MEMORANDUM

To: Jamie Oliver, Isle of Wight County

From: Devin E. Simpson, P.E.

Kimley-Horn and Associates, Inc.

Date: April 30, 2026

Subject: Benns Church Boulevard & Turner Drive Intersection Improvements
Smithfield, VA

Kimley-Horn was retained to perform a traffic operational analysis for the intersection of Benns Church Boulevard & Turner Drive in Isle of Wight County, Virginia. The purpose of this analysis is to analyze and validate the operational performance of the proposed intersection improvements funded through VDOT's Revenue Sharing and SMART SCALE programs (UPC #124999 and #119216).

Project Overview

This project will install dual left-turn lanes along northbound Benns Church Boulevard (Route 10) at Turner Drive (UPC #119216) and construct a roundabout intersection at the access to planned developments to the north and south of Turner Drive (UPC #124999). The proposed improvements consist of turn lane additions, curb and gutter improvements, drainage and stormwater management improvements, pedestrian accommodations, and traffic signal and pedestrian signal upgrades, consistent with the respective funding applications.

Methodology

Intersection capacity analyses were performed for 2025 Existing, 2034 No Build, and 2034 Build conditions at Benns Church Boulevard & Turner Drive. The No Build and Build year of 2034 was established consistent with VDOT guidance of +7 years from the advertisement year, which is anticipated to be 2027. The operational analyses were performed consistent with VDOT's *Traffic Operations and Safety Analysis Manual, Version 2.0* (TOSAM 2.0) using *Synchro 12* and its microsimulation companion tool, *SimTraffic*. For the purposes of this analysis, delay, level of service (LOS), and queue lengths were the primary measures of effectiveness.

Signal timings for Benns Church Boulevard & Turner Drive were obtained from VDOT. Key assumptions in this analysis included:

No Build 2034 Scenario

- Background traffic from approved developments within the Benns Church Master TIA (October 2023) and the Smithfield Retail (Sheetz) TIA (July 2025) were added to the No Build scenario with the exception of the previously proposed Wawa on the southwest corner of Benns Church Boulevard & Turner Drive, which was changed to High-Turnover (Sit Down) Restaurant.

- Geometric and signal timing improvements at Benns Church Boulevard & Turner Drive are consistent with the most recent submittal of the Sheetz Off-Site improvements (March 2026), which include:
  - Addition of a northbound right-turn lane with 235' effective storage
  - Addition of a southbound left-turn lane with 300' effective storage
  - Reconfiguration of the westbound approach to a left and shared through-right lane
  - Reconfiguration of the eastbound approach to a left, through, and channelized right-turn lane
  - Conversion to Flashing Yellow Arrow protected/permissive side street phasing
- Site access to Turner North and Turner South developments is provided by a conventional unsignalized, two-way stop-controlled intersection.

Build 2034 Scenario

- Phase splits for the side streets were adjusted to accommodate the intersection improvements.
- The storage of the northbound right-turn lane at Benns Church Boulevard & Turner Drive is shortened by 25' to accommodate the proposed pedestrian crossing.

Data Collection

Existing traffic volumes were obtained from recently collected turning movement counts (TMCs) in July 2025. Based on these TMC, the peak hour for the intersection was determined to be 7:00-8:00 AM and 4:45-5:45 PM. Due to the data collection timeframe, a seasonal factor was applied based on historical data to reflect a typical weekday with school in session.

An annual growth rate of 3% was determined based upon historical traffic count data within or near the study intersection obtained from VDOT's online traffic count database. This growth rate was applied annually to the 2025 Existing traffic volumes to develop the 2034 No Build and Build traffic volumes.

Traffic Operational Analysis

EXISTING CONDITIONS

Under existing conditions, Benns Church Boulevard & Turner Drive operates at LOS B during both the AM and PM peak hours. The eastbound and westbound approaches operate at LOS D due to lower volumes and signal timing priority given to throughput north-south along Benns Church Boulevard.

In the AM peak hour, southbound through queueing blocks access to the adjacent right and left-turn lanes for approximately 14% and 38% of the study period, respectively, though the left-turn lane serves no vehicles during this peak. In the PM peak hour, northbound left-turn queues spill back into the adjacent through lane for approximately 5% of the study period. While there is some blockage of turn-lanes by through queues, it is not significant in this peak hour.

The site driveway on Turner Drive does not currently exist and was only analyzed in future conditions.

NO BUILD CONDITIONS

Benns Church Boulevard & Turner Drive

Under 2034 No Build conditions, the intersection of Benns Church Boulevard & Turner Drive operates at an LOS F during both the AM and PM peak hour, with overall intersection delays exceeding 150 seconds. In the AM peak hour, the intersection delay is primarily driven by the southbound through movement, with a delay approaching 6.5 minutes (380 seconds). In addition to delays, the following blockages/spillbacks were noted during the analysis period:

- Southbound through queues block access to the adjacent right and left-turn lanes for 56% and 65% of the analysis period, respectively.
- Eastbound through queues block access to the turn lanes for 25% of the analysis period.
- Eastbound left and right-turning queues spill into the through lane for 25% and 29% of the analysis period, respectively.
- Northbound left-turn queues exceed storage and spill into the adjacent through lane for 17% of the analysis period.

In the PM peak hour, all four approaches operate at an LOS F with vehicles waiting at the intersection for greater than a full cycle length, on average. Southbound through, eastbound left, and westbound through-right vehicles are delayed for more than 3.5 minutes. Similar to the AM peak, queueing of several movements impacted effective capacity of overall approaches:

- Southbound through queues block access to the adjacent right and left-turn lanes for 56% and 59% of the analysis period, respectively.
- Eastbound left-turn queues spill into the adjacent through lane for 65% of the analysis period.
- Northbound left-turn queues spill into the adjacent through lane for 35% of the analysis period.
- Northbound through queues block access to the adjacent right and left-turn lanes for 35% of the analysis period.

Turner Drive & Site Driveway

Under stop-control, proposed site access to the west of Benns Church Boulevard & Turner Drive is expected to operate at an LOS F and LOS C in the AM and PM peak hours, respectively. While delays are low along Turner Drive, vehicles exiting either site are expected to experience several minutes of delay across both peak hours.

BUILD CONDITIONS

Benns Church Boulevard & Turner Drive

Under 2034 Build conditions, the intersection of Benns Church Boulevard & Turner Drive continues to operate at an LOS F during both the AM and PM peak hour. However, all approach delays are improved from No Build conditions except for westbound during the AM peak hour.

In the AM peak hour, the southbound through delay is reduced by over 2 minutes (130 seconds) while the eastbound left-turn delay is reduced by about 1.5 minutes (90 seconds). Additionally, the following queueing changes are noted between the No Build and Build condition:

- Along the northbound approach, no queues interfere with the operation of adjacent lanes.
- Southbound through blockage of adjacent turn lanes is reduced to 56%.
- Eastbound through queues block access to turn lanes for only 7% of the analysis period.
- Eastbound left-turn queues no longer spill back into the adjacent through lane.

In the PM peak hour, overall approach delays were all reduced by at least 30 seconds. The minor streets experienced significant improvements in delay, with the westbound through-right movement being reduced by over 2 minutes (140 seconds) and the eastbound-left turn movement being reduced by almost 1.5 minutes (85 seconds). Additionally, the following queueing changes are noted between the No Build and Build condition:

- The combined percentage of the study period where northbound left-turn vehicles spill back into the adjacent through lane or through vehicles block access to the left-turn lanes is reduced from 70% to 41%.
- The combined percentage of the study period where eastbound left-turn vehicles spill back into the adjacent through lane or through vehicles block access to the left-turn lanes is reduced from 81% to 22%.

Turner Drive & Site Driveway

In both the AM and PM peak hours, the installation of a roundabout in place of a full access site driveway improves the intersection to LOS A. Spillback from Benns Church Boulevard & Turner Drive continue to contribute to queuing of eastbound vehicles at the roundabout, however, this queueing is reduced by approximately 200 and 500 feet in the AM and PM peak hours, respectively, and the roundabout reduces the impact of this spillback on minor street operations.

Conclusion

Based on the operational analysis performed for the intersection of Benns Church Boulevard & Turner Drive, the addition of dual left turn lanes along northbound and eastbound Benns Church Boulevard are expected to improve overall delay and queueing significantly. In addition, the roundabout vastly improves the ability of vehicles to enter and exit the planned developments at Turner South and Turner North compared to a conventional unsignalized intersection. A full summary of intersection results can be found in **Tables 1** through **4**.

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Table 1: Benns Church Boulevard & Turner Drive Intersection Operations Results

Scenario	Traffic Control	LOS	Level of Service (LOS)											
			Eastbound (Turner Drive)			Westbound (Turner Drive)			Northbound (Benns Church Boulevard)			Southbound (Benns Church Boulevard)		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
AM Peak Hour														
2025 Existing	Signalized	C	D (50.0)		D (38.8)	D (36.9)			C (31.1)	A (9.1)		-	D (42.8)	B (13.5)
		(30.0)	D (43.1)			D (36.9)			B (13.9)			D (37.2)		
2034 No Build	Signalized	F	F (150.8)	D (42.6)	D (44.6)	D (40.1)	D (54.3)		D (38.8)	B (15.7)	B (16.5)	B (17.0)	F (379.8)	D (43.7)
		(154.3)	F (89.7)			D (48.1)			C (21.8)			F (289.0)		
2034 Build	Signalized	F	E (61.6)	D (47.8)	D (49.3)	E (60.2)	D (54.3)		C (32.8)	B (18.0)	B (18.6)	E (57.1)	F (250.3)	D (35.5)
		(106.2)	D (54.5)			E (56.8)			C (21.9)			F (194.1)		
PM Peak Hour														
2025 Existing	Signalized	B	D (46.7)		D (35.8)	C (34.8)			C (21.6)	B (18.9)		A (1.8)	B (10.9)	B (17.5)
		(18.4)	D (41.2)			C (34.8)			B (19.3)			B (11.4)		
2034 No Build	Signalized	F	F (214.7)	D (47.1)	D (44.9)	D (45.5)	F (245.4)		F (114.2)	F (140.3)	F (105.0)	C (33.0)	F (217.5)	C (22.9)
		(153.6)	F (134.8)			F (142.6)			F (133.7)			F (184.7)		
2034 Build	Signalized	F	F (130.2)	D (49.8)	D (53.2)	F (128.3)	F (105.5)		E (63.0)	F (116.6)	A (3.6)	F (179.4)	F (170.3)	C (21.3)
		(120.8)	F (93.6)			F (117.2)			F (100.4)			F (154.1)		

Table 2: Turner Drive & Site Driveway Intersection Operations Results

Scenario	Traffic Control	LOS	Level of Service (LOS)				
			Eastbound	Westbound		Northbound	Southbound
			LTR	LT	TR	LTR	LTR
AM Peak Hour							
2034 No Build	Unsignalized	F (53.7)	A (0.4)	A (0.8)		F (353.3)	F (734.2)
			A (0.4)	A (0.8)		F (353.3)	F (734.2)
2034 Build	Unsignalized	A (9.8)	B (14.3)	A (6.2)	A (6.2)	A (8.5)	A (8.9)
			B (14.3)	A (6.2)		A (8.5)	A (8.9)
PM Peak Hour							
2034 No Build	Unsignalized	C (23.1)	A (0.5)	A (0.7)		F (104.6)	F (239.2)
			A (0.5)	A (0.7)		F (104.6)	F (239.2)
2034 Build	Unsignalized	A (7.8)	B (10.5)	A (5.5)	A (5.4)	A (7.8)	A (7.0)
			B (10.5)	A (5.4)		A (7.8)	A (7.0)

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Table 3: Benns Church Boulevard & Turner Drive Queue Results

Scenario	95th Percentile Queue Length by Movement (Feet)											
	Eastbound			Westbound			Northbound			Southbound		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
AM Peak Hour												
2025 Existing	180		165	<25			170	210		-	635	325
2034 No Build	365 *(25%)	570 **(25%)	65 *(29%)	105	180		380 *(17%)	650 **(7%)	310 *(1%)	375	685 **(65%)	320 *(3%)
2034 Build	245	315 **(7%)	85 *(23%)	110	145		295	230	90	370	685 **(56%)	315 *(3%)
PM Peak Hour												
2025 Existing	170		105	<25			175	295		80	270	95
2034 No Build	310 *(65%)	445 **(16%)	60	225	595		370 *(35%)	820 **(35%)	310 *(1%)	385	680 **(59%)	370
2034 Build	305 *(13%)	460 **(9%)	95	280	275		635	850 **(41%)	285 *(1%)	390	675 **(56%)	370 *(1%)

**(X%) - Maximum queue extends full length of storage bay for X% of the analysis period*

***(Y%) - Queue in lane adjacent to storage bay extends beyond end of storage bay for Y% of the analysis period*

Table 4: Turner Drive & Site Driveway Queue Results

Scenario	95th Percentile Queue Length by Movement (Feet)											
	Eastbound			Westbound		Northbound			Southbound			
	LT	TH	RT	LTH	THR	LT	TH	RT	LT	TH	RT	
AM Peak Hour												
2034 No Build	735			275		270			385			
2034 Build	530			70	40	60			55			
PM Peak Hour												
2034 No Build	1055			130		407			355			
2034 Build	545			60	35	160			65			

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ATTACHMENT A

EXISTING AND FUTURE VOLUME FIGURES

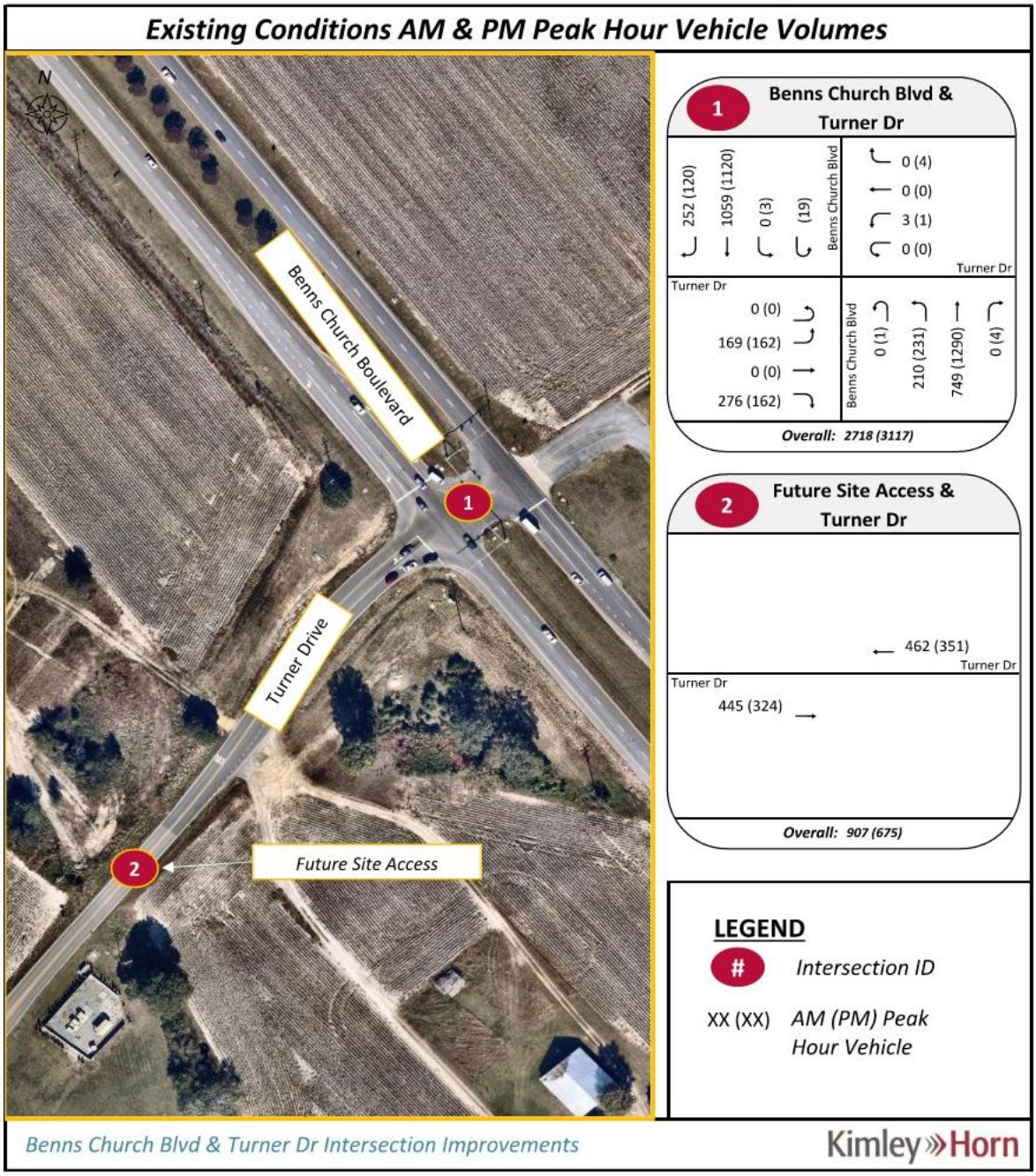


Figure 1: Existing Conditions Traffic Volumes

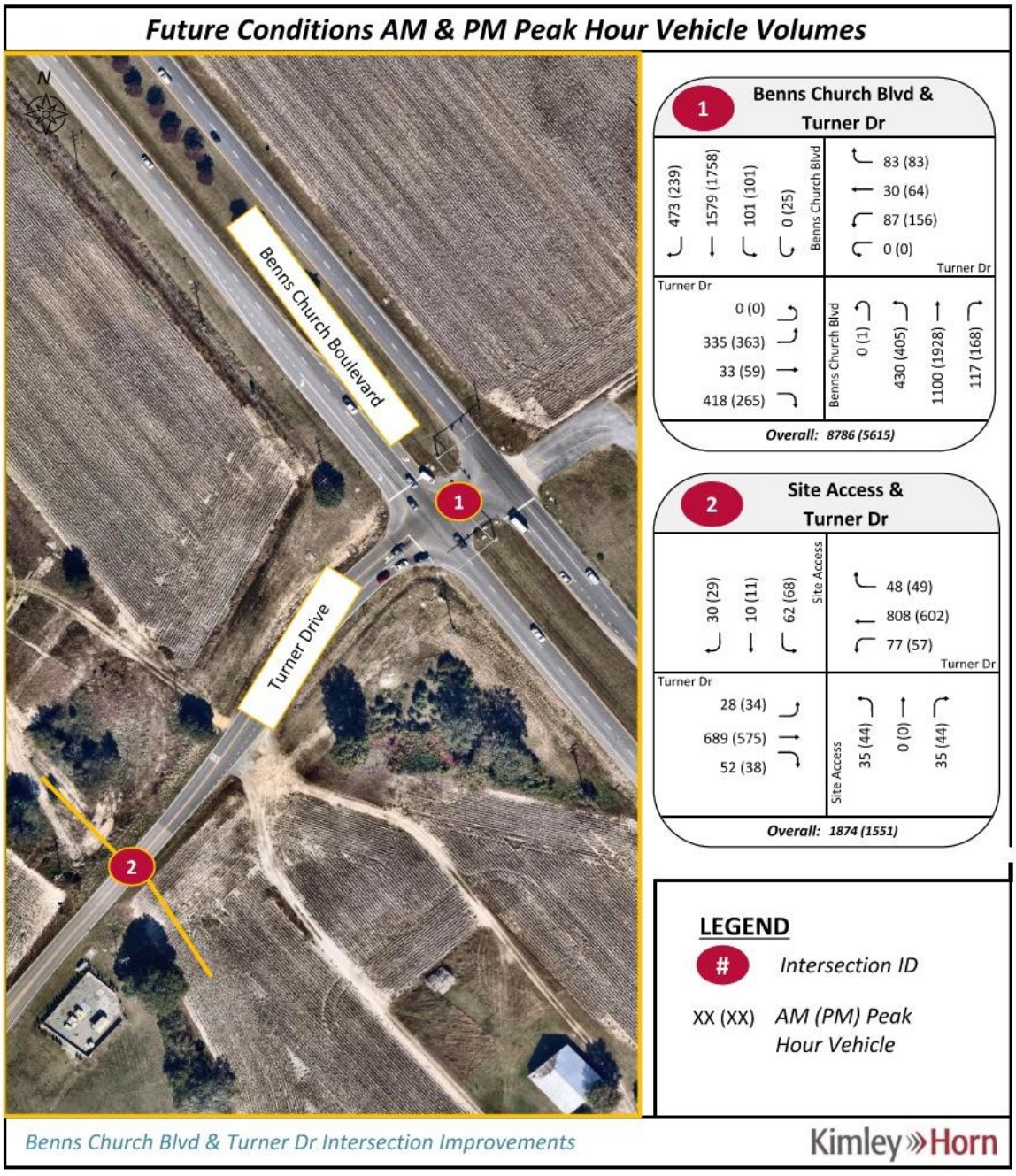
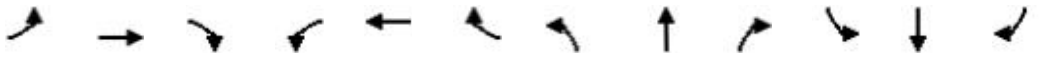


Figure 2: Future Conditions Traffic Volumes

ATTACHMENT B

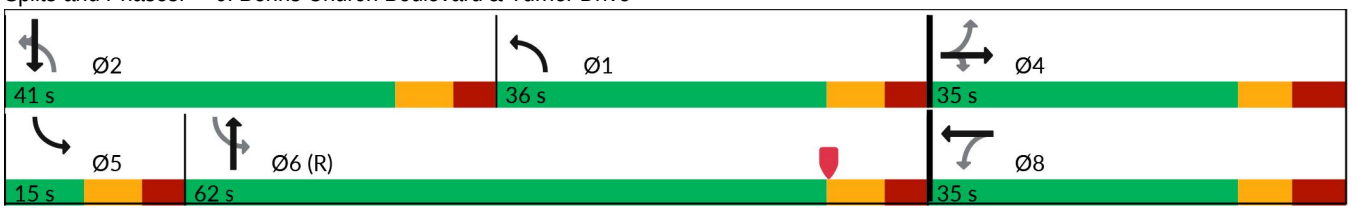
SYNCHRO/SIMTRAFFIC/SIDRA OUTPUT REPORTS

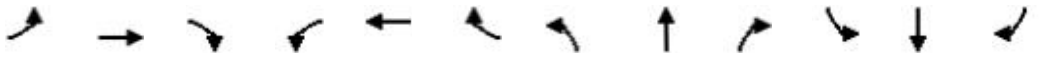


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	169	0	276	3	0	0	210	749	0	0	1059	252
Future Volume (vph)	169	0	276	3	0	0	210	749	0	0	1059	252
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt			0.850									0.850
Flt Protected		0.950			0.950		0.950					
Satd. Flow (prot)	0	1805	1553	0	1805	0	1703	3374	0	1900	3471	1553
Flt Permitted		0.756			0.611		0.107					
Satd. Flow (perm)	0	1436	1553	0	1161	0	192	3374	0	1900	3471	1553
Satd. Flow (RTOR)			294									238
Adj. Flow (vph)	180	0	294	3	0	0	223	797	0	0	1127	268
Lane Group Flow (vph)	0	180	294	0	3	0	223	797	0	0	1127	268
Turn Type	Perm	NA	Perm	Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8			2			6		2
Detector Phase	4	4	4	8	8		1	6		5	2	2
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	3.0	3.0		5.0	15.0		3.0	15.0	15.0
Minimum Split (s)	18.0	18.0	18.0	15.0	15.0		16.0	30.0		15.0	30.0	30.0
Total Split (s)	35.0	35.0	35.0	35.0	35.0		36.0	62.0		15.0	41.0	41.0
Total Split (%)	31.3%	31.3%	31.3%	31.3%	31.3%		32.1%	55.4%		13.4%	36.6%	36.6%
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.8	4.8		4.8	4.8	4.8
All-Red Time (s)	4.5	4.5	4.5	4.5	4.5		3.5	3.5		3.5	3.5	3.5
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)		9.0	9.0		9.0		8.3	8.3		8.3	8.3	8.3
Lead/Lag							Lag	Lag		Lead	Lead	Lead
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	Yes
Recall Mode	None	None	None	None	None		None	C-Max		None	Max	Max
Act Effct Green (s)		21.2	21.2		21.2		65.2	73.5			37.5	37.5
Actuated g/C Ratio		0.19	0.19		0.19		0.58	0.66			0.33	0.33
v/c Ratio		0.66	0.55		0.01		0.46	0.36			0.97	0.40
Control Delay (s/veh)		53.5	8.4		34.0		29.6	9.8			45.8	4.4
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.0	0.0
Total Delay (s/veh)		53.5	8.4		34.0		29.6	9.8			45.8	4.4
LOS		D	A		C		C	A			D	A
Approach Delay (s/veh)		25.6			34.0			14.1			37.8	
Approach LOS		C			C			B			D	

Intersection Summary	
Cycle Length: 112	
Actuated Cycle Length: 112	
Offset: 75 (67%), Referenced to phase 6:NBSB, Start of Yellow	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.97	
Intersection Signal Delay (s/veh): 27.4	Intersection LOS: C
Intersection Capacity Utilization 71.6%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 6: Benns Church Boulevard & Turner Drive





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	169	0	276	3	0	0	210	749	0	0	1059	252
Future Volume (vph)	169	0	276	3	0	0	210	749	0	0	1059	252
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		9.0	9.0		9.0		8.3	8.3			8.3	8.3
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95			0.95	1.00
Frt		1.00	0.85		1.00		1.00	1.00			1.00	0.85
Flt Protected		0.95	1.00		0.95		0.95	1.00			1.00	1.00
Satd. Flow (prot)		1805	1553		1805		1703	3374			3471	1553
Flt Permitted		0.76	1.00		0.61		0.11	1.00			1.00	1.00
Satd. Flow (perm)		1436	1553		1160		191	3374			3471	1553
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	180	0	294	3	0	0	223	797	0	0	1127	268
RTOR Reduction (vph)	0	0	238	0	0	0	0	0	0	0	0	158
Lane Group Flow (vph)	0	180	56	0	3	0	223	797	0	0	1127	110
Heavy Vehicles (%)	0%	0%	4%	0%	0%	0%	6%	7%	0%	0%	4%	4%
Turn Type	Perm	NA	Perm	Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8			2			6		2
Actuated Green, G (s)		21.2	21.2		21.2		65.2	73.5			37.5	37.5
Effective Green, g (s)		21.2	21.2		21.2		65.2	73.5			37.5	37.5
Actuated g/C Ratio		0.19	0.19		0.19		0.58	0.66			0.33	0.33
Clearance Time (s)		9.0	9.0		9.0		8.3	8.3			8.3	8.3
Vehicle Extension (s)		5.0	5.0		3.0		4.0	4.0			4.0	4.0
Lane Grp Cap (vph)		271	293		219		485	2214			1162	519
v/s Ratio Prot							c0.11	0.24			c0.32	
v/s Ratio Perm		c0.13	0.04		0.00		0.15					0.07
v/c Ratio		0.66	0.19		0.01		0.46	0.36			0.97	0.21
Uniform Delay, d1		42.1	38.2		36.9		30.1	8.7			36.7	26.7
Progression Factor		1.00	1.00		1.00		1.00	1.00			0.64	0.47
Incremental Delay, d2		7.9	0.7		0.0		0.9	0.5			19.5	0.9
Delay (s)		50.0	38.8		36.9		31.1	9.1			42.8	13.5
Level of Service		D	D		D		C	A			D	B
Approach Delay (s/veh)		43.1			36.9			13.9			37.2	
Approach LOS		D			D			B			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	30.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	112.0	Sum of lost time (s)	25.6
Intersection Capacity Utilization	71.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

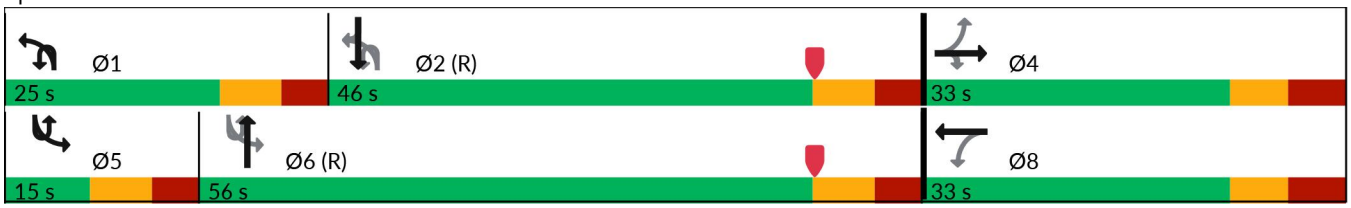
Intersection: 6: Benns Church Boulevard & Turner Drive

Movement	EB	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LTR	L	T	TR	T	T	R
Maximum Queue (ft)	208	191	30	149	262	240	639	656	265
Average Queue (ft)	102	95	3	111	93	95	335	320	151
95th Queue (ft)	176	162	16	168	209	189	628	632	325
Link Distance (ft)	1966		309		1183	1183	1314	1314	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		310		150					265
Storage Blk Time (%)				4	1		38	14	1
Queuing Penalty (veh)				14	2		0	35	4

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	162	0	162	1	0	4	1	231	1290	4	19	3
Future Volume (vph)	162	0	162	1	0	4	1	231	1290	4	19	3
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	0.95	0.95	1.00
Frt			0.850		0.892							
Flt Protected		0.950			0.990			0.950				0.950
Satd. Flow (prot)	0	1805	1599	0	1678	0	0	1787	3505	0	0	1634
Flt Permitted		0.754			0.936			0.127				0.128
Satd. Flow (perm)	0	1433	1599	0	1586	0	0	239	3505	0	0	220
Satd. Flow (RTOR)			230		230							
Adj. Flow (vph)	167	0	167	1	0	4	1	238	1330	4	20	3
Lane Group Flow (vph)	0	167	167	0	5	0	0	239	1334	0	0	23
Turn Type	Perm	NA	Perm	Perm	NA		D.P+P	D.P+P	NA		D.P+P	D.P+P
Protected Phases		4			8		1	1	6		5	5
Permitted Phases	4		4	8			2	2			6	6
Detector Phase	4	4	4	8	8		1	1	6		5	5
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	3.0	3.0		5.0	5.0	15.0		3.0	3.0
Minimum Split (s)	18.0	18.0	18.0	15.0	15.0		18.0	18.0	30.0		15.0	15.0
Total Split (s)	33.0	33.0	33.0	33.0	33.0		25.0	25.0	56.0		15.0	15.0
Total Split (%)	31.7%	31.7%	31.7%	31.7%	31.7%		24.0%	24.0%	53.8%		14.4%	14.4%
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.8	4.8	4.8		4.8	4.8
All-Red Time (s)	4.5	4.5	4.5	4.5	4.5		3.5	3.5	3.5		3.5	3.5
Lost Time Adjust (s)		0.0	0.0		0.0			0.0	0.0			0.0
Total Lost Time (s)		9.0	9.0		9.0			8.3	8.3			8.3
Lead/Lag							Lead	Lead	Lag		Lead	Lead
Lead-Lag Optimize?							Yes	Yes	Yes		Yes	Yes
Recall Mode	None	None	None	None	None		None	None	C-Max		None	None
Act Effct Green (s)		18.9	18.9		18.9			59.5	62.2			64.5
Actuated g/C Ratio		0.18	0.18		0.18			0.57	0.60			0.62
v/c Ratio		0.64	0.35		0.01			0.68	0.64			0.11
Control Delay (s/veh)		50.4	3.3		0.0			27.8	17.6			2.1
Queue Delay		0.0	0.0		0.0			0.0	0.0			0.0
Total Delay (s/veh)		50.4	3.3		0.0			27.8	17.6			2.1
LOS		D	A		A			C	B			A
Approach Delay (s/veh)		26.8							19.1			
Approach LOS		C							B			

Intersection Summary	
Cycle Length: 104	
Actuated Cycle Length: 104	
Offset: 47 (45%), Referenced to phase 2:NBSB and 6:NBSB, Start of Yellow	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.75	
Intersection Signal Delay (s/veh): 16.6	Intersection LOS: B
Intersection Capacity Utilization 86.0%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 6: Benns Church Boulevard & Turner Drive



Lane Group	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	1120	120
Future Volume (vph)	1120	120
Lane Util. Factor	0.95	1.00
Frt		0.850
Flt Protected		
Satd. Flow (prot)	3574	1599
Flt Permitted		
Satd. Flow (perm)	3574	1599
Satd. Flow (RTOR)		237
Adj. Flow (vph)	1155	124
Lane Group Flow (vph)	1155	124
Turn Type	NA	Perm
Protected Phases	2	
Permitted Phases		2
Detector Phase	2	2
Switch Phase		
Minimum Initial (s)	15.0	15.0
Minimum Split (s)	30.0	30.0
Total Split (s)	46.0	46.0
Total Split (%)	44.2%	44.2%
Yellow Time (s)	4.8	4.8
All-Red Time (s)	3.5	3.5
Lost Time Adjust (s)	0.0	0.0
Total Lost Time (s)	8.3	8.3
Lead/Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes
Recall Mode	C-Max	C-Max
Act Effct Green (s)	45.0	45.0
Actuated g/C Ratio	0.43	0.43
v/c Ratio	0.75	0.15
Control Delay (s/veh)	12.4	0.7
Queue Delay	0.0	0.0
Total Delay (s/veh)	12.4	0.7
LOS	B	A
Approach Delay (s/veh)	11.1	
Approach LOS	B	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	162	0	162	1	0	4	1	231	1290	4	19	3
Future Volume (vph)	162	0	162	1	0	4	1	231	1290	4	19	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		9.0	9.0		9.0			8.3	8.3			8.3
Lane Util. Factor		1.00	1.00		1.00			1.00	0.95			1.00
Frt		1.00	0.85		0.89			1.00	1.00			1.00
Flt Protected		0.95	1.00		0.99			0.95	1.00			0.95
Satd. Flow (prot)		1805	1599		1678			1787	3504			1634
Flt Permitted		0.75	1.00		0.94			0.13	1.00			0.13
Satd. Flow (perm)		1434	1599		1586			238	3504			219
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	167	0	167	1	0	4	1	238	1330	4	20	3
RTOR Reduction (vph)	0	0	137	0	4	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	167	30	0	1	0	0	239	1334	0	0	23
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	0%	1%	3%	0%	12%	0%
Turn Type	Perm	NA	Perm	Perm	NA		D.P+P	D.P+P	NA		D.P+P	D.P+P
Protected Phases		4			8		1	1	6		5	5
Permitted Phases	4		4	8			2	2			6	6
Actuated Green, G (s)		18.9	18.9		18.9			59.5	57.2			59.5
Effective Green, g (s)		18.9	18.9		18.9			59.5	57.2			59.5
Actuated g/C Ratio		0.18	0.18		0.18			0.57	0.55			0.57
Clearance Time (s)		9.0	9.0		9.0			8.3	8.3			8.3
Vehicle Extension (s)		5.0	5.0		3.0			4.0	4.0			2.0
Lane Grp Cap (vph)		260	290		288			352	1927			156
v/s Ratio Prot								c0.09	c0.38			0.00
v/s Ratio Perm		c0.12	0.02		0.00			0.29				0.08
v/c Ratio		0.64	0.10		0.00			0.68	0.69			0.15
Uniform Delay, d1		39.4	35.5		34.8			15.8	17.0			12.1
Progression Factor		1.00	1.00		1.00			1.01	0.99			0.14
Incremental Delay, d2		7.2	0.3		0.0			5.6	2.1			0.1
Delay (s)		46.7	35.8		34.8			21.6	18.9			1.8
Level of Service		D	D		C			C	B			A
Approach Delay (s/veh)		41.2			34.8				19.3			
Approach LOS		D			C				B			

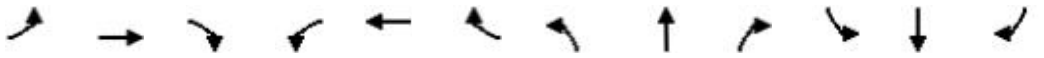
Intersection Summary			
HCM 2000 Control Delay (s/veh)	18.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	104.0	Sum of lost time (s)	25.6
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	1120	120
Future Volume (vph)	1120	120
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	8.3	8.3
Lane Util. Factor	0.95	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	3574	1599
Flt Permitted	1.00	1.00
Satd. Flow (perm)	3574	1599
Peak-hour factor, PHF	0.97	0.97
Adj. Flow (vph)	1155	124
RTOR Reduction (vph)	0	70
Lane Group Flow (vph)	1155	54
Heavy Vehicles (%)	1%	1%
Turn Type	NA	Perm
Protected Phases	2	
Permitted Phases		2
Actuated Green, G (s)	45.0	45.0
Effective Green, g (s)	45.0	45.0
Actuated g/C Ratio	0.43	0.43
Clearance Time (s)	8.3	8.3
Vehicle Extension (s)	4.0	4.0
Lane Grp Cap (vph)	1546	691
v/s Ratio Prot	c0.32	
v/s Ratio Perm		0.03
v/c Ratio	0.75	0.08
Uniform Delay, d1	24.7	17.3
Progression Factor	0.32	1.00
Incremental Delay, d2	2.9	0.2
Delay (s)	10.9	17.5
Level of Service	B	B
Approach Delay (s/veh)	11.4	
Approach LOS	B	

Intersection Summary

Intersection: 6: Benns Church Boulevard & Turner Drive

Movement	EB	EB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LTR	UL	T	TR	UL	T	T	R
Maximum Queue (ft)	183	127	28	150	328	327	114	304	275	163
Average Queue (ft)	98	52	4	118	164	176	22	149	130	26
95th Queue (ft)	166	101	21	175	293	295	76	266	236	91
Link Distance (ft)	1966		309		1181	1181		1314	1314	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)		310		150			140			265
Storage Blk Time (%)				5	6		0	8	0	0
Queuing Penalty (veh)				32	14		0	2	0	0

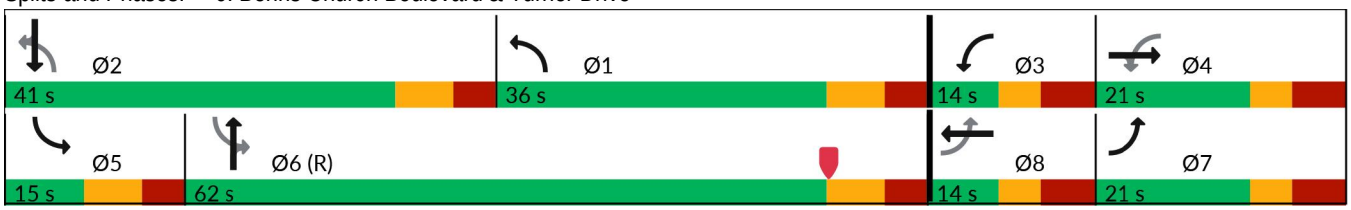


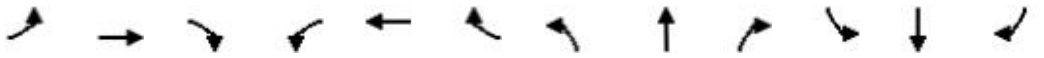
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	335	33	418	87	30	83	430	1100	117	101	1579	473
Future Volume (vph)	335	33	418	87	30	83	430	1100	117	101	1579	473
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	310		50	0		0	325		235	300		265
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (ft)	0			0			0			0		
Satd. Flow (prot)	1805	1900	1553	1805	1691	0	1703	3374	1615	1805	3471	1553
Flt Permitted	0.680			0.734			0.129			0.138		
Satd. Flow (perm)	1292	1900	1553	1395	1691	0	231	3374	1615	262	3471	1553
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			445		88				207			300
Link Speed (mph)		40			30			45			45	
Link Distance (ft)		535			903			802			730	
Travel Time (s)		9.1			20.5			12.2			11.1	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	0%	4%	0%	0%	0%	6%	7%	0%	0%	4%	4%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	356	35	445	93	120	0	457	1170	124	107	1680	503
Turn Type	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	8		4	4			2		6	6		2
Detector Phase	7	4	4	3	8		1	6	6	5	2	2
Switch Phase												
Minimum Initial (s)	4.0	5.0	5.0	4.0	3.0		5.0	15.0	15.0	3.0	15.0	15.0
Minimum Split (s)	12.0	18.0	18.0	12.0	15.0		16.0	30.0	30.0	15.0	30.0	30.0
Total Split (s)	21.0	21.0	21.0	14.0	14.0		36.0	62.0	62.0	15.0	41.0	41.0
Total Split (%)	18.8%	18.8%	18.8%	12.5%	12.5%		32.1%	55.4%	55.4%	13.4%	36.6%	36.6%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		4.8	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	4.5	4.5	4.5	4.5	4.5		3.5	3.5	3.5	3.5	3.5	3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	8.0	8.0	8.0	8.0	8.0		8.3	8.3	8.3	8.3	8.3	8.3
Lead/Lag	Lag	Lag	Lag	Lead	Lead		Lag	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	None	Max	Max
Act Effct Green (s)	19.0	15.8	15.8	20.6	6.0		60.4	54.1	54.1	60.4	32.7	32.7
Actuated g/C Ratio	0.17	0.14	0.14	0.18	0.05		0.54	0.48	0.48	0.54	0.29	0.29
v/c Ratio	1.28	0.13	0.74	0.33	0.69		0.94	0.72	0.14	0.47	1.66	0.76
Control Delay (s/veh)	188.2	46.1	12.8	38.8	39.3		39.8	15.1	1.0	16.5	329.5	22.3
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 (s/veh)	188.2	46.1	12.8	38.8	39.3		39.8	15.1	1.0	16.5	329.5	22.3
LOS	F	D	B	D	D		D	B	A	B	F	C
Approach Delay (s/veh)		88.9			39.1			20.5			247.4	
Approach LOS		F			D			C			F	

Intersection Summary	
Area Type:	Other
Cycle Length: 112	
Actuated Cycle Length: 112	

Offset: 0 (0%), Referenced to phase 6:NBSB, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.66
Intersection Signal Delay (s/veh): 134.6 Intersection LOS: F
Intersection Capacity Utilization 113.2% ICU Level of Service H
Analysis Period (min) 15

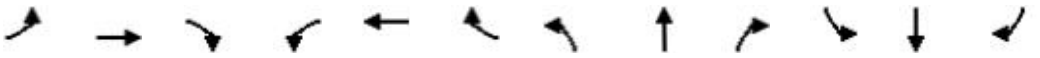
Splits and Phases: 6: Benns Church Boulevard & Turner Drive





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	335	33	418	87	30	83	430	1100	117	101	1579	473
Future Volume (vph)	335	33	418	87	30	83	430	1100	117	101	1579	473
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	8.0	8.0	8.0	8.0	8.0		8.3	8.3	8.3	8.3	8.3	8.3
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.89		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1900	1553	1805	1691		1703	3374	1615	1805	3471	1553
Flt Permitted	0.68	1.00	1.00	0.73	1.00		0.13	1.00	1.00	0.14	1.00	1.00
Satd. Flow (perm)	1292	1900	1553	1395	1691		231	3374	1615	261	3471	1553
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	356	35	445	93	32	88	457	1170	124	107	1680	503
RTOR Reduction (vph)	0	0	382	0	83	0	0	0	66	0	0	217
Lane Group Flow (vph)	356	35	63	93	37	0	457	1170	58	107	1680	286
Heavy Vehicles (%)	0%	0%	4%	0%	0%	0%	6%	7%	0%	0%	4%	4%
Turn Type	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	8		4	4			2		6	6		2
Actuated Green, G (s)	20.6	15.8	15.8	20.6	6.0		58.8	52.5	52.5	58.8	31.1	31.1
Effective Green, g (s)	20.6	15.8	15.8	20.6	6.0		58.8	52.5	52.5	58.8	31.1	31.1
Actuated g/C Ratio	0.18	0.14	0.14	0.18	0.05		0.53	0.47	0.47	0.53	0.28	0.28
Clearance Time (s)	8.0	8.0	8.0	8.0	8.0		8.3	8.3	8.3	8.3	8.3	8.3
Vehicle Extension (s)	3.0	5.0	5.0	3.0	3.0		4.0	4.0	4.0	2.0	4.0	4.0
Lane Grp Cap (vph)	304	268	219	274	90		485	1581	757	223	963	431
v/s Ratio Prot	c0.15	0.02		0.01	0.02		c0.23	0.35		0.03	c0.48	
v/s Ratio Perm	c0.06		0.04	0.05			0.26		0.04	0.22		0.18
v/c Ratio	1.17	0.13	0.29	0.34	0.41		0.94	0.74	0.08	0.48	1.74	0.66
Uniform Delay, d1	44.4	42.1	43.1	39.3	51.3		37.9	24.2	16.4	16.4	40.5	35.8
Progression Factor	1.00	1.00	1.00	1.00	1.00		0.61	0.59	1.00	1.00	1.00	1.00
Incremental Delay, d2	106.3	0.5	1.5	0.7	3.0		15.6	1.4	0.1	0.6	339.4	7.9
Delay (s)	150.8	42.6	44.6	40.1	54.3		38.8	15.7	16.5	17.0	379.8	43.7
Level of Service	F	D	D	D	D		D	B	B	B	F	D
Approach Delay (s/veh)		89.7			48.1			21.8			289.0	
Approach LOS		F			D			C			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	154.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.31		
Actuated Cycle Length (s)	112.0	Sum of lost time (s)	32.6
Intersection Capacity Utilization	113.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	689	52	77	808	48	35	0	35	62	10	30
Future Volume (vph)	28	689	52	77	808	48	35	0	35	62	10	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1842	0	0	1842	0	0	1694	0	0	1736	0
Flt Permitted		0.998			0.996			0.976			0.971	
Satd. Flow (perm)	0	1842	0	0	1842	0	0	1694	0	0	1736	0
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		889			535			366			325	
Travel Time (s)		15.2			9.1			8.3			7.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	836	0	0	1014	0	0	76	0	0	111	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 92.0%		ICU Level of Service F	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	53.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	28	689	52	77	808	48	35	0	35	62	10	30
Future Vol, veh/h	28	689	52	77	808	48	35	0	35	62	10	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	30	749	57	84	878	52	38	0	38	67	11	33

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	878	0	0	806	0	0	1906	1884	778	1929	1938	904
Stage 1	-	-	-	-	-	-	838	838	-	1072	1072	-
Stage 2	-	-	-	-	-	-	1068	1046	-	857	866	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	769	-	-	819	-	-	52	71	396	~ 50	65	335
Stage 1	-	-	-	-	-	-	361	382	-	267	297	-
Stage 2	-	-	-	-	-	-	268	305	-	352	370	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	769	-	-	819	-	-	~ 31	52	396	~ 36	47	335
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 31	52	-	~ 36	47	-
Stage 1	-	-	-	-	-	-	335	355	-	248	233	-
Stage 2	-	-	-	-	-	-	181	239	-	296	344	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0.4	0.8	$ 352.3	$ 734.2
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	57	769	-	-	819	-	-	50
HCM Lane V/C Ratio	1.335	0.04	-	-	0.102	-	-	2.217
HCM Ctrl Dly (s/v)	$ 352.3	9.9	0	-	9.9	0	-	$ 734.2
HCM Lane LOS	F	A	A	-	A	A	-	F
HCM 95th %tile Q (veh)	6.7	0.1	-	-	0.3	-	-	11.3

Notes	
~: Volume exceeds capacity	$: Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

Intersection: 6: Benns Church Boulevard & Turner Drive

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	TR	L	T	T	R	L	T	T
Maximum Queue (ft)	310	445	72	140	233	325	632	589	234	300	681	692
Average Queue (ft)	284	328	51	49	80	254	309	272	46	157	674	673
95th Queue (ft)	365	566	61	104	176	379	648	570	146	374	681	683
Link Distance (ft)		426		827	827		736	736			662	662
Upstream Blk Time (%)		18					1	0			42	39
Queuing Penalty (veh)		141					6	0			453	418
Storage Bay Dist (ft)	310		50			325			235	300		
Storage Blk Time (%)	25	25	29			17	7	3	0	0	65	56
Queuing Penalty (veh)	115	186	105			91	29	4	0	1	65	266

Intersection: 6: Benns Church Boulevard & Turner Drive

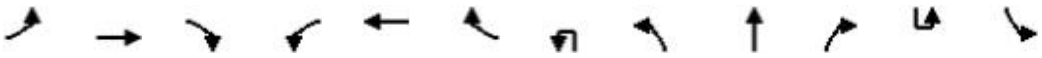
Movement	SB
Directions Served	R
Maximum Queue (ft)	265
Average Queue (ft)	253
95th Queue (ft)	316
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	265
Storage Blk Time (%)	3
Queuing Penalty (veh)	25

Intersection: 14: Turner South Driveway/Turner North Driveway & Turner Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	726	334	268	317
Average Queue (ft)	272	102	116	244
95th Queue (ft)	732	275	269	383
Link Distance (ft)	839	426	310	287
Upstream Blk Time (%)	4	0	7	66
Queuing Penalty (veh)	0	2	0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 1909



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	363	59	265	156	64	83	1	405	1928	168	25	101
Future Volume (vph)	363	59	265	156	64	83	1	405	1928	168	25	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	310		50	0		0		325		235		300
Storage Lanes	1		1	1		0		1		1		1
Taper Length (ft)	0			0				0				0
Satd. Flow (prot)	1805	1900	1599	1805	1738	0	0	1787	3505	1615	0	1763
Flt Permitted	0.800			0.717				0.106				0.084
Satd. Flow (perm)	1520	1900	1599	1362	1738	0	0	199	3505	1615	0	156
Right Turn on Red			Yes			Yes				Yes		
Satd. Flow (RTOR)			314		47					223		
Link Speed (mph)		40			30				45			
Link Distance (ft)		530			886				785			
Travel Time (s)		9.0			20.1				11.9			
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	0%	1%	3%	0%	12%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	374	61	273	161	152	0	0	419	1988	173	0	130
Turn Type	D.P+P	NA	Perm	D.P+P	NA		D.P+P	D.P+P	NA	Perm	D.P+P	D.P+P
Protected Phases	7	4		3	8		1	1	6		5	5
Permitted Phases	8		4	4			2	2		6	6	6
Detector Phase	7	4	4	3	8		1	1	6	6	5	5
Switch Phase												
Minimum Initial (s)	4.0	5.0	5.0	4.0	3.0		5.0	5.0	15.0	15.0	3.0	3.0
Minimum Split (s)	12.0	18.0	18.0	12.0	15.0		18.0	18.0	30.0	30.0	15.0	15.0
Total Split (s)	20.0	18.0	18.0	15.0	13.0		25.0	25.0	56.0	56.0	15.0	15.0
Total Split (%)	19.2%	17.3%	17.3%	14.4%	12.5%		24.0%	24.0%	53.8%	53.8%	14.4%	14.4%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		4.8	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	4.5	4.5	4.5	4.5	4.5		3.5	3.5	3.5	3.5	3.5	3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0		0.0
Total Lost Time (s)	8.0	8.0	8.0	8.0	8.0			8.3	8.3	8.3		8.3
Lead/Lag	Lead	Lead	Lead	Lag	Lag		Lead	Lead	Lag	Lag	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None		None	None	C-Max	C-Max	None	None
Act Effct Green (s)	17.0	9.4	9.4	17.0	5.0			54.4	47.8	47.8		54.4
Actuated g/C Ratio	0.16	0.09	0.09	0.16	0.05			0.52	0.46	0.46		0.52
v/c Ratio	1.33	0.36	0.63	0.63	1.19			1.17	1.23	0.20		0.71
Control Delay (s/veh)	203.8	50.3	10.1	48.0	169.7			110.7	137.2	5.9		38.9
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0		0.0
Total Delay (s/veh)	203.8	50.3	10.1	48.0	169.7			110.7	137.2	5.9		38.9
LOS	F	D	B	D	F			F	F	A		D
Approach Delay (s/veh)		115.9			107.1				124.1			
Approach LOS		F			F				F			

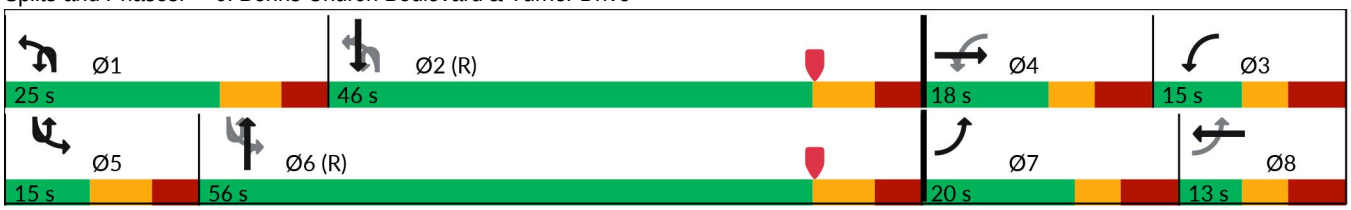
Intersection Summary	
Area Type:	Other
Cycle Length: 104	
Actuated Cycle Length: 104	

Lane Group	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	1758	239
Future Volume (vph)	1758	239
Ideal Flow (vphpl)	1900	1900
Storage Length (ft)		265
Storage Lanes		1
Taper Length (ft)		
Satd. Flow (prot)	3574	1599
Flt Permitted		
Satd. Flow (perm)	3574	1599
Right Turn on Red		Yes
Satd. Flow (RTOR)		310
Link Speed (mph)	45	
Link Distance (ft)	730	
Travel Time (s)	11.1	
Peak Hour Factor	0.97	0.97
Heavy Vehicles (%)	1%	1%
Shared Lane Traffic (%)		
Lane Group Flow (vph)	1812	246
Turn Type	NA	Perm
Protected Phases	2	
Permitted Phases		2
Detector Phase	2	2
Switch Phase		
Minimum Initial (s)	15.0	15.0
Minimum Split (s)	30.0	30.0
Total Split (s)	46.0	46.0
Total Split (%)	44.2%	44.2%
Yellow Time (s)	4.8	4.8
All-Red Time (s)	3.5	3.5
Lost Time Adjust (s)	0.0	0.0
Total Lost Time (s)	8.3	8.3
Lead/Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes
Recall Mode	C-Max	C-Max
Act Effct Green (s)	37.7	37.7
Actuated g/C Ratio	0.36	0.36
v/c Ratio	1.40	0.32
Control Delay (s/veh)	213.5	2.0
Queue Delay	0.0	0.0
Total Delay (s/veh)	213.5	2.0
LOS	F	A
Approach Delay (s/veh)	179.4	
Approach LOS	F	

Intersection Summary

Offset: 21 (20%), Referenced to phase 2:NBSB and 6:NBSB, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.40
Intersection Signal Delay (s/veh): 143.1 Intersection LOS: F
Intersection Capacity Utilization 126.8% ICU Level of Service H
Analysis Period (min) 15

Splits and Phases: 6: Benns Church Boulevard & Turner Drive



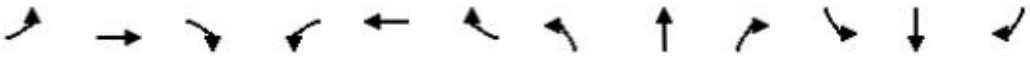
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	363	59	265	156	64	83	1	405	1928	168	25	101
Future Volume (vph)	363	59	265	156	64	83	1	405	1928	168	25	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	8.0	8.0	8.0	8.0	8.0			8.3	8.3	8.3		8.3
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	0.95	1.00		1.00
Frt	1.00	1.00	0.85	1.00	0.92			1.00	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	1.00		0.95
Satd. Flow (prot)	1805	1900	1599	1805	1739			1787	3505	1615		1763
Flt Permitted	0.80	1.00	1.00	0.72	1.00			0.11	1.00	1.00		0.08
Satd. Flow (perm)	1520	1900	1599	1363	1739			200	3505	1615		155
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	374	61	273	161	66	86	1	418	1988	173	26	104
RTOR Reduction (vph)	0	0	248	0	45	0	0	0	0	93	0	0
Lane Group Flow (vph)	374	61	25	161	107	0	0	419	1988	80	0	130
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	0%	1%	3%	0%	12%	0%
Turn Type	D.P+P	NA	Perm	D.P+P	NA		D.P+P	D.P+P	NA	Perm	D.P+P	D.P+P
Protected Phases	7	4		3	8		1	1	6		5	5
Permitted Phases	8		4	4			2	2		6	6	6
Actuated Green, G (s)	17.0	9.4	9.4	17.0	5.0			54.4	47.8	47.8		54.4
Effective Green, g (s)	17.0	9.4	9.4	17.0	5.0			54.4	47.8	47.8		54.4
Actuated g/C Ratio	0.16	0.09	0.09	0.16	0.05			0.52	0.46	0.46		0.52
Clearance Time (s)	8.0	8.0	8.0	8.0	8.0			8.3	8.3	8.3		8.3
Vehicle Extension (s)	3.0	5.0	5.0	3.0	3.0			4.0	4.0	4.0		2.0
Lane Grp Cap (vph)	281	171	144	255	83			359	1610	742		183
v/s Ratio Prot	c0.15	0.03		c0.05	0.06			c0.19	c0.57			0.05
v/s Ratio Perm	c0.06		0.02	0.06				0.42		0.05		0.33
v/c Ratio	1.33	0.36	0.17	0.63	1.29			1.17	1.23	0.11		0.71
Uniform Delay, d1	43.3	44.5	43.7	40.5	49.5			31.6	28.1	16.0		22.7
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.14	1.22	6.57		1.00
Incremental Delay, d2	171.3	2.7	1.2	5.0	195.9			78.2	106.2	0.0		10.3
Delay (s)	214.7	47.1	44.9	45.5	245.4			114.2	140.3	105.0		33.0
Level of Service	F	D	D	D	F			F	F	F		C
Approach Delay (s/veh)		134.8			142.6				133.7			
Approach LOS		F			F				F			

Intersection Summary			
HCM 2000 Control Delay (s/veh)	153.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.39		
Actuated Cycle Length (s)	104.0	Sum of lost time (s)	32.6
Intersection Capacity Utilization	126.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			



Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	1758	239
Future Volume (vph)	1758	239
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	8.3	8.3
Lane Util. Factor	0.95	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	3574	1599
Flt Permitted	1.00	1.00
Satd. Flow (perm)	3574	1599
Peak-hour factor, PHF	0.97	0.97
Adj. Flow (vph)	1812	246
RTOR Reduction (vph)	0	157
Lane Group Flow (vph)	1812	89
Heavy Vehicles (%)	1%	1%
Turn Type	NA	Perm
Protected Phases	2	
Permitted Phases		2
Actuated Green, G (s)	37.7	37.7
Effective Green, g (s)	37.7	37.7
Actuated g/C Ratio	0.36	0.36
Clearance Time (s)	8.3	8.3
Vehicle Extension (s)	4.0	4.0
Lane Grp Cap (vph)	1295	579
v/s Ratio Prot	c0.51	
v/s Ratio Perm		0.06
v/c Ratio	1.40	0.15
Uniform Delay, d1	33.2	22.4
Progression Factor	1.00	1.00
Incremental Delay, d2	184.4	0.6
Delay (s)	217.5	22.9
Level of Service	F	C
Approach Delay (s/veh)	184.7	
Approach LOS	F	

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	575	38	57	602	49	44	0	44	68	11	29
Future Volume (vph)	34	575	38	57	602	49	44	0	44	68	11	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1842	0	0	1839	0	0	1694	0	0	1740	0
Flt Permitted		0.997			0.996			0.976			0.970	
Satd. Flow (perm)	0	1842	0	0	1839	0	0	1694	0	0	1740	0
Link Speed (mph)		30			40			30			30	
Link Distance (ft)		890			530			372			345	
Travel Time (s)		20.2			9.0			8.5			7.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	703	0	0	769	0	0	96	0	0	118	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 69.2%		ICU Level of Service C	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	23.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	34	575	38	57	602	49	44	0	44	68	11	29
Future Vol, veh/h	34	575	38	57	602	49	44	0	44	68	11	29
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	37	625	41	62	654	53	48	0	48	74	12	32

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	707	0	0	666	0	0	1547	1551	646	1549	1545	681
Stage 1	-	-	-	-	-	-	720	720	-	805	805	-
Stage 2	-	-	-	-	-	-	827	831	-	744	740	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	891	-	-	923	-	-	93	114	472	93	115	450
Stage 1	-	-	-	-	-	-	419	432	-	376	395	-
Stage 2	-	-	-	-	-	-	366	384	-	407	423	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	891	-	-	923	-	-	68	95	472	~ 73	95	450
Mov Cap-2 Maneuver	-	-	-	-	-	-	68	95	-	~ 73	95	-
Stage 1	-	-	-	-	-	-	391	403	-	351	351	-
Stage 2	-	-	-	-	-	-	292	341	-	342	395	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0.5	0.7	104.6	239.2
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	119	891	-	-	923	-	-	97
HCM Lane V/C Ratio	0.804	0.041	-	-	0.067	-	-	1.21
HCM Ctrl Dly (s/v)	104.6	9.2	0	-	9.2	0	-	239.2
HCM Lane LOS	F	A	A	-	A	A	-	F
HCM 95th %tile Q (veh)	4.7	0.1	-	-	0.2	-	-	8

Notes	
~: Volume exceeds capacity	$: Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

Intersection: 6: Benns Church Boulevard & Turner Drive

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	TR	UL	T	T	R	UL	T	T
Maximum Queue (ft)	310	444	52	281	486	325	731	772	235	300	678	684
Average Queue (ft)	310	436	40	110	297	318	641	648	143	172	669	670
95th Queue (ft)	310	443	57	224	591	369	818	819	309	383	678	680
Link Distance (ft)		421		809	809		716	716			661	661
Upstream Blk Time (%)		58					9	4			36	35
Queuing Penalty (veh)		400					110	52			378	376
Storage Bay Dist (ft)	310		50			325			235	300		
Storage Blk Time (%)	65	16	7			35	35	34	1	0	59	56
Queuing Penalty (veh)	211	100	30			340	142	57	6	2	74	135

Intersection: 6: Benns Church Boulevard & Turner Drive

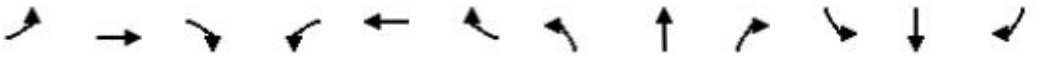
Movement	SB
Directions Served	R
Maximum Queue (ft)	265
Average Queue (ft)	201
95th Queue (ft)	367
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	265
Storage Blk Time (%)	1
Queuing Penalty (veh)	10

Intersection: 14: Turner South Driveway/Turner North Driveway & Turner Drive

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	881	214	330	325
Average Queue (ft)	803	32	261	303
95th Queue (ft)	1055	130	407	353
Link Distance (ft)	834	421	310	308
Upstream Blk Time (%)	76		65	94
Queuing Penalty (veh)	0		0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 2423



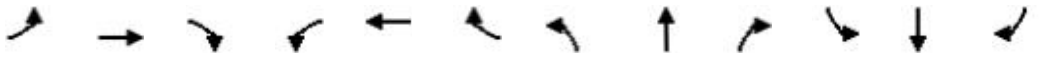
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	335	33	418	87	30	83	430	1100	117	101	1579	473
Future Volume (vph)	335	33	418	87	30	83	430	1100	117	101	1579	473
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	265		75	0		0	600		215	300		265
Storage Lanes	2		1	1		0	2		1	1		1
Taper Length (ft)	0			0			0			0		
Satd. Flow (prot)	3502	1900	1553	1805	1691	0	3303	3374	1615	1805	3471	1553
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3502	1900	1553	1805	1691	0	3303	3374	1615	1805	3471	1553
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			445		88				227			313
Link Speed (mph)		40			30			45			45	
Link Distance (ft)		530			1238			768			730	
Travel Time (s)		9.0			28.1			11.6			11.1	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	0%	4%	0%	0%	0%	6%	7%	0%	0%	4%	4%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	356	35	445	93	120	0	457	1170	124	107	1680	503
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4						6			2
Detector Phase	7	4	4	3	8		1	6	6	5	2	2
Switch Phase												
Minimum Initial (s)	4.0	5.0	5.0	4.0	3.0		5.0	15.0	15.0	3.0	15.0	15.0
Minimum Split (s)	12.0	18.0	18.0	12.0	15.0		16.0	30.0	30.0	15.0	30.0	30.0
Total Split (s)	20.0	15.0	15.0	20.0	15.0		30.0	57.0	57.0	20.0	47.0	47.0
Total Split (%)	17.9%	13.4%	13.4%	17.9%	13.4%		26.8%	50.9%	50.9%	17.9%	42.0%	42.0%
Yellow Time (s)	3.5	4.5	4.5	3.5	4.5		4.8	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	4.5	4.5	4.5	4.5	4.5		3.5	3.5	3.5	3.5	3.5	3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	8.0	9.0	9.0	8.0	9.0		8.3	8.3	8.3	8.3	8.3	8.3
Lead/Lag	Lag	Lag	Lag	Lead	Lead		Lag	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	None	Max	Max
Act Effct Green (s)	12.0	10.7	10.7	10.2	6.0		21.7	50.4	50.4	10.0	38.7	38.7
Actuated g/C Ratio	0.11	0.10	0.10	0.09	0.05		0.19	0.45	0.45	0.09	0.35	0.35
v/c Ratio	0.95	0.19	0.81	0.57	0.69		0.72	0.77	0.15	0.67	1.40	0.68
Control Delay (s/veh)	84.9	53.7	17.5	61.9	39.3		35.0	17.2	0.4	69.1	216.5	16.5
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 (s/veh)	84.9	53.7	17.5	61.9	39.3		35.0	17.2	0.4	69.1	216.5	16.5
LOS	F	D	B	E	D		C	B	A	E	F	B
Approach Delay (s/veh)		47.7			49.1			20.6			165.7	
Approach LOS		D			D			C			F	

Intersection Summary	
Area Type:	Other
Cycle Length: 112	
Actuated Cycle Length: 112	

Offset: 8 (7%), Referenced to phase 6:NBT, Start of Yellow	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.40	
Intersection Signal Delay (s/veh): 91.5	Intersection LOS: F
Intersection Capacity Utilization 95.4%	ICU Level of Service F
Analysis Period (min) 15	

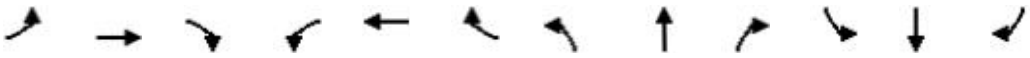
Splits and Phases: 6: Benns Church Boulevard & Turner Drive





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	335	33	418	87	30	83	430	1100	117	101	1579	473
Future Volume (vph)	335	33	418	87	30	83	430	1100	117	101	1579	473
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	8.0	9.0	9.0	8.0	9.0		8.3	8.3	8.3	8.3	8.3	8.3
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00		0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.89		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3502	1900	1553	1805	1691		3303	3374	1615	1805	3471	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3502	1900	1553	1805	1691		3303	3374	1615	1805	3471	1553
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	356	35	445	93	32	88	457	1170	124	107	1680	503
RTOR Reduction (vph)	0	0	402	0	83	0	0	0	70	0	0	209
Lane Group Flow (vph)	356	35	43	93	37	0	457	1170	54	107	1680	294
Heavy Vehicles (%)	0%	0%	4%	0%	0%	0%	6%	7%	0%	0%	4%	4%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4						6			2
Actuated Green, G (s)	13.6	10.7	10.7	8.9	6.0		21.7	48.8	48.8	10.0	37.1	37.1
Effective Green, g (s)	13.6	10.7	10.7	8.9	6.0		21.7	48.8	48.8	10.0	37.1	37.1
Actuated g/C Ratio	0.12	0.10	0.10	0.08	0.05		0.19	0.44	0.44	0.09	0.33	0.33
Clearance Time (s)	8.0	9.0	9.0	8.0	9.0		8.3	8.3	8.3	8.3	8.3	8.3
Vehicle Extension (s)	3.0	5.0	5.0	3.0	3.0		4.0	4.0	4.0	2.0	4.0	4.0
Lane Grp Cap (vph)	425	181	148	143	90		639	1470	703	161	1149	514
v/s Ratio Prot	c0.10	0.02		c0.05	0.02		0.14	c0.35		0.06	c0.48	
v/s Ratio Perm			0.03						0.03			0.19
v/c Ratio	0.84	0.19	0.29	0.65	0.41		0.72	0.80	0.08	0.66	1.46	0.57
Uniform Delay, d1	48.1	46.7	47.1	50.0	51.3		42.3	27.3	18.4	49.4	37.4	30.9
Progression Factor	1.00	1.00	1.00	1.00	1.00		0.71	0.54	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.4	1.1	2.2	10.1	3.0		2.9	3.2	0.1	7.8	212.8	4.6
Delay (s)	61.6	47.8	49.3	60.2	54.3		32.8	18.0	18.6	57.1	250.3	35.5
Level of Service	E	D	D	E	D		C	B	B	E	F	D
Approach Delay (s/veh)		54.5			56.8			21.9			194.1	
Approach LOS		D			E			C			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	106.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	112.0	Sum of lost time (s)	33.6
Intersection Capacity Utilization	95.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	689	52	77	808	48	35	0	35	62	10	30
Future Volume (vph)	28	689	52	77	808	48	35	0	35	62	10	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1842	0	0	3497	0	0	1694	0	0	1736	0
Flt Permitted		0.998			0.996			0.976			0.971	
Satd. Flow (perm)	0	1842	0	0	3497	0	0	1694	0	0	1736	0
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		876			530			403			323	
Travel Time (s)		14.9			9.0			9.2			7.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	836	0	0	1014	0	0	76	0	0	111	0
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 76.8%		ICU Level of Service D	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	9.1
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	2	1	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	836	1014	76	111
Demand Flow Rate, veh/h	853	1035	78	113
Vehicles Circulating, veh/h	165	70	863	1021
Vehicles Exiting, veh/h	969	871	155	31
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	12.8	6.2	6.7	8.5
Approach LOS	B	A	A	A

Lane	Left	Left	Right	Bypass	Left	Left
Designated Moves	LTR	LT	TR	R	LTR	LTR
Assumed Moves	LTR	LT	TR		LTR	LTR
RT Channelized				Yield		
Lane Util	1.000	0.470	0.530		1.000	1.000
Follow-Up Headway, s	2.535	2.667	2.535		2.535	2.535
Critical Headway, s	4.328	4.645	4.328		4.328	4.328
Entry Flow, veh/h	853	462	520	53	78	113
Cap Entry Lane, veh/h	1234	1266	1338	1337	682	596
Entry HV Adj Factor	0.980	0.979	0.981	0.980	0.974	0.980
Flow Entry, veh/h	836	452	510	52	76	111
Cap Entry, veh/h	1210	1239	1313	1311	664	584
V/C Ratio	0.691	0.365	0.389	0.040	0.114	0.190
Control Delay, s/veh	12.8	6.4	6.4	3.1	6.7	8.5
LOS	B	A	A	A	A	A
95th %tile Queue, veh	6	2	2	0	0	1

Intersection: 6: Benns Church Boulevard & Turner Drive

Movement	EB	EB	EB	EB	WB	WB	NB	NB	NB	NB	NB	SB
Directions Served	L	L	T	R	L	TR	L	L	T	T	R	L
Maximum Queue (ft)	219	264	414	76	120	162	229	248	265	271	164	300
Average Queue (ft)	122	158	154	73	58	68	117	128	136	133	25	176
95th Queue (ft)	191	244	315	84	108	143	191	203	229	222	89	367
Link Distance (ft)			394		1162	1162			691	691		
Upstream Blk Time (%)			1									
Queuing Penalty (veh)			8									
Storage Bay Dist (ft)	265	265		75			600	600			215	300
Storage Blk Time (%)	0	0	7	23						1	0	0
Queuing Penalty (veh)	0	1	56	83						1	0	2

Intersection: 6: Benns Church Boulevard & Turner Drive

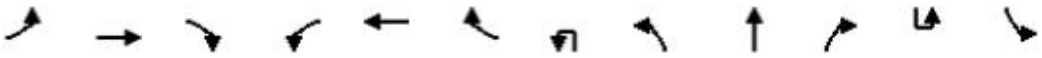
Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	683	687	265
Average Queue (ft)	675	672	256
95th Queue (ft)	684	683	311
Link Distance (ft)	663	663	
Upstream Blk Time (%)	34	30	
Queuing Penalty (veh)	365	326	
Storage Bay Dist (ft)			265
Storage Blk Time (%)	56	49	3
Queuing Penalty (veh)	56	230	21

Intersection: 14: Turner Drive

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	LT	TR	LTR	LTR
Maximum Queue (ft)	528	100	70	72	67
Average Queue (ft)	186	19	8	25	22
95th Queue (ft)	526	68	39	57	51
Link Distance (ft)	813	394	394	340	245
Upstream Blk Time (%)	2				
Queuing Penalty (veh)	0				
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 1150



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	363	59	265	156	64	83	1	405	1928	168	25	101
Future Volume (vph)	363	59	265	156	64	83	1	405	1928	168	25	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	265		75	0		0		600		215		300
Storage Lanes	2		1	1		0		2		1		1
Taper Length (ft)	0			0				0				0
Satd. Flow (prot)	3502	1900	1599	1805	1738	0	0	3467	3505	1615	0	1763
Flt Permitted	0.950			0.950				0.950				0.950
Satd. Flow (perm)	3502	1900	1599	1805	1738	0	0	3467	3505	1615	0	1763
Right Turn on Red			Yes			Yes				Yes		
Satd. Flow (RTOR)			227		48					223		
Link Speed (mph)		40			30				45			
Link Distance (ft)		530			1206				817			
Travel Time (s)		9.0			27.4				12.4			
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	0%	1%	3%	0%	12%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	374	61	273	161	152	0	0	419	1988	173	0	130
Turn Type	Prot	NA	Perm	Prot	NA		Prot	Prot	NA	Perm	Prot	Prot
Protected Phases	7	4		3	8		1	1	6		5	5
Permitted Phases			4							6		
Detector Phase	7	4	4	3	8		1	1	6	6	5	5
Switch Phase												
Minimum Initial (s)	4.0	5.0	5.0	4.0	3.0		5.0	5.0	15.0	15.0	3.0	3.0
Minimum Split (s)	12.0	18.0	18.0	12.0	15.0		18.0	18.0	30.0	30.0	15.0	15.0
Total Split (s)	18.0	16.0	16.0	17.0	15.0		22.0	22.0	56.0	56.0	15.0	15.0
Total Split (%)	17.3%	15.4%	15.4%	16.3%	14.4%		21.2%	21.2%	53.8%	53.8%	14.4%	14.4%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		4.8	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	4.5	4.5	4.5	4.5	4.5		3.5	3.5	3.5	3.5	3.5	3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0		0.0
Total Lost Time (s)	8.0	8.0	8.0	8.0	8.0			8.3	8.3	8.3		8.3
Lead/Lag	Lead	Lead	Lead	Lag	Lag		Lead	Lead	Lag	Lag	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None		None	None	C-Max	C-Max	None	None
Act Effct Green (s)	10.0	8.0	8.0	9.0	7.0			13.7	47.7	47.7		6.7
Actuated g/C Ratio	0.10	0.08	0.08	0.09	0.07			0.13	0.46	0.46		0.06
v/c Ratio	1.11	0.42	0.82	1.03	0.94			0.92	1.24	0.20		1.15
Control Delay (s/veh)	127.1	55.0	31.6	128.7	92.1			63.1	122.7	0.3		175.5
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0		0.0
Total Delay (s/veh)	127.1	55.0	31.6	128.7	92.1			63.1	122.7	0.3		175.5
LOS	F	D	C	F	F			E	F	A		F
Approach Delay (s/veh)		84.1			110.9				104.8			
Approach LOS		F			F				F			

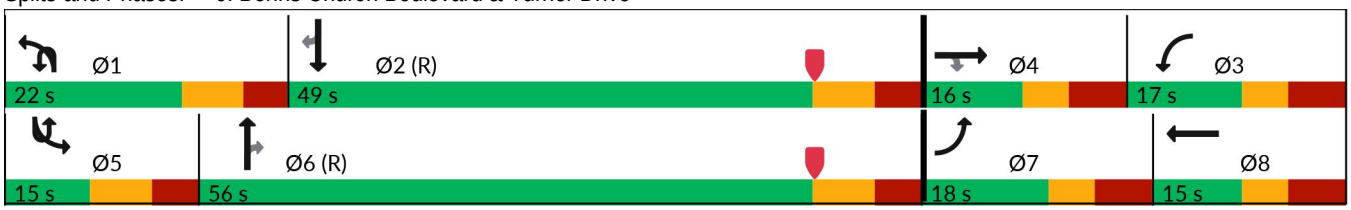
Intersection Summary	
Area Type:	Other
Cycle Length: 104	
Actuated Cycle Length: 104	

Lane Group	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	1758	239
Future Volume (vph)	1758	239
Ideal Flow (vphpl)	1900	1900
Storage Length (ft)		265
Storage Lanes		1
Taper Length (ft)		
Satd. Flow (prot)	3574	1599
Flt Permitted		
Satd. Flow (perm)	3574	1599
Right Turn on Red		Yes
Satd. Flow (RTOR)		223
Link Speed (mph)	45	
Link Distance (ft)	730	
Travel Time (s)	11.1	
Peak Hour Factor	0.97	0.97
Heavy Vehicles (%)	1%	1%
Shared Lane Traffic (%)		
Lane Group Flow (vph)	1812	246
Turn Type	NA	Perm
Protected Phases	2	
Permitted Phases		2
Detector Phase	2	2
Switch Phase		
Minimum Initial (s)	15.0	15.0
Minimum Split (s)	30.0	30.0
Total Split (s)	49.0	49.0
Total Split (%)	47.1%	47.1%
Yellow Time (s)	4.8	4.8
All-Red Time (s)	3.5	3.5
Lost Time Adjust (s)	0.0	0.0
Total Lost Time (s)	8.3	8.3
Lead/Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes
Recall Mode	C-Max	C-Max
Act Effct Green (s)	40.7	40.7
Actuated g/C Ratio	0.39	0.39
v/c Ratio	1.30	0.32
Control Delay (s/veh)	168.1	5.1
Queue Delay	0.0	0.0
Total Delay (s/veh)	168.1	5.1
LOS	F	A
Approach Delay (s/veh)	150.2	
Approach LOS	F	

Intersection Summary

Offset: 66 (63%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.30
Intersection Signal Delay (s/veh): 119.8 Intersection LOS: F
Intersection Capacity Utilization 112.4% ICU Level of Service H
Analysis Period (min) 15

Splits and Phases: 6: Benns Church Boulevard & Turner Drive

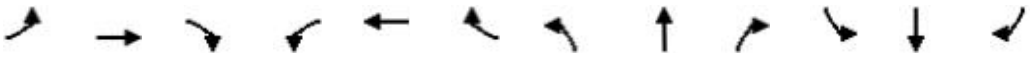


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	363	59	265	156	64	83	1	405	1928	168	25	101
Future Volume (vph)	363	59	265	156	64	83	1	405	1928	168	25	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	8.0	8.0	8.0	8.0	8.0			8.3	8.3	8.3		8.3
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00			0.97	0.95	1.00		1.00
Frt	1.00	1.00	0.85	1.00	0.92			1.00	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	1.00		0.95
Satd. Flow (prot)	3502	1900	1599	1805	1739			3467	3505	1615		1763
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.95	1.00	1.00		0.95
Satd. Flow (perm)	3502	1900	1599	1805	1739			3467	3505	1615		1763
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	374	61	273	161	66	86	1	418	1988	173	26	104
RTOR Reduction (vph)	0	0	210	0	45	0	0	0	0	94	0	0
Lane Group Flow (vph)	374	61	63	161	107	0	0	419	1988	79	0	130
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	0%	1%	3%	0%	12%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	Prot	NA	Perm	Prot	Prot
Protected Phases	7	4		3	8		1	1	6		5	5
Permitted Phases			4							6		
Actuated Green, G (s)	10.0	8.0	8.0	9.0	7.0			13.7	47.7	47.7		6.7
Effective Green, g (s)	10.0	8.0	8.0	9.0	7.0			13.7	47.7	47.7		6.7
Actuated g/C Ratio	0.10	0.08	0.08	0.09	0.07			0.13	0.46	0.46		0.06
Clearance Time (s)	8.0	8.0	8.0	8.0	8.0			8.3	8.3	8.3		8.3
Vehicle Extension (s)	3.0	5.0	5.0	3.0	3.0			4.0	4.0	4.0		2.0
Lane Grp Cap (vph)	336	146	123	156	117			456	1607	740		113
v/s Ratio Prot	c0.11	0.03		c0.09	0.06			c0.12	c0.57			0.07
v/s Ratio Perm			0.04							0.05		
v/c Ratio	1.11	0.42	0.52	1.03	0.92			0.92	1.24	0.11		1.15
Uniform Delay, d1	47.0	45.8	46.1	47.5	48.2			44.6	28.2	16.0		48.7
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.34	0.33	0.23		1.00
Incremental Delay, d2	83.2	4.0	7.1	80.8	57.3			3.2	107.2	0.0		130.8
Delay (s)	130.2	49.8	53.2	128.3	105.5			63.0	116.6	3.6		179.4
Level of Service	F	D	D	F	F			E	F	A		F
Approach Delay (s/veh)		93.6			117.2				100.4			
Approach LOS		F			F				F			

Intersection Summary			
HCM 2000 Control Delay (s/veh)	120.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.27		
Actuated Cycle Length (s)	104.0	Sum of lost time (s)	32.6
Intersection Capacity Utilization	112.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	1758	239
Future Volume (vph)	1758	239
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	8.3	8.3
Lane Util. Factor	0.95	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	3574	1599
Flt Permitted	1.00	1.00
Satd. Flow (perm)	3574	1599
Peak-hour factor, PHF	0.97	0.97
Adj. Flow (vph)	1812	246
RTOR Reduction (vph)	0	136
Lane Group Flow (vph)	1812	110
Heavy Vehicles (%)	1%	1%
Turn Type	NA	Perm
Protected Phases	2	
Permitted Phases		2
Actuated Green, G (s)	40.7	40.7
Effective Green, g (s)	40.7	40.7
Actuated g/C Ratio	0.39	0.39
Clearance Time (s)	8.3	8.3
Vehicle Extension (s)	4.0	4.0
Lane Grp Cap (vph)	1398	625
v/s Ratio Prot	0.51	
v/s Ratio Perm		0.07
v/c Ratio	1.30	0.18
Uniform Delay, d1	31.7	20.7
Progression Factor	1.00	1.00
Incremental Delay, d2	138.7	0.6
Delay (s)	170.3	21.3
Level of Service	F	C
Approach Delay (s/veh)	154.1	
Approach LOS	F	

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	575	38	57	602	49	44	0	44	68	11	29
Future Volume (vph)	34	575	38	57	602	49	44	0	44	68	11	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1842	0	0	3490	0	0	1694	0	0	1740	0
Flt Permitted		0.997			0.996			0.976			0.970	
Satd. Flow (perm)	0	1842	0	0	3490	0	0	1694	0	0	1740	0
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		865			530			366			383	
Travel Time (s)		14.7			9.0			8.3			8.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	703	0	0	769	0	0	96	0	0	118	0
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 72.7%		ICU Level of Service C	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	7.5
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	2	1	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	703	769	96	118
Demand Flow Rate, veh/h	718	784	98	120
Vehicles Circulating, veh/h	150	87	751	779
Vehicles Exiting, veh/h	749	762	117	92
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.7	5.6	6.3	6.8
Approach LOS	A	A	A	A

Lane	Left	Left	Right	Left	Left
Designated Moves	LTR	LT	TR	LTR	LTR
Assumed Moves	LTR	LT	TR	LTR	LTR
RT Channelized					
Lane Util	1.000	0.469	0.531	1.000	1.000
Follow-Up Headway, s	2.535	2.667	2.535	2.535	2.535
Critical Headway, s	4.328	4.645	4.328	4.328	4.328
Entry Flow, veh/h	718	368	416	98	120
Cap Entry Lane, veh/h	1250	1246	1319	750	732
Entry HV Adj Factor	0.980	0.982	0.980	0.980	0.981
Flow Entry, veh/h	703	361	408	96	118
Cap Entry, veh/h	1225	1224	1292	735	719
V/C Ratio	0.574	0.295	0.315	0.131	0.164
Control Delay, s/veh	9.7	5.6	5.6	6.3	6.8
LOS	A	A	A	A	A
95th %tile Queue, veh	4	1	1	0	1

Intersection: 6: Benns Church Boulevard & Turner Drive

Movement	EB	EB	EB	EB	WB	WB	NB	NB	NB	NB	NB	SB
Directions Served	L	L	T	R	L	TR	UL	L	T	T	R	UL
Maximum Queue (ft)	256	265	438	75	297	287	249	580	710	724	215	300
Average Queue (ft)	186	207	200	68	151	134	122	287	501	531	128	199
95th Queue (ft)	295	305	459	95	280	275	192	634	804	847	281	387
Link Distance (ft)			400		1129	1129			742	742		
Upstream Blk Time (%)			8						1	1		
Queuing Penalty (veh)			55						12	19		
Storage Bay Dist (ft)	265	265		75			600	600			215	300
Storage Blk Time (%)	1	13	9	10				0	6	41	1	0
Queuing Penalty (veh)	3	42	55	41				2	25	70	6	3

Intersection: 6: Benns Church Boulevard & Turner Drive

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	678	680	265
Average Queue (ft)	666	666	209
95th Queue (ft)	674	674	366
Link Distance (ft)	659	659	
Upstream Blk Time (%)	33	31	
Queuing Penalty (veh)	346	335	
Storage Bay Dist (ft)			265
Storage Blk Time (%)	56	53	1
Queuing Penalty (veh)	71	126	11

Intersection: 14: Turner Drive

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	LT	TR	LTR	LTR
Maximum Queue (ft)	444	86	60	87	68
Average Queue (ft)	153	18	8	28	22
95th Queue (ft)	545	59	34	69	56
Link Distance (ft)	802	400	400	302	320
Upstream Blk Time (%)	7				
Queuing Penalty (veh)	0				
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 1220