)</u>		<u>Design (N)</u>	
v _p = (V or DDHV) / (PHF x N x f _{HV})	849	Design LOS	
x f _p)		v _p = (V or DDHV) / (PHF x N x f _{HV})	pc/h/ln
S	70.0	x f _p)	
D = v _p / S	12.1	S	mph
LOS	B	D = v _p / S	pc/mi/ln
		Required Number of Lanes, N	
Glossary		Factor Location	
N - Number of lanes	S - Speed	E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9
v _p - Flow rate	FFS - Free-flow speed	f _p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v _p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

BASIC FREEWAY SEGMENTS WORKSHEET			
General Information		Site Information	
Analyst	VV	Highway/Direction of Travel	SR 429 E-W
Agency or Company	GMB Engineers & Planners	From/To	CR 435 to SR 453
Date Performed	7/17/2014	Jurisdiction	Orange County
Analysis Time Period	PM - WB	Analysis Year	2035
Project Description SR 429 and CR 435			
<input checked="" type="checkbox"/> Oper.(LOS)		<input type="checkbox"/> Des.(N)	
<input type="checkbox"/> Planning Data			
Flow Inputs			
Volume, V	2893	veh/h	Peak-Hour Factor, PHF 0.95
AADT		veh/day	%Trucks and Buses, P _T 5
Peak-Hr Prop. of AADT, K			%RVs, P _R 0
Peak-Hr Direction Prop, D			General Terrain: Level
DDHV = AADT x K x D		veh/h	Grade % Length mi Up/Down %
Calculate Flow Adjustments			
f _p	1.00	E _R	1.2
E _T	1.5	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.976	
Speed Inputs		Calc Speed Adj and FFS	
Lane Width	ft		
Rt-Side Lat. Clearance	ft	f _{LW}	mph
Number of Lanes, N	2	f _{LC}	mph
Total Ramp Density, TRD	ramps/mi	TRD Adjustment	mph
FFS (measured)	70.0	FFS	70.0
Base free-flow Speed, BFFS	mph		
LOS and Performance Measures		Design (N)	
<u>Operational (LOS)</u>		<u>Design (N)</u>	
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)	1561 pc/h/ln	Design LOS	
S	68.5 mph	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)	pc/h/ln
D = v _p / S	22.8 pc/mi/ln	S	mph
LOS	C	D = v _p / S	pc/mi/ln
		Required Number of Lanes, N	
Glossary		Factor Location	
N - Number of lanes	S - Speed	E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9
v _p - Flow rate	FFS - Free-flow speed	f _p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v _p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

BASIC FREEWAY SEGMENTS WORKSHEET			
General Information		Site Information	
Analyst	VV	Highway/Direction of Travel	SR 429 E-W
Agency or Company	GMB Engineers & Planners	From/To	CR 435 to SR 46
Date Performed	7/17/2014	Jurisdiction	Orange County
Analysis Time Period	PM - WB	Analysis Year	2035
Project Description SR 429 and CR 435			
<input checked="" type="checkbox"/> Oper.(LOS)		<input type="checkbox"/> Des.(N)	
<input type="checkbox"/> Planning Data			
Flow Inputs			
Volume, V	3360	veh/h	Peak-Hour Factor, PHF 0.95
AADT		veh/day	%Trucks and Buses, P _T 5
Peak-Hr Prop. of AADT, K			%RVs, P _R 0
Peak-Hr Direction Prop, D			General Terrain: Level
DDHV = AADT x K x D		veh/h	Grade % Length mi Up/Down %
Calculate Flow Adjustments			
f _p	1.00	E _R	1.2
E _T	1.5	f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)] 0.976	
Speed Inputs		Calc Speed Adj and FFS	
Lane Width	ft		
Rt-Side Lat. Clearance	ft	f _{LW}	mph
Number of Lanes, N	2	f _{LC}	mph
Total Ramp Density, TRD	ramps/mi	TRD Adjustment	mph
FFS (measured)	70.0	FFS	70.0
Base free-flow Speed, BFFS	mph		
LOS and Performance Measures		Design (N)	
<u>Operational (LOS)</u>		<u>Design (N)</u>	
v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)	1813 pc/h/ln	Design LOS	
S	65.6 mph	v _p = (V or DDHV) / (PHF x N x f _{HV} x f _p)	pc/h/ln
D = v _p / S	27.6 pc/mi/ln	S	mph
LOS	D	D = v _p / S	pc/mi/ln
		Required Number of Lanes, N	
Glossary		Factor Location	
N - Number of lanes	S - Speed	E _R - Exhibits 11-10, 11-12	f _{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E _T - Exhibits 11-10, 11-11, 11-13	f _{LC} - Exhibit 11-9
v _p - Flow rate	FFS - Free-flow speed	f _p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v _p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

Appendix I – Select Link Analysis Model Plots

Year 2015 CFRPM5.1 - - Select Link Volumes - Wekiva Parkway Study



Year 2035 CFRPM5.1 - Select Link Volumes - Wekiva Parkway Study (Build)

