CDM Smith

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Subject: **Project Traffic Analysis Memorandum**
SR 429 and Binion Road Interchange PD&E Study (Project # 429-309)

1.0 Overview

1.1 Background

As part of the 2045 Central Florida Expressway Authority (CFX) Master Plan stakeholder outreach efforts, the City of Apopka asked CFX to consider a new interchange on SR 429 connecting to Binion Road. In early 2021, the City of Apopka reviewed a new 365-acre mixed-use development project called The Ridge at Lake Bronson, located between Ocoee Apopka Road and Binion Road near the system-to-system interchange of SR 429, SR 414, and SR 451. The City also has 29 other recently approved and planned developments within the vicinity of the SR 429 corridor. These developments will increase population, employment, and traffic in the area. A direct access to SR 429 is expected to reduce congestion on local roads and relief adjacent interchanges. **Figure 1.1** is a map of the proposed interchange location in the regional context. The proposed interchange is located less than a mile north of SR 414 in west Orange County. It will include ramps to and from the north of SR 429 only, that will terminate at the Binion Road and Boy Scout Road intersection.

In Summer 2022, CFX initiated a Project Development and Environment (PD&E) study for the proposed partial interchange. This Project Traffic Analysis Memorandum is prepared to support the PD&E study. It provides existing conditions data, future traffic forecasts, and operational analysis results for the 2022 existing, 2025 opening and 2045 design year conditions.
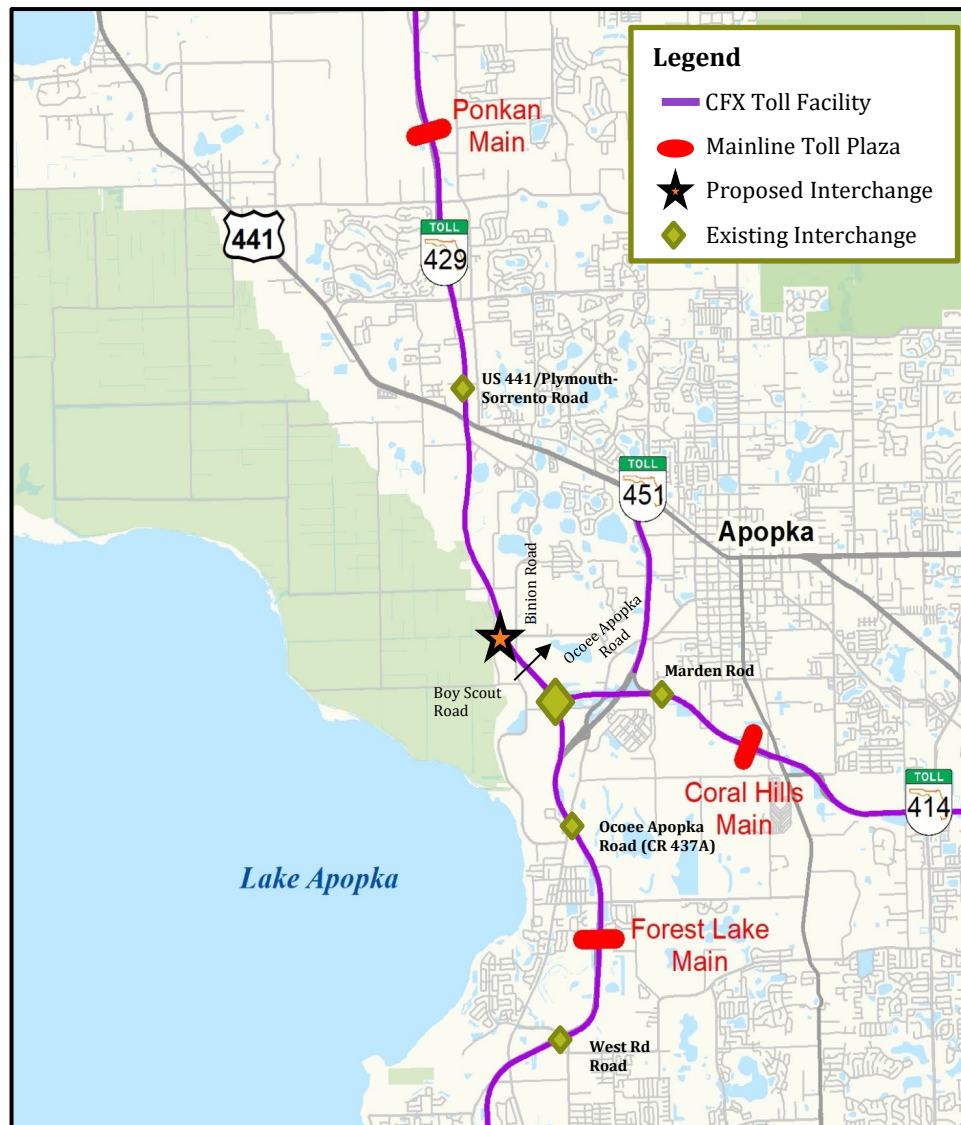
1.2 Analysis Area of Influence

The analysis Area of Influence (AOI) for the proposed interchange is depicted on **Figure 1.2**. It includes the following existing facilities:
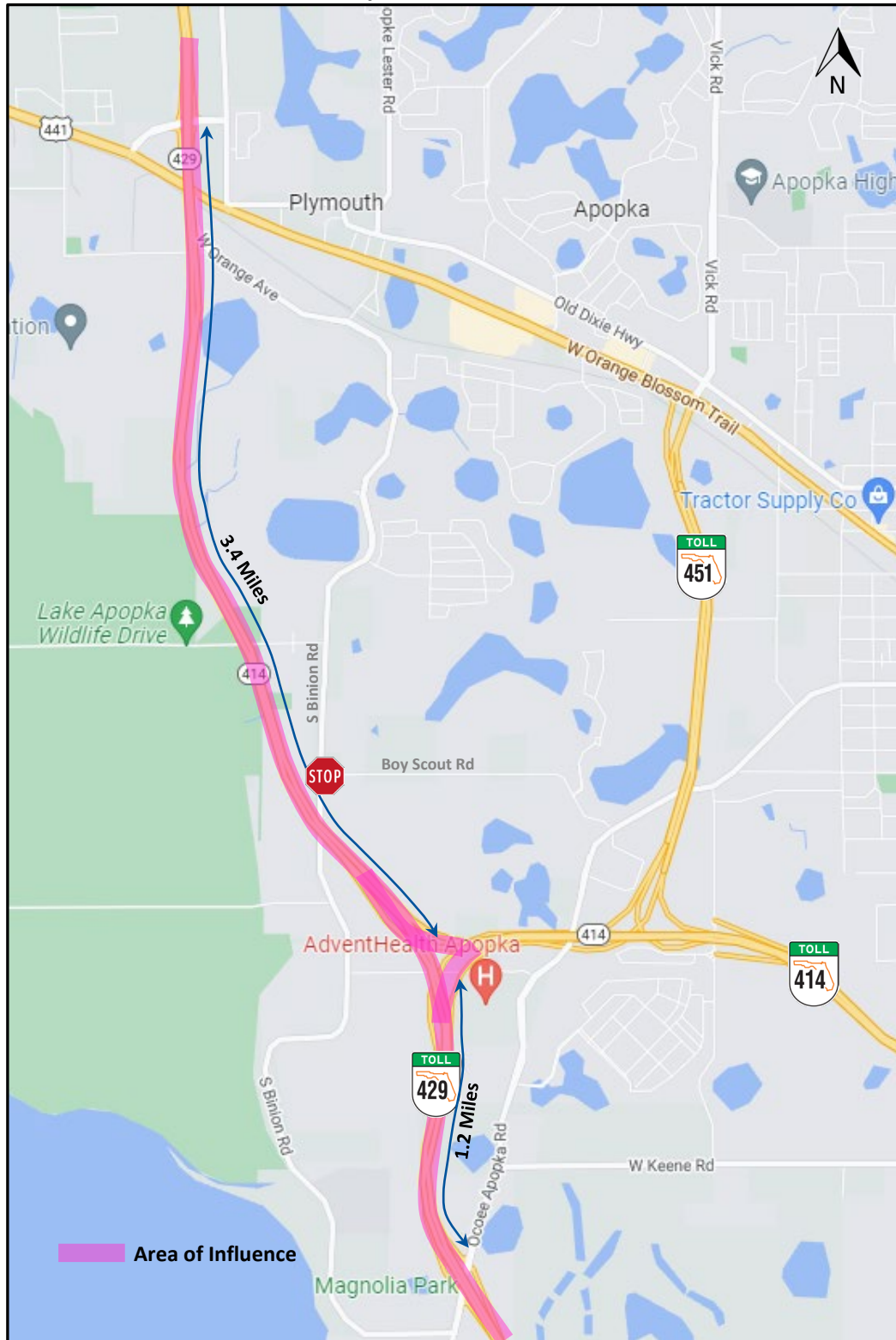
- SR 429 mainline segments from south of Ocoee Apopka Road to north of US 441 and interchange ramps
- Binion Road and Boy Scout Road intersection

For Build conditions, the analysis also included the proposed partial interchange at SR 429 and Binion Road.

Figure 1.1
Project Location

Figure 1.2
Analysis Area of Influence

1.3 Operational Analysis Methodology

The analysis documented in this memorandum was conducted for the 2022 existing, 2025 opening and 2045 design years. A Volume to Capacity (V/C) analysis was conducted for the SR 429 mainline segments and ramp roadways. The Binion Road and Boy Scout Road intersection was evaluated based on Level of Service (LOS)/delay.

The freeway segments V/C analysis was based on the LOS D maximum service volumes published in the 2020 Florida Department of Transportation (FDOT) Quality and LOS Handbook. The analysis for ramp roadways was based on LOS E targets from the Highway Capacity Manual (HCM) 7th Edition. The FDOT and HCM targets were adjusted for local conditions such as speed, truck proportion and Peak Hour Factor (PHF). Intersections were evaluated using Synchro Version 11, based on the HCM 7th Edition LOS and the delay targets presented in **Tables 1.1** and **1.2**. Unlike the HCM, Synchro has additional procedures for estimating control delay, such as estimation of right turn on red and queue delay associated with starvation and spillback. Thus, Synchro is expected to yield more accurate results than HCM because of these additional refinements.

Table 1.1
Signalized Intersection HCM 7th Edition Level of Service Criteria

Control Delay (s/veh)	LOS by Volume-to-Capacity Ratio*	
	≤1.0	>1.0
≤10	A	F
>10-20	B	F
>20-35	C	F
>35-55	D	F
>55-80	E	F
>80	F	F

*For approach-based and intersection wide assessments, LOS is defined solely by control delay.

Table 1.2
Unsignalized Intersection HCM 7th Edition Level of Service Criteria

Control Delay (s/veh)	LOS by Volume-to-Capacity Ratio	
	≤1.0	>1.0
0-10	A	F
>10-15	B	F
>15-25	C	F
>25-35	D	F
>35-50	E	F
>50	F	F

The LOS criteria apply to each lane on a given approach and to each approach on the minor street.

LOS is not calculated for major-street approaches or for the intersection as a whole.

2.0 Existing Conditions

2.1 Roadway Facilities

SR 429 is a north-south, limited-access tolled facility that forms a portion of the belt route system around the Orlando metro area. This facility begins at I-4 to the south, close to Champions Gate, and ends at US 441 to the north in South Apopka. SR 429 is designated as Wekiva Parkway north of US 441. The final link in the Central Florida Beltway - the extension of the Wekiva Parkway - is being built in stages by CFX and FDOT. The Wekiva Parkway extension is scheduled to be completed in 2023. CFX owns and operates most of the existing SR 429 corridor, including the segment within the project location. FTE owns and operates the portion of SR 429 from I-4 to Seidel Road.

The SR 429 mainline south of Ocoee Apopka Road and north of US 441 has two 12-foot lanes and 10-foot inside and outside shoulders in each direction. The segment between Ocoee Apopka Road and SR 414 has two 12-foot lanes, one auxiliary lane, and 10-foot inside and outside shoulders in each direction. From SR 414 to US 441, the SR 429 mainline has three 12-foot lanes and 10-foot inside and outside shoulders in each direction. The posted speed limit within the study area is 70 mph. SR 429 forms a diamond interchange with Ocoee Apopka Road, a system-to system connection with SR 414 and a diamond interchange with US 441 via a connector road.

Binion Road is a two-lane, undivided rural collector which runs north-south. It serves mostly residential uses. It starts on the west side of Ocoee Apopka Road, runs north, and ends at the intersection with Pickford Circle/Lake View Drive. The posted speed limit within the study area is 40 mph.

Boy Scout Road is an east-west local road that terminates at Binion Road at a T-intersection. It is a two-lane road with a posted speed of 45 mph within the study area.

Existing conditions lane geometry at the Binion Road and Boy Scout Road intersection is depicted on **Figure 2.1**. Lane geometry information was obtained from high resolution aerial maps and field reviews.

Figure 2.1
2022 (Existing) Intersection Lane Geometry and Control
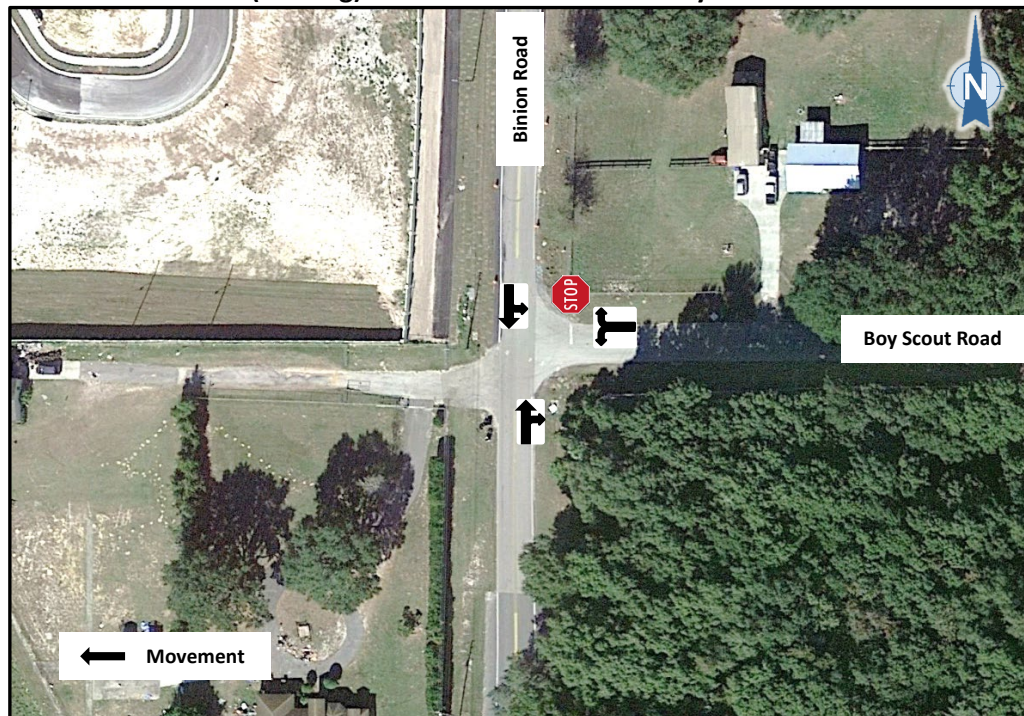
2.2 Existing Traffic Data and Operations

Traffic volumes for SR 429 at Forest Lake mainline plaza and tolled ramps at Ocoee Apopka Road for 2022 were obtained from transaction data. Traffic data for non-tolled ramps were obtained from the 2021 CFX Traffic Data and Statistics Manual and the Florida Traffic Online web application. Traffic data for Binion Road was obtained from the Orange County Traffic Counts web application for 2021. To calculate the 2022 existing peak hour volumes, an analysis was conducted for the daily counts and the four highest consecutive 15-minute periods in the morning and evening. Seasonal and axle adjustment factors were applied to the data where necessary. Growth rates estimated from historical data were used where applicable. The data were then aggregated and balanced to ensure continuity of flow and consistency. A summary of the 2022 existing traffic and LOS D V/C ratios is presented in **Table 2.1**. The results show that the roadway segments and ramps within the AOI have a LOS D V/C ratio of 0.8 or less in year 2022, indicating that there are no capacity concerns in the area under existing conditions.

Figure 2.2 shows the final 2022 existing year peak hour volumes in the AM and PM conditions at the Binion Road and Boy Scout Road intersection. Typical peak hour traffic is low at the intersection.

The intersection LOS and delay was evaluated using the Synchro software, Version 11. Queue lengths were estimated using SimTraffic, the microsimulation companion of Synchro, to better account for vehicle interactions. The analysis results for the 2022 AM and PM peak hours are summarized in **Table 2.2**. Detailed Synchro/SimTraffic output reports are provided in **Appendix A**. The results show that all movements are currently operating at an acceptable LOS C or better in both the AM and PM peak hours.

Table 2.1
**2022 Traffic and Volume to Capacity Ratios**

Location	SR 429	Lanes /Direction	AADT		AM Peak Hour		PM Peak Hour		LOS D Volume/Capacity (V/C)*					
									AADT		AM Peak Hour		PM Peak Hour	
			SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB
Ponkan Mainline Plaza		2	11,820	11,160	755	484	797	958	0.3	0.3	0.2	0.1	0.2	0.2
US 441		1	500	500	41	46	46	41	0.0	0.0	0.0	0.0	0.0	0.0
		2	8,210	8,740	782	693	693	782	0.2	0.2	0.2	0.2	0.2	0.2
		3	19,530	19,400	1,495	1,131	1,444	1,698	0.3	0.3	0.3	0.2	0.2	0.3
SR 414		2	6,200	6,100	643	526	526	643	0.2	0.2	0.2	0.1	0.1	0.2
		2	16,720	16,650	1,744	1,427	1,427	1,744	0.4	0.4	0.5	0.4	0.4	0.5
		2+1 Aux	30,050	29,950	2,596	2,031	2,345	2,799	0.6	0.6	0.5	0.4	0.5	0.6
Ocoee Apopka Road		1	1,250	1,300	95	111	108	96	0.1	0.1	0.1	0.1	0.1	0.1
		1	2,750	2,750	237	203	207	233	0.1	0.1	0.1	0.1	0.1	0.1
Forest Lake Mainline Plaza		2	31,550	31,400	2,738	2,124	2,444	2,937	0.8	0.8	0.7	0.5	0.6	0.8
Binion Road			SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB
North of Boy Scout Road		1	3,500	3,600	378	302	311	368	0.4	0.4	0.4	0.3	0.4	0.4
South of Boy Scout Road		1	2,600	2,600	284	227	226	302	0.3	0.3	0.3	0.3	0.3	0.3
Boy Scout Road			EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
East of Binion Road		1	2,400	2,300	255	236	245	226	0.3	0.3	0.3	0.3	0.3	0.3

AADT and peak hour volumes based on days of the week and peak periods with the highest demand.

Values in purple indicate peak hour directional volumes

*LOS D V/C for freeway mainline and arterials. LOS E (capacity) V/C for ramps.

Figure 2.2
2022 (Existing) AM and PM Peak Hour Intersection Volumes

Binion Road

189 (160)
189 (151)

STOP

141 (160)
95 (66)

Boy Scout Road

161 (208)
66 (94)

AM (PM) Peak Hour Volume
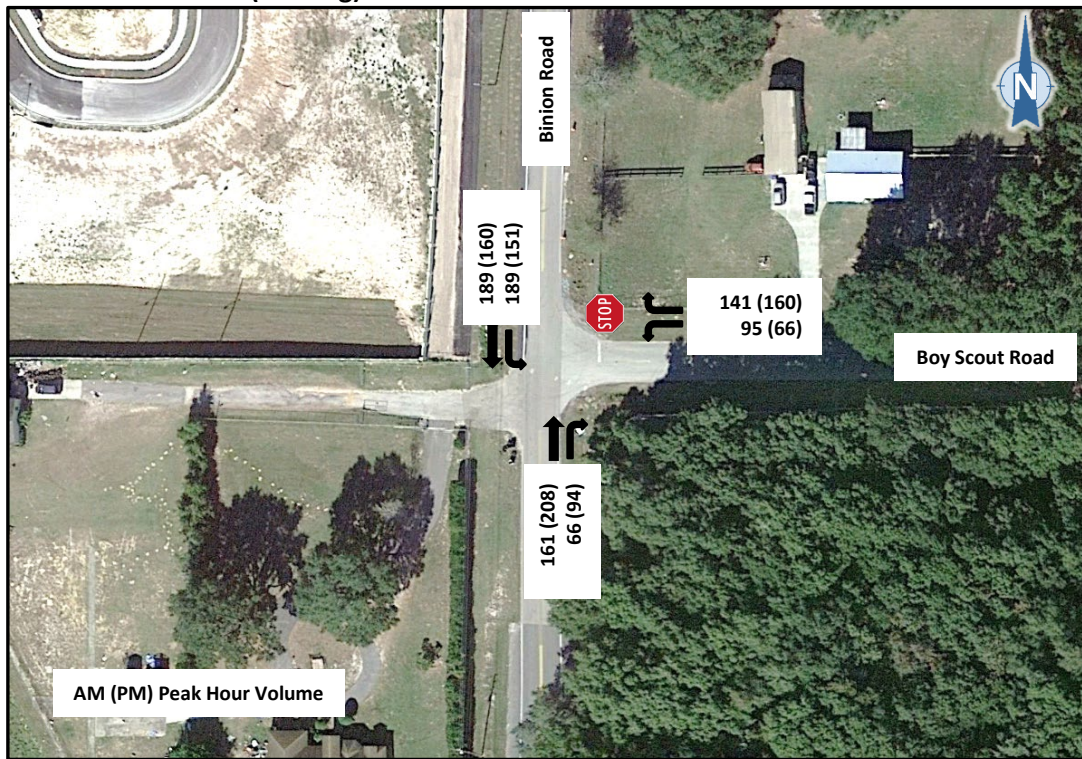
Table 2.2
2022 Existing AM and PM Peak Hour Intersection LOS/Delay (sec)

Intersection	Approach	Movement	LOS	Delay (Seconds)	Maximum Queue Length (Feet)*
			AM (PM)	AM (PM)	AM (PM)
Binion Road and Boy Scout Road (Unsignalized)	Eastbound	Left	-	-	-
		Through	-	-	-
		Right	-	-	-
	Westbound	Left	C (C)	21.5 (18.3)	141 (160)
		Through	-	-	-
		Right	C (C)	21.5 (18.3)	141 (160)
	Northbound	Left	-	-	-
		Through	A (A)	0.0 (0.0)	41 (22)
		Right	A (A)	0.0 (0.0)	41 (22)
	Southbound	Left	A (A)	1.5 (1.3)	95 (72)
		Through	A (A)	4.9 (4.8)	95 (72)
		Right	-	-	-
Overall Intersection			*C (C)*	*21.5 (18.3)*	-

*SimTraffic maximum queue length

3.0 Future Conditions

3.1 Travel Demand Model

The CFX travel demand model selected for this analysis was based on the Central Florida Regional Planning Model (CFRPM) version 6.1, covering ten counties. Using the regional model for the SR 414 Expressway Extension PD&E study as a starting point, updates and refinements with special emphasis on the I-4 corridor and SR 429 were made for better base year validation of year 2017. This model was designated CFX Model 414 Traffic and Revenue (T&R) and used for the SR 429 and Binion Road interchange PD&E study. Documentation for the base-year and future-year travel demand models can be found in the *Planning Level Traffic and Revenue Estimates for SR 429 and Binion Road Interchange* letter report Travel Demand Modeling Section provided in **Appendix B**.

3.2 Traffic Factors

The future traffic factors for this study are presented in **Table 3.1**. The Design Hour Factor (K) is the proportion of the AADT that occurs during the design hour. The Directional Distribution Factor (D) is the proportion of traffic traveling in the peak direction during the design hour. The K and D factors represent the traffic demand a roadway is typically designed to accommodate.

Table 3.1
Future Traffic Factors

Segment	Traffic Factors			
	K	D	T_{24}	DHT
Freeway Mainline				
SR 429	9.5%	55.0%	3.6%	2.0%
SR 429 Ramps				
US 441				
Southbound Off-ramp and Northbound On-ramp	8.7%	52.8%	3.6%	2.0%
Southbound On-ramp and Northbound Off-ramp	8.7%	52.8%	3.6%	2.0%
Binion Road				
Southbound Off-ramp and Northbound On-ramp	9.5%	53.0%	3.6%	2.0%
SR 414				
Southbound Off-ramp and Northbound On-ramp	9.5%	55.0%	3.6%	2.0%
Southbound On-ramp and Northbound Off-ramp	9.5%	55.0%	3.6%	2.0%
Arterials				
Binion Road	9.0%	55.5%	6.2%	4.0%
Boy Scout Road	9.0%	52.2%	6.2%	4.0%

For future conditions analysis, this study used the standard K factor for the SR 429 and arterials. Consistent with FDOT, CFX has developed standard K factors for use in planning and design applications. The D factors were originally calculated using count data and adjusted where

applicable based on future projections to account for anticipated changes in land use and traffic patterns. The daily truck (T_{24}) factors were obtained from the Florida Traffic Online web application for Portable Traffic Monitoring Site (PTMS) 75-0665, located on the SR 429 mainline, north of Ocoee Apopka Road and PTMS 75-8335, located on Binion Road, south of Lake View Drive. The Design Hour Truck (DHT) factor is the proportion of trucks within the peak hour and is assumed to be half of the T_{24} proportion rounded up to the nearest whole number for this study. A PHF of 0.95 was assumed for future conditions.

3.3 Traffic Forecasts

Traffic projections were developed using the updated CFX Model 414 T&R for years 2025 and 2045, corresponding to the opening and design analysis years for the PD&E study, respectively. The ongoing widening of the SR 429 mainline to three lanes and Part Time Shoulder Use (PTSU) per direction from West Road to SR 414 (429-153) was considered in the analysis, and other planned and programmed improvements within the study area. The Peak Season Weekday Average Daily Traffic (PSWADT) from the model was converted to AADT by applying a Model Output Calibration Factor (MOCF) of 0.98. The future No Build AADT were compared against the year 2017 validated model to establish linear model growth rates. Using historical growth rates and model growth rates, the 2025 and 2045 No Build AADT were generated based on the final 2022 existing conditions profile. The Build AADT were refined by comparing against the No Build estimates. Directional Design Hour Volumes (DDHV) for the No Build and Build alternatives were generated by applying the project K and D traffic factors. Finally, adjustments were made to balance volumes to ensure continuity of flow and for reasonableness where applicable.

The final mainline and ramps AADT and the corresponding DDHV for years 2025 and 2045 are provided in **Tables 3.2** and **3.3** for the No Build and Build conditions, respectively. The bold values represent the mainline volumes, and the non-bold values represent ramp volumes. The data shows that traffic will primarily be diverted from the Ocoee Apopka Road and US 441 ramps to/from the north of SR 429 to the proposed Binion Road ramps. A small diversion is expected from the SR 414 ramps to/from north and there will be a small amount of induced trips due to the proposed ramps.
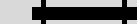
Future year turn movement volumes for the Binion Road and Boy Scout Road/SR 429 Ramps terminal intersection were developed using the projected ramp DDHV. Turn proportions were estimated using peak period data from the model and adjusted based on anticipated changes in land use and traffic patterns where applicable. The projected 2025 and 2045 design hour volumes are presented in **Figures 3.1** through **3.4** for the No Build and Build conditions. Generally, the 2045 DDHV at the Binion Road and Boy Scout Road intersection are expected to be low in the future during typical peak hours, even with the new SR 429 ramps to and from the north.

Table 3.2
No Build Traffic Forecasts

Location	SR 429	2025 AADT	2025 AM - DDHV SB	2025 AM - DDHV NB	2025 PM - DDHV SB	2025 PM - DDHV NB	2045 AADT	2045 AM - DDHV SB	2045 AM - DDHV NB	2045 PM - DDHV SB	2045 PM - DDHV NB
Ponkan Mainline Plaza		32,200	1,850	1,530	1,530	1,850	82,200	4,300	3,640	3,640	4,300
US 441		3,500	150	170	170	150	10,200	420	470	470	420
		20,200	970	860	860	970	30,700	1,420	1,260	1,260	1,420
		48,900	2,670	2,220	2,220	2,670	102,700	5,300	4,430	4,430	5,300
SR 414		18,800	1,030	850	850	1,030	34,200	1,790	1,460	1,460	1,790
		37,100	2,040	1,670	1,670	2,040	47,200	2,470	2,020	2,020	2,470
		67,200	3,680	3,040	3,040	3,680	115,700	5,980	4,990	4,990	5,980
Ocoee Apopka Road		4,100	190	210	210	190	10,900	490	550	550	490
		7,800	410	360	360	410	13,900	710	630	630	710
Forest Lake Mainline Plaza		70,900	3,900	3,190	3,190	3,900	118,700	6,200	5,070	5,070	6,200

Values in purple indicate peak hour directional volumes

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Table 3.3
Build Traffic Forecasts

Location	SR 429	2025						2045					
		AADT	AM - DDHV		PM - DDHV			AADT	AM - DDHV		PM - DDHV		
			SB	NB	SB	NB			SB	NB	SB	NB	
Ponkan Mainline Plaza		32,300	1,850	1,540	1,540	1,850		82,500	4,330	3,680	3,680	4,330	
US 441		2,800	120	140	140	120		8,200	340	380	380	340	
		20,300	980	870	870	980		30,800	1,420	1,260	1,260	1,420	
		49,800	2,710	2,270	2,270	2,710		105,100	5,410	4,560	4,560	5,410	
Binion Road		1,800	80	90	90	80		4,600	210	230	230	210	
		48,000	2,630	2,180	2,180	2,630		100,500	5,200	4,330	4,330	5,200	
SR 414		18,600	1,020	840	840	1,020		33,900	1,770	1,450	1,450	1,770	
		37,100	2,040	1,670	1,670	2,040		47,200	2,470	2,020	2,020	2,470	
		66,500	3,650	3,010	3,010	3,650		113,800	5,900	4,900	4,900	5,900	
Ocoee Apopka Road		3,400	160	180	180	160		9,000	410	460	460	410	
		7,800	410	360	360	410		13,900	710	630	630	710	
Forest Lake Mainline Plaza		70,900	3,900	3,190	3,190	3,900		118,700	6,200	5,070	5,070	6,200	

Values in purple indicate peak hour directional volumes

Figure 3.1
2025 AM (PM) No Build DDHV

Binion Road

200 (170)
200 (160)
400 (330)
320 (390)

150 (170)
100 (70)
250 (240)   Boy Scout Road
270 (260)

170 (220)
70 (100)

300 (240)
240 (320)
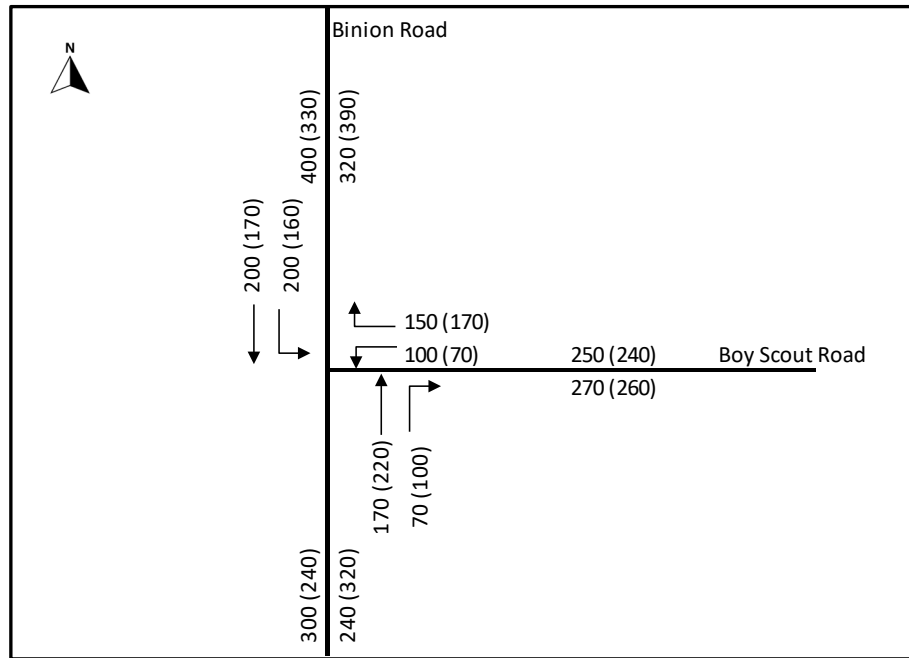
Figure 3.2
2045 AM (PM) No Build DDHV

Binion Road

400 (330)
340 (280)
740 (610)
590 (720)

250 (290)
180 (130)
430 (420)   Boy Scout Road
470 (460)

340 (430)
130 (180)

580 (460)
470 (610)
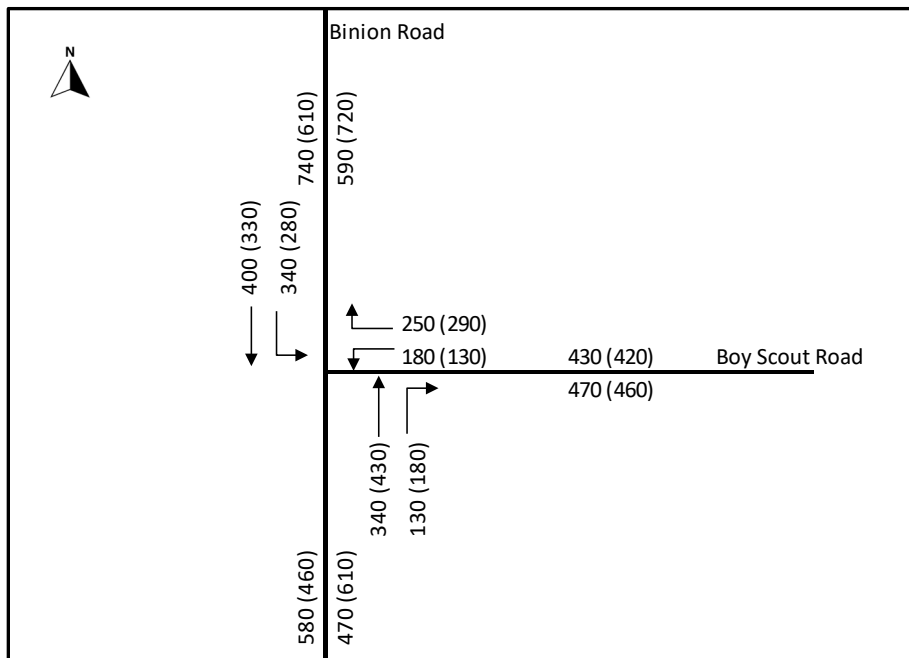
Figure 3.3
2025 AM (PM) Build DDHV

N

Binion Road

SR 429 Ramps

370 (300)
290 (360)

10 (10)
180 (140)
180 (150)

90 (80)
140 (150)
30 (40)
100 (70)   270 (260)   Boy Scout Road

80 (90)
10 (10)
40 (30)
30 (50)
290 (280)

50 (30)
140 (200)
70 (100)

310 (260)
260 (330)
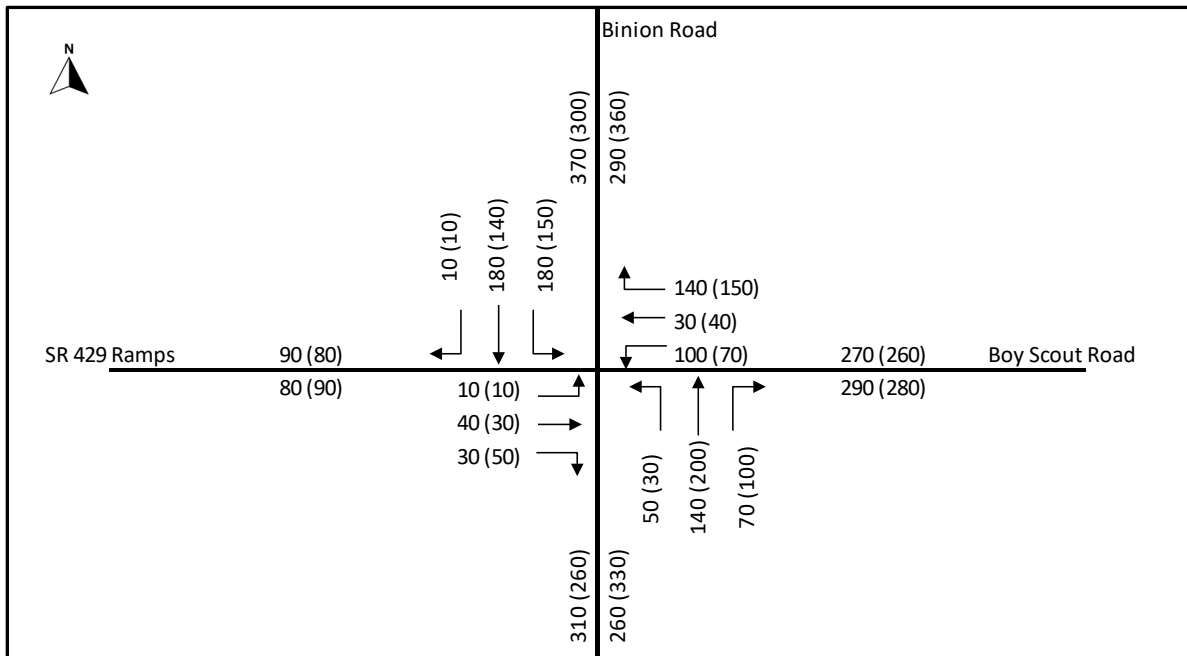
Figure 3.4
2045 AM (PM) Build DDHV

N

Binion Road

SR 429 Ramps

680 (550)
530 (660)

50 (60)
330 (250)
300 (240)

230 (210)
210 (250)
70 (70)
180 (130)   460 (450)   Boy Scout Road

210 (230)
60 (50)
70 (70)
80 (110)
500 (490)

110 (80)
260 (360)
130 (180)

590 (490)
500 (620)

14
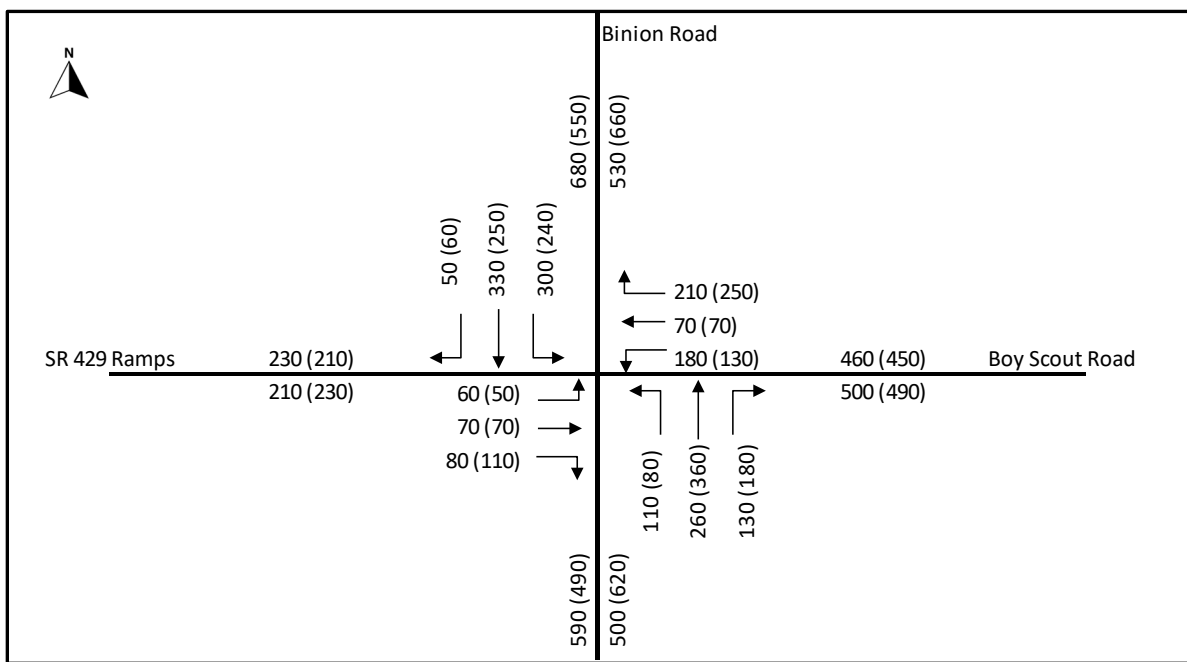
3.4 Capacity Analysis for Freeway Mainline and Ramps

Future lane requirements were evaluated to provide an estimated timeline for the onset of capacity deficiencies along the SR 429 mainline and ramp roadways for the No Build and Build alternatives. Freeway mainline LOS targets were based on the FDOT's Quality and LOS Handbook. Capacity analysis for ramp roadways was based on HCM targets. The FDOT and HCM targets were adjusted for local conditions such as speed, truck proportion and PHF.

The lane requirements analysis per direction for the SR 429 mainline and ramps is summarized in **Table 3.4**. The analysis for the mainline segments was based on both LOS D and E (capacity) constraints. The analysis for ramp roadways was based on LOS E (capacity) target only. The future No Build and Build analysis considered the ongoing widening of the SR 429 mainline to three lanes and PTSU per direction from West Road to SR 414 (429-153).

The analysis showed that the programmed and proposed future number of lanes for the No Build and Build conditions are expected to accommodate projected demand through the 2045 design year, except for the SR 429 mainline segment north of US 441. This segment will require an additional third lane per direction in year 2042 and 2045 based on LOS D and E constraints, respectively, for both No Build and Build conditions. Detailed color-coded lane requirements analysis is presented in **Tables 3.5** through **3.8**.

Table 3.4
Lanes Requirements Summary – Number of Lanes per Direction

Location	SR 429	2022 Existing Number of Lanes	Future No Build			Future Build		
			Number of Lanes	Lanes Needed (Year) [1]LOS D/E	Lanes Needed (Year) [2]LOS E/E	Number of Lanes	Lanes Needed (Year) [1]LOS D/E	Lanes Needed (Year) [2]LOS E/E
Ponkan Mainline Plaza		2	2	3 (2042)	3 (2045)	2	3 (2042)	3 (2045)
US 441		1	1	n/a	n/a	1	n/a	n/a
		2	2	n/a	n/a	2	n/a	n/a
		3	3	n/a	n/a	3	n/a	n/a
Binion Road		n/a	n/a	n/a	n/a	1	n/a	n/a
		3	3	n/a	n/a	3	n/a	n/a
SR 414		2	2	n/a	n/a	2	n/a	n/a
		2	2	n/a	n/a	2	n/a	n/a
		2 + 1 Aux	5 (4 + 1 PTSU) + 1 Aux SB	n/a	n/a	5 (4 + 1 PTSU) + 1 Aux SB	n/a	n/a
			4 (3 + 1 PTSU) + 1 Aux NB	n/a	n/a	4 (3 + 1 PTSU) + 1 Aux NB	n/a	n/a
Ocoee Apopka Road		1	1	n/a	n/a	1	n/a	n/a
		1	1	n/a	n/a	1	n/a	n/a
Forest Lake Mainline Plaza		2	4 (3 + 1 PTSU)	n/a	n/a	4 (3 + 1 PTSU)	n/a	n/a

[1]Mainline Maximum Service Volume (LOS D)/Ramp Capacity (LOS E)

[2]Mainline Maximum Service Volume (LOS E)/Ramp Capacity (LOS E)

n/a - not applicable or no additional lane needs

Table 3.5
No Build Mainline (LOS D) and Ramp Capacity (LOS E) Lane Requirements

Location	SR 429	Opening	Interpolated																			Design
		2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Ponkan Mainline Plaza		1,850	1,970	2,090	2,220	2,340	2,460	2,580	2,700	2,830	2,950	3,070	3,190	3,320	3,440	3,560	3,690	3,810	3,930	4,050	4,180	4,300
US 441		170	190	200	220	230	250	260	280	290	310	320	340	350	370	380	400	410	430	440	460	470
		970	990	1,020	1,040	1,060	1,090	1,110	1,130	1,150	1,180	1,200	1,220	1,240	1,270	1,290	1,310	1,330	1,350	1,380	1,400	1,420
		2,670	2,800	2,930	3,060	3,190	3,330	3,460	3,590	3,720	3,850	3,980	4,110	4,240	4,380	4,510	4,640	4,770	4,900	5,040	5,170	5,300
SR 414		1,030	1,070	1,110	1,140	1,180	1,220	1,260	1,300	1,330	1,370	1,410	1,450	1,490	1,520	1,560	1,600	1,640	1,680	1,710	1,750	1,790
		2,040	2,060	2,080	2,110	2,130	2,150	2,170	2,190	2,220	2,240	2,260	2,280	2,300	2,320	2,340	2,370	2,390	2,410	2,430	2,450	2,470
	+1 Aux	3,680	3,800	3,910	4,030	4,140	4,260	4,370	4,490	4,600	4,720	4,830	4,950	5,060	5,180	5,290	5,410	5,520	5,640	5,750	5,870	5,980
Ocoee Apopka Road		210	230	240	260	280	300	310	330	350	360	380	400	410	430	450	470	480	500	520	530	550
		410	430	440	460	470	490	500	520	530	550	560	580	590	610	620	640	650	670	680	700	710
Forest Lake Mainline Plaza		3,900	4,020	4,130	4,250	4,360	4,480	4,590	4,710	4,820	4,940	5,050	5,170	5,280	5,400	5,510	5,630	5,740	5,860	5,970	6,090	6,200

DDHV - Worst Case AM or PM Design Hour

Freeway Inputs	
Truck % (t_f)	2.0%
Free Flow Speed (mph)	75
Peak Hour Factor (PHF)	0.95

Freeway LOS Targets			
Lanes	LOS D	Lanes*	LOS D
2	3,900	2+1	4,900
3	5,850	3+1	6,850
4	7,800	4+1	8,800
5	9,750	5+1	10,750
6	11,700	6+1	12,700

*Plus Auxiliary Lane

Ramp Capacity	
Lanes	LOS E
1	1,850
2	3,700
3	5,550

Speed - 40 to 50 MPH

Table 3.6
Build Mainline (LOS D) and Ramp Capacity (LOS E) Lane Requirements

Location	SR 429	Opening									Interpolated												Design
		2025	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**
Ponkan Mainline Plaza		1,850	1,980	2,100	2,230	2,350	2,480	2,600	2,730	2,850	2,980	3,100	3,220	3,350	3,470	3,590	3,720	3,840	3,960	4,080	4,210	4,330
US 441		140	150	160	180	190	200	210	220	240	250	260	270	280	300	310	320	330	340	360	370	380
		980	1,000	1,020	1,050	1,070	1,090	1,110	1,130	1,160	1,180	1,200	1,220	1,240	1,270	1,290	1,310	1,330	1,350	1,380	1,400	1,420
		2,710	2,850	2,980	3,120	3,250	3,390	3,530	3,660	3,800	3,930	4,070	4,200	4,340	4,470	4,610	4,740	4,870	5,010	5,140	5,280	5,410
Binion Road		90	100	100	110	120	130	130	140	150	150	160	170	170	180	190	200	200	210	220	220	230
		2,630	2,760	2,890	3,020	3,150	3,280	3,400	3,530	3,660	3,790	3,920	4,050	4,180	4,300	4,430	4,560	4,690	4,820	4,940	5,070	5,200
SR 414		1,020	1,060	1,100	1,130	1,170	1,210	1,250	1,290	1,320	1,360	1,400	1,440	1,470	1,510	1,550	1,590	1,620	1,660	1,700	1,730	1,770
		2,040	2,060	2,080	2,110	2,130	2,150	2,170	2,190	2,220	2,240	2,260	2,280	2,300	2,320	2,340	2,370	2,390	2,410	2,430	2,450	2,470
	+1 Aux	3,650	3,760	3,880	3,990	4,100	4,220	4,330	4,440	4,550	4,670	4,780	4,890	5,000	5,120	5,230	5,340	5,450	5,560	5,680	5,790	5,900
Ocoee Apopka Road		180	190	210	220	240	250	260	280	290	310	320	330	350	360	380	390	400	420	430	450	460
		410	430	440	460	470	490	500	520	530	550	560	580	590	610	620	640	650	670	680	700	710
Forest Lake Mainline Plaza		3,900	4,020	4,130	4,250	4,360	4,480	4,590	4,710	4,820	4,940	5,050	5,170	5,280	5,400	5,510	5,630	5,740	5,860	5,970	6,090	6,200

DDHV - Worst Case AM or PM Design Hour

Freeway Inputs	
Truck % (t$_r$)	2.0%
Free Flow Speed (mph)	75
Peak Hour Factor (PHF)	0.95

Freeway LOS Targets			
Lanes	LOS D	Lanes*	LOS D
2	3,900	2+1	4,900
3	5,850	3+1	6,850
4	7,800	4+1	8,800
5	9,750	5+1	10,750
6	11,700	6+1	12,700

*Plus Auxiliary Lane

Ramp Capacity	
Lanes	LOS E
1	1,850
2	3,700
3	5,550

Speed - 40 to 50 MPH

Table 3.7
No Build Mainline (LOS E) and Ramp Capacity (LOS E) Lane Requirements

Location	SR 429	Opening 2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Design 2045
DDHV - Worst Case AM or PM Design Hour									Interpolated													
Ponkan Mainline Plaza		1,850	1,970	2,090	2,220	2,340	2,460	2,580	2,700	2,830	2,950	3,070	3,190	3,320	3,440	3,560	3,690	3,810	3,930	4,050	4,180	4,300
US 441		170	190	200	220	230	250	260	280	290	310	320	340	350	370	380	400	410	430	440	460	470
		970	990	1,020	1,040	1,060	1,090	1,110	1,130	1,150	1,180	1,200	1,220	1,240	1,270	1,290	1,310	1,330	1,350	1,380	1,400	1,420
		2,670	2,800	2,930	3,060	3,190	3,330	3,460	3,590	3,720	3,850	3,980	4,110	4,240	4,380	4,510	4,640	4,770	4,900	5,040	5,170	5,300
SR 414		1,030	1,070	1,110	1,140	1,180	1,220	1,260	1,300	1,330	1,370	1,410	1,450	1,490	1,520	1,560	1,600	1,640	1,680	1,710	1,750	1,790
		2,040	2,060	2,080	2,110	2,130	2,150	2,170	2,190	2,220	2,240	2,260	2,280	2,300	2,320	2,340	2,370	2,390	2,410	2,430	2,450	2,470
	+1 Aux	3,680	3,800	3,910	4,030	4,140	4,260	4,370	4,490	4,600	4,720	4,830	4,950	5,060	5,180	5,290	5,410	5,520	5,640	5,750	5,870	5,980
Ocoee Apopka Road		210	230	240	260	280	300	310	330	350	360	380	400	410	430	450	470	480	500	520	530	550
		410	430	440	460	470	490	500	520	530	550	560	580	590	610	620	640	650	670	680	700	710
Forest Lake Mainline Plaza		3,900	4,020	4,130	4,250	4,360	4,480	4,590	4,710	4,820	4,940	5,050	5,170	5,280	5,400	5,510	5,630	5,740	5,860	5,970	6,090	6,200

Freeway Inputs

Truck % (t_f)	2.0%
Free Flow Speed (mph)	75
Peak Hour Factor (PHF)	0.95
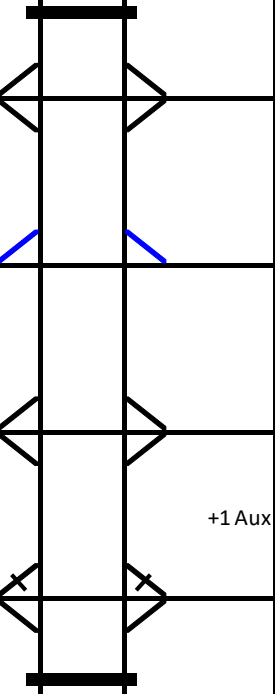
Freeway LOS Targets

Lanes	LOS E	Lanes*	LOS E
2	4,240	2+1	5,240
3	6,360	3+1	7,360
4	8,480	4+1	9,480
5	10,600	5+1	11,600
6	12,720	6+1	13,720

*Plus Auxiliary Lane

Ramp Capacity

Lanes	LOS E
1	1,850
2	3,700
3	5,550

Speed - 40 to 50 MPH

Table 3.8
Build Mainline (LOS E) and Ramp Capacity (LOS E) Lane Requirements

Location	SR 429	Opening	Interpolated																			Design
		2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Ponkan Mainline Plaza		1,850	1,980	2,100	2,230	2,350	2,480	2,600	2,730	2,850	2,980	3,100	3,220	3,350	3,470	3,590	3,720	3,840	3,960	4,080	4,210	4,330
US 441		140	150	160	180	190	200	210	220	240	250	260	270	280	300	310	320	330	340	360	370	380
		980	1,000	1,020	1,050	1,070	1,090	1,110	1,130	1,160	1,180	1,200	1,220	1,240	1,270	1,290	1,310	1,330	1,350	1,380	1,400	1,420
		2,710	2,850	2,980	3,120	3,250	3,390	3,530	3,660	3,800	3,930	4,070	4,200	4,340	4,470	4,610	4,740	4,870	5,010	5,140	5,280	5,410
Binion Road		90	100	100	110	120	130	130	140	150	150	160	170	170	180	190	200	200	210	220	220	230
		2,630	2,760	2,890	3,020	3,150	3,280	3,400	3,530	3,660	3,790	3,920	4,050	4,180	4,300	4,430	4,560	4,690	4,820	4,940	5,070	5,200
		1,020	1,060	1,100	1,130	1,170	1,210	1,250	1,290	1,320	1,360	1,400	1,440	1,470	1,510	1,550	1,590	1,620	1,660	1,700	1,730	1,770
SR 414		2,040	2,060	2,080	2,110	2,130	2,150	2,170	2,190	2,220	2,240	2,260	2,280	2,300	2,320	2,340	2,370	2,390	2,410	2,430	2,450	2,470
	+1 Aux	3,650	3,760	3,880	3,990	4,100	4,220	4,330	4,440	4,550	4,670	4,780	4,890	5,000	5,120	5,230	5,340	5,450	5,560	5,680	5,790	5,900
Ocoee Apopka Road		180	190	210	220	240	250	260	280	290	310	320	330	350	360	380	390	400	420	430	450	460
		410	430	440	460	470	490	500	520	530	550	560	580	590	610	620	640	650	670	680	700	710
Forest Lake Mainline Plaza		3,900	4,020	4,130	4,250	4,360	4,480	4,590	4,710	4,820	4,940	5,050	5,170	5,280	5,400	5,510	5,630	5,740	5,860	5,970	6,090	6,200

DDHV - Worst Case AM or PM Design Hour

Freeway Inputs	
Truck % (t_r)	2.0%
Free Flow Speed (mph)	75
Peak Hour Factor (PHF)	0.95

Freeway LOS Targets			
Lanes	LOS E	Lanes*	LOS E
2	4,240	2+1	5,240
3	6,360	3+1	7,360
4	8,480	4+1	9,480
5	10,600	5+1	11,600
6	12,720	6+1	13,720

*Plus Auxiliary Lane

| Ramp Capacity	
Lanes	LOS E
1	1,850
2	3,700
3	5,550

Speed - 40 to 50 MPH

20

3.5 Ramp Terminal Intersection Analysis Alternatives

The proposed SR 429 and Binion Road interchange will form a partial interchange on SR 429, providing access to/from the north only. The ramps will be tolled and will terminate at the Binion Road and Boy Scout Road intersection. Due to right-of-way constraints on SR 429, a concept was developed in which the southbound ramp flies over the SR 429 mainline. To accommodate the geometrics for the flyover ramp, Boy Scout Road will need to be realigned to the south as it intersects with Binion Road. Two configurations were developed for the ramp terminal intersection at Binion Road: a signalized and a roundabout intersection.

The proposed concepts are depicted on **Figures 3.5** and **3.6** for the signalized and roundabout intersections, respectively. The proposed configuration for the roundabout includes a right-turn bypass lane for the SR 429 off-ramp and a wide circulatory lane and apron to properly accommodate trucks.

Figure 3.5
Conceptual Layout of Proposed Interchange Configuration (Signal Alternative)
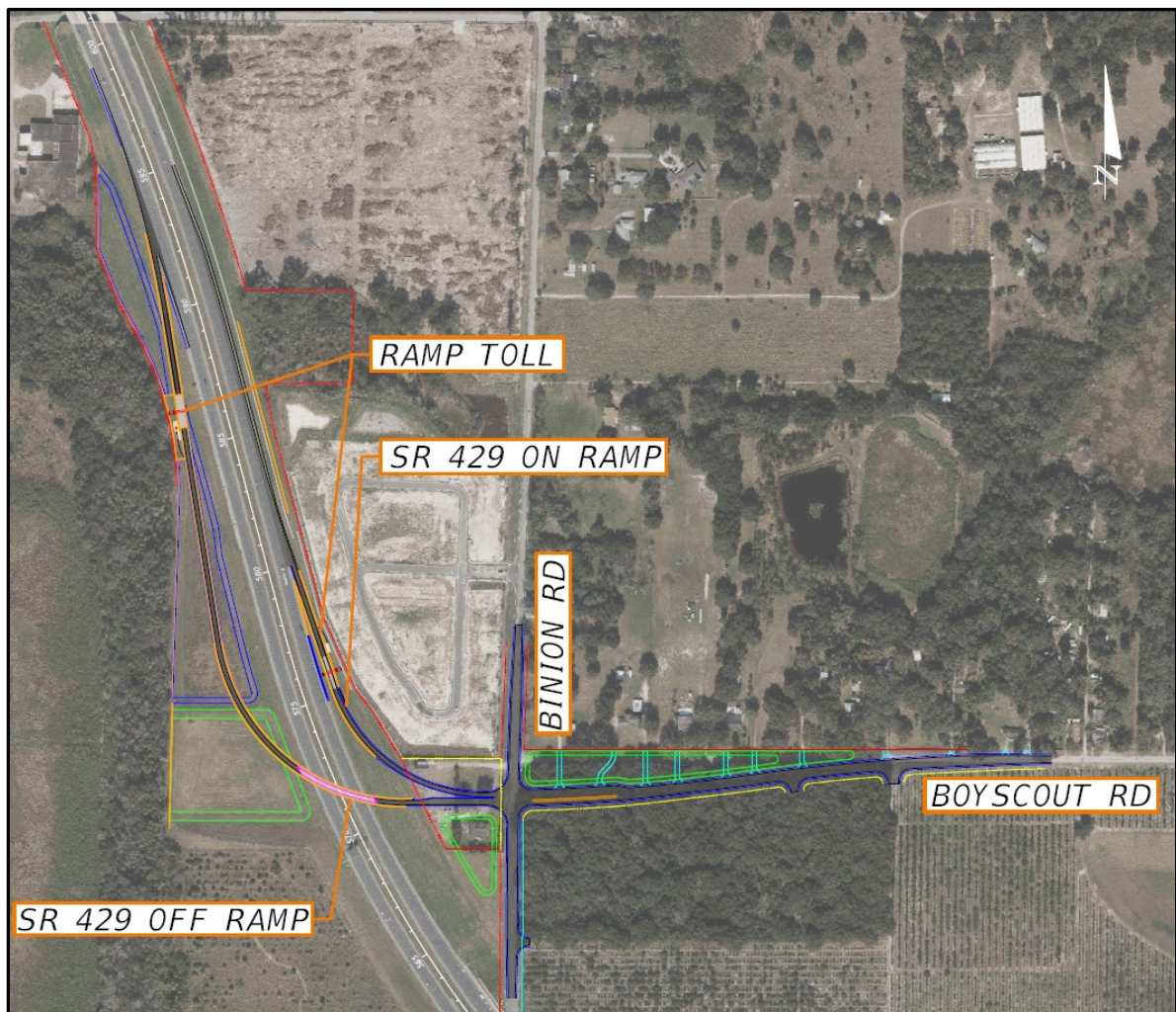
Figure 3.6
Conceptual Layout of Proposed Interchange Configuration (Roundabout Alternative)
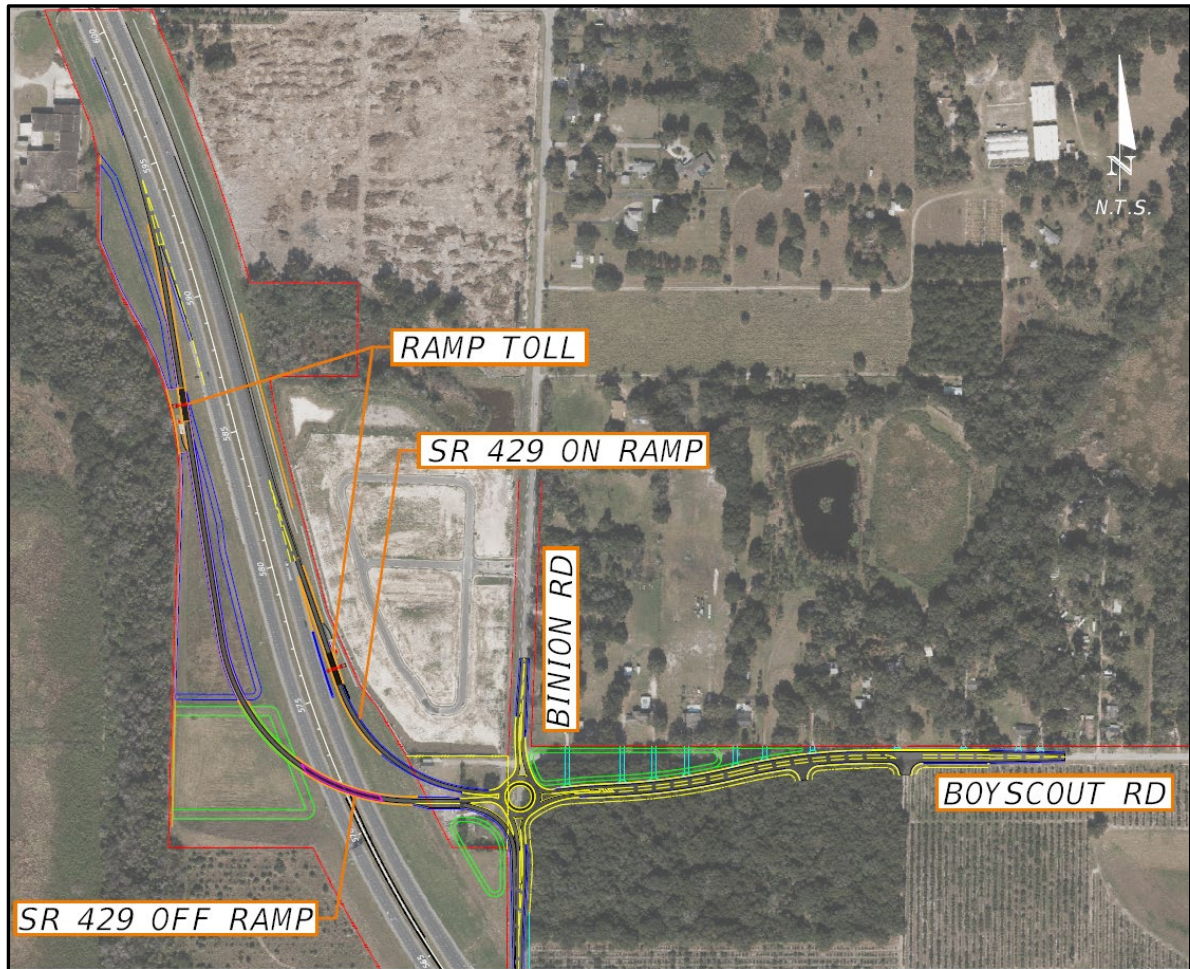
3.6 Future Intersection Operations Analysis

Future operations analysis was conducted for the proposed Binion Road and Boy Scout Road/SR 429 Ramps intersection alternatives using the 2025 and 2045 design hour volumes on **Figures 3.3** and **3.4**, to verify operations in the opening and design years. The signalized intersection alternative was evaluated using the Synchro software, Version 11, whereas, the roundabout alternative was evaluated using the SIDRA software, Version 9. The analysis results for the 2025 and 2045 AM (PM) peak hour conditions are presented in **Tables 3.9** through **3.12**. The proposed storage lengths for the turn bays based on 2045 peak hour maximum queues are also provided in the tables and graphically depicted on **Figures 3.7** and **3.8**. For the signalized intersection, queue lengths were estimated using SimTraffic, the microsimulation companion of Synchro, to better account for vehicle interactions. Detailed Synchro/SimTraffic and SIDRA reports are provided in **Appendices C** and **D**, respectively.

Table 3.9
2025 AM (PM) Design Hour Signalized Intersection LOS/Delay (sec)

Intersection	Approach	Movement	LOS AM (PM)	Delay (Seconds) AM (PM)	Maximum Queue Length (Feet)* AM (PM)
Binion Road and Boy Scout Road/ SR 429 Ramps	Eastbound	Left	B (B)	15.9 (16.6)	31 (50)
		Through	C (C)	27.6 (26.7)	98 (72)
		Right	A (A)	0.3 (0.7)	52 (74)
	Westbound	Left	B (B)	18.7 (18.4)	134 (90)
		Through	C (C)	20.9 (21.3)	63 (70)
		Right	A (A)	1.1 (4.6)	68 (65)
	Northbound	Left	B (A)	11.1 (9.8)	70 (49)
		Through	C (C)	25.3 (21.5)	89 (136)
		Right	A (A)	0.5 (0.4)	66 (45)
	Southbound	Left	B (A)	11.4 (9.9)	110 (87)
		Through	B (B)	18.3 (14.3)	126 (112)
		Right	B (B)	18.3 (14.3)	126 (112)
	Overall Intersection		*B (B)*	*13.9 (12.4)*	-

*SimTraffic maximum queue length

Table 3.10
2025 AM (PM) Design Hour Roundabout Intersection LOS/Delay (sec)

Intersection	Approach	Movement	LOS	Delay (Seconds)	Maximum Queue Length (Feet)
			AM (PM)	AM (PM)	AM (PM)
Binion Road and Boy Scout Road/ SR 429 Ramps	Eastbound	Left	A (A)	5.6 (5.1)	11 (11)
		Through	A (A)	5.6 (5.1)	11 (11)
		Right	A (A)	5.6 (5.1)	11 (11)
	Westbound	Left	A (A)	6.0 (6.2)	34 (34)
		Through	A (A)	6.0 (6.2)	34 (34)
		Right	A (A)	6.0 (6.2)	34 (34)
	Northbound	Left	A (A)	6.1 (6.6)	33 (44)
		Through	A (A)	6.1 (6.6)	33 (44)
		Right	A (A)	6.1 (6.6)	33 (44)
	Southbound	Left	A (A)	7.0 (5.8)	51 (37)
		Through	A (A)	7.0 (5.8)	51 (37)
		Right	A (A)	7.0 (5.8)	51 (37)
	Overall Intersection		*A (A)*	*6.3 (6.1)*	-

Table 3.11
2045 AM (PM) Design Hour Signalized Intersection LOS/Delay (sec)

Intersection	Approach	Movement	LOS	Delay (Seconds)	Maximum Queue Length (Feet)*	Proposed # of Turn Lanes/ Storage Length (Feet)
			AM (PM)	AM (PM)	AM (PM)	
Binion Road and Boy Scout Road/ SR 429 Ramps	Eastbound	Left	C (C)	21.4 (22.5)	116 (94)	1/200'
		Through	C (C)	34.8 (34.4)	137 (126)	-
		Right	A (A)	0.9 (2.4)	90 (96)	1/200'
	Westbound	Left	C (C)	33.6 (29.0)	193 (165)	1/275'
		Through	C (C)	32.5 (31.7)	95 (114)	-
		Right	A (A)	4.9 (9.7)	113 (220)	1/275'
	Northbound	Left	B (B)	13.8 (10.8)	176 (108)	1/275'
		Through	C (C)	34.5 (30.4)	235 (240)	-
		Right	A (A)	1.0 (4.1)	92 (141)	1/275'
	Southbound	Left	B (B)	16.0 (14.7)	263 (194)	1/350'
		Through	C (B)	24.0 (18.7)	332 (219)	-
		Right	C (B)	24.0 (18.7)	332 (219)	-
Overall Intersection			*C (B)*	*20.4 (18.4)*	-	-

*SimTraffic maximum queue length

Table 3.12
2045 AM (PM) Design Hour Roundabout Intersection LOS/Delay (sec)

Intersection	Approach	Movement	LOS	Delay (Seconds)	Maximum Queue Length (Feet)	Proposed # of Turn Lanes/ Storage Length (Feet)
			AM (PM)	AM (PM)	AM (PM)	
Binion Road and Boy Scout Road/ SR 429 Ramps	Eastbound	Left	B (B)	13.4 (10.3)	52 (45)	-
		Through	B (B)	13.4 (10.3)	52 (45)	-
		Right	B (B)	13.4 (10.3)	52 (45)	1/200'
	Westbound	Left	B (C)	13.4 (15.0)	136 (144)	-
		Through	B (C)	13.4 (15.0)	136 (144)	-
		Right	B (C)	13.4 (15.0)	136 (144)	-
	Northbound	Left	C (C)	15.1 (18.1)	170 (286)	-
		Through	C (C)	15.1 (18.1)	170 (286)	-
		Right	C (C)	15.1 (18.1)	170 (286)	-
	Southbound	Left	C (B)	22.6 (12.0)	402 (154)	-
		Through	C (B)	22.6 (12.0)	402 (154)	-
		Right	C (B)	22.6 (12.0)	402 (154)	-
Overall Intersection			*C (B)*	*17.2 (14.6)*	-	-

A 200' storage is proposed for the eastbound right turn by-pass to ensure the turn lane is not blocked by through movement queue.

Figure 3.7
Proposed Lane Geometry and Storage Lengths for Signalized Intersection

Binion Road

350 ft

SR 429 Ramps

275 ft

200 ft

Boy Scout Road

275 ft

N

Not to Scale

Note: Lane tapers not included in storage lengths
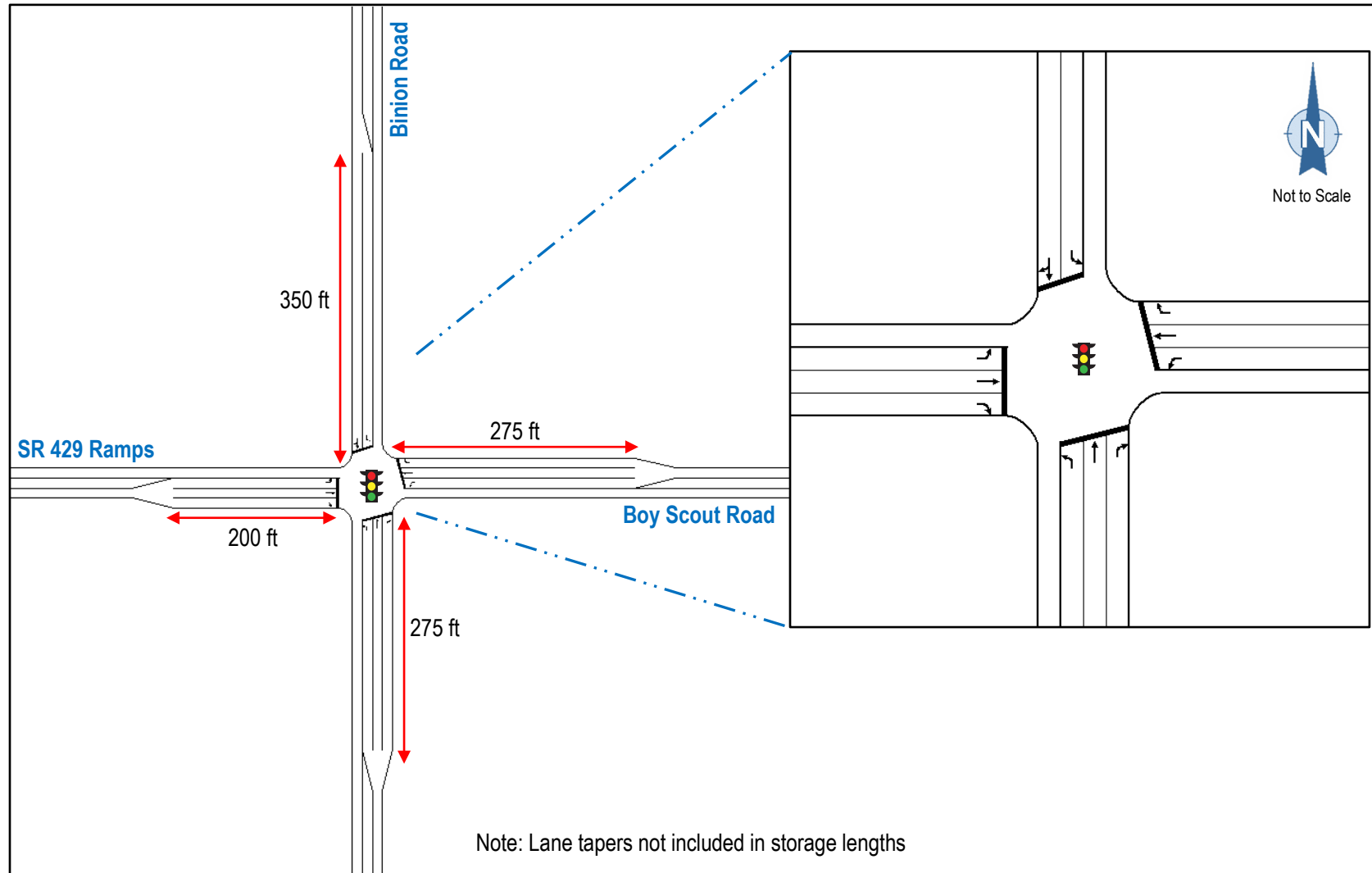
Figure 3.8
Proposed Lane Geometry and Storage Lengths for Roundabout Intersection
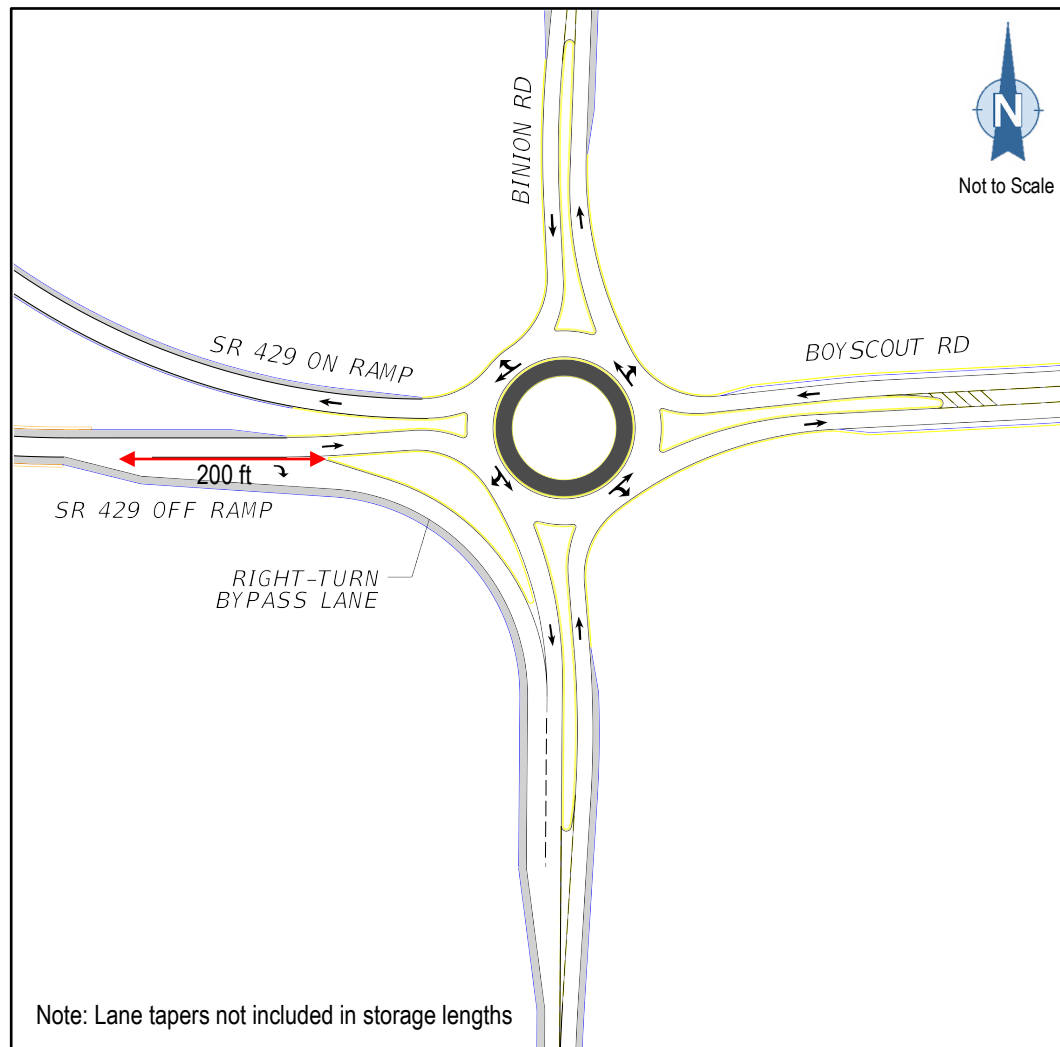
The results in Tables 3.9 and 3.10 show that all movements are expected to operate at an acceptable LOS C or better in 2025 for the signalized intersection alternative and LOS A for the roundabout alternative. The overall LOS is B for the signalized intersection and A for the roundabout intersection. In the 2045 design year (Tables 3.11 and 3.12), all movements are expected to operate at an acceptable LOS C or better for both the signalized and roundabout intersection alternatives. The overall LOS for the intersection is also C or better. Although traffic operations are similar for both alternatives, delays are lower for the roundabout when compared to the signal. The roundabout alternative also has fewer conflict points and is deemed safer than the signalized alternative.

4.0 Conclusion

The proposed SR 429 and Binion Road partial interchange is being considered to provide new access by adding ramps to and from the north. The Binion Road interchange will provide additional local access between SR 414 and US 441 and allow trips that need to navigate the local street system to access SR 429 to points north including US 441, SR 46, and the Wekiva Parkway. The analysis showed that traffic will primarily be diverted from the Ocoee Apopka Road and US 441 ramps to/from the north of SR 429 to the proposed Binion Road ramps. A small diversion is expected from the SR 414 ramps to/from north and there will be a small amount of induced trips due to the proposed ramps.

Two intersection configurations were developed for the ramp terminal: a signalized and a roundabout intersection. Both intersection alternatives are expected to operate at an acceptable LOS C or better in the 2045 design year. However, the roundabout alternative has fewer conflict points and is deemed safer than the signalized alternative. Both intersection configurations were presented to the City of Apopka's Transportation Planning Department for feedback on a preferred alternative. The City selected the signalized intersection alternative.

Appendices

Appendix A

2022 AM and PM Peak Hour Synchro/SimTraffic Reports

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations	⍄		⇅			⍃		
Traffic Volume (vph)	95	141	161	66	189	189		
Future Volume (vph)	95	141	161	66	189	189		
Satd. Flow (prot)	1645	0	1756	0	0	1783		
Flt Permitted	0.980					0.976		
Satd. Flow (perm)	1645	0	1756	0	0	1783		
Confl. Peds. (#/hr)								
Confl. Bikes (#/hr)								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Growth Factor	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%		
Bus Blockages (#/hr)	0	0	0	0	0	0		
Parking (#/hr)								
Mid-Block Traffic (%)	0%		0%			0%		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	256	0	247	0	0	410		
Sign Control	Stop		Free			Free		

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 56.8%	ICU Level of Service B
Analysis Period (min) 15	

Intersection: 4: Binion Road & Boy Scout Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	141	41	95
Average Queue (ft)	61	1	32
95th Queue (ft)	103	11	71
Link Distance (ft)	972	966	978
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	66	160	208	94	151	160
Future Volume (vph)	66	160	208	94	151	160
Satd. Flow (prot)	1628	0	1750	0	0	1783
Flt Permitted	0.986					0.976
Satd. Flow (perm)	1628	0	1750	0	0	1783
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	254	0	340	0	0	350
Sign Control	Stop		Free			Free

Intersection Summary
Control Type: Unsignalized
Intersection Capacity Utilization 57.0%   ICU Level of Service B
Analysis Period (min) 15

Intersection: 4: Binion Road & Boy Scout Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	160	22	72
Average Queue (ft)	61	1	30
95th Queue (ft)	106	7	63
Link Distance (ft)	972	966	978
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 0

Appendix B

**Planning Level T&R Estimates for SR 429 and Binion Road Interchange Letter Report
Travel Demand Modeling Section**

Planning Level T&R Estimates for SR 429 and Binion Road Interchange

1. Travel Demand Modeling

This section contains brief descriptions of the base-year and future-year travel demand models, including an account of model validation and the assumptions used to produce traffic forecasts (socio-economic data forecasts, network improvements and toll rates).

1.1. Base-Year Model

CDM Smith used the latest version of the CFX travel demand model with validation year of 2017 and forecast years of 2025 and 2045, updated for application to the T&R study. CDM Smith started with the regional model used to predict the traffic and revenue growth for the S.R. 414 Expressway Extension PD&E study, referred to as *CFX Model 414 T&R*. This model was created with updates/revisions to the models from previous studies and originally based on the *Central Florida Regional Planning Model (CFRPM) v6.1,* produced by the Florida Department of Transportation (FDOT), District 5. Like its predecessor, the *CFX Model 414 T&R,* is a project-specific model of peak-season, average weekday traffic, with a disaggregated zone structure and supporting transportation network in the study area. The base year model was reviewed for use in this study. No additional validation efforts were completed for this planning level study. Documentation for the base year model validation can be found in *the Preliminary Level Traffic and Revenue Estimates for S.R. 414 Expressway Extension* letter report. For this study a closer evaluation of the area around the proposed interchange was considered, and the project-specific model area is shown in **Figure 1-1**. The purple outlined areas represent the traffic analysis zones (TAZs) that contain the socio-economic data within the modeling structure for the study area.

Figure 1-1. Binion Road Study Area in *CFX Model 414 T&R*
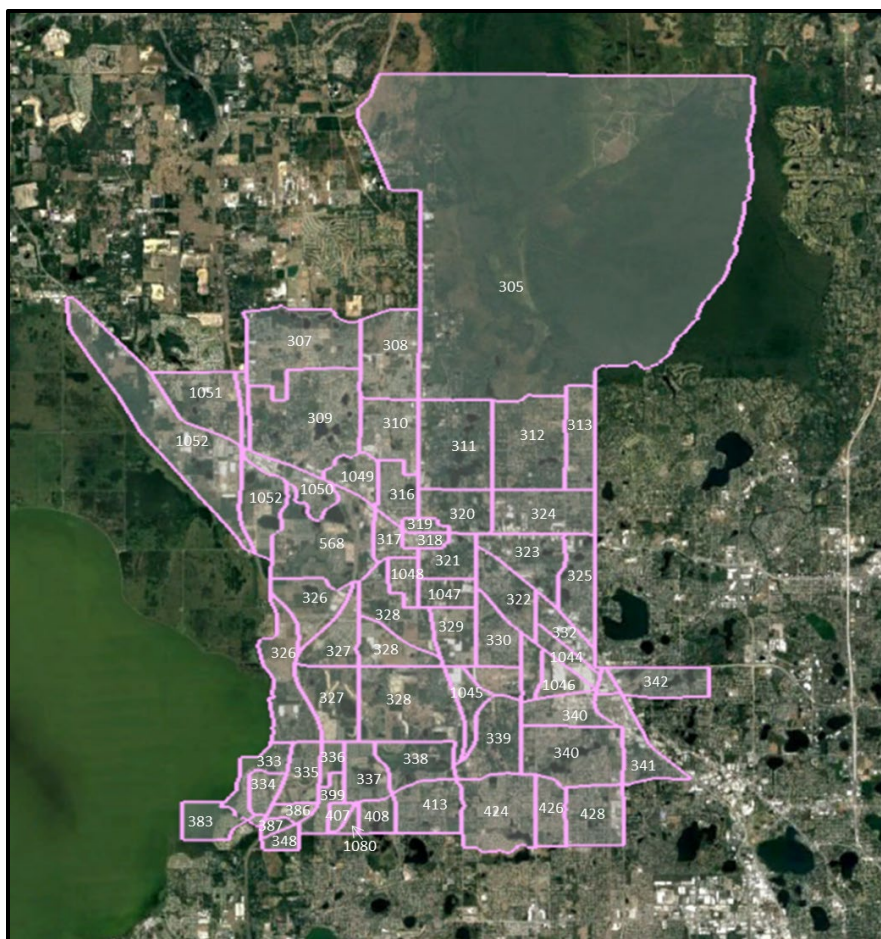
1.2. Future-Year Models

The future-year models start from the base-year *CFX Model 414 T&R* and retain all the updates and enhancements created for previous models as well as the model improvements identified in the study area. There are two future year models, one for opening year of 2025 and the second for the horizon year of 2045. Additionally, for each model year, there are three scenario models: No Build, Build No-Toll and Build Toll models. The results for 2035 are interpolated, assuming a proportion of the difference between 2025 and 2045.

1.2.1.   Socioeconomic Data Forecasts

Independent socioeconomic forecasts of population, employment and school enrollment were developed by Fishkind and Associates (FKA) for the entirety of Orange and Lake Counties for the Lake Orange County Connector (S.R. 516) project which were also incorporated into this project model. These forecasts are documented under separate cover, *Lake Orange Connector, Lake and Orange Counties Analysis, 2017 Base Year Analysis and Socioeconomic Data Forecast Analysis (2025, 2035 and 2045)*, January 31, 2019.

The SE data forecasts for the Binion Road interchange analysis were modified to incorporate the 30 planned and approved developments provided by the City of Apopka, in addition to the SE data set adjustments from the S.R. 414 Expressway Extension T&R study. In the model, the ZDATA1 file contains the housing and population data and the ZDATA2 file contains the employment and school enrollment data. For the ZDATA1 file, each of the housing developments were located by TAZ and dwelling units were added by category, i.e., single-family or multi-family, and population was calculated using the average person/household in a comparable TAZ. These changes are summarized in the SE data forecasts for Orange County for Year 2025 data set and are contained in **Table 1-1**. The data in the 2045 data set was reviewed for consistency and negative growth but ultimately not updated for this analysis.

Table 1-1. Comparison of SE Data Sets

ZDATA1	Single Family Dwelling Unit	Single Family Population	Multi-Family Dwelling Unit	Multi-Family Population
S.R. 414 SE Data Set	354,949	902,730	249,926	478,613
Binion Road SE Data Set	357,062	912,840	253,380	487,781
Net Increase	2,113	10,110	3,454	9,168
Percent Change	0.60%	1.12%	1.38%	1.92%

As the largest development planned in the City of Apopka, and the one with the greatest impact on this interchange, The Ridge at Lake Bronson development plan employment was estimated based on land use from the Planned Development Master Plan, dated April 26, 2021, and shown in **Table 1-2**. The employment was calculated using national standards for employment per square foot of 1 employee/ 1,500 sq. ft. of Industrial uses, 1 employee/500 sq. ft. for Commercial uses, 1 employee/300 sq. ft. for Office uses, and 0.15 employees/acre for Civic uses. Employment data is found in the ZDATA2 file of the model, and this was checked against the employment estimates for The Ridge at Lake Bronson development as well as the other developments provided by the City of Apopka. No adjustments were made to the ZDATA2 files for 2025 or 2045 as the employment in these zones were already sufficient to meet employment thresholds from these developments.

Table 1-2. Employment Estimates for The Ridge at Lake Bronson Development

The Ridge at Lake Bronson Land Uses	INDUSTRIAL		COMMERCIAL		SERVICE		SERVICE		Total Employment
	Industrial (SF)	IND Jobs	Retail (SF)	COM Jobs	Office (SF)	SER Jobs	Civic (acre)	SER Jobs	
Commercial	-	-	300,000	600	-	-	-	-	600
Office	-	-	-	-	75,000	250	-	-	250
Industrial	1,500,000	1,000	-	-	-	-	-	-	1,000
Recreation	-	-	-	-	-	-	57	9	9
	1,500,000	1,000	125,000	250	75,000	250	57	9	1,859

Source: Square feet from The Ridge PD, Planned Development Master Plan, April 2021.

1.2.2. Roadway Improvements

The future year networks from the *CFX Model S.R. 414 T&R* were taken directly from the model for use in this study. The future year networks were updated to include the new interchange and connection to Boy Scout Road. These networks already included the transportation improvements identified in the CFX, FDOT and county work programs, as well as the improvements included in the cost feasible plan from Metroplan Orlando's Long-Range Transportation Plan (LRTP) for year 2040. Some 2045 regional network improvements to note include:

- Widening of S.R. 429 (6 lanes) from Seidel Road to S.R. 414
- Completion of I-4 Ultimate Improvement (10 lanes) from S.R. 408 to S.R. 434
- Completion of Wekiva Parkway (4 lanes) from Mt. Plymouth Road to I-4
- Construction of the S.R. 414 Expressway Extension from US 441 to S.R. 434

1.2.3. Tolls

The future-year models contain updated toll amounts at CFX toll locations, based on the following procedures. Like the base-year model, the future-year models use the average toll amounts that reflect the combination of vehicle class and payment method. Based on traffic count data, CDM Smith has determined that 6% of the traffic stream will be trucks of all sizes and used the toll amounts from 4-Axle vehicles to represent the truck toll. The payment method splits used in this analysis were established using the share of revenue by payment method from FY 2021 CFX toll operations data, as shown in **Table 1-3**.

Table 1-3. FY 2021 Share by Payment Method

Average	Rev Split
Paid In-Lane	81.1%
PBP	18.9%
Total	100.0%

The S.R. 429/Wekiva Parkway, including the Ponkan Mainline, Mt. Plymouth Mainline and Coronado Mainline Plazas, was created with all electronic tolling (AET), i.e., without cash toll collection. **Table 1-4** contains a summary of the FY 2021 2-Axle and 4-Axle toll amounts by payment method and the derived average toll amounts. With the Binion Road interchange being in the Forest Lake Plaza group, the rate per mile for this segment of S.R. 429 is $0.128 per mile for 2-axle ETC customers. The Binion Road interchange is approximately 2.3 miles from the zero-point location at US 441, and at $0.128 per mile equates to a $0.30 ETC toll for 2-axle vehicles. This is consistent with the S.R. 438/Plant St. interchange at the south end of this plaza group.

Table 1-4. FY 2021 Toll Amounts by Class and Payment Method

Toll Location	Plaza Group	ETC		Cash		Pay By Plate		Average toll
		2 Axles	4 Axles	2 Axles	4 Axles	2 Axles	4 Axles	
S.R. 438	Forest Lake	$0.30	$0.30	$0.50	$0.50	$0.60	$0.60	$0.36
West Road		$0.87	$0.87	$1.00	$1.00	$1.74	$1.74	$1.04
Forest Lake Main		$1.45	$2.61	$1.75	$3.00	$2.90	$5.22	$1.82
C.R. 437A		$0.58	$0.58	$0.75	$0.75	$1.16	$1.16	$0.70
Binion Road		$0.30	$0.30	n/a	n/a	$0.60	$0.60	$0.36
Ponkan Main	Ponkan	$0.83	$1.66	n/a	n/a	$1.66	$3.32	$1.05
Mt. Plymouth Main	Mt. Plymouth	$0.78	$1.55	n/a	n/a	$1.56	$3.10	$0.99
Coronado Main	Coronado	$0.67	$1.35	n/a	n/a	$1.34	$2.70	$0.85

The final step in determining toll amount for the travel demand model was to escalate the present toll amounts at the CFX floor index rate of 1.5% per year, per the Customer First Toll Policy. **Table 1-5** contains the future average toll rates used in the travel demand model and in the revenue calculations. The shares of traffic by vehicle class and payment type were assumed to be an average of the shares. Finally, the toll amounts were escalated at 1.5% per year according to CFX policy.

Table 1-5. Average Toll Rates

Location	Average Toll Rate		
	2025	2035	2045
Forest Lake Main	$1.930	$2.240	$2.600
Binion Road Ramps	$0.380	$0.440	$0.510
Ponkan Main	$1.118	$1.297	$1.505
Mount Plymouth Main	$1.049	$1.217	$1.412
Coronado Main	$0.903	$1.048	$1.217

1.2.4. Other Parameters

CDM Smith has assumed an annual inflation rate of 2.5%. The value of time (VOT) from model validation was established to be $16.67 per hour in the validation year. This is consistent with prior models. The models use a parameter known as the Coefficient of Toll (CTOLL) which is the inverse of the value of time. The product of CTOLL and the toll amount is the time penalty from the tolls. **Table 1-6** contains the values of VOT and CTOLL used in the base-year and future-year models.

Table 1-6. VOT and CTOLL

	2017	2025	2045
VOT	$16.67	$20.31	$33.27
CTOLL	0.060	0.049	0.030

Other model parameters include the following:

- Vehicle operating cost (VOC) = $0.03 per mile in base year
- For interpolation to 2035 between 2025 and 2045 = 45% of difference occurs in 2035

Appendix C

2025 AM and PM Peak Hour Synchro/SimTraffic Reports
2045 AM and PM Peak Hour Synchro/SimTraffic Reports

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	⬏	↑	⬏	⬏	↑	⬏	⬏	↑	⬏	⬏	⬏	
Traffic Volume (vph)	10	40	30	100	30	140	50	140	70	180	180	10
Future Volume (vph)	10	40	30	100	30	140	50	140	70	180	180	10
Satd. Flow (prot)	1736	1827	1553	1736	1827	1553	1736	1827	1553	1736	1812	0
Flt Permitted	0.736			0.431			0.632			0.475		
Satd. Flow (perm)	1345	1827	1553	787	1827	1553	1155	1827	1553	868	1812	0
Satd. Flow (RTOR)			279			279			284		4	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	42	32	105	32	147	53	147	74	189	200	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Total Split (s)	15.0	24.0	24.0	14.0	23.0	23.0	13.0	28.0	28.0	24.0	39.0	
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.4	6.4	6.4	6.4	6.4	
Act Effct Green (s)	10.3	7.3	7.3	13.8	12.5	12.5	18.9	12.2	12.2	28.0	24.8	
Actuated g/C Ratio	0.19	0.14	0.14	0.26	0.23	0.23	0.35	0.23	0.23	0.52	0.46	
v/c Ratio	0.04	0.17	0.07	0.31	0.07	0.26	0.11	0.36	0.13	0.31	0.24	
Control Delay	15.9	27.6	0.3	18.7	20.9	1.1	11.1	25.3	0.5	11.4	18.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	15.9	27.6	0.3	18.7	20.9	1.1	11.1	25.3	0.5	11.4	18.3	
LOS	B	C	A	B	C	A	B	C	A	B	B	
Approach Delay		15.8			9.8			15.9			14.9	
Approach LOS		B			A			B			B	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 53.6
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.36

Intersection Signal Delay: 13.9	Intersection LOS: B
Intersection Capacity Utilization 46.8%	ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: Binion Road & SR 429 Ramps/Boy Scout Road

Ø1	Ø2	Ø3	Ø4
24 s	28 s	14 s	24 s

Ø5	Ø6	Ø7	Ø8
13 s	39 s	15 s	23 s

Intersection: 4: Binion Road & SR 429 Ramps/Boy Scout Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	TR
Maximum Queue (ft)	31	98	52	134	63	68	70	89	66	110	126
Average Queue (ft)	8	28	17	45	16	24	23	39	21	48	45
95th Queue (ft)	28	65	41	82	42	44	51	76	51	90	92
Link Distance (ft)		966			954			954			953
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	200		200	275		275	275		275	350	
Storage Blk Time (%)											
Queuing Penalty (veh)											

Network Summary

Network wide Queuing Penalty: 0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	30	50	70	40	150	30	200	100	150	140	10
Future Volume (vph)	10	30	50	70	40	150	30	200	100	150	140	10
Satd. Flow (prot)	1736	1827	1553	1736	1827	1553	1736	1827	1553	1736	1809	0
Flt Permitted	0.730			0.592			0.657			0.506		
Satd. Flow (perm)	1334	1827	1553	1082	1827	1553	1200	1827	1553	924	1809	0
Satd. Flow (RTOR)			201			201			206		5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	32	53	74	42	158	32	211	105	158	158	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Total Split (s)	12.0	21.0	21.0	12.0	21.0	21.0	12.0	40.0	40.0	17.0	45.0	
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.4	6.4	6.4	6.4	6.4	
Act Effct Green (s)	9.7	7.2	7.2	12.0	11.3	11.3	21.7	20.0	20.0	28.3	27.5	
Actuated g/C Ratio	0.19	0.14	0.14	0.23	0.22	0.22	0.42	0.38	0.38	0.54	0.53	
v/c Ratio	0.04	0.13	0.14	0.23	0.11	0.32	0.06	0.30	0.15	0.25	0.17	
Control Delay	16.6	26.7	0.7	18.4	21.3	4.6	9.8	21.5	0.4	9.9	14.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	16.6	26.7	0.7	18.4	21.3	4.6	9.8	21.5	0.4	9.9	14.3	
LOS	B	C	A	B	C	A	A	C	A	A	B	
Approach Delay		11.2			10.9			14.1			12.1	
Approach LOS		B			B			B			B	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 52.1	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.32	
Intersection Signal Delay: 12.4	Intersection LOS: B
Intersection Capacity Utilization 45.7%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 4: Binion Road & SR 429 Ramps/Boy Scout Road

Ø1	Ø2		Ø3	Ø4
17 s	40 s		12 s	21 s

Ø5	Ø6		Ø7	Ø8
12 s	45 s		12 s	21 s

Intersection: 4: Binion Road & SR 429 Ramps/Boy Scout Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	TR
Maximum Queue (ft)	50	72	74	90	70	65	49	136	45	87	112
Average Queue (ft)	8	23	26	37	18	27	10	48	21	40	32
95th Queue (ft)	29	51	51	71	42	50	33	95	36	72	77
Link Distance (ft)		966			954			954			953
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	200		200	275		275	275		275	350	
Storage Blk Time (%)											
Queuing Penalty (veh)											

Network Summary

Network wide Queuing Penalty: 0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	↑	↱	↱	↑	↱	↱	↑	↱	↱	↱	
Traffic Volume (vph)	60	70	80	180	70	210	110	260	130	300	330	50
Future Volume (vph)	60	70	80	180	70	210	110	260	130	300	330	50
Satd. Flow (prot)	1736	1827	1553	1736	1827	1553	1736	1827	1553	1736	1790	0
Flt Permitted	0.709			0.508			0.526			0.349		
Satd. Flow (perm)	1295	1827	1553	928	1827	1553	961	1827	1553	638	1790	0
Satd. Flow (RTOR)			279			279			284		10	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	63	74	84	189	74	221	116	274	137	316	400	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Total Split (s)	15.0	24.0	24.0	14.0	23.0	23.0	13.0	28.0	28.0	24.0	39.0	
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.4	6.4	6.4	6.4	6.4	
Act Effct Green (s)	14.5	8.9	8.9	15.9	12.0	12.0	22.7	16.0	16.0	35.5	26.2	
Actuated g/C Ratio	0.21	0.13	0.13	0.23	0.17	0.17	0.33	0.23	0.23	0.51	0.38	
v/c Ratio	0.20	0.32	0.19	0.63	0.23	0.44	0.30	0.65	0.24	0.59	0.59	
Control Delay	21.4	34.8	0.9	33.6	32.5	4.9	13.8	34.5	1.0	16.0	24.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	21.4	34.8	0.9	33.6	32.5	4.9	13.8	34.5	1.0	16.0	24.0	
LOS	C	C	A	C	C	A	B	C	A	B	C	
Approach Delay		18.1			20.3			21.2			20.5	
Approach LOS		B			C			C			C	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 69.6	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 20.4	Intersection LOS: C
Intersection Capacity Utilization 63.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 4: Binion Road & SR 429 Ramps/Boy Scout Road

Ø1	Ø2	Ø3	Ø4
24 s	28 s	14 s	24 s

Ø5	Ø6	Ø7	Ø8
13 s	39 s	15 s	23 s
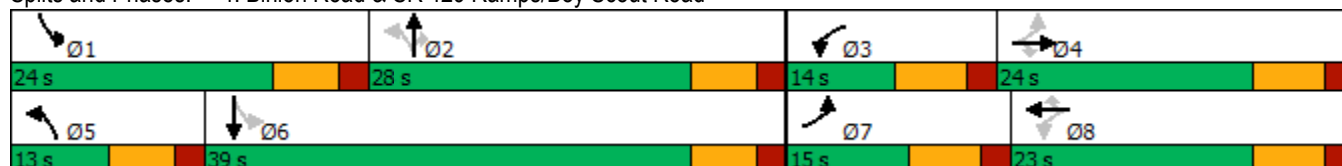
Intersection: 4: Binion Road & SR 429 Ramps/Boy Scout Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	TR
Maximum Queue (ft)	116	137	90	193	95	113	176	235	92	263	332
Average Queue (ft)	39	48	35	83	37	48	47	104	32	100	113
95th Queue (ft)	80	92	63	145	74	88	93	178	60	170	199
Link Distance (ft)		966			954			954			953
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	200		200	275		275	275		275	350	
Storage Blk Time (%)											0
Queuing Penalty (veh)											0

Network Summary

Network wide Queuing Penalty: 0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↱	
Traffic Volume (vph)	50	70	110	130	70	250	80	360	180	240	250	60
Future Volume (vph)	50	70	110	130	70	250	80	360	180	240	250	60
Satd. Flow (prot)	1736	1827	1553	1736	1827	1553	1736	1827	1553	1736	1774	0
Flt Permitted	0.709			0.640			0.563			0.288		
Satd. Flow (perm)	1295	1827	1553	1169	1827	1553	1029	1827	1553	526	1774	0
Satd. Flow (RTOR)			201			263			206		17	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	53	74	116	137	74	263	84	379	189	253	326	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Total Split (s)	12.0	21.0	21.0	12.0	21.0	21.0	12.0	40.0	40.0	17.0	45.0	
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.4	6.4	6.4	6.4	6.4	
Act Effct Green (s)	12.6	8.7	8.7	14.0	11.3	11.3	26.0	20.2	20.2	35.7	28.0	
Actuated g/C Ratio	0.18	0.13	0.13	0.20	0.16	0.16	0.38	0.29	0.29	0.52	0.41	
v/c Ratio	0.19	0.32	0.31	0.48	0.25	0.55	0.19	0.71	0.31	0.56	0.44	
Control Delay	22.5	34.4	2.4	29.0	31.7	9.7	10.8	30.4	4.1	14.7	18.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	22.5	34.4	2.4	29.0	31.7	9.7	10.8	30.4	4.1	14.7	18.7	
LOS	C	C	A	C	C	A	B	C	A	B	B	
Approach Delay		16.5			18.7			20.3			17.0	
Approach LOS		B			B			C			B	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 68.5
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 18.4 — Intersection LOS: B
Intersection Capacity Utilization 62.4% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 4: Binion Road & SR 429 Ramps/Boy Scout Road

Ø1	Ø2		Ø3	Ø4
17 s	40 s		12 s	21 s

Ø5	Ø6		Ø7	Ø8
12 s	45 s		12 s	21 s

Intersection: 4: Binion Road & SR 429 Ramps/Boy Scout Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	TR
Maximum Queue (ft)	94	126	96	165	114	220	108	240	141	194	219
Average Queue (ft)	30	45	40	69	36	64	35	125	32	80	85
95th Queue (ft)	66	86	71	123	74	125	73	214	64	138	161
Link Distance (ft)		966			954			954			953
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	200		200	275		275	275		275	350	
Storage Blk Time (%)											
Queuing Penalty (veh)											

Network Summary

Network wide Queuing Penalty: 0

CDM
Smith

Appendix D

2025 AM and PM Peak Hour SIDRA Reports
2045 AM and PM Peak Hour SIDRA Reports

MOVEMENT SUMMARY

▼ **Site: 1 [RA 1-lane (Site Folder: 2025 AM Build)]**

SR 429/Binion Road Interchange
2025 AM Build
Site Category: (None)
Roundabout

Mov ID	Turn	INPUT VOLUMES [Total veh/h]	HV %	DEMAND FLOWS [Total veh/h]	HV %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh.] veh	95% BACK OF QUEUE [Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Binion Road														
3	L2	50	4.0	53	4.0	0.267	6.1	LOS A	1.3	33.3	0.45	0.33	0.45	28.8
8	T1	140	4.0	147	4.0	0.267	6.1	LOS A	1.3	33.3	0.45	0.33	0.45	28.7
18	R2	70	4.0	74	4.0	0.267	6.1	LOS A	1.3	33.3	0.45	0.33	0.45	27.7
Approach		260	4.0	274	4.0	0.267	6.1	LOS A	1.3	33.3	0.45	0.33	0.45	28.5
East: Boy Scout Road														
1	L2	100	4.0	105	4.0	0.268	6.0	LOS A	1.3	34.0	0.42	0.30	0.42	28.4
6	T1	30	4.0	32	4.0	0.268	6.0	LOS A	1.3	34.0	0.42	0.30	0.42	28.3
16	R2	140	4.0	147	4.0	0.268	6.0	LOS A	1.3	34.0	0.42	0.30	0.42	27.3
Approach		270	4.0	284	4.0	0.268	6.0	LOS A	1.3	34.0	0.42	0.30	0.42	27.8
North: Binion Road														
7	L2	180	4.0	189	4.0	0.359	7.0	LOS A	2.0	50.5	0.44	0.31	0.44	27.6
4	T1	180	4.0	189	4.0	0.359	7.0	LOS A	2.0	50.5	0.44	0.31	0.44	27.6
14	R2	10	4.0	11	4.0	0.359	7.0	LOS A	2.0	50.5	0.44	0.31	0.44	26.6
Approach		370	4.0	389	4.0	0.359	7.0	LOS A	2.0	50.5	0.44	0.31	0.44	27.6
West: Ramps														
5	L2	10	4.0	11	4.0	0.106	5.6	LOS A	0.4	10.9	0.53	0.46	0.53	29.3
2	T1	40	4.0	42	4.0	0.106	5.6	LOS A	0.4	10.9	0.53	0.46	0.53	29.2
12	R2	30	4.0	32	4.0	0.106	5.6	LOS A	0.4	10.9	0.53	0.46	0.53	28.2
Approach		80	4.0	84	4.0	0.106	5.6	LOS A	0.4	10.9	0.53	0.46	0.53	28.8
All Vehicles		980	4.0	1032	4.0	0.359	6.3	LOS A	2.0	50.5	0.45	0.32	0.45	28.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

QUEUE ANALYSIS

▽ Site: 1 [RA 1-lane (Site Folder: 2025 AM Build)]

SR 429/Binion Road Interchange
2025 AM Build
Site Category: (None)
Roundabout

Lane Queues (Distance)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (ft)	Back of Queue (ft) Av.	95%	Queue at Start of Green (ft) Av.	95%	Cycle Average Queue (ft) Av.	95%	Queue Storage Ratio Av.	95%	Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
South: Binion Road															
Lane 1		0.267	1.000	0.0	13.4	33.3	NA	NA	12.0	21.7	0.01	0.03	0.0	NA	NA
Approach		0.267			13.4	33.3	NA	NA	12.0	21.7	0.01	0.03			
East: Boy Scout Road															
Lane 1		0.268	1.000	0.0	13.7	34.0	NA	NA	12.2	22.0	0.01	0.03	0.0	NA	NA
Approach		0.268			13.7	34.0	NA	NA	12.2	22.0	0.01	0.03			
North: Binion Road															
Lane 1		0.359	1.000	0.0	20.3	50.5	NA	NA	19.4	35.2	0.02	0.05	0.0	NA	NA
Approach		0.359			20.3	50.5	NA	NA	19.4	35.2	0.02	0.05			
West: Ramps															
Lane 1		0.106	1.000	0.0	4.4	10.9	NA	NA	3.4	6.1	0.00	0.01	0.0	NA	NA
Approach		0.106			4.4	10.9	NA	NA	3.4	6.1	0.00	0.01			
Intersection		0.359			20.3	50.5	NA	NA	19.4	35.2	0.02	0.05			

Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.

Lane Queues (Vehicles)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (veh)	Back of Queue (veh) Av.	95%	Queue at Start of Green (veh) Av.	95%	Cycle Average Queue (veh) Av.	95%	Queue Storage Ratio Av.	95%	Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
South: Binion Road															
Lane 1		0.267	1.000	0.0	0.5	1.3	NA	NA	0.5	0.8	0.01	0.03	0.0	NA	NA
Approach		0.267			0.5	1.3	NA	NA	0.5	0.8	0.01	0.03			
East: Boy Scout Road															
Lane 1		0.268	1.000	0.0	0.5	1.3	NA	NA	0.5	0.9	0.01	0.03	0.0	NA	NA
Approach		0.268			0.5	1.3	NA	NA	0.5	0.9	0.01	0.03			
North: Binion Road															
Lane 1		0.359	1.000	0.0	0.8	2.0	NA	NA	0.8	1.4	0.02	0.05	0.0	NA	NA
Approach		0.359			0.8	2.0	NA	NA	0.8	1.4	0.02	0.05			
West: Ramps															
Lane 1		0.106	1.000	0.0	0.2	0.4	NA	NA	0.1	0.2	0.00	0.01	0.0	NA	NA
Approach		0.106			0.2	0.4	NA	NA	0.1	0.2	0.00	0.01			
Intersection		0.359			0.8	2.0	NA	NA	0.8	1.4	0.02	0.05			

Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.

Continuous Lane Performance

Lane Number	Deg. Satn v/c	Unint. Speed mph	Unint. Travel Delay sec	Hdwy Spacing sec	Aver. Vehicle Length ft	Occup. Time sec	Space Time sec	Space Occup. Ratio %	Time Occup. Ratio %	Density veh/mi	pc/mi	LOS (Density Method)
South: Binion Road												
This approach does not have any continuous lanes												
East: Boy Scout Road												
This approach does not have any continuous lanes												
North: Binion Road												
This approach does not have any continuous lanes												
West: Ramps												
This approach does not have any continuous lanes												

Midblock Effective Detection Zone Length = 7 ft

MOVEMENT SUMMARY

▽ Site: 1 [RA 1-lane (Site Folder: 2025 PM Build)]

SR 429/Binion Road Interchange
2025 PM Build
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] ft				mph
South: Binion Road														
3	L2	30	4.0	32	4.0	0.324	6.6	LOS A	1.7	43.6	0.44	0.31	0.44	28.8
8	T1	200	4.0	211	4.0	0.324	6.6	LOS A	1.7	43.6	0.44	0.31	0.44	28.7
18	R2	100	4.0	105	4.0	0.324	6.6	LOS A	1.7	43.6	0.44	0.31	0.44	27.7
Approach		330	4.0	347	4.0	0.324	6.6	LOS A	1.7	43.6	0.44	0.31	0.44	28.4
East: Boy Scout Road														
1	L2	70	4.0	74	4.0	0.270	6.2	LOS A	1.3	33.7	0.46	0.35	0.46	28.5
6	T1	40	4.0	42	4.0	0.270	6.2	LOS A	1.3	33.7	0.46	0.35	0.46	28.4
16	R2	150	4.0	158	4.0	0.270	6.2	LOS A	1.3	33.7	0.46	0.35	0.46	27.4
Approach		260	4.0	274	4.0	0.270	6.2	LOS A	1.3	33.7	0.46	0.35	0.46	27.9
North: Binion Road														
7	L2	150	4.0	158	4.0	0.278	5.8	LOS A	1.4	36.7	0.36	0.22	0.36	28.2
4	T1	140	4.0	147	4.0	0.278	5.8	LOS A	1.4	36.7	0.36	0.22	0.36	28.1
14	R2	10	4.0	11	4.0	0.278	5.8	LOS A	1.4	36.7	0.36	0.22	0.36	27.2
Approach		300	4.0	316	4.0	0.278	5.8	LOS A	1.4	36.7	0.36	0.22	0.36	28.2
West: Ramps														
5	L2	10	4.0	11	4.0	0.107	5.1	LOS A	0.4	11.2	0.48	0.38	0.48	29.6
2	T1	30	4.0	32	4.0	0.107	5.1	LOS A	0.4	11.2	0.48	0.38	0.48	29.5
12	R2	50	4.0	53	4.0	0.107	5.1	LOS A	0.4	11.2	0.48	0.38	0.48	28.5
Approach		90	4.0	95	4.0	0.107	5.1	LOS A	0.4	11.2	0.48	0.38	0.48	28.9
All Vehicles		980	4.0	1032	4.0	0.324	6.1	LOS A	1.7	43.6	0.42	0.30	0.42	28.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

QUEUE ANALYSIS

▽ Site: 1 [RA 1-lane (Site Folder: 2025 PM Build)]

SR 429/Binion Road Interchange
2025 PM Build
Site Category: (None)
Roundabout

Lane Queues (Distance)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (ft)	Back of Queue (ft)		Queue at Start of Green (ft)		Cycle Average Queue (ft)		Queue Storage Ratio		Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
					Av.	95%	Av.	95%	Av.	95%	Av.	95%			
South: Binion Road															
Lane 1		0.324	1.000	0.0	17.6	43.6	NA	NA	16.4	29.7	0.02	0.04	0.0	NA	NA
Approach		0.324			17.6	43.6	NA	NA	16.4	29.7	0.02	0.04			
East: Boy Scout Road															
Lane 1		0.270	1.000	0.0	13.5	33.7	NA	NA	12.2	22.1	0.01	0.03	0.0	NA	NA
Approach		0.270			13.5	33.7	NA	NA	12.2	22.1	0.01	0.03			
North: Binion Road															
Lane 1		0.278	1.000	0.0	14.8	36.7	NA	NA	13.1	23.7	0.01	0.04	0.0	NA	NA
Approach		0.278			14.8	36.7	NA	NA	13.1	23.7	0.01	0.04			
West: Ramps															
Lane 1		0.107	1.000	0.0	4.5	11.2	NA	NA	3.4	6.2	0.00	0.01	0.0	NA	NA
Approach		0.107			4.5	11.2	NA	NA	3.4	6.2	0.00	0.01			
Intersection		0.324			17.6	43.6	NA	NA	16.4	29.7	0.02	0.04			

Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.

Lane Queues (Vehicles)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (veh)	Back of Queue (veh)		Queue at Start of Green (veh)		Cycle Average Queue (veh)		Queue Storage Ratio		Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
					Av.	95%	Av.	95%	Av.	95%	Av.	95%			
South: Binion Road															
Lane 1		0.324	1.000	0.0	0.7	1.7	NA	NA	0.6	1.1	0.02	0.04	0.0	NA	NA
Approach		0.324			0.7	1.7	NA	NA	0.6	1.1	0.02	0.04			
East: Boy Scout Road															
Lane 1		0.270	1.000	0.0	0.5	1.3	NA	NA	0.5	0.9	0.01	0.03	0.0	NA	NA
Approach		0.270			0.5	1.3	NA	NA	0.5	0.9	0.01	0.03			
North: Binion Road															
Lane 1		0.278	1.000	0.0	0.6	1.4	NA	NA	0.5	0.9	0.01	0.04	0.0	NA	NA
Approach		0.278			0.6	1.4	NA	NA	0.5	0.9	0.01	0.04			
West: Ramps															
Lane 1		0.107	1.000	0.0	0.2	0.4	NA	NA	0.1	0.2	0.00	0.01	0.0	NA	NA
Approach		0.107			0.2	0.4	NA	NA	0.1	0.2	0.00	0.01			
Intersection		0.324			0.7	1.7	NA	NA	0.6	1.1	0.02	0.04			

Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.

Continuous Lane Performance

Lane Number	Deg. Satn v/c	Unint. Speed mph	Unint. Travel Delay sec	Hdwy Spacing sec	Aver. Vehicle Length ft	Occup. Time sec	Space Time sec	Space Occup. Ratio %	Time Occup. Ratio %	Density veh/mi	pc/mi	LOS (Density Method)
South: Binion Road												
This approach does not have any continuous lanes												
East: Boy Scout Road												
This approach does not have any continuous lanes												
North: Binion Road												
This approach does not have any continuous lanes												
West: Ramps												
This approach does not have any continuous lanes												

Midblock Effective Detection Zone Length = 7 ft

MOVEMENT SUMMARY

▽ Site: 1 [RA 1-lane (Site Folder: 2045 AM Build)]

SR 429/Binion Road Interchange
2045 AM Build
Site Category: (None)
Roundabout

Mov ID	Turn	INPUT VOLUMES [Total] veh/h	HV %	DEMAND FLOWS [Total] veh/h	HV %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh.] veh	Dist ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Binion Road														
3	L2	110	4.0	116	4.0	0.641	15.1	LOS C	6.6	170.3	0.79	1.03	1.34	24.4
8	T1	260	4.0	274	4.0	0.641	15.1	LOS C	6.6	170.3	0.79	1.03	1.34	24.3
18	R2	130	4.0	137	4.0	0.641	15.1	LOS C	6.6	170.3	0.79	1.03	1.34	23.6
Approach		500	4.0	526	4.0	0.641	15.1	LOS C	6.6	170.3	0.79	1.03	1.34	24.1
East: Boy Scout Road														
1	L2	180	4.0	189	4.0	0.590	13.4	LOS B	5.3	136.2	0.75	0.93	1.18	24.7
6	T1	70	4.0	74	4.0	0.590	13.4	LOS B	5.3	136.2	0.75	0.93	1.18	24.6
16	R2	210	4.0	221	4.0	0.590	13.4	LOS B	5.3	136.2	0.75	0.93	1.18	23.9
Approach		460	4.0	484	4.0	0.590	13.4	LOS B	5.3	136.2	0.75	0.93	1.18	24.3
North: Binion Road														
7	L2	300	4.0	316	4.0	0.806	22.6	LOS C	15.6	401.9	0.93	1.41	2.04	21.4
4	T1	330	4.0	347	4.0	0.806	22.6	LOS C	15.6	401.9	0.93	1.41	2.04	21.3
14	R2	50	4.0	53	4.0	0.806	22.6	LOS C	15.6	401.9	0.93	1.41	2.04	20.8
Approach		680	4.0	716	4.0	0.806	22.6	LOS C	15.6	401.9	0.93	1.41	2.04	21.3
West: Ramps														
5	L2	60	4.0	63	4.0	0.412	13.4	LOS B	2.0	52.1	0.74	0.83	0.99	25.0
2	T1	70	4.0	74	4.0	0.412	13.4	LOS B	2.0	52.1	0.74	0.83	0.99	24.9
12	R2	80	4.0	84	4.0	0.412	13.4	LOS B	2.0	52.1	0.74	0.83	0.99	24.1
Approach		210	4.0	221	4.0	0.412	13.4	LOS B	2.0	52.1	0.74	0.83	0.99	24.6
All Vehicles		1850	4.0	1947	4.0	0.806	17.2	LOS C	15.6	401.9	0.83	1.12	1.52	23.1

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

QUEUE ANALYSIS

▽ Site: 1 [RA 1-lane (Site Folder: 2045 AM Build)]

SR 429/Binion Road Interchange
2045 AM Build
Site Category: (None)
Roundabout

Lane Queues (Distance)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (ft)	Back of Queue (ft) Av.	95%	Queue at Start of Green (ft) Av.	95%	Cycle Average Queue (ft) Av.	95%	Queue Storage Ratio Av.	95%	Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
South: Binion Road															
Lane 1		0.641	1.000	21.6	68.5	170.3	NA	NA	56.9	103.2	0.07	0.17	0.0	NA	NA
Approach		0.641			68.5	170.3	NA	NA	56.9	103.2	0.07	0.17			
East: Boy Scout Road															
Lane 1		0.590	1.000	15.4	54.8	136.2	NA	NA	46.6	84.6	0.05	0.14	0.0	NA	NA
Approach		0.590			54.8	136.2	NA	NA	46.6	84.6	0.05	0.14			
North: Binion Road															
Lane 1		0.806	1.000	64.6	161.7	401.9	NA	NA	115.8	210.0	0.16	0.40	0.0	NA	NA
Approach		0.806			161.7	401.9	NA	NA	115.8	210.0	0.16	0.40			
West: Ramps															
Lane 1		0.412	1.000	3.9	21.0	52.1	NA	NA	21.2	38.4	0.02	0.05	0.0	NA	NA
Approach		0.412			21.0	52.1	NA	NA	21.2	38.4	0.02	0.05			
Intersection		0.806			161.7	401.9	NA	NA	115.8	210.0	0.16	0.40			

Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.

Lane Queues (Vehicles)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (veh)	Back of Queue (veh) Av.	95%	Queue at Start of Green (veh) Av.	95%	Cycle Average Queue (veh) Av.	95%	Queue Storage Ratio Av.	95%	Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
South: Binion Road															
Lane 1		0.641	1.000	0.8	2.7	6.6	NA	NA	2.2	4.0	0.07	0.17	0.0	NA	NA
Approach		0.641			2.7	6.6	NA	NA	2.2	4.0	0.07	0.17			
East: Boy Scout Road															
Lane 1		0.590	1.000	0.6	2.1	5.3	NA	NA	1.8	3.3	0.05	0.14	0.0	NA	NA
Approach		0.590			2.1	5.3	NA	NA	1.8	3.3	0.05	0.14			
North: Binion Road															
Lane 1		0.806	1.000	2.5	6.3	15.6	NA	NA	4.5	8.1	0.16	0.40	0.0	NA	NA
Approach		0.806			6.3	15.6	NA	NA	4.5	8.1	0.16	0.40			
West: Ramps															
Lane 1		0.412	1.000	0.2	0.8	2.0	NA	NA	0.8	1.5	0.02	0.05	0.0	NA	NA
Approach		0.412			0.8	2.0	NA	NA	0.8	1.5	0.02	0.05			
Intersection		0.806			6.3	15.6	NA	NA	4.5	8.1	0.16	0.40			

Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.

Continuous Lane Performance

Lane Number	Deg. Satn v/c	Unint. Speed mph	Unint. Travel Delay sec	Hdwy Spacing sec		Aver. Vehicle Length ft	Occup. Time sec	Space Time sec	Space Occup. Ratio %	Time Occup. Ratio %	Density veh/mi	pc/mi	LOS (Density Method)

South: Binion Road

This approach does not have any continuous lanes

East: Boy Scout Road

This approach does not have any continuous lanes

North: Binion Road

This approach does not have any continuous lanes

West: Ramps

This approach does not have any continuous lanes

Midblock Effective Detection Zone Length = 7 ft

MOVEMENT SUMMARY

▽ Site: 1 [RA 1-lane (Site Folder: 2045 PM Build)]

SR 429/Binion Road Interchange
2045 PM Build
Site Category: (None)
Roundabout

Mov ID	Turn	INPUT VOLUMES [Total] veh/h	HV %	DEMAND FLOWS [Total] veh/h	HV %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh.] veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Binion Road														
3	L2	80	4.0	84	4.0	0.735	18.1	LOS C	11.1	285.8	0.85	1.18	1.64	23.4
8	T1	360	4.0	379	4.0	0.735	18.1	LOS C	11.1	285.8	0.85	1.18	1.64	23.3
18	R2	180	4.0	189	4.0	0.735	18.1	LOS C	11.1	285.8	0.85	1.18	1.64	22.6
Approach		620	4.0	653	4.0	0.735	18.1	LOS C	11.1	285.8	0.85	1.18	1.64	23.1
East: Boy Scout Road														
1	L2	130	4.0	137	4.0	0.617	15.0	LOS C	5.6	144.2	0.78	1.00	1.32	24.2
6	T1	70	4.0	74	4.0	0.617	15.0	LOS C	5.6	144.2	0.78	1.00	1.32	24.1
16	R2	250	4.0	263	4.0	0.617	15.0	LOS C	5.6	144.2	0.78	1.00	1.32	23.4
Approach		450	4.0	474	4.0	0.617	15.0	LOS C	5.6	144.2	0.78	1.00	1.32	23.8
North: Binion Road														
7	L2	240	4.0	253	4.0	0.596	12.0	LOS B	6.0	154.1	0.69	0.72	0.95	25.3
4	T1	250	4.0	263	4.0	0.596	12.0	LOS B	6.0	154.1	0.69	0.72	0.95	25.2
14	R2	60	4.0	63	4.0	0.596	12.0	LOS B	6.0	154.1	0.69	0.72	0.95	24.5
Approach		550	4.0	579	4.0	0.596	12.0	LOS B	6.0	154.1	0.69	0.72	0.95	25.2
West: Ramps														
5	L2	50	4.0	53	4.0	0.365	10.3	LOS B	1.7	45.1	0.69	0.72	0.79	26.5
2	T1	70	4.0	74	4.0	0.365	10.3	LOS B	1.7	45.1	0.69	0.72	0.79	26.4
12	R2	110	4.0	116	4.0	0.365	10.3	LOS B	1.7	45.1	0.69	0.72	0.79	25.5
Approach		230	4.0	242	4.0	0.365	10.3	LOS B	1.7	45.1	0.69	0.72	0.79	26.0
All Vehicles		1850	4.0	1947	4.0	0.735	14.6	LOS B	11.1	285.8	0.77	0.94	1.25	24.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

QUEUE ANALYSIS

▽ Site: 1 [RA 1-lane (Site Folder: 2045 PM Build)]

SR 429/Binion Road Interchange
2045 PM Build
Site Category: (None)
Roundabout

Lane Queues (Distance)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (ft)	Back of Queue (ft) Av.	Back of Queue (ft) 95%	Queue at Start of Green (ft) Av.	Queue at Start of Green (ft) 95%	Cycle Average Queue (ft) Av.	Cycle Average Queue (ft) 95%	Queue Storage Ratio Av.	Queue Storage Ratio 95%	Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
South: Binion Road															
Lane 1		0.735	1.000	41.0	115.0	285.8	NA	NA	84.6	153.5	0.11	0.29	0.0	NA	NA
Approach		0.735			115.0	285.8	NA	NA	84.6	153.5	0.11	0.29			
East: Boy Scout Road															
Lane 1		0.617	1.000	18.0	58.0	144.2	NA	NA	51.0	92.5	0.06	0.14	0.0	NA	NA
Approach		0.617			58.0	144.2	NA	NA	51.0	92.5	0.06	0.14			
North: Binion Road															
Lane 1		0.596	1.000	13.8	62.0	154.1	NA	NA	49.9	90.4	0.06	0.15	0.0	NA	NA
Approach		0.596			62.0	154.1	NA	NA	49.9	90.4	0.06	0.15			
West: Ramps															
Lane 1		0.365	1.000	1.7	18.2	45.1	NA	NA	17.9	32.5	0.02	0.05	0.0	NA	NA
Approach		0.365			18.2	45.1	NA	NA	17.9	32.5	0.02	0.05			
Intersection		0.735			115.0	285.8	NA	NA	84.6	153.5	0.11	0.29			

Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.

Lane Queues (Vehicles)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (veh)	Back of Queue (veh) Av.	Back of Queue (veh) 95%	Queue at Start of Green (veh) Av.	Queue at Start of Green (veh) 95%	Cycle Average Queue (veh) Av.	Cycle Average Queue (veh) 95%	Queue Storage Ratio Av.	Queue Storage Ratio 95%	Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
South: Binion Road															
Lane 1		0.735	1.000	1.6	4.5	11.1	NA	NA	3.3	5.9	0.11	0.29	0.0	NA	NA
Approach		0.735			4.5	11.1	NA	NA	3.3	5.9	0.11	0.29			
East: Boy Scout Road															
Lane 1		0.617	1.000	0.7	2.2	5.6	NA	NA	2.0	3.6	0.06	0.14	0.0	NA	NA
Approach		0.617			2.2	5.6	NA	NA	2.0	3.6	0.06	0.14			
North: Binion Road															
Lane 1		0.596	1.000	0.5	2.4	6.0	NA	NA	1.9	3.5	0.06	0.15	0.0	NA	NA
Approach		0.596			2.4	6.0	NA	NA	1.9	3.5	0.06	0.15			
West: Ramps															
Lane 1		0.365	1.000	0.1	0.7	1.7	NA	NA	0.7	1.3	0.02	0.05	0.0	NA	NA
Approach		0.365			0.7	1.7	NA	NA	0.7	1.3	0.02	0.05			
Intersection		0.735			4.5	11.1	NA	NA	3.3	5.9	0.11	0.29			

Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.

Continuous Lane Performance

Lane Number	Deg. Satn v/c	Unint. Speed mph	Unint. Travel Delay sec	Hdwy sec	Spacing ft	Aver. Vehicle Length ft	Occup. Time sec	Space Time sec	Space Occup. Ratio %	Time Occup. Ratio %	Density veh/mi	pc/mi	LOS (Density Method)

South: Binion Road

This approach does not have any continuous lanes

East: Boy Scout Road

This approach does not have any continuous lanes

North: Binion Road

This approach does not have any continuous lanes

West: Ramps

This approach does not have any continuous lanes

Midblock Effective Detection Zone Length = 7 ft