



INTERSECTION CONTROL EVALUATION MEMORANDUM

McCulloch Road

Orlando, Florida
Contract No.: Y20-832

Prepared for:
Orange County, Florida

February 2024

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Introduction

This Intersection Control Evaluation (ICE) Memorandum has been prepared to evaluate intersection control alternatives to the current control types along McCulloch Rd from Lockwood Blvd/Orion Blvd to Tanner Rd/Old Lockwood Rd. This evaluation is needed as the future population growth in the area will increase the traffic on these roads substantially. A widening project through this section of McCulloch Rd will expand McCulloch Rd from a 2-lane undivided to a 4-lane divided road and will open in 2028 with a design year of 2048. Control strategy alternatives were evaluated for the 4 intersections in this section of McCulloch Rd.

Stage 1 ICE

Stage 1 ICE included a planning level V/C ratio assessment and a planning level safety assessment using the CAP-X and SPICE tools provided by FDOT.

CAP-X Analysis

For the CAP-X analysis, the current control strategy for the intersection was compared to a 2-lane roundabout using the geometry for the widening project. The design year of 2048 was used. Traffic volumes were taken from the McCulloch Road Conceptual Analysis prepared by Luke Transportation Engineering Consultants, Inc. Table 1 provides the results from the CAP-X analysis.

Table 1: Stage 1 CAP-X Results

Intersection	Control Strategy	Weekday AM Peak V/C Ratio	Weekday PM Peak V/C Ratio	Ped Accom.	Bike Accom.
McCulloch Rd at Lockwood Blvd/Orion Blvd	Signalized	0.72	1.04	4.71	4.58
	Roundabout (2-lane)	1.62	5.67	4.38	4.50
McCulloch Rd at Keats Way/ Worcester Dr	Signalized	0.64	0.63	5.24	4.92
	Roundabout (2-lane)	0.69	0.74	5.04	4.75
McCulloch Rd at Amour de Flame Way/ Worcester Dr	Two-Way Stop Control	2.65	>10	2.91	4.17
	Roundabout (2-lane)	0.59	0.71	5.04	4.67
McCulloch Rd at N Tanner Rd/ Old Lockwood Rd	Signalized	1.06	1.34	5.02	4.62
	Roundabout (2-lane)	1.33	1.50	4.87	4.50

The signalized control strategies have better V/C ratios and higher ped/bike accommodation scores than the 2-lane roundabouts for the Orion Blvd, Keats Way, and Tanner Rd

intersections. At Amour de Flame Way, the 2-lane roundabout has better V/C ratios and higher ped/bike accommodation scores than the current two-way stop control.

SPICE Analysis

As seen in Table 2 below, the 2-lane roundabouts at Orion Blvd and Amour de Flame Way produce more total crashes but slightly less fatalities/injuries than the current control strategies. The 2-lane roundabouts at Keats Way and Tanner Rd produce more total crashes and more fatalities/injuries than the current control strategies.

Table 2: Stage 1 SPICE Results

Intersection	Control Strategy	Opening Year 2028			Design Year 2048		
		Predicted Total Crashes	Predicted Fatal + Injury Crashes	SSI Score	Predicted Total Crashes	Predicted Fatal + Injury Crashes	SSI Score
McCulloch Rd at Lockwood Blvd/Orion Blvd	Signalized	15.17	3.85	69	29.75	7.68	42
	Roundabout (2-lane)	18.82	3.57	77	34.74	7.00	62
McCulloch Rd at Keats Way/Worcester Dr	Signalized	2.35	1.53	96	3.95	2.69	92
	Roundabout (2-lane)	10.39	1.85	96	17.74	3.34	93
McCulloch Rd at Amour de Flame Way/Worcester Dr	Two-Way Stop Control	7.12	2.96	98	10.76	4.70	95
	Roundabout (2-lane)	9.56	1.69	99	16.25	3.03	99
McCulloch Rd at N Tanner Rd/Old Lockwood Rd	Signalized	3.83	1.30	97	7.39	2.53	91
	Roundabout (2-lane)	9.49	1.68	99	17.49	3.29	97

Stage 1 Conclusions

In general, the signalized intersections have better V/C ratios and higher ped/bike accommodation scores with slightly lower safety scores compared to the roundabouts. All intersection control types from Stage 1 will move on to Stage 2 for further analysis.

Stage 2 ICE

Stage 2 ICE includes operational analyses for both alternatives for the opening year and design year, as well as a benefit/cost analysis.

Operational Analysis

To analyze level of service (LOS) and delay HCS was used for the roundabouts and Synchro was used for the signalized and two-way stop control intersections. Full printouts of the analyses can be found in the Appendix. See Tables 3 and 4 below for a summary of the results.

Table 3: Stage 2 Operational Analysis – Opening Year 2028

Intersection	Control Strategy	Weekday AM Peak		Weekday PM Peak	
		LOS	Delay (sec.)	LOS	Delay (sec.)
McCulloch Rd at Lockwood Blvd/Orión Blvd	Signalized	C	27.6	C	31.6
	Roundabout (2-lane)	B	14.8	F	89.2
McCulloch Rd at Keats Way/Worcester Dr	Signalized	C	21.2	B	19.7
	Roundabout (2-lane)	A	6.0	A	6.7
McCulloch Rd at Amour de Flame Way/Worcester Dr	Two-Way Stop Control	A	2.0	A	3.0
	Roundabout (2-lane)	A	5.5	A	6.5
McCulloch Rd at N Tanner Rd/ Old Lockwood Rd	Signalized	B	18.3	B	12.7
	Roundabout (2-lane)	B	11.2	B	13.9

Table 4: Stage 2 Operational Analysis – Design Year 2048

Intersection	Control Strategy	Weekday AM Peak		Weekday PM Peak	
		LOS	Delay (sec.)	LOS	Delay (sec.)
McCulloch Rd at Lockwood Blvd/Orion Blvd	Signalized	D	37.8	D	51.2
	Roundabout (2-lane)	F	225.4	F	1093.3
McCulloch Rd at Keats Way/ Worcester Dr	Signalized	D	35.7	C	26.5
	Roundabout (2-lane)	B	11.5	B	13.0
McCulloch Rd at Amour de Flame Way/ Worcester Dr	Two-Way Stop Control	A	7.4	E	57.8
	Roundabout (2-lane)	A	9.2	B	12.2
McCulloch Rd at N Tanner Rd/ Old Lockwood Rd	Signalized	C	23.1	D	36.6
	Roundabout (2-lane)	F	134.5	F	176.6

Benefit/Cost Analysis

The total costs of each alternative were analyzed using the ICE tool provided by FDOT. For the Orion Blvd intersection, the net present value of the traffic signal over the roundabout is \$292,650,849. For the Keats Way intersection, the net present value of the roundabout over the traffic signal is \$11,005,539. For the Amour de Flame Way intersection, the net present value of the roundabout over the two-way stop control is \$8,995,370. For the Tanner Rd intersection, the net present value of the traffic signal over the roundabout is \$26,223,431.

Stage 2 Conclusions

At the Orion Blvd and Tanner Rd intersections, the signalized control provides much better LOS than the roundabout particularly in the design year of 2048 where the roundabout fails during peak hours. This leads to the traffic signal having a large net present value over the roundabout for these two intersections. At the Keats Way intersection, the roundabout offers a slight improvement in the LOS at peaks hours, which leads to the net present value over the traffic signal. At the Amour de Flame intersection, the roundabout provides an improvement in the

LOS in the 2048 PM peak hour, which leads to a net present value over the two-way stop control.

Recommended Intersection Alternatives

At the Orion Blvd intersection, we recommend the signalized control based on better LOS, lower cost, better V/C ratio, higher ped/bike accommodation scores, and less total crashes when compared to a 2-lane roundabout.

At the Keats Way intersection, we recommend the signalized control based on better V/C ratios, higher ped/bike accommodation scores, less total crashes, and less injuries/fatalities when compared to a 2-lane roundabout. The 2-lane roundabout had slightly better LOS and net present value, but the roundabout would have more impacts to right of way and utilities due to the larger area needed to construct. A roundabout may not be feasible to construct due to lack of space with the nearby developments.

At the Amour de Flame intersection, we recommend the two-way stop control based on acceptable LOS through the design year, lower total crashes compared to a 2-lane roundabout, and the space constraints for building a roundabout. The 2-lane roundabout had slightly better LOS and net present value, but the roundabout would have more impacts to right of way and utilities due to the larger area needed to construct. A roundabout may not be feasible to construct due to lack of space with the nearby developments.

At the Tanner Rd intersection, we recommend the signalized control based on better LOS, lower cost, better V/C ratio, higher ped/bike accommodation scores, less total crashes, and less fatalities/injuries when compared to a 2-lane roundabout.







Appendix A: CAP-X Results

Capacity Analysis for Planning of Junctions

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Project Name	McCulloch Rd @ Lockwood Blvd / Orion Blvd
Project Number	0
Location	Orlando, FL
Date	2048 Peak Hour (AM)
Number of Intersection Legs	4
Major Street Direction	East-West

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	503	467	426	2.00%	0.00%
Westbound	0	628	1097	76	2.00%	0.00%
Southbound	0	65	547	240	2.00%	0.00%
Northbound	0	65	81	90	2.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
FDOT Context Zone		C2-Rural				
E-W / Crossing East-West Legs		Low	Low	Low		
N-S / Crossing North-South Legs		Low	Low	Low		
Critical Lane Volume Threshold		2-phase signal		Suggested = 1800	1800	
		3-phase signal		Suggested = 1750	1750	
		4-phase signal		Suggested = 1700	1700	

Capacity Analysis for Planning of Junctions

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Project Name	McCulloch Rd @ Lockwood Blvd / Orion Blvd
Project Number	0
Location	Orlando, FL
Date	2048 Peak Hour (PM)
Number of Intersection Legs	4
Major Street Direction	East-West

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	1086	1306	328	2.00%	0.00%
Westbound	0	408	1028	52	2.00%	0.00%
Southbound	0	29	218	101	2.00%	0.00%
Northbound	0	462	684	500	2.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
FDOT Context Zone		C2-Rural				
E-W / Crossing East-West Legs		Low	Low	Low		
N-S / Crossing North-South Legs		Low	Low	Low		
Critical Lane Volume Threshold		2-phase signal		Suggested = 1800	1800	
		3-phase signal		Suggested = 1750	1750	
		4-phase signal		Suggested = 1700	1700	

Capacity Analysis for Planning of Junctions

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Project Name	McCulloch Road @ Keats Way / Worchester Dr
Project Number	0
Location	Orlando, FL
Date	2048 Peak Hour (AM)
Number of Intersection Legs	4
Major Street Direction	East-West

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	47	451	49	2.00%	0.00%
Westbound	0	7	1566	4	2.00%	0.00%
Southbound	0	7	2	110	2.00%	0.00%
Northbound	0	114	0	16	2.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
FDOT Context Zone			C2-Rural			
E-W / Crossing East-West Legs			Low	Low	Low	
N-S / Crossing North-South Legs			Low	Low	Low	
Critical Lane Volume Threshold			2-phase signal		Suggested = 1800	1800
			3-phase signal		Suggested = 1750	1750
			4-phase signal		Suggested = 1700	1700

Capacity Analysis for Planning of Junctions

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Project Name	McCulloch Road @ Keats Way / Worchester Dr
Project Number	0
Location	Orlando, FL
Date	2048 Peak Hour (PM)
Number of Intersection Legs	4
Major Street Direction	East-West

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	94	1694	123	2.00%	0.00%
Westbound	0	13	1194	27	2.00%	0.00%
Southbound	0	13	0	94	2.00%	0.00%
Northbound	0	85	0	11	2.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
FDOT Context Zone			C2-Rural			
E-W / Crossing East-West Legs			Low	Low	Low	
N-S / Crossing North-South Legs			Low	Low	Low	
Critical Lane Volume Threshold			2-phase signal		Suggested = 1800	1800
			3-phase signal		Suggested = 1750	1750
			4-phase signal		Suggested = 1700	1700

Capacity Analysis for Planning of Junctions

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Project Name	McCulloch Rd @ Amour de Flame Way / Worchester Dr
Project Number	0
Location	Orlando, FL
Date	2048 Peak Hour (AM)
Number of Intersection Legs	4
Major Street Direction	East-West

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	31	437	29	2.00%	0.00%
Westbound	0	22	1393	9	2.00%	0.00%
Southbound	0	25	0	114	2.00%	0.00%
Northbound	0	67	0	47	2.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
FDOT Context Zone		C2-Rural				
E-W / Crossing East-West Legs		Low	Low	Low		
N-S / Crossing North-South Legs		Low	Low	Low		
Critical Lane Volume Threshold		2-phase signal		Suggested = 1800	1800	
		3-phase signal		Suggested = 1750	1750	
		4-phase signal		Suggested = 1700	1700	

Capacity Analysis for Planning of Junctions

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Project Name	McCulloch Rd @ Amour de Flame Way / Worchester Dr
Project Number	0
Location	Orlando, FL
Date	2048 Peak Hour (PM)
Number of Intersection Legs	4
Major Street Direction	East-West

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	150	1517	58	2.00%	0.00%
Westbound	0	52	1061	34	2.00%	0.00%
Southbound	0	34	0	119	2.00%	0.00%
Northbound	0	45	0	47	2.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
FDOT Context Zone			C2-Rural			
E-W / Crossing East-West Legs			Low	Low	Low	
N-S / Crossing North-South Legs			Low	Low	Low	
Critical Lane Volume Threshold			2-phase signal		Suggested = 1800	1800
			3-phase signal		Suggested = 1750	1750
			4-phase signal		Suggested = 1700	1700

Capacity Analysis for Planning of Junctions

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Project Name	McCulloch Rd @ N Tanner Rd / Old Lockwood Rd
Project Number	0
Location	Orlando, FL
Date	2048 Peak Hour (AM)
Number of Intersection Legs	4
Major Street Direction	East-West

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	110	49	388	2.00%	0.00%
Westbound	0	81	72	34	2.00%	0.00%
Southbound	0	20	182	85	2.00%	0.00%
Northbound	0	1203	334	52	2.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
FDOT Context Zone			C2-Rural			
E-W / Crossing East-West Legs			Low	Low	Low	
N-S / Crossing North-South Legs			Low	Low	Low	
Critical Lane Volume Threshold			2-phase signal		Suggested = 1800	1800
			3-phase signal		Suggested = 1750	1750
			4-phase signal		Suggested = 1700	1700

Capacity Analysis for Planning of Junctions

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Project Name	McCulloch Rd @ N Tanner Rd / Old Lockwood Rd
Project Number	0
Location	Orlando, FL
Date	2048 Peak Hour (PM)
Number of Intersection Legs	4
Major Street Direction	East-West

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	155	117	1310	2.00%	0.00%
Westbound	0	43	87	11	2.00%	0.00%
Southbound	0	25	469	130	2.00%	0.00%
Northbound	0	913	411	52	2.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
FDOT Context Zone			C2-Rural			
E-W / Crossing East-West Legs			Low	Low	Low	
N-S / Crossing North-South Legs			Low	Low	Low	
Critical Lane Volume Threshold			2-phase signal		Suggested = 1800	1800
			3-phase signal		Suggested = 1750	1750
			4-phase signal		Suggested = 1700	1700



Appendix B: SPICE Results

Safety Performance for Intersection Control Evaluation Tool

Results

Summary of crash prediction results for each alternative

Project Information

Project Name:	McCulloch Rd @ Lockwood Blvd / Orion Blvd	Intersection Type	At-Grade Intersection
Intersection:		Opening Year	2028
Agency:		Design Year	2048
Project Reference:		Facility Type	On Urban and Suburban Arterial
City:	Orlando	Number of Legs	4-leg
State:	FL	1-Way/2-Way	2-way Intersecting 2-way
Date:		# of Major Street Lanes (both directions)	5 or fewer
Analyst:		Major Street Approach Speed	Less than 50 mph

Crash Prediction Summary

SSI Score

Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	Crash Prediction Rank	AADT Within SPF Prediction Range?		Source of Prediction	Opening Year	Design Year	Rank
						(Open Year)	(Design Year)				
Traffic Signal	Total	15.17	29.75	468.02	2	Yes	Yes	Calibrated SPF w/ EB	69	42	2
	Fatal & Injury	3.85	7.68	119.88							
2-lane Roundabout	Total	18.82	34.74	560.08	1	Yes	No	Uncalibrated SPF	77	62	1
	Fatal & Injury	3.57	7.00	110.18							

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Safety Performance for Intersection Control Evaluation Tool**

Results

Summary of crash prediction results for each alternative

Project Information

Project Name:	McCulluch Rd @ Keats Way / Worchester Dr	Intersection Type	At-Grade Intersection
Intersection:		Opening Year	2028
Agency:		Design Year	2048
Project Reference:		Facility Type	On Urban and Suburban Arterial
City:	Orlando	Number of Legs	4-leg
State:	FL	1-Way/2-Way	2-way Intersecting 2-way
Date:		# of Major Street Lanes (both directions)	5 or fewer
Analyst:		Major Street Approach Speed	Less than 50 mph

Crash Prediction Summary

SSI Score

Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	Crash Prediction Rank	AADT Within SPF Prediction Range?		Source of Prediction	Opening Year	Design Year	Rank
						(Open Year)	(Design Year)				
Traffic Signal	Total	2.35	3.95	66.12	1	Yes	Yes	Calibrated SPF w/ EB	96	92	2
	Fatal & Injury	1.53	2.69	44.17							
2-lane Roundabout	Total	10.39	17.74	294.45	2	Yes	No	Uncalibrated SPF	96	93	1
	Fatal & Injury	1.85	3.34	54.25							

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Safety Performance for Intersection Control Evaluation Tool**

Results

Summary of crash prediction results for each alternative

Project Information

Project Name:	McCulloch Rd @ Amour de Flame Way / Worchester Dr	Intersection Type	At-Grade Intersection
Intersection:		Opening Year	2028
Agency:		Design Year	2048
Project Reference:		Facility Type	On Urban and Suburban Arterial
City:	Orlando	Number of Legs	4-leg
State:	FL	1-Way/2-Way	2-way Intersecting 2-way
Date:		# of Major Street Lanes (both directions)	5 or fewer
Analyst:		Major Street Approach Speed	Less than 50 mph

Crash Prediction Summary

SSI Score

Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	Crash Prediction Rank	AADT Within SPF Prediction Range?		Source of Prediction	Opening Year	Design Year	Rank
						(Open Year)	(Design Year)				
Minor Road Stop	Total	7.12	10.76	188.37	2	Yes	Yes	Calibrated SPF w/ EB	98	95	2
	Fatal & Injury	2.96	4.70	80.67							
2-lane Roundabout	Total	9.56	16.25	270.17	1	Yes	No	Uncalibrated SPF	99	99	1
	Fatal & Injury	1.69	3.03	49.34							

**Florida Department of Transportation
Safety Performance for Intersection Control Evaluation Tool**

Results

Summary of crash prediction results for each alternative

Project Information

Project Name:	McCulloch Rd @ Tanner Rd / Old Lockwood Blvd	Intersection Type	At-Grade Intersection
Intersection:		Opening Year	2028
Agency:		Design Year	2048
Project Reference:		Facility Type	On Urban and Suburban Arterial
City:	Orlando	Number of Legs	4-leg
State:	FL	1-Way/2-Way	2-way Intersecting 2-way
Date:		# of Major Street Lanes (both directions)	5 or fewer
Analyst:		Major Street Approach Speed	Less than 50 mph

Crash Prediction Summary

SSI Score

Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	Crash Prediction Rank	AADT Within SPF Prediction Range?		Source of Prediction	Opening Year	Design Year	Rank
						(Open Year)	(Design Year)				
Traffic Signal	Total	3.83	7.39	116.91	1	Yes	Yes	Calibrated SPF w/ EB	97	91	2
	Fatal & Injury	1.30	2.53	39.91							
2-lane Roundabout	Total	9.49	17.49	282.17	2	Yes	No	Uncalibrated SPF	99	97	1
	Fatal & Injury	1.68	3.29	51.78							



Appendix C: Operational Analysis

Lanes, Volumes, Timings
1: N. Orion Bv/Lockwood Bv & McCulloch Rd

2028 AM Build
05/05/2022

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	296	275	251	370	647	45	38	48	53	38	323	141
Future Volume (vph)	296	275	251	370	647	45	38	48	53	38	323	141
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	13	13	14	14	14	12	12	12	12	12	12
Storage Length (ft)	500		475	260		300	235		370	275		225
Storage Lanes	2		2	2		1	2		2	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	0.88	0.97	0.95	1.00	0.97	0.95	0.88	1.00	0.95	1.00
Frnt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3618	3693	2771	3698	3813	1672	2537	3167	2842	1805	3610	1538
Flt Permitted	0.950			0.575			0.357			0.722		
Satd. Flow (perm)	3618	3693	2771	2238	3813	1672	954	3167	2842	1372	3610	1538
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			264			196			95			148
Link Speed (mph)		45			45			30				35
Link Distance (ft)		2725			2685			978				942
Travel Time (s)		41.3			40.7			22.2				18.4
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
Heavy Vehicles (%)	0%	1%	6%	1%	1%	3%	38%	14%	0%	0%	0%	5%
Adj. Flow (vph)	312	289	264	389	681	47	40	51	56	40	340	148
Shared Lane Traffic (%)												
Lane Group Flow (vph)	312	289	264	389	681	47	40	51	56	40	340	148
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		28			28			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	0.96	0.96	0.96	0.92	0.92	0.92	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pt+ov	pm+pt	NA	Perm	pm+pt	NA	pm+ov	Perm	NA	pm+ov

2028 AM Build McCulloch Rd RCA 10:02 am 05/05/2022 2028 AM Build
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Synchro 11 Report
Page 1

Lanes, Volumes, Timings
1: N. Orion Bv/Lockwood Bv & McCulloch Rd

2028 AM Build
05/05/2022

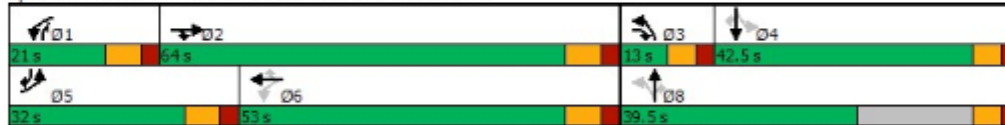


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	5	2	2 3	1	6		3	8	1		4	5
Permitted Phases				6		6	8		8	4		4
Detector Phase	5	2	2 3	1	6	6	3	8	1	4	4	5
Switch Phase												
Minimum Initial (s)	6.0	15.0		6.0	15.0	15.0	6.0	8.0	6.0	8.0	8.0	6.0
Minimum Split (s)	13.6	50.6		13.6	50.6	50.6	12.5	45.5	13.6	44.5	44.5	13.6
Total Split (s)	32.0	64.0		21.0	53.0	53.0	13.0	39.5	21.0	42.5	42.5	32.0
Total Split (%)	22.8%	45.6%		14.9%	37.7%	37.7%	9.3%	28.1%	14.9%	30.2%	30.2%	22.8%
Maximum Green (s)	24.4	56.4		13.4	45.4	45.4	6.5	33.0	13.4	36.0	36.0	24.4
Yellow Time (s)	4.9	4.9		4.9	4.9	4.9	4.0	4.0	4.9	4.0	4.0	4.9
All-Red Time (s)	2.7	2.7		2.7	2.7	2.7	2.5	2.5	2.7	2.5	2.5	2.7
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)	7.6	7.6		7.6	7.6	7.6	6.5	6.5	7.6	6.5	6.5	7.6
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead		Lead	Lag	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	Max	None	None	None	None
Walk Time (s)		7.0			7.0	7.0		7.0		7.0	7.0	
Flash Dont Walk (s)		36.0			36.0	36.0		32.0		31.0	31.0	
Pedestrian Calls (#/hr)		0			0	0		0		0	0	
Act Effct Green (s)	16.3	56.4	69.3	63.2	51.7	51.7	39.0	39.0	57.1	26.1	26.1	49.0
Actuated g/C Ratio	0.13	0.44	0.54	0.49	0.40	0.40	0.30	0.30	0.44	0.20	0.20	0.38
v/c Ratio	0.68	0.18	0.16	0.32	0.45	0.45	0.06	0.11	0.05	0.04	0.14	0.46
Control Delay	61.4	22.6	1.9	13.7	29.6	0.2	33.1	32.5	0.8	44.4	47.8	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.4	22.6	1.9	13.7	29.6	0.2	33.1	32.5	0.8	44.4	47.8	4.6
LOS	E	C	A	B	C	C	A	C	A	D	D	A
Approach Delay		30.3			22.9			20.6			35.4	
Approach LOS		C			C			C			D	

Intersection Summary













Area Type:	Other
Cycle Length:	140.5
Actuated Cycle Length:	128.7
Natural Cycle:	125
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.68
Intersection Signal Delay:	27.6
Intersection LOS:	C
Intersection Capacity Utilization:	60.7%
ICU Level of Service:	B
Analysis Period (min):	15

Splits and Phases: 1: N. Orion Bv/Lockwood Bv & McCulloch Rd



Queues
1: N. Orion Bv/Lockwood Bv & McCulloch Rd

2028 AM Build
05/05/2022

														
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Group Flow (vph)	312	289	264	389	681	47	40	51	56	40	340	148		
v/c Ratio	0.68	0.18	0.16	0.32	0.45	0.06	0.11	0.05	0.04	0.14	0.46	0.22		
Control Delay	61.4	22.6	1.9	13.7	29.6	0.2	33.1	32.5	0.8	44.4	47.8	4.6		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	61.4	22.6	1.9	13.7	29.6	0.2	33.1	32.5	0.8	44.4	47.8	4.6		
Queue Length 50th (ft)	129	76	0	73	215	0	12	15	0	28	132	0		
Queue Length 95th (ft)	176	108	22	98	284	0	27	33	3	63	184	42		
Internal Link Dist (ft)	2645			2605			898			862				
Turn Bay Length (ft)	500		475		260		300		235		370		275	225
Base Capacity (vph)	686	1618	1616	1283	1530	788	369	1205	1352	383	1010	764		
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio	0.45	0.18	0.16	0.30	0.45	0.06	0.11	0.04	0.04	0.10	0.34	0.19		
Intersection Summary														

HCM 6th Signalized Intersection Summary
1: N. Orion Bv/Lockwood Bv & McCulloch Rd

2028 AM Build
05/05/2022

	↖	→	↗	↖	←	↖	↗	↑	↖	↗	↓	↖
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↖	↖↖	↖↖	↖↖	↖↖	↖	↖↖	↖↖	↖↖	↖	↖↖	↖
Traffic Volume (veh/h)	296	275	251	370	647	45	38	48	53	38	323	141
Future Volume (veh/h)	296	275	251	370	647	45	38	48	53	38	323	141
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1976	1961	1884	1961	1961	1930	1337	1693	1900	1900	1900	1826
Adj Flow Rate, veh/h	312	289	264	389	681	47	40	51	56	40	340	148
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
Percent Heavy Veh, %	0	1	6	1	1	3	38	14	0	0	0	5
Cap, veh/h	390	1741	1416	1141	1638	719	333	880	1000	299	660	448
Arrive On Green	0.11	0.47	0.47	0.08	0.44	0.44	0.04	0.27	0.27	0.18	0.18	0.18
Sat Flow, veh/h	3651	3725	2809	3622	3725	1635	2470	3216	2834	1307	3610	1547
Grp Volume(v), veh/h	312	289	264	389	681	47	40	51	56	40	340	148
Grp Sat Flow(s),veh/h/ln	1825	1863	1405	1811	1863	1635	1235	1608	1417	1307	1805	1547
Q Serve(g_s), s	10.1	5.4	6.2	7.0	15.1	2.0	1.5	1.4	1.6	3.1	10.3	9.1
Cycle Q Clear(g_c), s	10.1	5.4	6.2	7.0	15.1	2.0	1.5	1.4	1.6	3.1	10.3	9.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	390	1741	1416	1141	1638	719	333	880	1000	299	660	448
V/C Ratio(X)	0.80	0.17	0.19	0.34	0.42	0.07	0.12	0.06	0.06	0.13	0.51	0.33
Avail Cap(c_a), veh/h	738	1741	1416	1257	1638	719	376	880	1000	450	1077	627
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	52.6	18.6	16.4	15.7	23.2	19.5	36.4	32.4	25.8	41.5	44.5	33.7
Incr Delay (d2), s/veh	3.8	0.2	0.3	0.2	0.8	0.2	0.2	0.1	0.1	0.2	0.6	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.7	2.3	2.1	2.8	6.5	0.8	0.5	0.6	0.6	1.0	4.6	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.4	18.8	16.7	15.8	23.9	19.7	36.6	32.5	25.9	41.8	45.1	34.1
LnGrp LOS	E	B	B	B	C	B	D	C	C	D	D	C
Approach Vol, veh/h		865			1117			147			528	
Approach Delay, s/veh		31.7			20.9			31.1			41.8	
Approach LOS		C			C			C			D	
Timer - Assigned Phs	1	2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s	17.2	64.0	10.9	28.6	20.5	60.7		39.5				
Change Period (Y+Rc), s	* 7.6	* 7.6	6.5	6.5	* 7.6	* 7.6		6.5				
Max Green Setting (Gmax), s	* 13	* 56	6.5	36.0	* 24	* 45		33.0				
Max Q Clear Time (g_c+1), s	9.0	8.2	3.5	12.3	12.1	17.1		3.6				
Green Ext Time (p_c), s	0.6	2.9	0.0	2.8	0.8	4.7		0.5				
Intersection Summary												
HCM 6th Ctrl Delay	29.1											
HCM 6th LOS	C											
Notes												
User approved pedestrian interval to be less than phase max green.												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Lanes, Volumes, Timings
2: Worcester Dr/Keats Wy & McCulloch Rd

2028 AM Build
05/05/2022

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	266	29	4	923	3	67	0	9	4	1	65
Future Volume (vph)	28	266	29	4	923	3	67	0	9	4	1	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	120		290	175		0	0		0	0		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr			0.850					0.850			0.852	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	2959	1615	1805	3610	0	1770	1615	0	1805	1619	0
Flt Permitted	0.141			0.585			0.615			0.752		
Satd. Flow (perm)	263	2959	1615	1112	3610	0	1146	1615	0	1429	1619	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			159					613				66
Link Speed (mph)		45			45			25				25
Link Distance (ft)		2685			1825			469				245
Travel Time (s)		40.7			27.7			12.8				6.7
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	22%	0%	0%	0%	0%	2%	0%	0%	0%	0%	0%
Adj. Flow (vph)	29	271	30	4	942	3	68	0	9	4	1	66
Shared Lane Traffic (%)												
Lane Group Flow (vph)	29	271	30	4	945	0	68	9	0	4	67	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		28			28			12				12
Link Offset(ft)		0			0			0				0
Crosswalk Width(ft)		16			16			16				16
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94				94
Detector 2 Size(ft)		6			6			6				6
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				0.0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	

2028 AM Build McCulloch Rd RCA 10:02 am 05/05/2022 2028 AM Build
PHR/LTEC

Synchro 11 Report
Page 1

Lanes, Volumes, Timings
2: Worcester Dr/Keats Wy & McCulloch Rd

2028 AM Build
05/05/2022

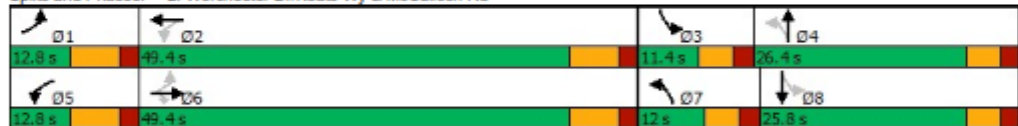


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	6		6	2			4			8		
Detector Phase	1	6	6	5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	6.0	15.0	15.0	6.0	15.0		6.0	8.0		6.0	8.0	
Minimum Split (s)	12.8	35.8	35.8	12.8	29.8		11.4	26.4		11.4	23.4	
Total Split (s)	12.8	49.4	49.4	12.8	49.4		12.0	26.4		11.4	25.8	
Total Split (%)	12.8%	49.4%	49.4%	12.8%	49.4%		12.0%	26.4%		11.4%	25.8%	
Maximum Green (s)	6.0	42.6	42.6	6.0	42.6		6.6	21.0		6.0	20.4	
Yellow Time (s)	4.8	4.8	4.8	4.8	4.8		3.4	3.4		3.4	3.4	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
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)	6.8	6.8	6.8	6.8	6.8		5.4	5.4		5.4	5.4	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	Min	Min	None	Min		None	None		None	Max	
Walk Time (s)		7.0	7.0		7.0			7.0				
Flash Dont Walk (s)		22.0	22.0		16.0			14.0				
Pedestrian Calls (#/hr)		0	0		0			0				
Act Effect Green (s)	30.2	29.2	29.2	29.0	27.1		29.9	28.9		26.2	21.7	
Actuated g/C Ratio	0.40	0.39	0.39	0.39	0.36		0.40	0.39		0.35	0.29	
v/c Ratio	0.12	0.23	0.04	0.01	0.72		0.13	0.01		0.01	0.13	
Control Delay	12.9	16.2	0.1	11.2	24.9		18.8	0.0		19.5	9.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	12.9	16.2	0.1	11.2	24.9		18.8	0.0		19.5	9.1	
LOS	B	B	A	B	C		B	A		B	A	
Approach Delay		14.4			24.8			16.6			9.7	
Approach LOS		B			C			B			A	

Intersection Summary

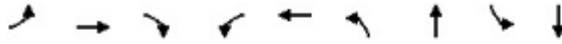
Area Type:	Other
Cycle Length:	100
Actuated Cycle Length:	74.9
Natural Cycle:	90
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.72
Intersection Signal Delay:	21.2
Intersection Capacity Utilization:	46.2%
Analysis Period (min):	15
Intersection LOS:	C
ICU Level of Service A:	

Splits and Phases: 2: Worcester Dr/Keats Wy & McCulloch Rd



Queues
2: Worcester Dr/Keats Wy & McCulloch Rd

2028 AM Build
05/05/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	29	271	30	4	945	68	9	4	67
v/c Ratio	0.12	0.23	0.04	0.01	0.72	0.13	0.01	0.01	0.13
Control Delay	12.9	16.2	0.1	11.2	24.9	18.8	0.0	19.5	9.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.9	16.2	0.1	11.2	24.9	18.8	0.0	19.5	9.1
Queue Length 50th (ft)	8	42	0	1	181	18	0	1	0
Queue Length 95th (ft)	21	85	0	6	308	59	0	9	34
Internal Link Dist (ft)		2605			1745		389		165
Turn Bay Length (ft)	120		290	175					
Base Capacity (vph)	234	1810	1050	489	2184	516	1002	532	516
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.15	0.03	0.01	0.43	0.13	0.01	0.01	0.13
Intersection Summary									

HCM 6th Signalized Intersection Summary
2: Worcester Dr/Keats Wy & McCulloch Rd

2028 AM Build
05/05/2022

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations	↖	↖↖	↖	↖	↖↖		↖	↖		↖	↖	
Traffic Volume (veh/h)	28	266	29	4	923	3	67	0	9	4	1	65
Future Volume (veh/h)	28	266	29	4	923	3	67	0	9	4	1	65
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1574	1900	1900	1900	1900	1870	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	29	271	30	4	942	3	68	0	9	4	1	66
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	22	0	0	0	0	2	0	0	0	0	0
Cap, veh/h	215	1070	576	426	1212	4	506	0	508	479	6	417
Arrive On Green	0.04	0.36	0.36	0.01	0.33	0.33	0.06	0.00	0.32	0.01	0.26	0.26
Sat Flow, veh/h	1781	2991	1610	1810	3691	12	1781	0	1610	1810	24	1590
Grp Volume(v), veh/h	29	271	30	4	461	484	68	0	9	4	0	67
Grp Sat Flow(s),veh/h/ln	1781	1495	1610	1810	1805	1898	1781	0	1610	1810	0	1614
Q Serve(g_s), s	0.8	5.0	0.9	0.1	17.9	17.9	2.1	0.0	0.3	0.1	0.0	2.5
Cycle Q Clear(g_c), s	0.8	5.0	0.9	0.1	17.9	17.9	2.1	0.0	0.3	0.1	0.0	2.5
Prop In Lane	1.00		1.00	1.00		0.01	1.00		1.00	1.00		0.99
Lane Grp Cap(c), veh/h	215	1070	576	426	593	623	506	0	508	479	0	424
V/C Ratio(X)	0.13	0.25	0.05	0.01	0.78	0.78	0.13	0.00	0.02	0.01	0.00	0.16
Avail Cap(c_a), veh/h	288	1639	882	554	989	1040	551	0	508	607	0	424
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.1	17.6	16.3	17.3	23.5	23.5	18.2	0.0	18.3	20.8	0.0	22.1
Incr Delay (d2), s/veh	0.3	0.1	0.0	0.0	2.2	2.1	0.1	0.0	0.0	0.0	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	1.6	0.3	0.0	7.1	7.5	0.8	0.0	0.1	0.1	0.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.4	17.7	16.4	17.3	25.8	25.7	18.3	0.0	18.3	20.8	0.0	22.9
LnGrp LOS	B	B	B	B	C	C	B	A	B	C	A	C
Approach Vol, veh/h		330			949			77				71
Approach Delay, s/veh		17.7			25.7			18.3				22.7
Approach LOS		B			C			B				C
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	9.6	32.3	5.9	29.9	7.3	34.6	10.0	25.8				
Change Period (Y+Rc), s	6.8	6.8	5.4	5.4	6.8	6.8	5.4	5.4				
Max Green Setting (Gmax), s	6.0	42.6	6.0	21.0	6.0	42.6	6.6	20.4				
Max Q Clear Time (g_c+1), s	2.8	19.9	2.1	2.3	2.1	7.0	4.1	4.5				
Green Ext Time (p_c), s	0.0	5.6	0.0	0.0	0.0	1.8	0.0	0.3				
Intersection Summary												
HCM 6th Ctrl Delay					23.3							
HCM 6th LOS					C							

Lanes, Volumes, Timings
3: Worchester Dr/Amour de Flame Wy & McCulloch Rd

2028 AM Build
07/28/2022

	↖	→	↘	↙	←	↖	↙	↑	↘	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↖↖	↘	↘	↖↖	↘	↘	↑	↘	↘	↖	↘
Traffic Volume (vph)	18	258	17	13	821	5	40	0	28	15	0	67
Future Volume (vph)	18	258	17	13	821	5	40	0	28	15	0	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	275		275	185		185	0		0	0		0
Storage Lanes	1		1	1		1	1		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950				0.950	
Satd. Flow (prot)	1805	3539	1615	1641	3610	1615	1805	1900	1615	0	1805	1615
Flt Permitted	0.950			0.950			0.950				0.950	
Satd. Flow (perm)	1805	3539	1615	1641	3610	1615	1805	1900	1615	0	1805	1615
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		1825			1081			387			223	
Travel Time (s)		27.7			16.4			10.6			6.1	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	2%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	18	263	17	13	838	5	41	0	29	15	0	68
Shared Lane Traffic (%)												
Lane Group Flow (vph)	18	263	17	13	838	5	41	0	29	0	15	68
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	40.2%
ICU Level of Service	A
Analysis Period (min)	15

Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↕	↗	↘	↕	↗	↘	↕	↗	↘	↕	↗
Traffic Vol, veh/h	18	258	17	13	821	5	40	0	28	15	0	67
Future Vol, veh/h	18	258	17	13	821	5	40	0	28	15	0	67
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	275	-	275	185	-	185	0	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	0	2	0	10	0	0	0	0	0	0	0	0
Mvmt Flow	18	263	17	13	838	5	41	0	29	15	0	68
Major/Minor	Major1	Major2		Minor1		Minor2						
Conflicting Flow All	843	0	0	280	0	0	744	1168	132	1032	1180	419
Stage 1	-	-	-	-	-	-	299	299	-	864	864	-
Stage 2	-	-	-	-	-	-	445	869	-	168	316	-
Critical Hdwy	4.1	-	-	4.3	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.3	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	802	-	-	1223	-	-	307	195	899	190	192	589
Stage 1	-	-	-	-	-	-	691	670	-	319	374	-
Stage 2	-	-	-	-	-	-	567	372	-	823	659	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	802	-	-	1223	-	-	265	189	899	179	186	589
Mov Cap-2 Maneuver	-	-	-	-	-	-	265	189	-	179	186	-
Stage 1	-	-	-	-	-	-	676	655	-	312	370	-
Stage 2	-	-	-	-	-	-	496	368	-	779	645	-
Approach	EB	WB		NB		SB						
HCM Control Delay, s	0.6	0.1		16.1		14.7						
HCM LOS			C		B							
Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	
Capacity (veh/h)	265	-	899	802	-	-	1223	-	-	179	589	
HCM Lane V/C Ratio	0.154	-	0.032	0.023	-	-	0.011	-	-	0.086	0.116	
HCM Control Delay (s)	21	0	9.1	9.6	-	-	8	-	-	27	11.9	
HCM Lane LOS	C	A	A	A	-	-	A	-	-	D	B	
HCM 95th %tile Q(veh)	0.5	-	0.1	0.1	-	-	0	-	-	0.3	0.4	

Lanes, Volumes, Timings
4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd

2028 AM Build
05/05/2022

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	29	229	48	42	20	709	197	31	12	107	50
Future Volume (vph)	65	29	229	48	42	20	709	197	31	12	107	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		600	250		0	500		0	650		0
Storage Lanes	1		2	1		0	2		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	0.88	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.952			0.979				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1810	2814	1703	1809	0	3467	1807	0	1805	1863	1538
Flt Permitted	0.950			0.950			0.579			0.613		
Satd. Flow (perm)	1805	1810	2814	1703	1809	0	2113	1807	0	1165	1863	1538
Right Turn on Red			Yes		Yes			Yes			Yes	
Satd. Flow (RTOR)			234		16			8				212
Link Speed (mph)		45			30			35				35
Link Distance (ft)		1081			2227			1225				1142
Travel Time (s)		16.4			50.6			23.9				22.2
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	5%	1%	6%	0%	0%	1%	2%	9%	0%	2%	5%
Adj. Flow (vph)	66	30	234	49	43	20	723	201	32	12	109	51
Shared Lane Traffic (%)												
Lane Group Flow (vph)	66	30	234	49	63	0	723	233	0	12	109	51
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24				24
Link Offset(ft)		0			0			0				0
Crosswalk Width(ft)		16			16			16				16
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94				94
Detector 2 Size(ft)		6			6			6				6
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				0.0
Turn Type	Split	NA	pt+ov	Split	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	8	8	8 1	4	4		1	6		5	2	

2028 AM Build McCulloch Rd RCA 10:02 am 05/05/2022 2028 AM Build
PHR/LTEC

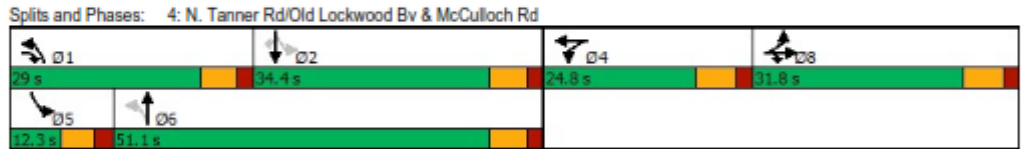
Synchro 11 Report
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Lanes, Volumes, Timings
4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd

2028 AM Build
05/05/2022

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases							6			2		2
Detector Phase	8	8	8 1	4	4		1	6		5	2	2
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	8.0		6.0	8.0	8.0
Minimum Split (s)	31.8	31.8		24.8	24.8		24.4	24.4		12.3	34.4	34.4
Total Split (s)	31.8	31.8		24.8	24.8		29.0	51.1		12.3	34.4	34.4
Total Split (%)	26.5%	26.5%		20.7%	20.7%		24.2%	42.6%		10.3%	28.7%	28.7%
Maximum Green (s)	25.0	25.0		18.0	18.0		22.6	44.7		6.0	28.0	28.0
Yellow Time (s)	4.8	4.8		4.8	4.8		4.4	4.4		4.0	4.4	4.4
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.3	2.0	2.0
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)	6.8	6.8		6.8	6.8		6.4	6.4		6.3	6.4	6.4
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		Min	Max		None	Max	Max
Walk Time (s)	7.0	7.0									7.0	7.0
Flash Dont Walk (s)	18.0	18.0									21.0	21.0
Pedestrian Calls (#/hr)	0	0									0	0
Act Effct Green (s)	8.8	8.8	31.4	8.2	8.2		51.6	49.5		35.3	29.0	29.0
Actuated g/C Ratio	0.10	0.10	0.37	0.10	0.10		0.60	0.58		0.41	0.34	0.34
v/c Ratio	0.36	0.16	0.20	0.30	0.34		0.47	0.22		0.02	0.17	0.08
Control Delay	44.5	40.3	3.1	44.4	36.5		10.8	11.8		11.3	25.1	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	44.5	40.3	3.1	44.4	36.5		10.8	11.8		11.3	25.1	0.2
LOS	D	D	A	D	D		B	B		B	C	A
Approach Delay		14.7			40.0			11.0			16.8	
Approach LOS		B			D			B			B	

Intersection Summary
 Area Type: Other
 Cycle Length: 120
 Actuated Cycle Length: 85.7
 Natural Cycle: 120
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.47
 Intersection Signal Delay: 14.5
 Intersection Capacity Utilization 48.2%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service A



Queues
4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd

2028 AM Build
05/05/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	66	30	234	49	63	723	233	12	109	51
v/c Ratio	0.36	0.16	0.20	0.30	0.34	0.47	0.22	0.02	0.17	0.08
Control Delay	44.5	40.3	3.1	44.4	36.5	10.8	11.8	11.3	25.1	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.5	40.3	3.1	44.4	36.5	10.8	11.8	11.3	25.1	0.2
Queue Length 50th (ft)	35	15	0	26	25	101	55	3	43	0
Queue Length 95th (ft)	80	45	25	65	68	159	143	11	98	0
Internal Link Dist (ft)		1001			2147		1145		1062	
Turn Bay Length (ft)			600	250		500		650		
Base Capacity (vph)	539	540	1393	366	401	1638	1048	525	631	661
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.06	0.17	0.13	0.16	0.44	0.22	0.02	0.17	0.08
Intersection Summary										

HCM 6th Signalized Intersection Summary
4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd

2028 AM Build
05/05/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘
Traffic Volume (veh/h)	65	29	229	48	42	20	709	197	31	12	107	50
Future Volume (veh/h)	65	29	229	48	42	20	709	197	31	12	107	50
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1826	1885	1811	1900	1900	1885	1870	1767	1900	1870	1826
Adj Flow Rate, veh/h	66	30	234	49	43	20	723	201	32	12	109	51
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	5	1	6	0	0	1	2	9	0	2	5
Cap, veh/h	184	186	749	111	79	37	1521	809	129	540	684	566
Arrive On Green	0.10	0.10	0.10	0.06	0.06	0.06	0.16	0.51	0.51	0.02	0.37	0.37
Sat Flow, veh/h	1810	1826	2812	1725	1227	571	3483	1575	251	1810	1870	1547
Grp Volume(v), veh/h	66	30	234	49	0	63	723	0	233	12	109	51
Grp Sat Flow(s),veh/h/ln	1810	1826	1406	1725	0	1797	1742	0	1825	1810	1870	1547
Q Serve(g_s), s	3.0	1.3	5.8	2.4	0.0	3.0	10.2	0.0	6.2	0.4	3.4	1.9
Cycle Q Clear(g_c), s	3.0	1.3	5.8	2.4	0.0	3.0	10.2	0.0	6.2	0.4	3.4	1.9
Prop In Lane	1.00		1.00	1.00		0.32	1.00		0.14	1.00		1.00
Lane Grp Cap(c), veh/h	184	186	749	111	0	116	1521	0	938	540	684	566
V/C Ratio(X)	0.36	0.16	0.31	0.44	0.00	0.54	0.48	0.00	0.25	0.02	0.16	0.09
Avail Cap(c_a), veh/h	520	525	1271	357	0	372	1853	0	938	634	684	566
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.4	35.7	25.5	39.2	0.0	39.5	11.2	0.0	11.8	16.7	18.6	18.1
Incr Delay (d2), s/veh	1.2	0.4	0.2	2.7	0.0	3.9	0.2	0.0	0.6	0.0	0.5	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.6	1.8	1.1	0.0	1.4	3.5	0.0	2.5	0.1	1.5	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.6	36.1	25.8	41.9	0.0	43.4	11.4	0.0	12.4	16.7	19.1	18.4
LnGrp LOS	D	D	C	D	A	D	B	A	B	B	B	B
Approach Vol, veh/h		330			112			956				172
Approach Delay, s/veh		29.1			42.7			11.7				18.7
Approach LOS		C			D			B				B
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	20.7	38.2		12.4	7.8	51.1		15.7				
Change Period (Y+Rc), s	6.4	6.4		6.8	* 6.3	6.4		6.8				
Max Green Setting (Gmax), s	22.6	28.0		18.0	* 6	44.7		25.0				
Max Q Clear Time (g_c+11), s	12.2	5.4		5.0	2.4	8.2		7.8				
Green Ext Time (p_c), s	2.1	0.7		0.3	0.0	1.4		1.1				
Intersection Summary												
HCM 6th Ctrl Delay	18.3											
HCM 6th LOS	B											
Notes												
User approved pedestrian interval to be less than phase max green.												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Lanes, Volumes, Timings
1: N. Orion Bv/Lockwood Bv & McCulloch Rd

2028 PM Build
05/05/2022

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	640	770	193	241	606	31	272	403	295	17	128	60
Future Volume (vph)	640	770	193	241	606	31	272	403	295	17	128	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	13	13	14	14	14	12	12	12	12	12	12
Storage Length (ft)	500		475	260		300	235		370	275		225
Storage Lanes	2		2	2		1	2		2	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	0.88	0.97	0.95	1.00	0.97	0.95	0.88	1.00	0.95	1.00
Frnt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3618	3730	2797	3662	3851	1723	3242	3406	2842	1805	3610	1615
Flt Permitted	0.950			0.354			0.407			0.511		
Satd. Flow (perm)	3618	3730	2797	1365	3851	1723	1389	3406	2842	971	3610	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			197			190			220			84
Link Speed (mph)		45			45			30				35
Link Distance (ft)		2725			2685			978				942
Travel Time (s)		41.3			40.7			22.2				18.4
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	5%	2%	0%	0%	8%	6%	0%	0%	0%	0%
Adj. Flow (vph)	653	786	197	246	618	32	278	411	301	17	131	61
Shared Lane Traffic (%)												
Lane Group Flow (vph)	653	786	197	246	618	32	278	411	301	17	131	61
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		28			28			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	0.96	0.96	0.96	0.92	0.92	0.92	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pt+ov	pm+pt	NA	Perm	pm+pt	NA	pm+ov	Perm	NA	pm+ov

2028 PM Build McCulloch Rd RCA 10:04 am 05/05/2022 2028 PM Build
PHR/LTEC

Synchro 11 Report
Page 1

Lanes, Volumes, Timings
1: N. Orion Bv/Lockwood Bv & McCulloch Rd

2028 PM Build
05/05/2022

	↖	→	↘	↙	←	↖	↙	↑	↘	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	5	2	2 3	1	6		3	8	1		4	5
Permitted Phases				6		6	8		8	4		4
Detector Phase	5	2	2 3	1	6	6	3	8	1	4	4	5
Switch Phase												
Minimum Initial (s)	6.0	15.0		6.0	15.0	15.0	6.0	8.0	6.0	8.0	8.0	6.0
Minimum Split (s)	13.6	50.6		13.6	50.6	50.6	12.5	45.5	13.6	44.5	44.5	13.6
Total Split (s)	52.0	77.0		24.0	49.0	49.0	18.0	44.0	24.0	26.0	26.0	52.0
Total Split (%)	35.9%	53.1%		16.6%	33.8%	33.8%	12.4%	30.3%	16.6%	17.9%	17.9%	35.9%
Maximum Green (s)	44.4	69.4		16.4	41.4	41.4	11.5	37.5	16.4	19.5	19.5	44.4
Yellow Time (s)	4.9	4.9		4.9	4.9	4.9	4.0	4.0	4.9	4.0	4.0	4.9
All-Red Time (s)	2.7	2.7		2.7	2.7	2.7	2.5	2.5	2.7	2.5	2.5	2.7
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)	7.6	7.6		7.6	7.6	7.6	6.5	6.5	7.6	6.5	6.5	7.6
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead		Lead	Lag	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Walk Time (s)		7.0			7.0	7.0		7.0		7.0	7.0	
Flash Dont Walk (s)		36.0			36.0	36.0		32.0		31.0	31.0	
Pedestrian Calls (#/hr)		0			0	0		0		0	0	
Act Effect Green (s)	28.4	69.4	87.3	58.5	49.8	49.8	28.0	28.0	43.2	10.1	10.1	45.0
Actuated g/C Ratio	0.22	0.54	0.68	0.46	0.39	0.39	0.22	0.22	0.34	0.08	0.08	0.35
v/c Ratio	0.81	0.39	0.10	0.32	0.41	0.41	0.04	0.59	0.55	0.27	0.22	0.46
Control Delay	55.8	18.0	1.2	12.7	30.6	0.1	48.5	47.6	9.1	62.7	61.8	2.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.8	18.0	1.2	12.7	30.6	0.1	48.5	47.6	9.1	62.7	61.8	2.5
LOS	E	B	A	B	C	C	A	D	A	E	E	A
Approach Delay		31.0			24.6			36.2			44.6	
Approach LOS		C			C			D			D	

Intersection Summary













Area Type:	Other
Cycle Length:	145
Actuated Cycle Length:	127.9
Natural Cycle:	135
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.81
Intersection Signal Delay:	31.6
Intersection LOS:	C
Intersection Capacity Utilization:	76.3%
ICU Level of Service:	D
Analysis Period (min):	15

Splits and Phases: 1: N. Orion Bv/Lockwood Bv & McCulloch Rd



Queues
1: N. Orion Bv/Lockwood Bv & McCulloch Rd

2028 PM Build
05/05/2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	653	786	197	246	618	32	278	411	301	17	131	61
v/c Ratio	0.81	0.39	0.10	0.32	0.41	0.04	0.59	0.55	0.27	0.22	0.46	0.10
Control Delay	55.8	18.0	1.2	12.7	30.6	0.1	48.5	47.6	9.1	62.7	61.8	2.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.8	18.0	1.2	12.7	30.6	0.1	48.5	47.6	9.1	62.7	61.8	2.5
Queue Length 50th (ft)	267	190	0	34	193	0	102	160	26	13	55	0
Queue Length 95th (ft)	328	258	14	52	278	0	147	218	60	39	91	16
Internal Link Dist (ft)		2645			2605			898			862	
Turn Bay Length (ft)	500		475	260		300	235		370	275		225
Base Capacity (vph)	1256	2025	1974	1000	1497	786	470	999	1263	148	550	814
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.39	0.10	0.25	0.41	0.04	0.59	0.41	0.24	0.11	0.24	0.07
Intersection Summary												

HCM 6th Signalized Intersection Summary
1: N. Orion Bv/Lockwood Bv & McCulloch Rd

2028 PM Build
05/05/2022

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	640	770	193	241	606	31	272	403	295	17	128	60
Future Volume (veh/h)	640	770	193	241	606	31	272	403	295	17	128	60
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1976	1976	1899	1945	1976	1976	1781	1811	1900	1900	1900	1900
Adj Flow Rate, veh/h	653	786	197	246	618	32	278	411	301	17	131	61
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	5	2	0	0	8	6	0	0	0	0
Cap, veh/h	756	2093	1841	802	1538	686	484	719	760	106	232	437
Arrive On Green	0.21	0.56	0.56	0.06	0.41	0.41	0.09	0.21	0.21	0.06	0.06	0.06
Sat Flow, veh/h	3651	3754	2832	3594	3754	1675	3291	3441	2834	750	3610	1610
Grp Volume(v), veh/h	653	786	197	246	618	32	278	411	301	17	131	61
Grp Sat Flow(s),veh/h/ln	1825	1877	1416	1797	1877	1675	1646	1721	1417	750	1805	1610
Q Serve(g_s), s	21.5	14.6	3.3	4.9	14.5	1.4	9.5	13.4	10.8	2.7	4.4	3.6
Cycle Q Clear(g_c), s	21.5	14.6	3.3	4.9	14.5	1.4	9.5	13.4	10.8	2.7	4.4	3.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	756	2093	1841	802	1538	686	484	719	760	106	232	437
V/C Ratio(X)	0.86	0.38	0.11	0.31	0.40	0.05	0.57	0.57	0.40	0.16	0.56	0.14
Avail Cap(c_a), veh/h	1302	2093	1841	1062	1538	686	484	1037	1022	175	565	586
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.6	15.4	8.2	18.8	26.0	22.1	46.7	44.2	37.3	55.8	56.6	34.3
Incr Delay (d2), s/veh	3.1	0.5	0.1	0.2	0.8	0.1	1.7	0.7	0.3	0.7	2.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.8	6.0	1.0	2.0	6.4	0.6	4.0	5.8	3.8	0.5	2.1	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.8	15.9	8.3	19.1	26.8	22.2	48.4	45.0	37.6	56.5	58.7	34.5
LnGrp LOS	D	B	A	B	C	C	D	D	D	E	E	C
Approach Vol, veh/h		1636			896			990			209	
Approach Delay, s/veh		28.9			24.5			43.7			51.5	
Approach LOS		C			C			D			D	
Timer - Assigned Phs	1	2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s	15.0	77.0	18.0	14.5	33.4	58.6		32.5				
Change Period (Y+Rc), s	* 7.6	* 7.6	6.5	6.5	* 7.6	* 7.6		6.5				
Max Green Setting (Gmax), s	* 16	* 69	11.5	19.5	* 44	* 41		37.5				
Max Q Clear Time (g_c+1), s	6.9	16.6	11.5	6.4	23.5	16.5		15.4				
Green Ext Time (p_c), s	0.5	6.8	0.0	0.8	2.3	4.0		4.0				
Intersection Summary												
HCM 6th Ctrl Delay					33.0							
HCM 6th LOS					C							
Notes												
User approved pedestrian interval to be less than phase max green.												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Lanes, Volumes, Timings
2: Worcester Dr/Keats Wy & McCulloch Rd

2028 PM Build
05/05/2022

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	998	73	8	704	16	50	0	7	8	0	55
Future Volume (vph)	55	998	73	8	704	16	50	0	7	8	0	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	120		290	175		0	0		0	0		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.997			0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	3610	1615	1805	3599	0	1805	1615	0	1805	1615	0
Flt Permitted	0.241			0.157			0.661			0.753		
Satd. Flow (perm)	458	3610	1615	298	3599	0	1256	1615	0	1431	1615	0
Right Turn on Red			Yes		Yes			Yes		Yes		Yes
Satd. Flow (RTOR)			145		3			254				293
Link Speed (mph)		45			45			25				25
Link Distance (ft)		2685			1825			469				245
Travel Time (s)		40.7			27.7			12.8				6.7
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	56	1018	74	8	718	16	51	0	7	8	0	56
Shared Lane Traffic (%)												
Lane Group Flow (vph)	56	1018	74	8	734	0	51	7	0	8	56	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		28			28			12				12
Link Offset(ft)		0			0			0				0
Crosswalk Width(ft)		16			16			16				16
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94				94
Detector 2 Size(ft)		6			6			6				6
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				0.0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	

Lanes, Volumes, Timings
2: Worcester Dr/Keats Wy & McCulloch Rd

2028 PM Build
05/05/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	6		6	2			4			8		
Detector Phase	1	6	6	5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	6.0	15.0	15.0	6.0	15.0		6.0	8.0		6.0	8.0	
Minimum Split (s)	12.8	35.8	35.8	12.8	29.8		11.4	26.4		11.4	23.4	
Total Split (s)	14.2	59.4	59.4	12.8	58.0		11.4	26.4		11.4	26.4	
Total Split (%)	12.9%	54.0%	54.0%	11.6%	52.7%		10.4%	24.0%		10.4%	24.0%	
Maximum Green (s)	7.4	52.6	52.6	6.0	51.2		6.0	21.0		6.0	21.0	
Yellow Time (s)	4.8	4.8	4.8	4.8	4.8		3.4	3.4		3.4	3.4	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
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)	6.8	6.8	6.8	6.8	6.8		5.4	5.4		5.4	5.4	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	Min	Min	None	Min		None	None		None	Max	
Walk Time (s)		7.0	7.0		7.0			7.0				
Flash Dont Walk (s)		22.0	22.0		16.0			14.0				
Pedestrian Calls (#/hr)		0	0		0			0				
Act Effect Green (s)	32.7	31.6	31.6	29.4	26.3		27.4	26.5		25.5	22.4	
Actuated g/C Ratio	0.44	0.42	0.42	0.39	0.35		0.37	0.35		0.34	0.30	
v/c Ratio	0.17	0.67	0.10	0.03	0.58		0.10	0.01		0.02	0.08	
Control Delay	12.7	20.2	0.2	11.6	23.2		19.6	0.0		20.0	0.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	12.7	20.2	0.2	11.6	23.2		19.6	0.0		20.0	0.2	
LOS	B	C	A	B	C		B	A		B	A	
Approach Delay		18.6			23.0			17.2			2.7	
Approach LOS		B			C			B			A	

Intersection Summary

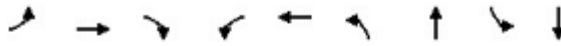
Area Type:	Other
Cycle Length:	110
Actuated Cycle Length:	74.7
Natural Cycle:	90
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.67
Intersection Signal Delay:	19.7
Intersection Capacity Utilization:	57.9%
Analysis Period (min):	15
Intersection LOS:	B
ICU Level of Service:	B

Splits and Phases: 2: Worcester Dr/Keats Wy & McCulloch Rd



Queues
2: Worcester Dr/Keats Wy & McCulloch Rd

2028 PM Build
05/05/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	56	1018	74	8	734	51	7	8	56
v/c Ratio	0.17	0.67	0.10	0.03	0.58	0.10	0.01	0.02	0.08
Control Delay	12.7	20.2	0.2	11.6	23.2	19.6	0.0	20.0	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.7	20.2	0.2	11.6	23.2	19.6	0.0	20.0	0.2
Queue Length 50th (ft)	16	200	0	2	175	15	0	2	0
Queue Length 95th (ft)	34	337	0	9	230	50	0	14	0
Internal Link Dist (ft)		2605			1745		389		165
Turn Bay Length (ft)	120		290	175					
Base Capacity (vph)	342	2680	1236	246	2621	508	737	519	689
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.38	0.06	0.03	0.28	0.10	0.01	0.02	0.08
Intersection Summary									

HCM 6th Signalized Intersection Summary
2: Worcester Dr/Keats Wy & McCulloch Rd

2028 PM Build
05/05/2022

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations	↖	↖↖	↖	↖	↖↖		↖	↖		↖	↖	
Traffic Volume (veh/h)	55	998	73	8	704	16	50	0	7	8	0	55
Future Volume (veh/h)	55	998	73	8	704	16	50	0	7	8	0	55
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	56	1018	74	8	718	16	51	0	7	8	0	56
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	306	1340	598	177	1191	27	504	0	484	486	0	421
Arrive On Green	0.05	0.37	0.37	0.01	0.33	0.33	0.05	0.00	0.30	0.01	0.00	0.26
Sat Flow, veh/h	1810	3610	1610	1810	3610	80	1810	0	1610	1810	0	1610
Grp Volume(v), veh/h	56	1018	74	8	359	375	51	0	7	8	0	56
Grp Sat Flow(s),veh/h/ln	1810	1805	1610	1810	1805	1886	1810	0	1610	1810	0	1610
Q Serve(g_s), s	1.6	19.8	2.4	0.2	13.3	13.3	1.6	0.0	0.2	0.3	0.0	2.1
Cycle Q Clear(g_c), s	1.6	19.8	2.4	0.2	13.3	13.3	1.6	0.0	0.2	0.3	0.0	2.1
Prop In Lane	1.00		1.00	1.00		0.04	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	306	1340	598	177	596	622	504	0	484	486	0	421
V/C Ratio(X)	0.18	0.76	0.12	0.05	0.60	0.60	0.10	0.00	0.01	0.02	0.00	0.13
Avail Cap(c_a), veh/h	377	2367	1056	290	1152	1203	547	0	484	600	0	421
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.9	22.1	16.6	19.2	22.5	22.5	19.5	0.0	19.7	21.2	0.0	22.7
Incr Delay (d2), s/veh	0.3	0.9	0.1	0.1	1.0	0.9	0.1	0.0	0.0	0.0	0.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	7.6	0.9	0.1	5.2	5.5	0.7	0.0	0.1	0.1	0.0	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.2	23.0	16.7	19.3	23.5	23.4	19.6	0.0	19.7	21.3	0.0	23.3
LnGrp LOS	B	C	B	B	C	C	B	A	B	C	A	C
Approach Vol, veh/h		1148			742			58				64
Approach Delay, s/veh		22.3			23.4			19.6				23.0
Approach LOS		C			C			B				C
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.1	33.3	6.4	29.5	7.8	36.6	9.5	26.4				
Change Period (Y+Rc), s	6.8	6.8	5.4	5.4	6.8	6.8	5.4	5.4				
Max Green Setting (Gmax), s	7.4	51.2	6.0	21.0	6.0	52.6	6.0	21.0				
Max Q Clear Time (g_c+1), s	3.6	15.3	2.3	2.2	2.2	21.8	3.6	4.1				
Green Ext Time (p_c), s	0.0	4.4	0.0	0.0	0.0	8.0	0.0	0.2				
Intersection Summary												
HCM 6th Ctrl Delay					22.7							
HCM 6th LOS					C							
Notes												
User approved pedestrian interval to be less than phase max green.												

Lanes, Volumes, Timings
3: Worcester Dr/Amour de Flame Wy & McCulloch Rd

2028 PM Build
07/28/2022

	↖	→	↘	↙	←	↖	↙	↑	↘	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↖↖	↘	↘	↖↖	↘	↘	↑	↘		↘	↘
Traffic Volume (vph)	89	894	34	31	625	20	26	0	28	20	0	70
Future Volume (vph)	89	894	34	31	625	20	26	0	28	20	0	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	275		275	185		185	0		0	0		0
Storage Lanes	1		1	1		1	1		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950				0.950	
Satd. Flow (prot)	1805	3610	1615	1805	3610	1615	1805	1900	1615	0	1805	1615
Flt Permitted	0.950			0.950			0.950				0.950	
Satd. Flow (perm)	1805	3610	1615	1805	3610	1615	1805	1900	1615	0	1805	1615
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		1825			1081			387			223	
Travel Time (s)		27.7			16.4			10.6			6.1	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	91	912	35	32	638	20	27	0	29	20	0	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	91	912	35	32	638	20	27	0	29	0	20	71
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	46.2%
ICU Level of Service	A
Analysis Period (min)	15

Intersection												
Int Delay, s/veh	3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↕	↗	↘	↕	↗	↘	↕	↗	↘	↕	↗
Traffic Vol, veh/h	89	894	34	31	625	20	26	0	28	20	0	70
Future Vol, veh/h	89	894	34	31	625	20	26	0	28	20	0	70
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	275	-	275	185	-	185	0	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	91	912	35	32	638	20	27	0	29	20	0	71
Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	658	0	0	947	0	0	1477	1816	456	1340	1831	319
Stage 1	-	-	-	-	-	-	1094	1094	-	702	702	-
Stage 2	-	-	-	-	-	-	383	722	-	638	1129	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	939	-	-	733	-	-	89	79	557	113	77	683
Stage 1	-	-	-	-	-	-	232	292	-	400	443	-
Stage 2	-	-	-	-	-	-	617	434	-	436	281	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	939	-	-	733	-	-	71	68	557	96	66	683
Mov Cap-2 Maneuver	-	-	-	-	-	-	71	68	-	96	66	-
Stage 1	-	-	-	-	-	-	209	264	-	361	424	-
Stage 2	-	-	-	-	-	-	528	415	-	374	254	-
Approach	EB	WB	NB	SB								
HCM Control Delay, s	0.8	0.5	46.2	20.1								
HCM LOS			E	C								
Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	
Capacity (veh/h)	71	-	557	939	-	-	733	-	-	96	683	
HCM Lane V/C Ratio	0.374	-	0.051	0.097	-	-	0.043	-	-	0.213	0.105	
HCM Control Delay (s)	83.3	0	11.8	9.2	-	-	10.1	-	-	52.4	10.9	
HCM Lane LOS	F	A	B	A	-	-	B	-	-	F	B	
HCM 95th %tile Q(veh)	1.4	-	0.2	0.3	-	-	0.1	-	-	0.8	0.3	

Lanes, Volumes, Timings
4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd

2028 PM Build
05/05/2022

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘
Traffic Volume (vph)	91	69	772	25	51	7	538	242	31	15	276	77
Future Volume (vph)	91	69	772	25	51	7	538	242	31	15	276	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		600	250		0	500		0	650		0
Storage Lanes	1		2	1		0	2		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	0.88	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.982			0.983				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1900	2842	1805	1866	0	3502	1868	0	1805	1881	1615
Flt Permitted	0.500			0.711			0.457			0.588		
Satd. Flow (perm)	950	1900	2842	1351	1866	0	1685	1868	0	1117	1881	1615
Right Turn on Red			Yes		Yes			Yes			Yes	
Satd. Flow (RTOR)			740		4			6				253
Link Speed (mph)		45			30			35				35
Link Distance (ft)		1081			2227			1225				1142
Travel Time (s)		16.4			50.6			23.9				22.2
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Adj. Flow (vph)	93	70	788	26	52	7	549	247	32	15	282	79
Shared Lane Traffic (%)												
Lane Group Flow (vph)	93	70	788	26	59	0	549	279	0	15	282	79
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	pt+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	3	8	8 1	7	4		1	6		5	2	

2028 PM Build McCulloch Rd RCA 10:04 am 05/05/2022 2028 PM Build
PHR/LTEC

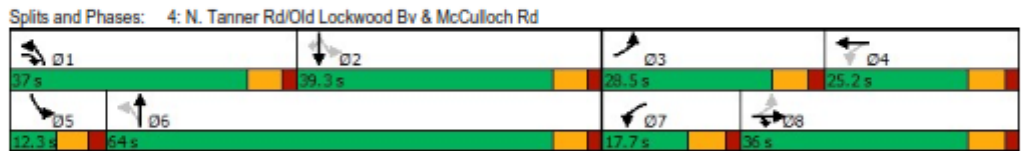
Synchro 11 Report
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Lanes, Volumes, Timings
4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd

2028 PM Build
05/05/2022

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	8			4			6			2		2
Detector Phase	3	8	8 1	7	4		1	6		5	2	2
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	8.0		6.0	8.0	8.0
Minimum Split (s)	31.8	31.8		24.8	24.8		24.4	24.4		12.3	34.4	34.4
Total Split (s)	28.5	36.0		17.7	25.2		37.0	64.0		12.3	39.3	39.3
Total Split (%)	21.9%	27.7%		13.6%	19.4%		28.5%	49.2%		9.5%	30.2%	30.2%
Maximum Green (s)	21.7	29.2		10.9	18.4		30.6	57.6		6.0	32.9	32.9
Yellow Time (s)	4.8	4.8		4.8	4.8		4.4	4.4		4.0	4.4	4.4
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.3	2.0	2.0
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)	6.8	6.8		6.8	6.8		6.4	6.4		6.3	6.4	6.4
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		Min	Max		None	Max	Max
Walk Time (s)	7.0	7.0									7.0	7.0
Flash Dont Walk (s)	18.0	18.0									21.0	21.0
Pedestrian Calls (#/hr)	0	0									0	0
Act Effct Green (s)	21.4	17.1	38.9	14.3	9.0		63.1	58.8		47.5	41.2	41.2
Actuated g/C Ratio	0.22	0.17	0.39	0.14	0.09		0.64	0.60		0.48	0.42	0.42
v/c Ratio	0.32	0.21	0.50	0.11	0.34		0.40	0.25		0.03	0.36	0.10
Control Delay	34.1	40.3	3.7	31.6	48.8		9.6	12.9		10.5	24.3	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	34.1	40.3	3.7	31.6	48.8		9.6	12.9		10.5	24.3	0.2
LOS	C	D	A	C	D		A	B		B	C	A
Approach Delay		9.3			43.5			10.7			18.7	
Approach LOS		A			D			B			B	

Intersection Summary	
Area Type:	Other
Cycle Length:	130
Actuated Cycle Length:	98.7
Natural Cycle:	120
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.50
Intersection Signal Delay:	12.7
Intersection Capacity Utilization:	63.2%
Analysis Period (min):	15
Intersection LOS:	B
ICU Level of Service:	B



Queues
4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd

2028 PM Build
05/05/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	93	70	788	26	59	549	279	15	282	79
v/c Ratio	0.32	0.21	0.50	0.11	0.34	0.40	0.25	0.03	0.36	0.10
Control Delay	34.1	40.3	3.7	31.6	48.8	9.6	12.9	10.5	24.3	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.1	40.3	3.7	31.6	48.8	9.6	12.9	10.5	24.3	0.2
Queue Length 50th (ft)	44	33	8	12	32	73	70	3	123	0
Queue Length 95th (ft)	96	91	54	37	81	124	178	13	237	0
Internal Link Dist (ft)		1001			2147		1145		1062	
Turn Bay Length (ft)			600	250		500		650		
Base Capacity (vph)	440	573	1899	302	358	1652	1115	579	786	821
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.12	0.41	0.09	0.16	0.33	0.25	0.03	0.36	0.10
Intersection Summary										

HCM 6th Signalized Intersection Summary
4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd

2028 PM Build
05/05/2022

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘
Traffic Volume (veh/h)	91	69	772	25	51	7	538	242	31	15	276	77
Future Volume (veh/h)	91	69	772	25	51	7	538	242	31	15	276	77
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1885	1900
Adj Flow Rate, veh/h	93	70	788	26	52	7	549	247	32	15	282	79
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	1	0
Cap, veh/h	445	457	1029	287	383	52	1071	782	101	509	698	596
Arrive On Green	0.06	0.24	0.24	0.05	0.23	0.23	0.12	0.47	0.47	0.02	0.37	0.37
Sat Flow, veh/h	1810	1900	2834	1810	1640	221	3510	1648	214	1810	1885	1610
Grp Volume(v), veh/h	93	70	788	26	0	59	549	0	279	15	282	79
Grp Sat Flow(s),veh/h/ln	1810	1900	1417	1810	0	1860	1755	0	1862	1810	1885	1610
Q Serve(g_s), s	4.7	3.5	29.2	1.3	0.0	3.1	11.0	0.0	11.3	0.6	13.5	3.9
Cycle Q Clear(g_c), s	4.7	3.5	29.2	1.3	0.0	3.1	11.0	0.0	11.3	0.6	13.5	3.9
Prop In Lane	1.00		1.00	1.00		0.12	1.00		0.11	1.00		1.00
Lane Grp Cap(c), veh/h	445	457	1029	287	0	434	1071	0	883	509	698	596
V/C Ratio(X)	0.21	0.15	0.77	0.09	0.00	0.14	0.51	0.00	0.32	0.03	0.40	0.13
Avail Cap(c_a), veh/h	667	457	1029	360	0	434	1525	0	883	562	698	596
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.3	36.4	34.1	31.7	0.0	36.9	18.7	0.0	19.8	22.8	28.3	25.3
Incr Delay (d2), s/veh	0.2	0.2	3.5	0.1	0.0	0.1	0.4	0.0	0.9	0.0	1.7	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	1.6	10.3	0.6	0.0	1.4	4.4	0.0	5.0	0.3	6.4	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	32.6	36.5	37.6	31.9	0.0	37.0	19.1	0.0	20.7	22.8	30.1	25.8
LnGrp LOS	C	D	D	C	A	D	B	A	C	C	C	C
Approach Vol, veh/h		951			85			828			376	
Approach Delay, s/veh		37.0			35.4			19.6			28.9	
Approach LOS		D			D			B			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	21.3	51.4	13.6	35.2	8.7	64.0	12.8	36.0				
Change Period (Y+Rc), s	6.4	6.4	6.8	6.8	*6.3	6.4	6.8	6.8				
Max Green Setting (Gmax), s	30.6	32.9	21.7	18.4	*6	57.6	10.9	29.2				
Max Q Clear Time (g_c+I1), s	13.0	15.5	6.7	5.1	2.6	13.3	3.3	31.2				
Green Ext Time (p_c), s	1.9	1.7	0.2	0.2	0.0	1.7	0.0	0.0				
Intersection Summary												
HCM 6th Ctrl Delay			29.2									
HCM 6th LOS			C									
Notes												
User approved pedestrian interval to be less than phase max green.												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Lanes, Volumes, Timings
1: N. Orion Bv/Lockwood Bv & McCulloch Rd

2048 AM Build
04/26/2022

	↖	→	↘	↙	←	↖	↙	↑	↘	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↖	↖↖	↖↖	↖↖	↖↖	↖	↖↖	↖↖	↖↖	↖	↖↖	↖
Traffic Volume (vph)	503	467	426	628	1097	76	65	81	90	65	547	240
Future Volume (vph)	503	467	426	628	1097	76	65	81	90	65	547	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	13	13	14	14	14	12	12	12	12	12	12
Storage Length (ft)	500		475	260		300	235		370	275		225
Storage Lanes	2		2	2		1	2		2	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	0.88	0.97	0.95	1.00	0.97	0.95	0.88	1.00	0.95	1.00
Frnt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3618	3693	2771	3698	3813	1672	2537	3167	2842	1805	3610	1538
Flt Permitted	0.950			0.472			0.176			0.699		
Satd. Flow (perm)	3618	3693	2771	1837	3813	1672	470	3167	2842	1328	3610	1538
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			86			196			95			86
Link Speed (mph)		45			45			30				35
Link Distance (ft)		2725			2685			978				942
Travel Time (s)		41.3			40.7			22.2				18.4
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
Heavy Vehicles (%)	0%	1%	6%	1%	1%	3%	38%	14%	0%	0%	0%	5%
Adj. Flow (vph)	529	492	448	661	1155	80	68	85	95	68	576	253
Shared Lane Traffic (%)												
Lane Group Flow (vph)	529	492	448	661	1155	80	68	85	95	68	576	253
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		28			28			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	0.96	0.96	0.96	0.92	0.92	0.92	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pt+ov	pm+pt	NA	Perm	pm+pt	NA	pm+ov	Perm	NA	pm+ov

2048 AM Build McCulloch Rd RCA 7:00 am 10/21/2021 2048 AM Build
PHR/LTEC

Synchro 11 Report
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Lanes, Volumes, Timings
1: N. Orion Bv/Lockwood Bv & McCulloch Rd

2048 AM Build
04/26/2022

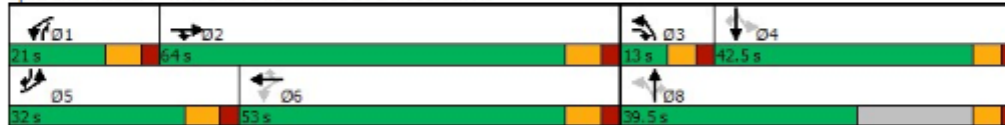


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	5	2	2 3	1	6		3	8	1		4	5
Permitted Phases				6		6	8		8	4		4
Detector Phase	5	2	2 3	1	6	6	3	8	1	4	4	5
Switch Phase												
Minimum Initial (s)	6.0	15.0		6.0	15.0	15.0	6.0	8.0	6.0	8.0	8.0	6.0
Minimum Split (s)	13.6	50.6		13.6	50.6	50.6	12.5	45.5	13.6	44.5	44.5	13.6
Total Split (s)	32.0	64.0		21.0	53.0	53.0	13.0	39.5	21.0	42.5	42.5	32.0
Total Split (%)	22.8%	45.6%		14.9%	37.7%	37.7%	9.3%	28.1%	14.9%	30.2%	30.2%	22.8%
Maximum Green (s)	24.4	56.4		13.4	45.4	45.4	6.5	33.0	13.4	36.0	36.0	24.4
Yellow Time (s)	4.9	4.9		4.9	4.9	4.9	4.0	4.0	4.9	4.0	4.0	4.9
All-Red Time (s)	2.7	2.7		2.7	2.7	2.7	2.5	2.5	2.7	2.5	2.5	2.7
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)	7.6	7.6		7.6	7.6	7.6	6.5	6.5	7.6	6.5	6.5	7.6
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead		Lead	Lag	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	Max	None	None	None	None
Walk Time (s)		7.0			7.0	7.0		7.0		7.0	7.0	
Flash Dont Walk (s)		36.0			36.0	36.0		32.0		31.0	31.0	
Pedestrian Calls (#/hr)		0			0	0		0		0	0	
Act Effect Green (s)	22.9	56.4	69.4	60.3	46.9	46.9	41.9	41.9	61.8	29.0	29.0	58.5
Actuated g/C Ratio	0.17	0.42	0.52	0.45	0.35	0.35	0.31	0.31	0.46	0.22	0.22	0.44
v/c Ratio	0.85	0.32	0.30	0.65	0.86	0.11	0.28	0.09	0.07	0.24	0.73	0.35
Control Delay	67.6	26.8	15.5	21.2	48.7	0.3	34.8	32.2	3.7	45.1	54.8	16.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	67.6	26.8	15.5	21.2	48.7	0.3	34.8	32.2	3.7	45.1	54.8	16.9
LOS	E	C	B	C	D	A	C	C	A	D	D	B
Approach Delay		38.0			37.0			22.0			43.4	
Approach LOS		D			D			C			D	

Intersection Summary

Area Type:	Other
Cycle Length:	140.5
Actuated Cycle Length:	133.5
Natural Cycle:	135
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.86
Intersection Signal Delay:	37.8
Intersection LOS:	D
Intersection Capacity Utilization:	88.3%
ICU Level of Service:	E
Analysis Period (min):	15

Splits and Phases: 1: N. Orion Bv/Lockwood Bv & McCulloch Rd



Queues

2048 AM Build

1: N. Orion Bv/Lockwood Bv & McCulloch Rd

04/26/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	529	492	448	661	1155	80	68	85	95	68	576	253
v/c Ratio	0.85	0.32	0.30	0.65	0.86	0.11	0.28	0.09	0.07	0.24	0.73	0.35
Control Delay	67.6	26.8	15.5	21.2	48.7	0.3	34.8	32.2	3.7	45.1	54.8	16.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	67.6	26.8	15.5	21.2	48.7	0.3	34.8	32.2	3.7	45.1	54.8	16.9
Queue Length 50th (ft)	223	143	92	138	484	0	21	27	0	49	246	90
Queue Length 95th (ft)	#325	207	150	203	#673	0	39	47	16	93	311	154
Internal Link Dist (ft)		2645			2605			898			862	
Turn Bay Length (ft)	500		475	260		300	235		370	275		225
Base Capacity (vph)	661	1561	1482	1016	1339	714	248	1163	1367	358	973	737
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.32	0.30	0.65	0.86	0.11	0.27	0.07	0.07	0.19	0.59	0.34

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary
1: N. Orion Bv/Lockwood Bv & McCulloch Rd

2048 AM Build
04/26/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	503	467	426	628	1097	76	65	81	90	65	547	240
Future Volume (veh/h)	503	467	426	628	1097	76	65	81	90	65	547	240
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1976	1961	1884	1961	1961	1930	1337	1693	1900	1900	1900	1826
Adj Flow Rate, veh/h	529	492	448	661	1155	80	68	85	95	68	576	253
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
Percent Heavy Veh, %	0	1	6	1	1	3	38	14	0	0	0	5
Cap, veh/h	596	1624	1344	911	1401	615	260	942	1123	301	723	563
Arrive On Green	0.16	0.44	0.44	0.10	0.38	0.38	0.04	0.29	0.29	0.20	0.20	0.20
Sat Flow, veh/h	3651	3725	2809	3622	3725	1635	2470	3216	2834	1223	3610	1547
Grp Volume(v), veh/h	529	492	448	661	1155	80	68	85	95	68	576	253
Grp Sat Flow(s),veh/h/ln	1825	1863	1405	1811	1863	1635	1235	1608	1417	1223	1805	1547
Q Serve(g_s), s	18.3	11.1	12.8	13.4	36.3	4.2	2.7	2.5	2.7	6.1	19.6	16.1
Cycle Q Clear(g_c), s	18.3	11.1	12.8	13.4	36.3	4.2	2.7	2.5	2.7	6.1	19.6	16.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	596	1624	1344	911	1401	615	260	942	1123	301	723	563
V/C Ratio(X)	0.89	0.30	0.33	0.73	0.82	0.13	0.26	0.09	0.08	0.23	0.80	0.45
Avail Cap(c_a), veh/h	688	1624	1344	911	1401	615	280	942	1123	396	1004	683
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.0	23.7	21.0	22.1	36.5	26.5	38.6	33.2	24.4	43.8	49.2	31.3
Incr Delay (d2), s/veh	12.2	0.5	0.7	2.9	5.6	0.4	0.5	0.2	0.1	0.4	3.1	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.2	4.8	4.4	6.5	16.9	1.7	0.8	1.0	0.9	1.9	9.1	6.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	65.1	24.2	21.6	25.1	42.1	26.9	39.1	33.4	24.5	44.2	52.4	31.9
LnGrp LOS	E	C	C	C	D	C	D	C	C	D	D	C
Approach Vol, veh/h		1469			1896			248			897	
Approach Delay, s/veh		38.2			35.5			31.6			46.0	
Approach LOS		D			D			C			D	
Timer - Assigned Phs	1	2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s	21.0	64.0	12.0	32.4	28.7	56.3		44.4				
Change Period (Y+Rc), s	* 7.6	* 7.6	6.5	6.5	* 7.6	* 7.6		6.5				
Max Green Setting (Gmax), s	* 13	* 56	6.5	36.0	* 24	* 45		33.0				
Max Q Clear Time (g_c+1), s	15.4	14.8	4.7	21.6	20.3	38.3		4.7				
Green Ext Time (p_c), s	0.0	5.4	0.0	4.3	0.8	4.2		0.9				
Intersection Summary												
HCM 6th Ctrl Delay	38.2											
HCM 6th LOS	D											
Notes												
User approved pedestrian interval to be less than phase max green.												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Lanes, Volumes, Timings
2: Worcester Dr/Keats Wy & McCulloch Rd

2048 AM Build
04/26/2022

	↖	→	↘	↙	←	↖	↙	↑	↘	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↖	↖	↖	↖↖		↖	↖		↖	↖	
Traffic Volume (vph)	47	451	49	7	1566	4	114	0	16	7	2	110
Future Volume (vph)	47	451	49	7	1566	4	114	0	16	7	2	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	120		290	175		0	0		0	0		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr			0.850					0.850			0.853	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	2959	1615	1805	3610	0	1770	1615	0	1805	1621	0
Flt Permitted	0.084			0.487			0.562			0.747		
Satd. Flow (perm)	156	2959	1615	925	3610	0	1047	1615	0	1419	1621	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			159					444			112	
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		2685			1825			469			245	
Travel Time (s)		40.7			27.7			12.8			6.7	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	22%	0%	0%	0%	0%	2%	0%	0%	0%	0%	0%
Adj. Flow (vph)	48	460	50	7	1598	4	116	0	16	7	2	112
Shared Lane Traffic (%)												
Lane Group Flow (vph)	48	460	50	7	1602	0	116	16	0	7	114	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		28			28			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	

2048 AM Build McCulloch Rd RCA 7:00 am 10/21/2021 2048 AM Build
PHR/LTEC

Synchro 11 Report
Page 1

Lanes, Volumes, Timings
2: Worcester Dr/Keats Wy & McCulloch Rd

2048 AM Build
04/26/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	6		6	2			4			8		
Detector Phase	1	6	6	5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	6.0	15.0	15.0	6.0	15.0		6.0	8.0		6.0	8.0	
Minimum Split (s)	12.8	35.8	35.8	12.8	29.8		11.4	26.4		11.4	23.4	
Total Split (s)	12.8	49.4	49.4	12.8	49.4		12.0	26.4		11.4	25.8	
Total Split (%)	12.8%	49.4%	49.4%	12.8%	49.4%		12.0%	26.4%		11.4%	25.8%	
Maximum Green (s)	6.0	42.6	42.6	6.0	42.6		6.6	21.0		6.0	20.4	
Yellow Time (s)	4.8	4.8	4.8	4.8	4.8		3.4	3.4		3.4	3.4	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
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)	6.8	6.8	6.8	6.8	6.8		5.4	5.4		5.4	5.4	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	Min	Min	None	Min		None	None		None	Max	
Walk Time (s)		7.0	7.0		7.0			7.0				
Flash Dont Walk (s)		22.0	22.0		16.0			14.0				
Pedestrian Calls (#/hr)		0	0		0			0				
Act Effect Green (s)	48.8	47.7	47.7	46.2	42.8		31.6	30.4		26.5	20.5	
Actuated g/C Ratio	0.51	0.50	0.50	0.49	0.45		0.33	0.32		0.28	0.22	
v/c Ratio	0.26	0.31	0.06	0.01	0.98		0.29	0.02		0.02	0.26	
Control Delay	14.3	15.2	0.1	10.3	46.5		26.1	0.1		23.4	8.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	14.3	15.2	0.1	10.3	46.5		26.1	0.1		23.4	8.6	
LOS	B	B	A	B	D		C	A		C	A	
Approach Delay		13.8			46.4			22.9			9.5	
Approach LOS		B			D			C			A	

Intersection Summary

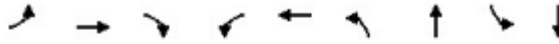
Area Type:	Other
Cycle Length:	100
Actuated Cycle Length:	94.9
Natural Cycle:	100
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.98
Intersection Signal Delay:	35.7
Intersection Capacity Utilization:	66.6%
Analysis Period (min):	15
Intersection LOS:	D
ICU Level of Service:	C

Splits and Phases: 2: Worcester Dr/Keats Wy & McCulloch Rd



Queues
2: Worcester Dr/Keats Wy & McCulloch Rd

2048 AM Build
04/26/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	48	460	50	7	1602	116	16	7	114
v/c Ratio	0.26	0.31	0.06	0.01	0.98	0.29	0.02	0.02	0.26
Control Delay	14.3	15.2	0.1	10.3	46.5	26.1	0.1	23.4	8.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.3	15.2	0.1	10.3	46.5	26.1	0.1	23.4	8.6
Queue Length 50th (ft)	13	76	0	2	~584	53	0	3	1
Queue Length 95th (ft)	30	143	0	8	#721	96	0	13	46
Internal Link Dist (ft)		2605			1745		389		165
Turn Bay Length (ft)	120		290	175					
Base Capacity (vph)	182	1486	890	506	1627	399	819	421	437
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.31	0.06	0.01	0.98	0.29	0.02	0.02	0.26

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary
2: Worcester Dr/Keats Wy & McCulloch Rd

2048 AM Build
04/26/2022

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations	↖	↖↖	↖	↖	↖↖		↖	↖		↖	↖	
Traffic Volume (veh/h)	47	451	49	7	1566	4	114	0	16	7	2	110
Future Volume (veh/h)	47	451	49	7	1566	4	114	0	16	7	2	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1574	1900	1900	1900	1900	1870	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	48	460	50	7	1598	4	116	0	16	7	2	112
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	22	0	0	0	0	2	0	0	0	0	0
Cap, veh/h	153	1397	752	427	1600	4	380	0	424	387	6	329
Arrive On Green	0.04	0.47	0.47	0.01	0.43	0.43	0.07	0.00	0.26	0.01	0.21	0.21
Sat Flow, veh/h	1781	2991	1610	1810	3694	9	1781	0	1610	1810	28	1586
Grp Volume(v), veh/h	48	460	50	7	781	821	116	0	16	7	0	114
Grp Sat Flow(s),veh/h/ln	1781	1495	1610	1810	1805	1898	1781	0	1610	1810	0	1614
Q Serve(g_s), s	1.4	9.5	1.7	0.2	42.5	42.5	4.8	0.0	0.7	0.3	0.0	5.9
Cycle Q Clear(g_c), s	1.4	9.5	1.7	0.2	42.5	42.5	4.8	0.0	0.7	0.3	0.0	5.9
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		0.98
Lane Grp Cap(c), veh/h	153	1397	752	427	782	822	380	0	424	387	0	335
V/C Ratio(X)	0.31	0.33	0.07	0.02	1.00	1.00	0.31	0.00	0.04	0.02	0.00	0.34
Avail Cap(c_a), veh/h	182	1397	752	518	782	822	381	0	424	478	0	335
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.0	16.5	14.4	15.5	27.8	27.8	26.5	0.0	26.9	30.2	0.0	33.2
Incr Delay (d2), s/veh	1.2	0.1	0.0	0.0	31.7	31.0	0.4	0.0	0.0	0.0	0.0	2.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	3.0	0.6	0.1	23.3	24.3	2.1	0.0	0.3	0.1	0.0	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.2	16.6	14.4	15.5	59.6	58.9	27.0	0.0	27.0	30.2	0.0	36.0
LnGrp LOS	C	B	B	B	E	E	C	A	C	C	A	D
Approach Vol, veh/h		558			1609			132			121	
Approach Delay, s/veh		17.1			59.0			27.0			35.6	
Approach LOS		B			E			C			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.2	49.4	6.4	31.3	7.8	52.7	11.9	25.8				
Change Period (Y+Rc), s	6.8	6.8	5.4	5.4	6.8	6.8	5.4	5.4				
Max Green Setting (Gmax), s	6.0	42.6	6.0	21.0	6.0	42.6	6.6	20.4				
Max Q Clear Time (g_c+I1), s	3.4	44.5	2.3	2.7	2.2	11.5	6.8	7.9				
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.0	3.1	0.0	0.4				
Intersection Summary												
HCM 6th Ctrl Delay					46.4							
HCM 6th LOS					D							

Lanes, Volumes, Timings
 3: Worcester Dr/Amour de Flame Wy & McCulloch Rd

2048 AM Build
 07/28/2022

	↖	→	↘	↙	←	↖	↙	↑	↘	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↖↖	↘	↘	↖↖	↘	↘	↑	↘	↘	↘	↘
Traffic Volume (vph)	31	437	29	22	1393	9	67	0	47	25	0	114
Future Volume (vph)	31	437	29	22	1393	9	67	0	47	25	0	114
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	275		275	185		185	0		0	0		0
Storage Lanes	1		1	1		1	1		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950				0.950	
Satd. Flow (prot)	1805	3539	1615	1641	3610	1615	1805	1900	1615	0	1805	1615
Flt Permitted	0.950			0.950			0.950				0.950	
Satd. Flow (perm)	1805	3539	1615	1641	3610	1615	1805	1900	1615	0	1805	1615
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		1825			1081			387			223	
Travel Time (s)		27.7			16.4			10.6			6.1	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	2%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	32	446	30	22	1421	9	68	0	48	26	0	116
Shared Lane Traffic (%)												
Lane Group Flow (vph)	32	446	30	22	1421	9	68	0	48	0	26	116
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary
 Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 59.3% ICU Level of Service B
 Analysis Period (min) 15

Intersection												
Int Delay, s/veh	7.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↗	↘	↘	↗	↘	↘	↗	↘	↘	↗	↘
Traffic Vol, veh/h	31	437	29	22	1393	9	67	0	47	25	0	114
Future Vol, veh/h	31	437	29	22	1393	9	67	0	47	25	0	114
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	275	-	275	185	-	185	0	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	0	2	0	10	0	0	0	0	0	0	0	0
Mvmt Flow	32	446	30	22	1421	9	68	0	48	26	0	116
Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	1430	0	0	476	0	0	1265	1984	223	1752	2005	711
Stage 1	-	-	-	-	-	-	510	510	-	1465	1465	-
Stage 2	-	-	-	-	-	-	755	1474	-	287	540	-
Critical Hdwy	4.1	-	-	4.3	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.3	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	482	-	-	1028	-	-	128	62	787	56	60	380
Stage 1	-	-	-	-	-	-	519	541	-	137	194	-
Stage 2	-	-	-	-	-	-	371	192	-	702	524	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	482	-	-	1028	-	-	83	57	787	49	55	380
Mov Cap-2 Maneuver	-	-	-	-	-	-	83	57	-	49	55	-
Stage 1	-	-	-	-	-	-	485	505	-	128	190	-
Stage 2	-	-	-	-	-	-	252	188	-	615	489	-
Approach	EB	WB	NB	SB								
HCM Control Delay, s	0.8	0.1	87.3	40.5								
HCM LOS			F	E								
Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	
Capacity (veh/h)	83	-	787	482	-	-	1028	-	-	49	380	
HCM Lane V/C Ratio	0.824	-	0.061	0.066	-	-	0.022	-	-	0.521	0.306	
HCM Control Delay (s)	141.6	0	9.9	13	-	-	8.6	-	-	140.5	18.6	
HCM Lane LOS	F	A	A	B	-	-	A	-	-	F	C	
HCM 95th %tile Q(veh)	4.2	-	0.2	0.2	-	-	0.1	-	-	2	1.3	

Lanes, Volumes, Timings
4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd

2048 AM Build
04/26/2022

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	49	388	81	72	34	1203	334	52	20	182	85
Future Volume (vph)	110	49	388	81	72	34	1203	334	52	20	182	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		600	250		0	500		0	650		0
Storage Lanes	1		2	1		0	2		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	0.88	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.951			0.980				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1810	2814	1703	1807	0	3467	1809	0	1805	1863	1538
Flt Permitted	0.950			0.950			0.503			0.529		
Satd. Flow (perm)	1805	1810	2814	1703	1807	0	1836	1809	0	1005	1863	1538
Right Turn on Red			Yes		Yes		Yes		Yes			Yes
Satd. Flow (RTOR)			396		17		7					212
Link Speed (mph)		45			30			35				35
Link Distance (ft)		1081			2227			1225				1142
Travel Time (s)		16.4			50.6			23.9				22.2
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	5%	1%	6%	0%	0%	1%	2%	9%	0%	2%	5%
Adj. Flow (vph)	112	50	396	83	73	35	1228	341	53	20	186	87
Shared Lane Traffic (%)												
Lane Group Flow (vph)	112	50	396	83	108	0	1228	394	0	20	186	87
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24				24
Link Offset(ft)		0			0			0				0
Crosswalk Width(ft)		16			16			16				16
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94				94
Detector 2 Size(ft)		6			6			6				6
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				0.0
Turn Type	Split	NA	pt+ov	Split	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	8	8	8 1	4	4		1	6		5	2	

2048 AM Build McCulloch Rd RCA 7:00 am 10/21/2021 2048 AM Build
PHR/LTEC

Synchro 11 Report
Page 1

Lanes, Volumes, Timings
4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd

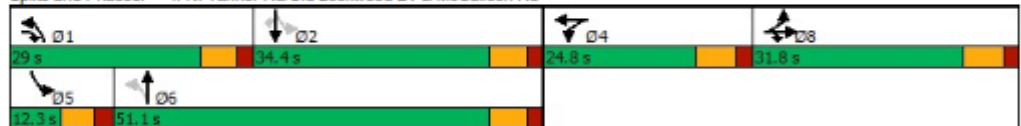
2048 AM Build
04/26/2022

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases							6			2		2
Detector Phase	8	8	8 1	4	4		1	6		5	2	2
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	8.0		6.0	8.0	8.0
Minimum Split (s)	31.8	31.8		24.8	24.8		24.4	24.4		12.3	34.4	34.4
Total Split (s)	31.8	31.8		24.8	24.8		29.0	51.1		12.3	34.4	34.4
Total Split (%)	26.5%	26.5%		20.7%	20.7%		24.2%	42.6%		10.3%	28.7%	28.7%
Maximum Green (s)	25.0	25.0		18.0	18.0		22.6	44.7		6.0	28.0	28.0
Yellow Time (s)	4.8	4.8		4.8	4.8		4.4	4.4		4.0	4.4	4.4
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.3	2.0	2.0
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)	6.8	6.8		6.8	6.8		6.4	6.4		6.3	6.4	6.4
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		Min	Max		None	Max	Max
Walk Time (s)	7.0	7.0									7.0	7.0
Flash Dont Walk (s)	18.0	18.0									21.0	21.0
Pedestrian Calls (#/hr)	0	0									0	0
Act Effct Green (s)	12.2	12.2	41.3	10.5	10.5		57.2	52.7		34.2	28.1	28.1
Actuated g/C Ratio	0.12	0.12	0.41	0.10	0.10		0.57	0.53		0.34	0.28	0.28
v/c Ratio	0.51	0.23	0.28	0.47	0.53		0.86	0.41		0.05	0.36	0.15
Control Delay	49.8	42.5	2.5	51.8	46.0		24.2	18.7		14.3	32.7	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	49.8	42.5	2.5	51.8	46.0		24.2	18.7		14.3	32.7	0.5
LOS	D	D	A	D	D		C	B		B	C	A
Approach Delay		15.6			48.5			22.9			21.9	
Approach LOS		B			D			C			C	

Intersection Summary

Area Type:	Other
Cycle Length:	120
Actuated Cycle Length:	100
Natural Cycle:	120
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.86
Intersection Signal Delay:	23.1
Intersection Capacity Utilization:	73.0%
Analysis Period (min):	15
Intersection LOS:	C
ICU Level of Service:	C

Splits and Phases: 4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd



Queues
4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd

2048 AM Build
04/26/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	112	50	396	83	108	1228	394	20	186	87
v/c Ratio	0.51	0.23	0.28	0.47	0.53	0.86	0.41	0.05	0.36	0.15
Control Delay	49.8	42.5	2.5	51.8	46.0	24.2	18.7	14.3	32.7	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.8	42.5	2.5	51.8	46.0	24.2	18.7	14.3	32.7	0.5
Queue Length 50th (ft)	67	29	0	51	56	251	126	5	94	0
Queue Length 95th (ft)	127	66	30	103	115	#476	302	19	178	0
Internal Link Dist (ft)		1001			2147		1145		1062	
Turn Bay Length (ft)			600	250		500		650		
Base Capacity (vph)	453	454	1394	307	340	1421	955	392	523	585
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.11	0.28	0.27	0.32	0.86	0.41	0.05	0.36	0.15

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary
4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd

2048 AM Build
04/26/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	110	49	388	81	72	34	1203	334	52	20	182	85
Future Volume (veh/h)	110	49	388	81	72	34	1203	334	52	20	182	85
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1826	1885	1811	1900	1900	1885	1870	1767	1900	1870	1826
Adj Flow Rate, veh/h	112	50	396	83	73	35	1228	341	53	20	186	87
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	5	1	6	0	0	1	2	9	0	2	5
Cap, veh/h	256	258	1037	144	102	49	1375	766	119	402	527	436
Arrive On Green	0.14	0.14	0.14	0.08	0.08	0.08	0.23	0.48	0.48	0.03	0.28	0.28
Sat Flow, veh/h	1810	1826	2812	1725	1213	582	3483	1580	246	1810	1870	1547
Grp Volume(v), veh/h	112	50	396	83	0	108	1228	0	394	20	186	87
Grp Sat Flow(s),veh/h/ln	1810	1826	1406	1725	0	1795	1742	0	1826	1810	1870	1547
Q Serve(g_s), s	5.6	2.4	10.3	4.6	0.0	5.8	22.6	0.0	14.1	0.8	7.9	4.3
Cycle Q Clear(g_c), s	5.6	2.4	10.3	4.6	0.0	5.8	22.6	0.0	14.1	0.8	7.9	4.3
Prop In Lane	1.00		1.00	1.00		0.32	1.00		0.13	1.00		1.00
Lane Grp Cap(c), veh/h	256	258	1037	144	0	150	1375	0	885	402	527	436
V/C Ratio(X)	0.44	0.19	0.38	0.57	0.00	0.72	0.89	0.00	0.45	0.05	0.35	0.20
Avail Cap(c_a), veh/h	455	459	1347	312	0	325	1375	0	885	465	527	436
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	39.0	37.7	23.0	43.8	0.0	44.4	19.5	0.0	16.8	24.1	28.5	27.2
Incr Delay (d2), s/veh	1.2	0.4	0.2	3.6	0.0	6.3	7.8	0.0	1.6	0.1	1.9	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	1.1	3.2	2.1	0.0	2.8	10.8	0.0	6.0	0.3	3.7	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.2	38.0	23.3	47.4	0.0	50.7	27.3	0.0	18.4	24.1	30.3	28.2
LnGrp LOS	D	D	C	D	A	D	C	A	B	C	C	C
Approach Vol, veh/h		558			191			1622			293	
Approach Delay, s/veh		28.0			49.3			25.1			29.3	
Approach LOS		C			D			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	29.0	34.4		15.1	8.8	54.6		20.8				
Change Period (Y+Rc), s	6.4	6.4		6.8	* 6.3	6.4		6.8				
Max Green Setting (Gmax), s	22.6	28.0		18.0	* 6	44.7		25.0				
Max Q Clear Time (g_c+1), s	24.6	9.9		7.8	2.8	16.1		12.3				
Green Ext Time (p_c), s	0.0	1.2		0.5	0.0	2.5		1.8				
Intersection Summary												
HCM 6th Ctrl Delay	27.9											
HCM 6th LOS	C											
Notes												
User approved pedestrian interval to be less than phase max green.												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Lanes, Volumes, Timings
1: N. Orion Bv/Lockwood Bv & McCulloch Rd

2048 PM Build
04/26/2022

	↖	→	↗	↖	←	↖	↗	↑	↖	↗	↓	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↖	↖↖	↖↖	↖↖	↖↖	↖	↖↖	↖↖	↖↖	↖	↖↖	↖
Traffic Volume (vph)	1086	1306	328	408	1028	52	462	684	500	29	218	101
Future Volume (vph)	1086	1306	328	408	1028	52	462	684	500	29	218	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	13	13	14	14	14	12	12	12	12	12	12
Storage Length (ft)	500		475	260		300	235		370	275		225
Storage Lanes	2		2	2		1	2		2	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	0.88	0.97	0.95	1.00	0.97	0.95	0.88	1.00	0.95	1.00
Frnt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3618	3730	2797	3662	3851	1723	3242	3406	2842	1805	3610	1615
Flt Permitted	0.950			0.172			0.374			0.302		
Satd. Flow (perm)	3618	3730	2797	663	3851	1723	1276	3406	2842	574	3610	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			147			190			92			84
Link Speed (mph)		45			45			30				35
Link Distance (ft)		2725			2685			978				942
Travel Time (s)		41.3			40.7			22.2				18.4
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	5%	2%	0%	0%	8%	6%	0%	0%	0%	0%
Adj. Flow (vph)	1108	1333	335	416	1049	53	471	698	510	30	222	103
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1108	1333	335	416	1049	53	471	698	510	30	222	103
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		28			28			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	0.96	0.96	0.96	0.92	0.92	0.92	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pt+ov	pm+pt	NA	Perm	pm+pt	NA	pm+ov	Perm	NA	pm+ov

2048 PM Build McCulloch Rd RCA 4:00 pm 10/21/2021 2048 PM Build
PHR/LTEC

Synchro 11 Report
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Lanes, Volumes, Timings
1: N. Orion Bv/Lockwood Bv & McCulloch Rd

2048 PM Build
04/26/2022

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	5	2	2 3	1	6		3	8	1		4	5
Permitted Phases				6		6	8		8	4		4
Detector Phase	5	2	2 3	1	6	6	3	8	1	4	4	5
Switch Phase												
Minimum Initial (s)	6.0	15.0		6.0	15.0	15.0	6.0	8.0	6.0	8.0	8.0	6.0
Minimum Split (s)	13.6	50.6		13.6	50.6	50.6	12.5	45.5	13.6	44.5	44.5	13.6
Total Split (s)	52.0	77.0		24.0	49.0	49.0	18.0	44.0	24.0	26.0	26.0	52.0
Total Split (%)	35.9%	53.1%		16.6%	33.8%	33.8%	12.4%	30.3%	16.6%	17.9%	17.9%	35.9%
Maximum Green (s)	44.4	69.4		16.4	41.4	41.4	11.5	37.5	16.4	19.5	19.5	44.4
Yellow Time (s)	4.9	4.9		4.9	4.9	4.9	4.0	4.0	4.9	4.0	4.0	4.9
All-Red Time (s)	2.7	2.7		2.7	2.7	2.7	2.5	2.5	2.7	2.5	2.5	2.7
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)	7.6	7.6		7.6	7.6	7.6	6.5	6.5	7.6	6.5	6.5	7.6
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead		Lead	Lag	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Walk Time (s)		7.0			7.0	7.0		7.0		7.0	7.0	
Flash Dont Walk (s)		36.0			36.0	36.0		32.0		31.0	31.0	
Pedestrian Calls (#/hr)		0			0	0		0		0	0	
Act Effect Green (s)	44.4	73.1	91.2	57.3	43.0	43.0	34.1	34.1	54.9	16.1	16.1	67.1
Actuated g/C Ratio	0.31	0.51	0.64	0.40	0.30	0.30	0.24	0.24	0.38	0.11	0.11	0.47
v/c Ratio	0.99	0.70	0.18	0.74	0.91	0.91	1.02	0.86	0.45	0.47	0.55	0.13
Control Delay	73.3	30.1	6.6	35.6	60.5	0.2	97.0	64.0	27.3	83.1	65.2	6.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	73.3	30.1	6.6	35.6	60.5	0.2	97.0	64.0	27.3	83.1	65.2	6.3
LOS	E	C	A	D	E	A	F	E	C	F	E	A
Approach Delay		44.5			51.6			62.1			49.6	
Approach LOS		D			D			E			D	


Intersection Summary	
Area Type:	Other
Cycle Length:	145
Actuated Cycle Length:	143.3
Natural Cycle:	145
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	1.02
Intersection Signal Delay:	51.2
Intersection LOS:	D
Intersection Capacity Utilization:	108.5%
ICU Level of Service:	G
Analysis Period (min):	15

Splits and Phases: 1: N. Orion Bv/Lockwood Bv & McCulloch Rd



Queues
1: N. Orion Bv/Lockwood Bv & McCulloch Rd

2048 PM Build
04/26/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1108	1333	335	416	1049	53	471	698	510	30	222	103
v/c Ratio	0.99	0.70	0.18	0.74	0.91	0.08	1.02	0.86	0.45	0.47	0.55	0.13
Control Delay	73.3	30.1	6.6	35.6	60.5	0.2	97.0	64.0	27.3	83.1	65.2	6.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	73.3	30.1	6.6	35.6	60.5	0.2	97.0	64.0	27.3	83.1	65.2	6.3
Queue Length 50th (ft)	~544	514	39	89	507	0	203	331	159	27	104	9
Queue Length 95th (ft)	#707	615	65	146	#643	0	#324	408	213	65	149	43
Internal Link Dist (ft)		2645			2605			898			862	
Turn Bay Length (ft)	500		475	260		300	235		370	275		225
Base Capacity (vph)	1121	1903	1832	618	1156	650	461	892	1187	78	491	800
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.99	0.70	0.18	0.67	0.91	0.08	1.02	0.78	0.43	0.38	0.45	0.13

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary
1: N. Orion Bv/Lockwood Bv & McCulloch Rd

2048 PM Build
04/26/2022

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶↷	↶↷	↶↷	↶↷	↶↷	↶↷	↶↷	↶↷	↶↷	↶↷	↶↷	↶↷
Traffic Volume (veh/h)	1086	1306	328	408	1028	52	462	684	500	29	218	101
Future Volume (veh/h)	1086	1306	328	408	1028	52	462	684	500	29	218	101
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1976	1976	1899	1945	1976	1976	1781	1811	1900	1900	1900	1900
Adj Flow Rate, veh/h	1108	1333	335	416	1049	53	471	698	510	30	222	103
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	5	2	0	0	8	6	0	0	0	0
Cap, veh/h	1118	1856	1624	579	1072	478	512	890	1009	83	485	710
Arrive On Green	0.31	0.49	0.49	0.10	0.29	0.29	0.08	0.26	0.26	0.13	0.13	0.13
Sat Flow, veh/h	3651	3754	2832	3594	3754	1675	3291	3441	2834	470	3610	1610
Grp Volume(v), veh/h	1108	1333	335	416	1049	53	471	698	510	30	222	103
Grp Sat Flow(s), veh/h/ln	1825	1877	1416	1797	1877	1675	1646	1721	1417	470	1805	1610
Q Serve(g_s), s	43.8	40.4	8.3	11.7	40.2	3.4	11.5	27.4	20.5	9.2	8.2	5.5
Cycle Q Clear(g_c), s	43.8	40.4	8.3	11.7	40.2	3.4	11.5	27.4	20.5	18.5	8.2	5.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	1118	1856	1624	579	1072	478	512	890	1009	83	485	710
V/C Ratio(X)	0.99	0.72	0.21	0.72	0.98	0.11	0.92	0.78	0.51	0.36	0.46	0.15
Avail Cap(c_a), veh/h	1118	1856	1624	635	1072	478	512	890	1009	83	485	710
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	50.1	28.8	15.0	32.4	51.4	38.2	55.6	50.0	36.7	67.0	57.9	24.2
Incr Delay (d2), s/veh	24.7	2.4	0.3	3.5	22.8	0.5	22.0	4.6	0.4	2.7	0.7	0.1
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	23.2	18.0	2.8	5.3	21.8	1.4	5.1	12.4	7.2	1.2	3.8	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.8	31.2	15.2	35.9	74.2	38.7	77.6	54.6	37.1	69.7	58.5	24.3
LnGrp LOS	E	C	B	D	E	D	E	D	D	E	E	C
Approach Vol, veh/h		2776			1518			1679			355	
Approach Delay, s/veh		46.7			62.4			55.7			49.6	
Approach LOS		D			E			E			D	
Timer - Assigned Phs	1	2	3	4	5	6	8					
Phs Duration (G+Y+Rc), s	21.7	79.3	18.0	26.0	52.0	49.0	44.0					
Change Period (Y+Rc), s	* 7.6	* 7.6	6.5	6.5	* 7.6	* 7.6	6.5					
Max Green Setting (Gmax), s	* 16	* 69	11.5	19.5	* 44	* 41	37.5					
Max Q Clear Time (g_c+1), s	13.7	42.4	13.5	20.5	45.8	42.2	29.4					
Green Ext Time (p_c), s	0.4	12.5	0.0	0.0	0.0	0.0	4.3					
Intersection Summary												
HCM 6th Ctrl Delay	53.0											
HCM 6th LOS	D											
Notes												
User approved pedestrian interval to be less than phase max green.												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Lanes, Volumes, Timings
2: Worcester Dr/Keats Wy & McCulloch Rd

2048 PM Build
04/26/2022

	↖	→	↘	↙	←	↖	↙	↑	↘	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↕	↘	↘	↕	↘	↘	↕	↘	↘	↕	↘
Traffic Volume (vph)	94	1694	123	13	1194	27	85	0	11	13	0	94
Future Volume (vph)	94	1694	123	13	1194	27	85	0	11	13	0	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	120		290	175		0	0		0	0		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.997			0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	3610	1615	1805	3599	0	1805	1615	0	1805	1615	0
Flt Permitted	0.097			0.080			0.608			0.750		
Satd. Flow (perm)	184	3610	1615	152	3599	0	1155	1615	0	1425	1615	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			145		3			205			184	
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		2685			1825			469			245	
Travel Time (s)		40.7			27.7			12.8			6.7	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	96	1729	126	13	1218	28	87	0	11	13	0	96
Shared Lane Traffic (%)												
Lane Group Flow (vph)	96	1729	126	13	1246	0	87	11	0	13	96	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		28			28			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	

2048 PM Build McCulloch Rd RCA 4:00 pm 10/21/2021 2048 PM Build
PHR/LTEC

Synchro 11 Report
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Lanes, Volumes, Timings
2: Worcester Dr/Keats Wy & McCulloch Rd

2048 PM Build
04/26/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	6		6	2			4			8		
Detector Phase	1	6	6	5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	6.0	15.0	15.0	6.0	15.0		6.0	8.0		6.0	8.0	
Minimum Split (s)	12.8	35.8	35.8	12.8	29.8		11.4	26.4		11.4	23.4	
Total Split (s)	14.2	59.4	59.4	12.8	58.0		11.4	26.4		11.4	26.4	
Total Split (%)	12.9%	54.0%	54.0%	11.6%	52.7%		10.4%	24.0%		10.4%	24.0%	
Maximum Green (s)	7.4	52.6	52.6	6.0	51.2		6.0	21.0		6.0	21.0	
Yellow Time (s)	4.8	4.8	4.8	4.8	4.8		3.4	3.4		3.4	3.4	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
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)	6.8	6.8	6.8	6.8	6.8		5.4	5.4		5.4	5.4	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	Min	Min	None	Min		None	None		None	Max	
Walk Time (s)		7.0	7.0		7.0			7.0				
Flash Dont Walk (s)		22.0	22.0		16.0			14.0				
Pedestrian Calls (#/hr)		0	0		0			0				
Act Effect Green (s)	56.4	53.7	53.7	52.1	47.5		29.0	27.9		25.8	21.2	
Actuated g/C Ratio	0.56	0.53	0.53	0.52	0.47		0.29	0.28		0.26	0.21	
v/c Ratio	0.44	0.90	0.14	0.07	0.73		0.23	0.02		0.03	0.20	
Control Delay	17.1	30.5	2.3	10.5	26.2		29.4	0.1		27.4	0.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	17.1	30.5	2.3	10.5	26.2		29.4	0.1		27.4	0.9	
LOS	B	C	A	B	C		C	A		C	A	
Approach Delay		28.1			26.0			26.1			4.1	
Approach LOS		C			C			C			A	

Intersection Summary

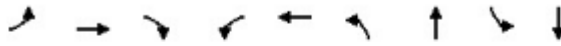
Area Type:	Other
Cycle Length:	110
Actuated Cycle Length:	100.7
Natural Cycle:	110
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.90
Intersection Signal Delay:	26.5
Intersection Capacity Utilization:	79.0%
Analysis Period (min):	15
Intersection LOS:	C
ICU Level of Service:	D

Splits and Phases: 2: Worcester Dr/Keats Wy & McCulloch Rd



Queues
2: Worcester Dr/Keats Wy & McCulloch Rd

2048 PM Build
04/26/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	96	1729	126	13	1246	87	11	13	96
v/c Ratio	0.44	0.90	0.14	0.07	0.73	0.23	0.02	0.03	0.20
Control Delay	17.1	30.5	2.3	10.5	26.2	29.4	0.1	27.4	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.1	30.5	2.3	10.5	26.2	29.4	0.1	27.4	0.9
Queue Length 50th (ft)	27	468	0	4	366	40	0	6	0
Queue Length 95th (ft)	51	#810	24	12	452	86	0	21	0
Internal Link Dist (ft)		2605			1745		389		165
Turn Bay Length (ft)	120		290	175					
Base Capacity (vph)	223	1933	932	178	1851	371	595	388	485
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.43	0.89	0.14	0.07	0.67	0.23	0.02	0.03	0.20

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary
2: Worcester Dr/Keats Wy & McCulloch Rd

2048 PM Build
04/26/2022

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations	↖	↖↖	↖	↖	↖↖		↖	↖		↖	↖	
Traffic Volume (veh/h)	94	1694	123	13	1194	27	85	0	11	13	0	94
Future Volume (veh/h)	94	1694	123	13	1194	27	85	0	11	13	0	94
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	96	1729	126	13	1218	28	87	0	11	13	0	96
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	251	1797	801	110	1667	38	360	0	377	386	0	322
Arrive On Green	0.05	0.50	0.50	0.02	0.46	0.46	0.05	0.00	0.23	0.02	0.00	0.20
Sat Flow, veh/h	1810	3610	1610	1810	3607	83	1810	0	1610	1810	0	1610
Grp Volume(v), veh/h	96	1729	126	13	609	637	87	0	11	13	0	96
Grp Sat Flow(s),veh/h/ln	1810	1805	1610	1810	1805	1885	1810	0	1610	1810	0	1610
Q Serve(g_s), s	2.9	48.6	4.5	0.4	28.8	28.8	4.0	0.0	0.6	0.6	0.0	5.3
Cycle Q Clear(g_c), s	2.9	48.6	4.5	0.4	28.8	28.8	4.0	0.0	0.6	0.6	0.0	5.3
Prop In Lane	1.00		1.00	1.00		0.04	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	251	1797	801	110	834	871	360	0	377	386	0	322
V/C Ratio(X)	0.38	0.96	0.16	0.12	0.73	0.73	0.24	0.00	0.03	0.03	0.00	0.30
Avail Cap(c_a), veh/h	281	1806	805	181	879	918	368	0	377	456	0	322
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.0	25.5	14.4	24.4	23.0	23.0	30.9	0.0	31.0	32.4	0.0	35.8
Incr Delay (d2), s/veh	1.0	13.4	0.1	0.5	3.0	2.9	0.3	0.0	0.0	0.0	0.0	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	21.8	1.7	0.2	11.9	12.4	1.8	0.0	0.2	0.3	0.0	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.0	38.8	14.5	24.9	25.9	25.8	31.2	0.0	31.1	32.4	0.0	38.2
LnGrp LOS	B	D	B	C	C	C	C	A	C	C	A	D
Approach Vol, veh/h		1951			1259			98				109
Approach Delay, s/veh		36.3			25.9			31.2				37.5
Approach LOS		D			C			C				D
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.4	55.4	7.3	30.0	8.7	59.1	10.9	26.4				
Change Period (Y+Rc), s	6.8	6.8	5.4	5.4	6.8	6.8	5.4	5.4				
Max Green Setting (Gmax), s	7.4	51.2	6.0	21.0	6.0	52.6	6.0	21.0				
Max Q Clear Time (g_c+1), s	4.9	30.8	2.6	2.6	2.4	50.6	6.0	7.3				
Green Ext Time (p_c), s	0.0	7.8	0.0	0.0	0.0	1.8	0.0	0.4				
Intersection Summary												
HCM 6th Ctrl Delay					32.3							
HCM 6th LOS					C							
Notes												
User approved pedestrian interval to be less than phase max green.												

Lanes, Volumes, Timings
 3: Worchester Dr/Amour de Flame Wy & McCulloch Rd

2048 PM Build
 07/28/2022

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↖	↖	↖	↖↖	↖	↖	↖	↖	↖	↖	↖
Traffic Volume (vph)	150	1517	58	52	1061	34	45	0	47	34	0	119
Future Volume (vph)	150	1517	58	52	1061	34	45	0	47	34	0	119
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	275		275	185		185	0		0	0		0
Storage Lanes	1		1	1		1	1		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950				0.950	
Satd. Flow (prot)	1805	3610	1615	1805	3610	1615	1805	1900	1615	0	1805	1615
Flt Permitted	0.950			0.950			0.950				0.950	
Satd. Flow (perm)	1805	3610	1615	1805	3610	1615	1805	1900	1615	0	1805	1615
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		1825			1081			387			223	
Travel Time (s)		27.7			16.4			10.6			6.1	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	153	1548	59	53	1083	35	46	0	48	35	0	121
Shared Lane Traffic (%)												
Lane Group Flow (vph)	153	1548	59	53	1083	35	46	0	48	0	35	121
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary
 Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 64.4% ICU Level of Service C
 Analysis Period (min) 15

Intersection												
Int Delay, s/veh	57.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↗	↘	↘	↗	↘	↘	↗	↘	↘	↗	↘
Traffic Vol, veh/h	150	1517	58	52	1061	34	45	0	47	34	0	119
Future Vol, veh/h	150	1517	58	52	1061	34	45	0	47	34	0	119
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	275	-	275	185	-	185	0	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	153	1548	59	53	1083	35	46	0	48	35	0	121
Major/Minor	Major1	Major2		Minor1		Minor2						
Conflicting Flow All	1118	0	1607	0	0	2502	3078	774	2269	3102	542	
Stage 1	-	-	-	-	-	1854	1854	-	1189	1189	-	
Stage 2	-	-	-	-	-	648	1224	-	1080	1913	-	
Critical Hdwy	4.1	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9	
Critical Hdwy Stg 1	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-	
Critical Hdwy Stg 2	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-	
Follow-up Hdwy	2.2	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3	
Pot Cap-1 Maneuver	632	-	412	-	-	~15	12	346	~23	12	490	
Stage 1	-	-	-	-	-	78	125	-	203	264	-	
Stage 2	-	-	-	-	-	430	254	-	236	117	-	
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	
Mov Cap-1 Maneuver	632	-	412	-	-	~8	8	346	~15	8	490	
Mov Cap-2 Maneuver	-	-	-	-	-	~8	8	-	~15	8	-	
Stage 1	-	-	-	-	-	59	95	-	154	230	-	
Stage 2	-	-	-	-	-	282	221	-	154	89	-	
Approach	EB	WB		NB		SB						
HCM Control Delay, s	1.1	0.7		\$ 1494.7		260.6						
HCM LOS				F		F						
Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	
Capacity (veh/h)	8	-	346	632	-	-	412	-	-	15	490	
HCM Lane V/C Ratio	5.74	-	0.139	0.242	-	-	0.129	-	-	2.313	0.248	
HCM Control Delay (s)	\$ 3037.9	0	17.1	12.5	-	-	15	-	-	\$ 1121	14.8	
HCM Lane LOS	F	A	C	B	-	-	C	-	-	F	B	
HCM 95th %tile Q(veh)	7.1	-	0.5	0.9	-	-	0.4	-	-	5	1	
Notes	~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon											

Lanes, Volumes, Timings
4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd

2048 PM Build
04/26/2022

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	155	117	1310	43	87	11	913	411	52	25	469	130
Future Volume (vph)	155	117	1310	43	87	11	913	411	52	25	469	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		600	250		0	500		0	650		0
Storage Lanes	1		2	1		0	2		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	0.88	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.983			0.983				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1900	2842	1805	1868	0	3502	1868	0	1805	1881	1615
Flt Permitted	0.527			0.681			0.101			0.493		
Satd. Flow (perm)	1001	1900	2842	1294	1868	0	372	1868	0	937	1881	1615
Right Turn on Red			Yes		Yes			Yes		Yes		Yes
Satd. Flow (RTOR)			470		4			6				253
Link Speed (mph)		45			30			35			35	
Link Distance (ft)		1081			2227			1225			1142	
Travel Time (s)		16.4			50.6			23.9			22.2	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Adj. Flow (vph)	158	119	1337	44	89	11	932	419	53	26	479	133
Shared Lane Traffic (%)												
Lane Group Flow (vph)	158	119	1337	44	100	0	932	472	0	26	479	133
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	pt+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	3	8	8 1	7	4		1	6		5	2	

2048 PM Build McCulloch Rd RCA 4:00 pm 10/21/2021 2048 PM Build
PHR/LTEC

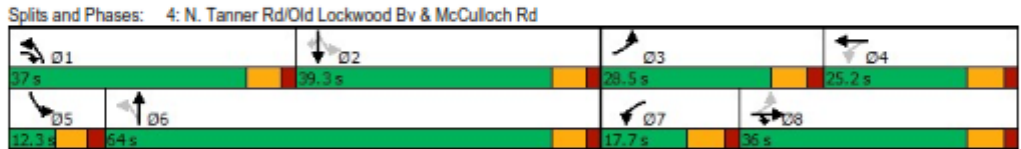
Synchro 11 Report
Page 1

Lanes, Volumes, Timings
4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd

2048 PM Build
04/26/2022

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	8			4			6			2		2
Detector Phase	3	8	8 1	7	4		1	6		5	2	2
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	8.0		6.0	8.0	8.0
Minimum Split (s)	31.8	31.8		24.8	24.8		24.4	24.4		12.3	34.4	34.4
Total Split (s)	28.5	36.0		17.7	25.2		37.0	64.0		12.3	39.3	39.3
Total Split (%)	21.9%	27.7%		13.6%	19.4%		28.5%	49.2%		9.5%	30.2%	30.2%
Maximum Green (s)	21.7	29.2		10.9	18.4		30.6	57.6		6.0	32.9	32.9
Yellow Time (s)	4.8	4.8		4.8	4.8		4.4	4.4		4.0	4.4	4.4
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.3	2.0	2.0
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)	6.8	6.8		6.8	6.8		6.4	6.4		6.3	6.4	6.4
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		Min	Max		None	Max	Max
Walk Time (s)	7.0	7.0									7.0	7.0
Flash Dont Walk (s)	18.0	18.0									21.0	21.0
Pedestrian Calls (#/hr)	0	0									0	0
Act Effect Green (s)	39.6	28.5	65.7	27.9	20.0		70.2	63.0		39.1	33.0	33.0
Actuated g/C Ratio	0.32	0.23	0.53	0.23	0.16		0.57	0.51		0.32	0.27	0.27
v/c Ratio	0.39	0.27	0.77	0.14	0.33		0.94	0.49		0.08	0.95	0.22
Control Delay	33.2	42.2	18.5	29.7	47.5		53.2	24.4		17.8	76.2	0.8
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	33.2	42.2	18.5	29.7	47.5		53.2	24.4		17.8	76.2	0.8
LOS	C	D	B	C	D		D	C		B	E	A
Approach Delay		21.7			42.0			43.5			58.1	
Approach LOS		C			D			D			E	

Intersection Summary	
Area Type:	Other
Cycle Length:	130
Actuated Cycle Length:	123.7
Natural Cycle:	130
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.95
Intersection Signal Delay:	36.6
Intersection Capacity Utilization:	92.2%
Analysis Period (min):	15
Intersection LOS:	D
ICU Level of Service:	F



Queues
4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd

2048 PM Build
04/26/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	158	119	1337	44	100	932	472	26	479	133
v/c Ratio	0.39	0.27	0.77	0.14	0.33	0.94	0.49	0.08	0.95	0.22
Control Delay	33.2	42.2	18.5	29.7	47.5	53.2	24.4	17.8	76.2	0.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.2	42.2	18.5	29.7	47.5	53.2	24.4	17.8	76.2	0.8
Queue Length 50th (ft)	93	81	332	24	68	339	274	9	393	0
Queue Length 95th (ft)	148	140	458	52	128	#491	393	24	#630	0
Internal Link Dist (ft)		1001			2147		1145		1062	
Turn Bay Length (ft)			600	250		500		650		
Base Capacity (vph)	467	450	1714	369	334	988	954	338	502	616
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.26	0.78	0.12	0.30	0.94	0.49	0.08	0.95	0.22

Intersection Summary

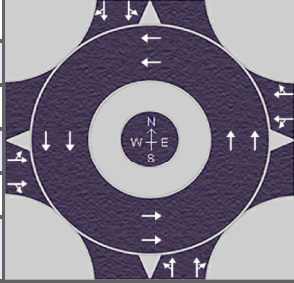
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 6th Signalized Intersection Summary
4: N. Tanner Rd/Old Lockwood Bv & McCulloch Rd

2048 PM Build
04/26/2022

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘
Traffic Volume (veh/h)	155	117	1310	43	87	11	913	411	52	25	469	130
Future Volume (veh/h)	155	117	1310	43	87	11	913	411	52	25	469	130
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1885	1900
Adj Flow Rate, veh/h	158	119	1337	44	89	11	932	419	53	26	479	133
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	1	0
Cap, veh/h	413	446	1348	213	325	40	984	789	100	357	498	425
Arrive On Green	0.09	0.23	0.23	0.05	0.20	0.20	0.24	0.48	0.48	0.03	0.26	0.26
Sat Flow, veh/h	1810	1900	2834	1810	1658	205	3510	1653	209	1810	1885	1610
Grp Volume(v), veh/h	158	119	1337	44	0	100	932	0	472	26	479	133
Grp Sat Flow(s),veh/h/ln	1810	1900	1417	1810	0	1863	1755	0	1862	1810	1885	1610
Q Serve(g_s), s	8.5	6.4	29.2	2.3	0.0	5.7	27.5	0.0	22.1	1.3	31.2	8.2
Cycle Q Clear(g_c), s	8.5	6.4	29.2	2.3	0.0	5.7	27.5	0.0	22.1	1.3	31.2	8.2
Prop In Lane	1.00		1.00	1.00		0.11	1.00		0.11	1.00		1.00
Lane Grp Cap(c), veh/h	413	446	1348	213	0	365	984	0	889	357	498	425
V/C Ratio(X)	0.38	0.27	0.99	0.21	0.00	0.27	0.95	0.00	0.53	0.07	0.96	0.31
Avail Cap(c_a), veh/h	571	446	1348	284	0	365	1000	0	889	392	498	425
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.2	38.9	32.4	36.5	0.0	42.5	35.5	0.0	22.8	31.6	45.2	36.7
Incr Delay (d2), s/veh	0.6	0.3	22.5	0.5	0.0	0.4	17.1	0.0	2.3	0.1	31.8	1.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	2.9	22.7	1.1	0.0	2.7	11.1	0.0	10.0	0.6	18.8	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.8	39.2	55.0	37.0	0.0	43.0	52.6	0.0	25.0	31.7	77.0	38.7
LnGrp LOS	D	D	D	D	A	D	D	A	C	C	E	D
Approach Vol, veh/h		1614			144			1404			638	
Approach Delay, s/veh		51.9			41.1			43.3			67.2	
Approach LOS		D			D			D			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	36.4	39.3	17.6	31.2	9.9	65.9	12.8	36.0				
Change Period (Y+Rc), s	6.4	6.4	6.8	6.8	*6.3	6.4	6.8	6.8				
Max Green Setting (Gmax), s	30.6	32.9	21.7	18.4	*6	57.6	10.9	29.2				
Max Q Clear Time (g_c+1), s	29.5	33.2	10.5	7.7	3.3	24.1	4.3	31.2				
Green Ext Time (p_c), s	0.5	0.0	0.3	0.3	0.0	3.2	0.0	0.0				
Intersection Summary												
HCM 6th Ctrl Delay			50.9									
HCM 6th LOS			D									
Notes												
User approved pedestrian interval to be less than phase max green.												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

HCS7 Roundabouts Report

General Information				Site Information				
Analyst					Intersection	McCulloch Rd @ Orion Blvd		
Agency or Co.					E/W Street Name	McCulloch Rd		
Date Performed	1/9/2024				N/S Street Name	Orion Blvd		
Analysis Year	2028				Analysis Time Period (hrs)	0.25		
Time Analyzed	AM Peak				Peak Hour Factor	1.00		
Project Description					Jurisdiction			

Volume Adjustments and Site Characteristics																
Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	2	0	0	0	2	0
Lane Assignment	LT		TR		LT		TR		LT		TR		LT		TR	
Volume (V), veh/h	0	296	275	251	0	370	647	45	0	38	48	53	0	38	323	141
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	302	280	256	0	377	660	46	0	39	49	54	0	39	329	144
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2				2				2				2			
Pedestrians Crossing, p/h	175				175				175				175			

Critical and Follow-Up Headway Adjustment													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Critical Headway (s)	4.6453	4.3276		4.6453	4.3276		4.6453	4.3276		4.6453	4.3276		
Follow-Up Headway (s)	2.6667	2.5352		2.6667	2.5352		2.6667	2.5352		2.6667	2.5352		

Flow Computations, Capacity and v/c Ratios													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Entry Flow (v _e), pc/h	419	419		542	542		71	71		256	256		
Entry Volume, veh/h	411	411		531	531		70	70		251	251		
Circulating Flow (v _c), pc/h	745			390			621			1076			
Exiting Flow (v _{ex}), pc/h	373			843			397			962			
Capacity (C _{PCE}), pc/h	680	754		943	1019		762	838		502	569		
Capacity (c), veh/h	628	696		831	899		692	760		491	556		
v/c Ratio (x)	0.65	0.59		0.64	0.59		0.10	0.09		0.51	0.45		

Delay and Level of Service													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Lane Control Delay (d), s/veh	19.2	15.3		14.8	12.6		6.3	5.7		17.3	13.9		
Lane LOS	C	C		B	B		A	A		C	B		
95% Queue, veh	4.8	3.9		4.7	4.0		0.3	0.3		2.9	2.3		
Approach Delay, s/veh	17.2			13.7			6.0			15.6			
Approach LOS	C			B			A			C			
Intersection Delay, s/veh LOS	14.8						B						

HCS7 Roundabouts Report

General Information				Site Information				
Analyst					Intersection	McCulloch Rd @ Orion Blvd		
Agency or Co.					E/W Street Name	McCulloch Rd		
Date Performed	1/9/2024				N/S Street Name	Orion Blvd		
Analysis Year	2028				Analysis Time Period (hrs)	0.25		
Time Analyzed	PM Peak				Peak Hour Factor	1.00		
Project Description					Jurisdiction			

Volume Adjustments and Site Characteristics																
Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	2	0	0	0	2	0
Lane Assignment	LT		TR		LT		TR		LT		TR		LT		TR	
Volume (V), veh/h	0	640	770	193	0	241	606	31	0	272	403	295	0	17	128	60
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	653	785	197	0	246	618	32	0	277	411	301	0	17	131	61
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2				2				2				2			
Pedestrians Crossing, p/h	175				175				175				175			

Critical and Follow-Up Headway Adjustment													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Critical Headway (s)	4.6453	4.3276		4.6453	4.3276		4.6453	4.3276		4.6453	4.3276		
Follow-Up Headway (s)	2.6667	2.5352		2.6667	2.5352		2.6667	2.5352		2.6667	2.5352		

Flow Computations, Capacity and v/c Ratios													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Entry Flow (v _e), pc/h	818	818		448	448		495	495		105	105		
Entry Volume, veh/h	801	801		439	439		485	485		102	102		
Circulating Flow (v _c), pc/h	394			1341			1455			1141			
Exiting Flow (v _{ex}), pc/h	1103			956			1096			574			
Capacity (C _{PCE}), pc/h	940	1016		393	454		354	412		473	538		
Capacity (c), veh/h	829	896		385	445		347	404		463	528		
v/c Ratio (x)	0.97	0.89		1.14	0.99		1.40	1.20		0.22	0.19		

Delay and Level of Service													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Lane Control Delay (d), s/veh	45.9	31.4		121.7	69.9		225.1	141.4		11.1	9.4		
Lane LOS	E	D		F	F		F	F		B	A		
95% Queue, veh	15.7	12.4		16.6	12.5		24.6	19.4		0.8	0.7		
Approach Delay, s/veh	38.7			95.8			183.2			10.2			
Approach LOS	E			F			F			B			
Intersection Delay, s/veh LOS	89.2						F						

HCS7 Roundabouts Report

General Information				Site Information				
Analyst					Intersection	McCulloch Rd @ Orion Blvd		
Agency or Co.					E/W Street Name	McCulloch Rd		
Date Performed	1/9/2024				N/S Street Name	Orion Blvd		
Analysis Year	2048				Analysis Time Period (hrs)	0.25		
Time Analyzed	AM Peak				Peak Hour Factor	1.00		
Project Description					Jurisdiction			

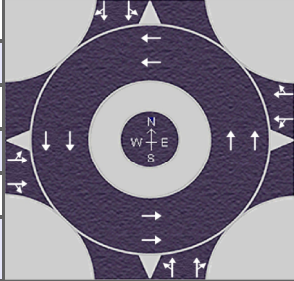
Volume Adjustments and Site Characteristics																
Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	2	0	0	0	2	0
Lane Assignment	LT		TR		LT		TR		LT		TR		LT		TR	
Volume (V), veh/h	0	503	467	426	0	628	1097	76	0	65	81	90	0	65	547	240
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	513	476	435	0	641	1119	78	0	66	83	92	0	66	558	245
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2				2				2				2			
Pedestrians Crossing, p/h	175				175				175				175			

Critical and Follow-Up Headway Adjustment													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Critical Headway (s)	4.6453	4.3276		4.6453	4.3276		4.6453	4.3276		4.6453	4.3276		
Follow-Up Headway (s)	2.6667	2.5352		2.6667	2.5352		2.6667	2.5352		2.6667	2.5352		

Flow Computations, Capacity and v/c Ratios													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Entry Flow (v _e), pc/h	712	712		919	919		121	121		435	435		
Entry Volume, veh/h	698	698		901	901		118	118		426	426		
Circulating Flow (v _c), pc/h	1265			662			1055			1826			
Exiting Flow (v _{ex}), pc/h	634			1430			674			1634			
Capacity (C _{PCE}), pc/h	422	485		734	809		511	579		252	301		
Capacity (c), veh/h	413	475		670	738		498	564		247	295		
v/c Ratio (x)	1.69	1.47		1.35	1.22		0.24	0.21		1.73	1.44		

Delay and Level of Service													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Lane Control Delay (d), s/veh	343.7	245.4		184.4	131.3		10.6	9.1		378.2	251.2		
Lane LOS	F	F		F	F		B	A		F	F		
95% Queue, veh	41.8	35.3		37.8	31.2		0.9	0.8		28.1	23.3		
Approach Delay, s/veh	294.5			157.9			9.9			314.7			
Approach LOS	F			F			A			F			
Intersection Delay, s/veh LOS	225.4						F						

HCS7 Roundabouts Report

General Information				Site Information				
Analyst					Intersection	McCulloch Rd @ Orion Blvd		
Agency or Co.					E/W Street Name	McCulloch Rd		
Date Performed	1/9/2024				N/S Street Name	Orion Blvd		
Analysis Year	2048				Analysis Time Period (hrs)	0.25		
Time Analyzed	PM Peak				Peak Hour Factor	1.00		
Project Description					Jurisdiction			

Volume Adjustments and Site Characteristics																
Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	2	0	0	0	2	0
Lane Assignment	LT		TR		LT		TR		LT		TR		LT		TR	
Volume (V), veh/h	0	1086	1306	328	0	408	1028	52	0	462	684	500	0	29	218	101
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	1108	1332	335	0	416	1049	53	0	471	698	510	0	30	222	103
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2				2				2				2			
Pedestrians Crossing, p/h	175				175				175				175			

Critical and Follow-Up Headway Adjustment													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Critical Headway (s)	4.6453	4.3276		4.6453	4.3276		4.6453	4.3276		4.6453	4.3276		
Follow-Up Headway (s)	2.6667	2.5352		2.6667	2.5352		2.6667	2.5352		2.6667	2.5352		

Flow Computations, Capacity and v/c Ratios													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Entry Flow (v _e), pc/h	1388	1388		759	759		840	840		178	178		
Entry Volume, veh/h	1360	1360		744	744		823	823		174	174		
Circulating Flow (v _c), pc/h	668			2277			2470			1936			
Exiting Flow (v _{ex}), pc/h	1872			1623			1859			973			
Capacity (C _{PCE}), pc/h	730	805		166	205		139	174		227	274		
Capacity (c), veh/h	667	735		163	201		136	171		223	269		
v/c Ratio (x)	2.04	1.85		4.57	3.70		6.03	4.83		0.78	0.65		

Delay and Level of Service													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Lane Control Delay (d), s/veh	488.9	403.3		1660.3	1263.1		2327.7	1773.8		60.7	38.4		
Lane LOS	F	F		F	F		F	F		F	E		
95% Queue, veh	92.2	84.2		76.3	71.8		89.3	85.2		5.6	4.1		
Approach Delay, s/veh	446.1			1461.7			2050.7			49.5			
Approach LOS	F			F			F			E			
Intersection Delay, s/veh LOS	1093.3						F						

HCS7 Roundabouts Report

General Information				Site Information				
Analyst					Intersection	McCulloch Rd @ Keats Way		
Agency or Co.					E/W Street Name	McCulloch Rd		
Date Performed	1/9/2024				N/S Street Name	Keats Way		
Analysis Year	2028				Analysis Time Period (hrs)	0.25		
Time Analyzed	AM Peak				Peak Hour Factor	1.00		
Project Description					Jurisdiction			

Volume Adjustments and Site Characteristics																
Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		TR		LT		TR		LTR				LTR			
Volume (V), veh/h	0	28	266	29	0	4	923	3	0	67	0	9	0	4	1	65
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	29	271	30	0	4	941	3	0	68	0	9	0	4	1	66
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	60				60				60				60			

Critical and Follow-Up Headway Adjustment													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Critical Headway (s)	4.5436	4.5436		4.5436	4.5436				4.3276				4.3276
Follow-Up Headway (s)	2.5352	2.5352		2.5352	2.5352				2.5352				2.5352

Flow Computations, Capacity and v/c Ratios													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Entry Flow (v _e), pc/h	165	165		474	474				77				71
Entry Volume, veh/h	162	162		465	465				75				70
Circulating Flow (v _c), pc/h	9			97			304			1013			
Exiting Flow (v _{ex}), pc/h	284			1075			32			35			
Capacity (C _{PCE}), pc/h	1408	1408		1300	1300				1097				600
Capacity (c), veh/h	1287	1287		1194	1194				1066				588
v/c Ratio (x)	0.13	0.13		0.39	0.39				0.07				0.12

Delay and Level of Service													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Lane Control Delay (d), s/veh	3.8	3.8		6.9	6.9				4.0				7.5
Lane LOS	A	A		A	A				A				A
95% Queue, veh	0.4	0.4		1.9	1.9				0.2				0.4
Approach Delay, s/veh	3.8			6.9			4.0			7.5			
Approach LOS	A			A			A			A			
Intersection Delay, s/veh LOS	6.0						A						

HCS7 Roundabouts Report

General Information				Site Information				
Analyst					Intersection	McCulloch Rd @ Keats Way		
Agency or Co.					E/W Street Name	McCulloch Rd		
Date Performed	1/9/2024				N/S Street Name	Keats Way		
Analysis Year	2028				Analysis Time Period (hrs)	0.25		
Time Analyzed	PM Peak				Peak Hour Factor	1.00		
Project Description					Jurisdiction			

Volume Adjustments and Site Characteristics																
Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		TR		LT		TR		LTR				LTR			
Volume (V), veh/h	0	55	998	73	0	8	704	16	0	50	0	7	0	8	0	55
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	56	1018	74	0	8	718	16	0	51	0	7	0	8	0	56
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	60				60				60				60			

Critical and Follow-Up Headway Adjustment													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Critical Headway (s)	4.5436	4.5436		4.5436	4.5436			4.3276				4.3276	
Follow-Up Headway (s)	2.5352	2.5352		2.5352	2.5352			2.5352				2.5352	

Flow Computations, Capacity and v/c Ratios													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Entry Flow (v _e), pc/h	574	574		371	371			58			64		
Entry Volume, veh/h	563	563		364	364			57			63		
Circulating Flow (v _c), pc/h	16			107			1082			777			
Exiting Flow (v _{ex}), pc/h	1033			825			72			82			
Capacity (C _{PCE}), pc/h	1399	1399		1288	1288			566			734		
Capacity (c), veh/h	1279	1279		1183	1183			555			713		
v/c Ratio (x)	0.44	0.44		0.31	0.31			0.10			0.09		

Delay and Level of Service													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Lane Control Delay (d), s/veh	7.2	7.2		5.9	5.9			7.7			6.0		
Lane LOS	A	A		A	A			A			A		
95% Queue, veh	2.3	2.3		1.3	1.3			0.3			0.3		
Approach Delay, s/veh	7.2			5.9			7.7			6.0			
Approach LOS	A			A			A			A			
Intersection Delay, s/veh LOS	6.7						A						

HCS7 Roundabouts Report

General Information				Site Information				
Analyst					Intersection	McCulloch Rd @ Keats Way		
Agency or Co.					E/W Street Name	McCulloch Rd		
Date Performed	1/9/2024				N/S Street Name	Keats Way		
Analysis Year	2048				Analysis Time Period (hrs)	0.25		
Time Analyzed	AM Peak				Peak Hour Factor	1.00		
Project Description					Jurisdiction			

Volume Adjustments and Site Characteristics																
Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		TR		LT		TR				LTR				LTR	
Volume (V), veh/h	0	47	451	49	0	7	1566	4	0	114	0	16	0	7	2	110
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	48	460	50	0	7	1597	4	0	116	0	16	0	7	2	112
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	60				60				60				60			

Critical and Follow-Up Headway Adjustment													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Critical Headway (s)	4.5436	4.5436		4.5436	4.5436				4.3276			4.3276	
Follow-Up Headway (s)	2.5352	2.5352		2.5352	2.5352				2.5352			2.5352	

Flow Computations, Capacity and v/c Ratios													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Entry Flow (v _e), pc/h	279	279		804	804				132			121	
Entry Volume, veh/h	274	274		788	788				129			119	
Circulating Flow (v _c), pc/h	16			164			515			1720			
Exiting Flow (v _{ex}), pc/h	483			1825			52			59			
Capacity (C _{PCE}), pc/h	1399	1399		1223	1223				917			329	
Capacity (c), veh/h	1279	1279		1127	1127				891			323	
v/c Ratio (x)	0.21	0.21		0.70	0.70				0.15			0.37	

Delay and Level of Service													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Lane Control Delay (d), s/veh	4.6	4.6		13.7	13.7				5.5			19.3	
Lane LOS	A	A		B	B				A			C	
95% Queue, veh	0.8	0.8		6.1	6.1				0.5			1.6	
Approach Delay, s/veh	4.6			13.7			5.5			19.3			
Approach LOS	A			B			A			C			
Intersection Delay, s/veh LOS	11.5						B						

HCS7 Roundabouts Report

General Information				Site Information				
Analyst					Intersection	McCulloch Rd @ Keats Way		
Agency or Co.					E/W Street Name	McCulloch Rd		
Date Performed	1/9/2024				N/S Street Name	Keats Way		
Analysis Year	2048				Analysis Time Period (hrs)	0.25		
Time Analyzed	PM Peak				Peak Hour Factor	1.00		
Project Description					Jurisdiction			

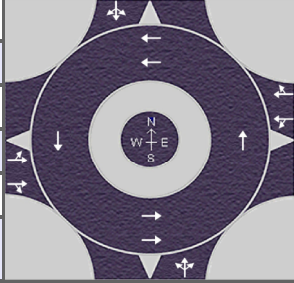
Volume Adjustments and Site Characteristics																
Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		TR		LT		TR		LTR				LTR			
Volume (V), veh/h	0	94	1694	123	0	13	1194	27	0	85	0	11	0	13	0	94
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	96	1728	125	0	13	1218	28	0	87	0	11	0	13	0	96
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	60				60				60				60			

Critical and Follow-Up Headway Adjustment													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Critical Headway (s)	4.5436	4.5436		4.5436	4.5436				4.3276			4.3276	
Follow-Up Headway (s)	2.5352	2.5352		2.5352	2.5352				2.5352			2.5352	

Flow Computations, Capacity and v/c Ratios													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Entry Flow (v _e), pc/h	975	975		630	630			98			109		
Entry Volume, veh/h	955	955		617	617			96			107		
Circulating Flow (v _c), pc/h	26			183			1837			1318			
Exiting Flow (v _{ex}), pc/h	1752			1401			124			138			
Capacity (C _{PCE}), pc/h	1387	1387		1202	1202			298			463		
Capacity (c), veh/h	1268	1268		1109	1109			292			454		
v/c Ratio (x)	0.75	0.75		0.56	0.56			0.33			0.24		

Delay and Level of Service													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Lane Control Delay (d), s/veh	14.7	14.7		10.0	10.0			19.9			11.5		
Lane LOS	B	B		B	B			C			B		
95% Queue, veh	7.7	7.7		3.6	3.6			1.4			0.9		
Approach Delay, s/veh	14.7			10.0			19.9			11.5			
Approach LOS	B			B			C			B			
Intersection Delay, s/veh LOS	13.0						B						

HCS7 Roundabouts Report

General Information				Site Information				
Analyst					Intersection	McCulloch@Amour de Flame		
Agency or Co.					E/W Street Name	McCulloch Rd		
Date Performed	1/9/2024				N/S Street Name	Amour de Flame Way		
Analysis Year	2028				Analysis Time Period (hrs)	0.25		
Time Analyzed	AM Peak				Peak Hour Factor	1.00		
Project Description					Jurisdiction			

Volume Adjustments and Site Characteristics																
Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		TR		LT		TR		LTR				LTR			
Volume (V), veh/h	0	18	258	17	0	13	821	5	0	40	0	28	0	15	0	67
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	18	263	17	0	13	837	5	0	41	0	29	0	15	0	68
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	60				60				60				60			

Critical and Follow-Up Headway Adjustment													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Critical Headway (s)	4.5436	4.5436		4.5436	4.5436				4.3276			4.3276	
Follow-Up Headway (s)	2.5352	2.5352		2.5352	2.5352				2.5352			2.5352	

Flow Computations, Capacity and v/c Ratios													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Entry Flow (v _e), pc/h	149	149		428	428			70			83		
Entry Volume, veh/h	146	146		419	419			69			81		
Circulating Flow (v _c), pc/h	28			59			296			891			
Exiting Flow (v _{ex}), pc/h	307			946			23			30			
Capacity (C _{PCE}), pc/h	1384	1384		1346	1346			1104			666		
Capacity (c), veh/h	1266	1266		1233	1233			1074			653		
v/c Ratio (x)	0.12	0.12		0.34	0.34			0.06			0.12		

Delay and Level of Service													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Lane Control Delay (d), s/veh	3.8	3.8		6.1	6.1			3.9			6.9		
Lane LOS	A	A		A	A			A			A		
95% Queue, veh	0.4	0.4		1.5	1.5			0.2			0.4		
Approach Delay, s/veh	3.8			6.1			3.9			6.9			
Approach LOS	A			A			A			A			
Intersection Delay, s/veh LOS	5.5						A						

HCS7 Roundabouts Report

General Information				Site Information				
Analyst					Intersection	McCulloch@Amour de Flame		
Agency or Co.					E/W Street Name	McCulloch Rd		
Date Performed	1/9/2024				N/S Street Name	Amour de Flame Way		
Analysis Year	2028				Analysis Time Period (hrs)	0.25		
Time Analyzed	PM Peak				Peak Hour Factor	1.00		
Project Description					Jurisdiction			

Volume Adjustments and Site Characteristics																
Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		TR		LT		TR		LTR				LTR			
Volume (V), veh/h	0	89	894	34	0	31	625	20	0	26	0	28	0	20	0	70
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	91	912	35	0	32	638	20	0	27	0	29	0	20	0	71
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	60				60				60				60			

Critical and Follow-Up Headway Adjustment													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Critical Headway (s)	4.5436	4.5436		4.5436	4.5436				4.3276				4.3276
Follow-Up Headway (s)	2.5352	2.5352		2.5352	2.5352				2.5352				2.5352

Flow Computations, Capacity and v/c Ratios													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Entry Flow (v _e), pc/h	519	519		345	345				56				91
Entry Volume, veh/h	509	509		338	338				55				89
Circulating Flow (v _c), pc/h	52			118			1023			697			
Exiting Flow (v _{ex}), pc/h	961			736			111			67			
Capacity (C _{PCE}), pc/h	1354	1354		1275	1275				595				785
Capacity (c), veh/h	1240	1240		1172	1172				584				763
v/c Ratio (x)	0.41	0.41		0.29	0.29				0.09				0.12

Delay and Level of Service													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Lane Control Delay (d), s/veh	7.0	7.0		5.8	5.8				7.3				5.9
Lane LOS	A	A		A	A				A				A
95% Queue, veh	2.0	2.0		1.2	1.2				0.3				0.4
Approach Delay, s/veh	7.0			5.8			7.3			5.9			
Approach LOS	A			A			A			A			
Intersection Delay, s/veh LOS	6.5						A						

HCS7 Roundabouts Report

General Information				Site Information				
Analyst					Intersection	McCulloch@Amour de Flame		
Agency or Co.					E/W Street Name	McCulloch Rd		
Date Performed	1/9/2024				N/S Street Name	Amour de Flame Way		
Analysis Year	2048				Analysis Time Period (hrs)	0.25		
Time Analyzed	AM Peak				Peak Hour Factor	1.00		
Project Description					Jurisdiction			

Volume Adjustments and Site Characteristics																
Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		TR		LT		TR		LTR				LTR			
Volume (V), veh/h	0	31	437	29	0	22	1393	9	0	67	0	47	0	25	0	114
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	32	446	30	0	22	1421	9	0	68	0	48	0	26	0	116
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	60				60				60				60			

Critical and Follow-Up Headway Adjustment															
Approach	EB			WB			NB			SB					
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)	4.5436	4.5436		4.5436	4.5436				4.3276				4.3276		
Follow-Up Headway (s)	2.5352	2.5352		2.5352	2.5352				2.5352				2.5352		

Flow Computations, Capacity and v/c Ratios															
Approach	EB			WB			NB			SB					
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v _e), pc/h	254	254		726	726			116					142		
Entry Volume, veh/h	249	249		712	712			114					139		
Circulating Flow (v _c), pc/h	48			100			504			1511					
Exiting Flow (v _{ex}), pc/h	520			1605			41			52					
Capacity (C _{PCE}), pc/h	1359	1359		1296	1296			925					393		
Capacity (c), veh/h	1245	1245		1191	1191			900					385		
v/c Ratio (x)	0.20	0.20		0.60	0.60			0.13					0.36		

Delay and Level of Service															
Approach	EB			WB			NB			SB					
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	4.6	4.6		10.4	10.4			5.2					16.3		
Lane LOS	A	A		B	B			A					C		
95% Queue, veh	0.7	0.7		4.2	4.2			0.4					1.6		
Approach Delay, s/veh	4.6			10.4			5.2			16.3					
Approach LOS	A			B			A			C					
Intersection Delay, s/veh LOS	9.2						A								

HCS7 Roundabouts Report

General Information				Site Information				
Analyst					Intersection	McCulloch@Amour de Flame		
Agency or Co.					E/W Street Name	McCulloch Rd		
Date Performed	1/9/2024				N/S Street Name	Amour de Flame Way		
Analysis Year	2048				Analysis Time Period (hrs)	0.25		
Time Analyzed	PM Peak				Peak Hour Factor	1.00		
Project Description					Jurisdiction			

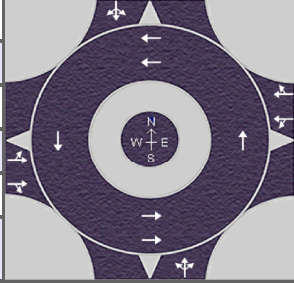
Volume Adjustments and Site Characteristics																
Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		TR		LT		TR		LTR				LTR			
Volume (V), veh/h	0	150	1517	58	0	52	1061	34	0	45	0	47	0	34	0	119
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	153	1547	59	0	53	1082	35	0	46	0	48	0	35	0	121
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	60				60				60				60			

Critical and Follow-Up Headway Adjustment													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Critical Headway (s)	4.5436	4.5436		4.5436	4.5436				4.3276			4.3276	
Follow-Up Headway (s)	2.5352	2.5352		2.5352	2.5352				2.5352			2.5352	

Flow Computations, Capacity and v/c Ratios													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Entry Flow (v _e), pc/h	880	880		585	585			94			156		
Entry Volume, veh/h	862	862		574	574			92			153		
Circulating Flow (v _c), pc/h	88			199			1735			1181			
Exiting Flow (v _{ex}), pc/h	1630			1249			188			112			
Capacity (C _{PCE}), pc/h	1311	1311		1185	1185			325			520		
Capacity (c), veh/h	1203	1203		1094	1094			319			510		
v/c Ratio (x)	0.72	0.72		0.52	0.52			0.29			0.30		

Delay and Level of Service													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Lane Control Delay (d), s/veh	13.8	13.8		9.5	9.5			17.3			11.5		
Lane LOS	B	B		A	A			C			B		
95% Queue, veh	6.6	6.6		3.2	3.2			1.2			1.2		
Approach Delay, s/veh	13.8			9.5			17.3			11.5			
Approach LOS	B			A			C			B			
Intersection Delay, s/veh LOS	12.2						B						

HCS7 Roundabouts Report

General Information				Site Information				
Analyst					Intersection	McCulloch Rd @ Tanner Rd		
Agency or Co.					E/W Street Name	McCulloch Rd		
Date Performed	1/9/2024				N/S Street Name	Tanner Rd		
Analysis Year	2028				Analysis Time Period (hrs)	0.25		
Time Analyzed	AM Peak				Peak Hour Factor	1.00		
Project Description					Jurisdiction			

Volume Adjustments and Site Characteristics																
Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		TR		LT		TR		LTR				LTR			
Volume (V), veh/h	0	65	29	229	0	48	42	20	0	709	197	31	0	12	107	50
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	66	30	234	0	49	43	20	0	723	201	32	0	12	109	51
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	60				60				60				60			

Critical and Follow-Up Headway Adjustment													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Critical Headway (s)	4.5436	4.5436		4.5436	4.5436			4.3276				4.3276	
Follow-Up Headway (s)	2.5352	2.5352		2.5352	2.5352			2.5352				2.5352	

Flow Computations, Capacity and v/c Ratios													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Entry Flow (v _e), pc/h	96	234		56	56			956			172		
Entry Volume, veh/h	94	229		55	55			937			169		
Circulating Flow (v _c), pc/h	170			990			108			815			
Exiting Flow (v _{ex}), pc/h	74			817			287			392			
Capacity (C _{PCE}), pc/h	1216	1216		577	577			1295			710		
Capacity (c), veh/h	1122	1122		566	566			1260			691		
v/c Ratio (x)	0.08	0.20		0.10	0.10			0.74			0.24		

Delay and Level of Service													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Lane Control Delay (d), s/veh	3.9	5.1		7.5	7.5			14.4			8.1		
Lane LOS	A	A		A	A			B			A		
95% Queue, veh	0.3	0.8		0.3	0.3			7.4			1.0		
Approach Delay, s/veh	4.7			7.5			14.4			8.1			
Approach LOS	A			A			B			A			
Intersection Delay, s/veh LOS	11.2						B						

HCS7 Roundabouts Report

General Information				Site Information				
Analyst					Intersection	McCulloch Rd @ Tanner Rd		
Agency or Co.					E/W Street Name	McCulloch Rd		
Date Performed	1/9/2024				N/S Street Name	Tanner Rd		
Analysis Year	2028				Analysis Time Period (hrs)	0.25		
Time Analyzed	PM Peak				Peak Hour Factor	1.00		
Project Description					Jurisdiction			

Volume Adjustments and Site Characteristics																
Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		TR		LT		TR		LTR				LTR			
Volume (V), veh/h	0	91	69	772	0	25	51	7	0	538	242	31	0	15	276	77
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	93	70	787	0	26	52	7	0	549	247	32	0	15	282	79
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	60				60				60				60			

Critical and Follow-Up Headway Adjustment													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Critical Headway (s)	4.5436	4.5436		4.5436	4.5436				4.3276			4.3276	
Follow-Up Headway (s)	2.5352	2.5352		2.5352	2.5352				2.5352			2.5352	

Flow Computations, Capacity and v/c Ratios													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Entry Flow (v _e), pc/h	163	787		43	43			828			376		
Entry Volume, veh/h	160	772		42	42			812			369		
Circulating Flow (v _c), pc/h	323			889			178			627			
Exiting Flow (v _{ex}), pc/h	117			680			347			1095			
Capacity (C _{PCE}), pc/h	1058	1058		632	632			1221			833		
Capacity (c), veh/h	985	985		618	618			1187			810		
v/c Ratio (x)	0.16	0.78		0.07	0.07			0.68			0.45		

Delay and Level of Service													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Lane Control Delay (d), s/veh	5.2	19.3		6.6	6.6			12.7			10.4		
Lane LOS	A	C		A	A			B			B		
95% Queue, veh	0.6	8.3		0.2	0.2			5.8			2.4		
Approach Delay, s/veh	16.9			6.6			12.7			10.4			
Approach LOS	C			A			B			B			
Intersection Delay, s/veh LOS	13.9						B						

HCS7 Roundabouts Report

General Information				Site Information				
Analyst					Intersection	McCulloch Rd @ Tanner Rd		
Agency or Co.					E/W Street Name	McCulloch Rd		
Date Performed	1/9/2024				N/S Street Name	Tanner Rd		
Analysis Year	2048				Analysis Time Period (hrs)	0.25		
Time Analyzed	AM Peak				Peak Hour Factor	1.00		
Project Description					Jurisdiction			

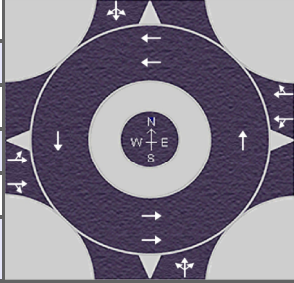
Volume Adjustments and Site Characteristics																
Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		TR		LT		TR		LTR				LTR			
Volume (V), veh/h	0	110	49	388	0	81	72	34	0	20	182	85	0	1203	334	52
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	112	50	396	0	83	73	35	0	20	186	87	0	1227	341	53
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	60				60				60				60			

Critical and Follow-Up Headway Adjustment													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Critical Headway (s)	4.5436	4.5436		4.5436	4.5436				4.3276			4.3276	
Follow-Up Headway (s)	2.5352	2.5352		2.5352	2.5352				2.5352			2.5352	

Flow Computations, Capacity and v/c Ratios													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Entry Flow (v _e), pc/h	162	396		96	96			293			1621		
Entry Volume, veh/h	159	388		94	94			287			1589		
Circulating Flow (v _c), pc/h	1651			318			1389			176			
Exiting Flow (v _{ex}), pc/h	1364			146			333			820			
Capacity (C _{PCE}), pc/h	316	316		1063	1063			436			1223		
Capacity (c), veh/h	310	310		990	990			428			1189		
v/c Ratio (x)	0.51	1.25		0.09	0.09			0.67			1.34		

Delay and Level of Service													
Approach	EB			WB			NB			SB			
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	
Lane Control Delay (d), s/veh	25.8	172.4		4.5	4.5			27.4			170.8		
Lane LOS	D	F		A	A			D			F		
95% Queue, veh	2.8	17.9		0.3	0.3			4.8			60.0		
Approach Delay, s/veh	129.9			4.5			27.4			170.8			
Approach LOS	F			A			D			F			
Intersection Delay, s/veh LOS	134.5						F						

HCS7 Roundabouts Report

General Information				Site Information				
Analyst					Intersection	McCulloch Rd @ Tanner Rd		
Agency or Co.					E/W Street Name	McCulloch Rd		
Date Performed	1/9/2024				N/S Street Name	Tanner Rd		
Analysis Year	2048				Analysis Time Period (hrs)	0.25		
Time Analyzed	PM Peak				Peak Hour Factor	1.00		
Project Description					Jurisdiction			

Volume Adjustments and Site Characteristics																
Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		TR		LT		TR		LTR				LTR			
Volume (V), veh/h	0	155	117	1310	0	43	87	11	0	913	411	52	0	25	469	130
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	158	119	1336	0	44	89	11	0	931	419	53	0	26	478	133
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	60				60				60				60			

Critical and Follow-Up Headway Adjustment															
Approach	EB			WB			NB			SB					
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)	4.5436	4.5436		4.5436	4.5436				4.3276				4.3276		
Follow-Up Headway (s)	2.5352	2.5352		2.5352	2.5352				2.5352				2.5352		

Flow Computations, Capacity and v/c Ratios															
Approach	EB			WB			NB			SB					
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v _e), pc/h	277	1336		72	72				1403				637		
Entry Volume, veh/h	272	1310		71	71				1375				625		
Circulating Flow (v _c), pc/h	548			1508			303			1064					
Exiting Flow (v _{ex}), pc/h	198			1153			588			1858					
Capacity (C _{PCE}), pc/h	862	862		360	360				1098				575		
Capacity (c), veh/h	816	816		353	353				1067				564		
v/c Ratio (x)	0.33	1.60		0.20	0.20				1.29				1.11		

Delay and Level of Service															
Approach	EB			WB			NB			SB					
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	8.3	292.8		13.7	13.7				152.0				97.2		
Lane LOS	A	F		B	B				F				F		
95% Queue, veh	1.5	68.8		0.7	0.7				49.1				19.6		
Approach Delay, s/veh	243.9			13.7			152.0			97.2					
Approach LOS	F			B			F			F					
Intersection Delay, s/veh LOS	176.6						F								



Appendix D: ICE Tool Results

This sheet compiles the data from summary tables in individual alternatives sheets. To populate the output sheet press the "Setup Worksheets" button in the Alternatives_MasterList tab.

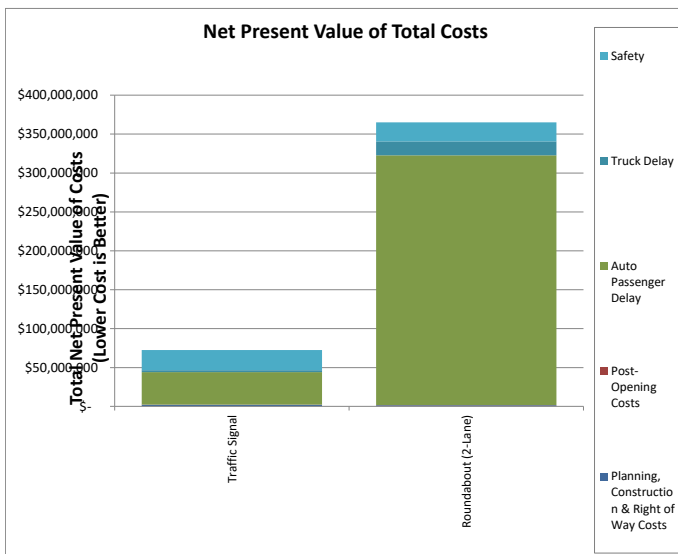
Outputs

Agency:		
Project Name:		McCulloch Rd @ Lockwood Blvd / Orion Blvd
Project Reference:		
Intersection:		
City:		Orlando
State:		FL
Performing Department or Organization:		
Date:		
Analyst:		
Analysis Type		At-Grade Intersection

Analysis Summary

Cost Categories	Net Present Value of Costs		
	Base Case - Roundabout (2-Lane)	Traffic Signal	Roundabout (2-Lane)
Planning, Construction & Right of Way Costs	\$ 1,430,000	\$ 2,090,000	\$ 1,430,000
Post-Opening Costs	\$ 72,952	\$ 98,229	\$ 72,952
Auto Passenger Delay	\$ 321,196,873	\$ 42,040,459	\$ 321,196,873
Truck Delay	\$ 17,952,420	\$ 2,349,736	\$ 17,952,420
Safety	\$ 24,478,567	\$ 25,901,539	\$ 24,478,567
Total cost	\$365,130,812	\$72,479,963	\$365,130,812

Select Base Case for Benefit-Cost Comparison: (Choose from list)	Roundabout (2-Lane)		
Benefit Categories	Net Present Value of Benefits Relative to Base Case		
	Traffic Signal	Roundabout (2-Lane)	
Auto Passenger Delay	\$ 279,156,414		
Truck Delay	\$ 15,602,684		
Safety	\$ (1,422,971)		
Net Present Value of Benefits	\$ 293,336,126		
Net Present Value of Costs	\$ 685,277		
Net Present Value of Improvement	\$ 292,650,849		
Benefit-Cost (B/C) Ratio	428.05		
Delay B/C	430.13		
Safety B/C			
	Control Strategy not preferred. Benefits are less than base case and cost is greater than base case.		



Outputs

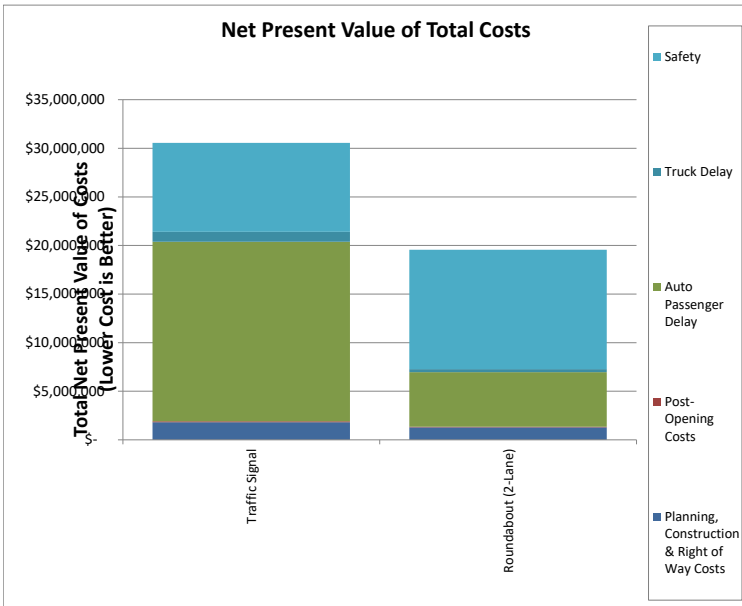
This sheet compiles the data from summary tables in individual alternatives sheets. To populate the output sheet press the "Setup Worksheets" button in

Agency:	
Project Name:	McCulloch Rd @ Keats Way / Worchester Dr
Project Reference:	
Intersection:	
City:	Orlando
State:	FL
Performing Department or Organization:	
Date:	
Analyst:	
Analysis Type	At-Grade Intersection

Analysis Summary

Cost Categories	Net Present Value of Costs		
	Base Case - Traffic Signal	Traffic Signal	Roundabout (2-Lane)
Planning, Construction & Right of Way Costs	\$ 1,815,000	\$ 1,815,000	\$ 1,283,000
Post-Opening Costs	\$ 98,229	\$ 98,229	\$ 72,952
Auto Passenger Delay	\$ 18,467,597	\$ 18,467,597	\$ 5,604,537
Truck Delay	\$ 1,032,196	\$ 1,032,196	\$ 313,250
Safety	\$ 9,147,164	\$ 9,147,164	\$ 12,280,908
Total cost	\$30,560,185	\$30,560,185	\$19,554,646

Select Base Case for Benefit-Cost Comparison: (Choose from list)	Traffic Signal		
Benefit Categories	Net Present Value of Benefits Relative to Base Case		
	Base Case - Traffic Signal	Traffic Signal	Roundabout (2-Lane)
Auto Passenger Delay			\$ 12,863,061
Truck Delay			\$ 718,946
Safety			\$ (3,133,744)
Net Present Value of Benefits			\$ 10,448,262
Net Present Value of Costs			\$ (557,277)
Net Present Value of Improvement			\$ 11,005,539
Benefit-Cost (B/C) Ratio			preferred. Benefits are greater than base case and cost is less than base
Delay B/C			preferred. Benefits are greater than base case and cost is less than base
Safety B/C			Benefits are less than base case and cost is less than base case.



Outputs

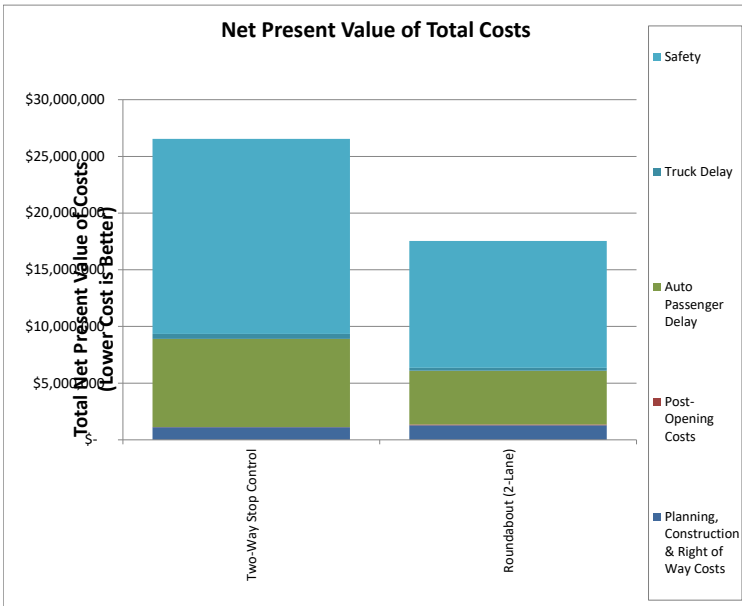
This sheet compiles the data from summary tables in individual alternatives sheets. To populate the output sheet press the "Setup Worksheets" button in

Agency:	
Project Name:	McCulloch Rd @ Amour de Flame Way / Worchester Dr
Project Reference:	
Intersection:	
City:	Orlando
State:	FL
Performing Department or Organization:	
Date:	
Analyst:	
Analysis Type	At-Grade Intersection

Analysis Summary

Cost Categories	Net Present Value of Costs		
	Base Case - Two-Way Stop Control	Two-Way Stop Control	Roundabout (2-Lane)
Planning, Construction & Right of Way Costs	\$ 1,115,000	\$ 1,115,000	\$ 1,283,000
Post-Opening Costs	\$ 14,590	\$ 14,590	\$ 72,952
Auto Passenger Delay	\$ 7,772,613	\$ 7,772,613	\$ 4,734,844
Truck Delay	\$ 434,429	\$ 434,429	\$ 264,641
Safety	\$ 17,206,853	\$ 17,206,853	\$ 11,192,678
Total cost	\$26,543,485	\$26,543,485	\$17,548,115

Select Base Case for Benefit-Cost Comparison: (Choose from list)	Two-Way Stop Control		
Benefit Categories	Net Present Value of Benefits Relative to Base Case		
	Two-Way Stop Control	Roundabout (2-Lane)	
Auto Passenger Delay		\$ 3,037,769	
Truck Delay		\$ 169,788	
Safety		\$ 6,014,175	
Net Present Value of Benefits		\$ 9,221,731	
Net Present Value of Costs		\$ 226,361	
Net Present Value of Improvement		\$ 8,995,370	
Benefit-Cost (B/C) Ratio			40.74
Delay B/C			14.17
Safety B/C			26.57



Outputs

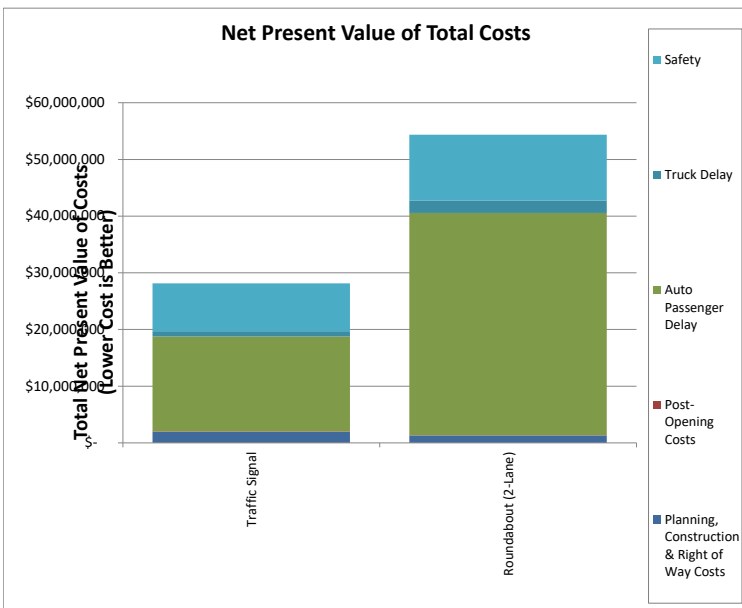
This sheet compiles the data from summary tables in individual alternatives sheets. To populate the output sheet press the "Setup Worksheets" button in

Agency:	
Project Name:	McCulloch Rd @ N Tanner Rd / Old Lockwood Rd
Project Reference:	
Intersection:	
City:	Orlando
State:	FL
Performing Department or Organization:	
Date:	
Analyst:	
Analysis Type	At-Grade Intersection

Analysis Summary

Cost Categories	Net Present Value of Costs		
	Base Case - Roundabout (2-Lane)	Traffic Signal	Roundabout (2-Lane)
Planning, Construction & Right of Way Costs	\$ 1,286,000	\$ 1,943,000	\$ 1,286,000
Post-Opening Costs	\$ 72,952	\$ 98,229	\$ 72,952
Auto Passenger Delay	\$ 39,210,544	\$ 16,720,330	\$ 39,210,544
Truck Delay	\$ 2,191,566	\$ 934,537	\$ 2,191,566
Safety	\$ 11,606,176	\$ 8,447,711	\$ 11,606,176
Total cost	\$54,367,237	\$28,143,806	\$54,367,237

Select Base Case for Benefit-Cost Comparison: (Choose from list)	Roundabout (2-Lane)		
Benefit Categories	Net Present Value of Benefits Relative to Base Case		
		Traffic Signal	Roundabout (2-Lane)
Auto Passenger Delay		\$ 22,490,214	
Truck Delay		\$ 1,257,029	
Safety		\$ 3,158,465	
Net Present Value of Benefits		\$ 26,905,708	
Net Present Value of Costs		\$ 682,277	
Net Present Value of Improvement		\$ 26,223,431	
Benefit-Cost (B/C) Ratio		39.44	
Delay B/C		34.81	
Safety B/C		4.63	





Appendix E: ICE Forms

Florida Department of Transportation
Intersection Control Evaluation (ICE) Form
Stage 1: Screening

Intersection Control Evaluation Form 750-010-30

To fulfill the requirements of Stage 1 (Screening) of FDOT's ICE procedures, complete the following form and append all supporting documentation. Completed forms are to be submitted to the District Traffic Operations Engineer (DTOE) and District Design Engineer (DDE) for the project's approval.

Project Name	McCulloch Rd at Lockwood Blvd / Orion Blvd		FDOT Project #		
Submitted By	Scott Bickar and Robert Watson	Agency/Company	Dewberry Engineers Inc.	Date	1/9/2024
Email		FDOT District	District 5	County	Orange
Project Locality (City/Town/Village)	Orlando				
Intersection Type	At-Grade Intersection	FDOT Context Classification	C4 - Urban General		
Project Funding Source	Federal	Project Type	Corridor Improvement Project		
Project Purpose (What is the catalyst for this project and why is it being undertaken?)	To accommodate future traffic volume increase in the area, McCulloch Rd will be widened from a two lane undivided road to a 4 lane divided road. The widening area will be from Lockwood/Orion Blvd to N Tanner Rd/Old Lockwood Rd. McCulloch Rd west of Orion Blvd is already 4 lane divided with a multi-use trail which will be extended to Tanner Rd.				
Project Setting Description (Describe the area surrounding the intersection)	McCulloch Rd is located adjacent to UCF and several residential developments making it a high traffic road for the area.				
Multimodal Context (Describe the pedestrian, bicycle, and transit activity in the area and the potential for activity based on surrounding land uses and development patterns)	Pedestrian and bicycle activity along McCulloch Rd is moderate because of students/faculty going to and from the UCF campus. The highest activity level is at the intersection of McCulloch Rd and Orion Blvd as Orion Blvd leads directly into the UCF campus.				

Major Street Information										
Route #:		Route Name(s)	McCulloch Rd				Milepost			
Existing Control Type	Signal		Existing AADT	20,850	Design Year AADT	46,750				
Design Vehicle			Control Vehicle							
Primary Functional Classification	Urban Minor Arterial				Design Speed (mph)	45				
Secondary Functional Classification (if app.)					Target Speed (mph) [if app.]					
Approach #1	Direction	Eastbound		Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes		
	Sidewalks along:	Both sides of the approach		Left-Turn	2					
	Crosswalk on Approach?	Yes		Left-Through		Weekday AM Peak		Weekday PM Peak		
	On-Street Bike Facilities?	No		Through	2	Left	503	Left	1,086	
	Multi-Use Path?	Yes		Left-Through-Right		Through	467	Through	1,306	
	Scheduled Bus Service?	No		Through-Right		Right	426	Right	328	
	Bus Stop on Approach?	No		Right-Turn	1	Daily Truck %		2.0%		
Approach #2	Direction	Westbound		Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes		
	Sidewalks along:	Both sides of the approach		Left-Turn	2					
	Crosswalk on Approach?	Yes		Left-Through		Weekday AM Peak		Weekday PM Peak		
	On-Street Bike Facilities?	No		Through	1	Left	628	Left	408	
	Multi-Use Path?	No		Left-Through-Right		Through	1,097	Through	1,028	
	Scheduled Bus Service?	No		Through-Right	1	Right	76	Right	52	
	Bus Stop on Approach?	No		Right-Turn		Daily Truck %		2.0%		

Minor Street Information										
Route #:		Route Name(s)	Lockwood Blvd / Orion Blvd				Milepost (if app.)			
Existing Control Type	Signal		Existing AADT	11,900		Design Year AADT	26,650			
Design Vehicle			Control Vehicle							
Primary Functional Classification			Urban Minor Arterial			Design Speed (mph)	30			
Secondary Functional Classification (if app.)						Target Speed (mph) [if app.]				
Approach #1	Direction	Northbound		Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes		
	Sidewalks along:	Both sides of the approach		Left-Turn	1					
	Crosswalk on Approach?	Yes		Left-Through		Weekday AM Peak		Weekday PM Peak		
	On-Street Bike Facilities?	Yes		Through	2	Left	65	Left	462	
	Multi-Use Path?	No		Left-Through-Right		Through	81	Through	684	
	Scheduled Bus Service?	No		Through-Right		Right	90	Right	500	
	Bus Stop on Approach?	No		Right-Turn	1	Daily Truck %		2.0%		
Approach #2	Direction	Southbound		Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes		
	Sidewalks along:	Both sides of the approach		Left-Turn	1					
	Crosswalk on Approach?	Yes		Left-Through		Weekday AM Peak		Weekday PM Peak		
	On-Street Bike Facilities?	No		Through	2	Left	65	Left	29	
	Multi-Use Path?	No		Left-Through-Right		Through	547	Through	218	
	Scheduled Bus Service?	No		Through-Right		Right	240	Right	101	
	Bus Stop on Approach?	No		Right-Turn	1	Daily Truck %		2.0%		
Approach #3	Direction			Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes		
	Sidewalks along:			Left-Turn						
	Crosswalk on Approach?			Left-Through		Weekday AM Peak		Weekday PM Peak		
	On-Street Bike Facilities?			Through		Left		Left		
	Multi-Use Path?			Left-Through-Right		Through		Through		
	Scheduled Bus Service?			Through-Right		Right		Right		
	Bus Stop on Approach?			Right-Turn		Daily Truck %				

Crash History (Existing Intersections Only)
Append the most recent five-years of crash data for the intersection from the CAR System. If the crash data evidences any issues relating to safety performance, discuss briefly here:

Control Strategy Evaluation								
Provide a brief justification as to why each of the following control strategies should be advanced or not. Justification should consider potential environmental impacts.								
Control Strategy	CAP-X Outputs				SPICE Outputs		Strategy to be Advanced?	Justification
	V/C Ratio		Ped Accom. Score	Bike Accom. Score	Crash Prediction Rank	SSI Rank		
	Weekday AM Peak	Weekday PM Peak						
Signalized Control	0.72	1.04	4.71	4.58	1	2	Yes	High scores for ped and bike accommodations and acceptable V/C ratio.
Roundabout (2-lane)	1.62	5.67	4.38	4.50	2	1	Yes	High scores for ped and bike accommodations.

Resolution						
<i>To be filled out by FDOT District Traffic Operations Engineer and District Design Engineer</i>						
Project Determination						
Comments						
DTE Name			Signature		Date	
DDE Name			Signature		Date	

**Florida Department of Transportation
Intersection Control Evaluation (ICE) Form**

Intersection Control Evaluation Form 750-010-30

Stage 2: Initial Control Strategy Assessment

To fulfill the requirements of Stage 2 (Intersection Control Strategy) of FDOT's ICE procedures, complete the following form and append all supporting documentation. Completed forms are to be submitted to the District Traffic Operations Engineer (DTOE) and District Design Engineer (DDE) for the project's approval.

Project Name	McCulloch Rd at Lockwood Blvd / Orion Blvd	FDOT Project #		Date	01/09/24
Submitted By	Scott Bickar and Robert Watson	Agency/Company	Dewberry Engineers Inc.	Email	
List all viable intersection control strategies identified in Stage 1 (Screening):					
Signalized Control		Roundabout (2-lane)			

Operational Analyses									
Summarize the results of the peak hour analysis performed for each control strategy. Select analysis year based on guidance in the ICE procedures document. Refer to Exhibit 19-8 of the <i>Highway Capacity Manual, 6th Edition</i> (HCM6) to determine the appropriate LOS based on intersection delay (<i>hover over this cell for Exhibit 19-8</i>).									
Design Vehicle					Control Vehicle				
Opening Year	2028								
Control Strategy	Peak Hour		Weekday AM Peak	Peak Hour		Weekday PM Peak	Peak Hour		
	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated?
Signalized Control	C	27.6	Yes	C	31.6	Yes			
Roundabout (2-lane)	B	14.8	Yes	F	89.2	No			
Design Year	2048								
Control Strategy	Peak Hour		Weekday AM Peak	Peak Hour		Weekday PM Peak	Peak Hour		
	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated?
Signalized Control	D	37.8	Yes	D	51.2	Yes			
Roundabout (2-lane)	F	225.4	No	F	1,093.3	No			
Provide any additional discussion necessary regarding the results of the operational analysis:									

Safety Performance							
Enter the most recent five (5) years of crash data from the CAR System.				Most recent year of crash data available			2022
Crash Type		2018	2019	2020	2021	2022	Total
Combined	Total						
	Fatal/Injury						
	PDO						
Single-Vehicle	Total	3	0	1	0	1	5
	Fatal/Injury	0	0	0	0	0	0
	PDO	3	0	1	0	1	5
Multi-Vehicle	Total	21	26	10	10	14	81
	Fatal/Injury	7	8	1	2	2	20
	PDO	14	18	9	8	12	61
Vehicle-Pedestrian	Fatal/Injury	0	0	0	0	0	0
Vehicle-Bicycle	Fatal/Injury	1	0	0	0	0	1
Total	All	25	26	11	10	15	87

Apply the FDOT SPICE Tool to model anticipated safety performance of each control strategy. For intersection types not accommodated in the tool, manually apply crash modification factors detailed in the ICE procedures document or qualitatively describe anticipated safety impacts.

Control Strategy	Anticipated Impact on Safety Performance	Opening Year			Design Year		
		Predicted Total Crashes	Predicted Fatal+Injury Crashes	SSI Score	Predicted Total Crashes	Predicted Fatal+Injury Crashes	SSI Score
Signalized Control	Less total crashes and slightly more fatalities/injuries (due to higher speeds through the intersection) when compared to the roundabout.	15.17	3.85	69	29.75	7.68	42
Roundabout (2-lane)	More total crashes and slightly less fatalities/injuries (due to slower speeds) when compared to the signalized control.	18.82	3.57	77	34.74	7.00	62

Costs and Benefit/Cost Ratios						
Remaining cognizant of the current level of detail of each control strategy's conceptual design, provide a cost estimate for each. You may want to include costs for preliminary engineering, required right-of-way acquisitions, construction, and a contingency. Apply the FDOT ICE Tool to determine the delay benefit-cost ratio (B/C), safety B/C, overall B/C, and net-present value for each control strategy.						
Control Strategy	ROW Costs (\$)	Construction Costs (\$)	FDOT ICE Tool Outputs			
			Delay B/C	Safety B/C	Overall B/C	Net Present Value
Signalized Control	\$0	\$2,090,000	430.13	N/A	428.05	\$292,650,849
Roundabout (2-lane)	\$0	\$1,430,000				

Multimodal Accommodations			
Note the existing/anticipated level of pedestrian/bicyclist activity at the study intersection during a typical day. After filling in the daily number of pedestrians crossing, the activity level field will auto-populate.			
Daily # of peds. crossing (all approaches):	700	Pedestrian Volume by Activity Level	
Daily # of bicyclists crossing (all approaches):		Medium (700 ≤ peds/day < 1,500)	
Summarize the ability of each viable control strategy to accommodate the existing/anticipated level of:			
Control Strategy	Pedestrians and Bicyclists	Transit Services	Freight Needs
Signalized Control			
Roundabout (2-lane)			

Environmental, Utility, and Right-of-Way Impacts	
Summarize any issues related to environmental, utility, or right-of-way (including relocation) impacts specific to each control strategy. Be sure to consider the NEPA requirements for each control type.	
Signalized Control	Less right-of-way and utility impacts when compared to roundabout. Intersection operates better as a signalized intersection, less pollution.
Roundabout (2-lane)	More right-of-way and utility impacts when compared to a signalized intersection. Intersection operates worse as a roundabout, more pollution.

Public Input/Feedback (if appropriate)
Summarize any agency or public input regarding the control strategies:

Control Strategy Evaluation		
Provide a brief justification as to why each of the following is either viable or not viable. If a single control strategy is recommended, select it as the only strategy to be advanced.		
Control Strategy	Strategy to be Advanced?	Justification
Signalized Control	Yes	Signalized control provides an acceptable LOS through the design year of 2048. Less delay, environmental impacts, right-of-way impacts, and total crashes compared to the 2 lane roundabout.
Roundabout (2-lane)	No	LOS of F in design and opening year peak hours.

Resolution				
<i>To be filled out by FDOT District Traffic Operations Engineer and District Design Engineer</i>				
Project Determination				
Comments				
DTOE Name		Signature		Date
DDE Name		Signature		Date

Florida Department of Transportation
Intersection Control Evaluation (ICE) Form
Stage 1: Screening

To fulfill the requirements of Stage 1 (Screening) of FDOT's ICE procedures, complete the following form and append all supporting documentation. Completed forms are to be submitted to the District Traffic Operations Engineer (DTOE) and District Design Engineer (DDE) for the project's approval.

Project Name	McCulloch Rd at Keats Way / Worchester Dr			FDOT Project #	
Submitted By	Scott Bickar and Robert Watson	Agency/Company	Dewberry Engineers Inc.	Date	1/9/2024
Email		FDOT District	District 5	County	Orange
Project Locality (City/Town/Village)	Orlando				
Intersection Type	At-Grade Intersection	FDOT Context Classification	C4 - Urban General		
Project Funding Source	Federal	Project Type	Corridor Improvement Project		
Project Purpose <i>(What is the catalyst for this project and why is it being undertaken?)</i>	To accommodate future traffic volume increase in the area, McCulloch Rd will be widened from a two lane undivided road to a 4 lane divided road. The widening area will be from Lockwood/Orion Blvd to N Tanner Rd/Old Lockwood Rd. McCulloch Rd west of Orion Blvd is already 4 lane divided with a multi-use trail which will be extended to Tanner Rd.				
Project Setting Description <i>(Describe the area surrounding the intersection)</i>	McCulloch Rd is located adjacent to UCF and several residential developments making it a high traffic road for the area.				
Multimodal Context <i>(Describe the pedestrian, bicycle, and transit activity in the area and the potential for activity based on surrounding land uses and development patterns)</i>	Pedestrian and bicycle activity along McCulloch Rd is moderate because of students/faculty going to and from the UCF campus. The highest activity level is at the intersection of McCulloch Rd and Orion Blvd as Orion Blvd leads directly into the UCF campus.				

Major Street Information								
Route #:		Route Name(s)	McCulloch Rd			Milepost		
Existing Control Type	Signal		Existing AADT	15,900	Design Year AADT	35,600		
Design Vehicle			Control Vehicle					
Primary Functional Classification	Urban Minor Arterial				Design Speed (mph)	35		
Secondary Functional Classification (if app.)					Target Speed (mph) [if app.]			
Approach #1	Direction	Eastbound	Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes	
	Sidewalks along:	Both sides of the approach	Left-Turn	1				
	Crosswalk on Approach?	No	Left-Through		Weekday AM Peak		Weekday PM Peak	
	On-Street Bike Facilities?	No	Through	2	Left	47	Left	94
	Multi-Use Path?	Yes	Left-Through-Right		Through	451	Through	1,694
	Scheduled Bus Service?	No	Through-Right		Right	49	Right	123
	Bus Stop on Approach?	No	Right-Turn	1	Daily Truck %		2.0%	
Approach #2	Direction	Westbound	Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes	
	Sidewalks along:	Both sides of the approach	Left-Turn	1				
	Crosswalk on Approach?	Yes	Left-Through		Weekday AM Peak		Weekday PM Peak	
	On-Street Bike Facilities?	No	Through	1	Left	7	Left	13
	Multi-Use Path?	No	Left-Through-Right		Through	1,566	Through	1,194
	Scheduled Bus Service?	No	Through-Right	1	Right	4	Right	27
	Bus Stop on Approach?	No	Right-Turn		Daily Truck %		2.0%	

Minor Street Information										
Route #:		Route Name(s)	Keats Way / Worchester Dr				Milepost (if app.)			
Existing Control Type	Signal		Existing AADT	1,200		Design Year AADT	1,200			
Design Vehicle			Control Vehicle							
Primary Functional Classification			Urban Minor Arterial			Design Speed (mph)	25			
Secondary Functional Classification (if app.)						Target Speed (mph) [if app.]				
Approach #1	Direction	Northbound		Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes		
	Sidewalks along:	Both sides of the approach		Left-Turn	1					
	Crosswalk on Approach?	Yes		Left-Through		Weekday AM Peak		Weekday PM Peak		
	On-Street Bike Facilities?	No		Through		Left	114	Left	85	
	Multi-Use Path?	No		Left-Through-Right		Through	0	Through	0	
	Scheduled Bus Service?	No		Through-Right	1	Right	16	Right	11	
	Bus Stop on Approach?	No		Right-Turn		Daily Truck %		2.0%		
Approach #2	Direction	Southbound		Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes		
	Sidewalks along:	Both sides of the approach		Left-Turn	1					
	Crosswalk on Approach?	Yes		Left-Through		Weekday AM Peak		Weekday PM Peak		
	On-Street Bike Facilities?	No		Through		Left	7	Left	13	
	Multi-Use Path?	No		Left-Through-Right		Through	2	Through	0	
	Scheduled Bus Service?	No		Through-Right	1	Right	110	Right	94	
	Bus Stop on Approach?	No		Right-Turn		Daily Truck %		2.0%		
Approach #3	Direction			Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes		
	Sidewalks along:			Left-Turn						
	Crosswalk on Approach?			Left-Through		Weekday AM Peak		Weekday PM Peak		
	On-Street Bike Facilities?			Through		Left		Left		
	Multi-Use Path?			Left-Through-Right		Through		Through		
	Scheduled Bus Service?			Through-Right		Right		Right		
	Bus Stop on Approach?			Right-Turn		Daily Truck %				

Crash History (Existing Intersections Only)
Append the most recent five-years of crash data for the intersection from the CAR System. If the crash data evidences any issues relating to safety performance, discuss briefly here:

Control Strategy Evaluation								
Provide a brief justification as to why each of the following control strategies should be advanced or not. Justification should consider potential environmental impacts.								
Control Strategy	CAP-X Outputs				SPICE Outputs		Strategy to be Advanced?	Justification
	V/C Ratio		Ped Accom. Score	Bike Accom. Score	Crash Prediction Rank	SSI Rank		
	Weekday AM Peak	Weekday PM Peak						
Signalized Control	0.64	0.63	5.24	4.67	1	2	Yes	High scores for ped and bike accommodations and acceptable V/C ratio.
Roundabout (2-lane)	0.69	0.74	4.67	4.50	2	1	Yes	High scores for ped and bike accommodations and acceptable V/C ratio.

Resolution				
<i>To be filled out by FDOT District Traffic Operations Engineer and District Design Engineer</i>				
Project Determination				
Comments				
DTE Name			Signature	Date
DDE Name			Signature	Date

**Florida Department of Transportation
Intersection Control Evaluation (ICE) Form**

Intersection Control Evaluation Form 750-010-30

Stage 2: Initial Control Strategy Assessment

To fulfill the requirements of Stage 2 (Intersection Control Strategy) of FDOT's ICE procedures, complete the following form and append all supporting documentation. Completed forms are to be submitted to the District Traffic Operations Engineer (DTOE) and District Design Engineer (DDE) for the project's approval.

Project Name	McCulloch Rd at Keats Way / Worchester Dr	FDOT Project #		Date	01/09/24
Submitted By	Scott Bickar and Robert Watson	Agency/Company	Dewberry Engineers Inc.	Email	
List all viable intersection control strategies identified in Stage 1 (Screening):					
Signalized Control		Roundabout (2-lane)			

Operational Analyses									
Summarize the results of the peak hour analysis performed for each control strategy. Select analysis year based on guidance in the ICE procedures document. Refer to Exhibit 19-8 of the <i>Highway Capacity Manual, 6th Edition</i> (HCM6) to determine the appropriate LOS based on intersection delay (<i>hover over this cell for Exhibit 19-8</i>).									
Design Vehicle					Control Vehicle				
Opening Year	2028								
Control Strategy	Peak Hour		Weekday AM Peak	Peak Hour		Weekday PM Peak	Peak Hour		
	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated?
Signalized Control	C	21.2	Yes	B	19.7	Yes			
Roundabout (2-lane)	A	6.0	Yes	A	6.7	Yes			
Design Year	2048								
Control Strategy	Peak Hour		Weekday AM Peak	Peak Hour		Weekday PM Peak	Peak Hour		
	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated?
Signalized Control	D	35.7	Yes	C	26.5	Yes			
Roundabout (2-lane)	B	11.5	Yes	B	13.0	Yes			
Provide any additional discussion necessary regarding the results of the operational analysis:									

Safety Performance							
Enter the most recent five (5) years of crash data from the CAR System.				Most recent year of crash data available			2022
Crash Type		2018	2019	2020	2021	2022	Total
Combined	Total						
	Fatal/Injury						
	PDO						
Single-Vehicle	Total	2	1	1	1	0	5
	Fatal/Injury	1	0	0	0	0	1
	PDO	1	1	1	1	0	4
Multi-Vehicle	Total	4	2	1	2	4	13
	Fatal/Injury	0	0	0	0	1	1
	PDO	4	2	1	2	3	12
Vehicle-Pedestrian	Fatal/Injury	0	0	0	0	0	0
Vehicle-Bicycle	Fatal/Injury	0	0	0	0	0	0
Total	All	6	3	2	3	4	18

Apply the FDOT SPICE Tool to model anticipated safety performance of each control strategy. For intersection types not accommodated in the tool, manually apply crash modification factors detailed in the ICE procedures document or qualitatively describe anticipated safety impacts.

Control Strategy	Anticipated Impact on Safety Performance	Opening Year			Design Year		
		Predicted Total Crashes	Predicted Fatal+Injury Crashes	SSI Score	Predicted Total Crashes	Predicted Fatal+Injury Crashes	SSI Score
Signalized Control	Less total crashes and less fatalities/injuries than the roundabout.	2.35	1.53	96	3.95	2.69	92
Roundabout (2-lane)	More total crashes and more fatalities/injuries compared to the signalized intersection.	10.39	1.85	96	17.74	3.34	93

Costs and Benefit/Cost Ratios						
Remaining cognizant of the current level of detail of each control strategy's conceptual design, provide a cost estimate for each. You may want to include costs for preliminary engineering, required right-of-way acquisitions, construction, and a contingency. Apply the FDOT ICE Tool to determine the delay benefit-cost ratio (B/C), safety B/C, overall B/C, and net-present value for each control strategy.						
Control Strategy	ROW Costs (\$)	Construction Costs (\$)	FDOT ICE Tool Outputs			
			Delay B/C	Safety B/C	Overall B/C	Net Present Value
Signalized Control	\$0	\$1,815,000		5.62		
Roundabout (2-lane)	\$0	\$1,283,000	N/A		N/A	\$11,005,539

Multimodal Accommodations			
Note the existing/anticipated level of pedestrian/bicyclist activity at the study intersection during a typical day. After filling in the daily number of pedestrians crossing, the activity level field will auto-populate.			
Daily # of peds. crossing (all approaches):	240	Pedestrian Volume by Activity Level	
Daily # of bicyclists crossing (all approaches):		Med Low (240 ≤ peds/day < 700)	
Summarize the ability of each viable control strategy to accommodate the existing/anticipated level of:			
Control Strategy	Pedestrians and Bicyclists	Transit Services	Freight Needs
Signalized Control			
Roundabout (2-lane)			

Environmental, Utility, and Right-of-Way Impacts	
Summarize any issues related to environmental, utility, or right-of-way (including relocation) impacts specific to each control strategy. Be sure to consider the NEPA requirements for each control type.	
Signalized Control	More delay than roundabout, more pollution.
Roundabout (2-lane)	More right-of-way and utility impacts than signalized intersection.

Public Input/Feedback (if appropriate)
Summarize any agency or public input regarding the control strategies:

Control Strategy Evaluation		
Provide a brief justification as to why each of the following is either viable or not viable. If a single control strategy is recommended, select it as the only strategy to be advanced.		
Control Strategy	Strategy to be Advanced?	Justification
Signalized Control	Yes	Signal provides acceptable LOS through the design year of 2048.
Roundabout (2-lane)	No	Roundabout has better LOS compared to signal but has more fatalities and total crashes and more potential impacts to right-of-way and utilities.

Resolution				
<i>To be filled out by FDOT District Traffic Operations Engineer and District Design Engineer</i>				
Project Determination				
Comments				
DTOE Name		Signature		Date
DDE Name		Signature		Date

Florida Department of Transportation
Intersection Control Evaluation (ICE) Form
Stage 1: Screening

To fulfill the requirements of Stage 1 (Screening) of FDOT's ICE procedures, complete the following form and append all supporting documentation. Completed forms are to be submitted to the District Traffic Operations Engineer (DTOE) and District Design Engineer (DDE) for the project's approval.

Project Name	McCulloch Rd at Amour de Flame Way / Worchester Dr			FDOT Project #	
Submitted By	Scott Bickar and Robert Watson	Agency/Company	Dewberry Engineers Inc.	Date	1/9/2024
Email		FDOT District	District 5	County	Orange
Project Locality (City/Town/Village)	Orlando				
Intersection Type	At-Grade Intersection	FDOT Context Classification	C4 - Urban General		
Project Funding Source	Federal	Project Type	Corridor Improvement Project		
Project Purpose <i>(What is the catalyst for this project and why is it being undertaken?)</i>	To accommodate future traffic volume increase in the area, McCulloch Rd will be widened from a two lane undivided road to a 4 lane divided road. The widening area will be from Lockwood/Orion Blvd to N Tanner Rd/Old Lockwood Rd. McCulloch Rd west of Orion Blvd is already 4 lane divided with a multi-use trail which will be extended to Tanner Rd.				
Project Setting Description <i>(Describe the area surrounding the intersection)</i>	McCulloch Rd is located adjacent to UCF and several residential developments making it a high traffic road for the area.				
Multimodal Context <i>(Describe the pedestrian, bicycle, and transit activity in the area and the potential for activity based on surrounding land uses and development patterns)</i>	Pedestrian and bicycle activity along McCulloch Rd is moderate because of students/faculty going to and from the UCF campus. The highest activity level is at the intersection of McCulloch Rd and Orion Blvd as Orion Blvd leads directly into the UCF campus.				

Major Street Information								
Route #:		Route Name(s)	McCulloch Rd			Milepost		
Existing Control Type	Two-way Stop-Control		Existing AADT	14,400	Design Year AADT	32,300		
Design Vehicle			Control Vehicle					
Primary Functional Classification	Urban Minor Arterial				Design Speed (mph)	35		
Secondary Functional Classification (if app.)					Target Speed (mph) [if app.]			
Approach #1	Direction	Eastbound	Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes	
	Sidewalks along:	Both sides of the approach	Left-Turn	1				
	Crosswalk on Approach?	No	Left-Through		Weekday AM Peak		Weekday PM Peak	
	On-Street Bike Facilities?	No	Through	2	Left	31	Left	150
	Multi-Use Path?	Yes	Left-Through-Right		Through	437	Through	1,517
	Scheduled Bus Service?	No	Through-Right		Right	29	Right	58
	Bus Stop on Approach?	No	Right-Turn	1	Daily Truck %		2.0%	
Approach #2	Direction	Westbound	Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes	
	Sidewalks along:	Both sides of the approach	Left-Turn	1				
	Crosswalk on Approach?	Yes	Left-Through		Weekday AM Peak		Weekday PM Peak	
	On-Street Bike Facilities?	No	Through	2	Left	22	Left	52
	Multi-Use Path?	No	Left-Through-Right		Through	1,393	Through	1,061
	Scheduled Bus Service?	No	Through-Right		Right	9	Right	34
	Bus Stop on Approach?	No	Right-Turn	1	Daily Truck %		2.0%	

Minor Street Information										
Route #:		Route Name(s)	Amour de Flame Way / Worchester Dr				Milepost (if app.)			
Existing Control Type	Two-way Stop-Control		Existing AADT	1,500		Design Year AADT	1,500			
Design Vehicle			Control Vehicle							
Primary Functional Classification			Urban Local			Design Speed (mph)	25			
Secondary Functional Classification (if app.)						Target Speed (mph) [if app.]				
Approach #1	Direction	Northbound		Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes		
	Sidewalks along:	Both sides of the approach		Left-Turn						
	Crosswalk on Approach?	Yes		Left-Through	1	Weekday AM Peak		Weekday PM Peak		
	On-Street Bike Facilities?	No		Through		Left	67	Left	45	
	Multi-Use Path?	No		Left-Through-Right		Through	0	Through	0	
	Scheduled Bus Service?	No		Through-Right		Right	47	Right	47	
	Bus Stop on Approach?	No		Right-Turn	1	Daily Truck %		2.0%		
Approach #2	Direction	Southbound		Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes		
	Sidewalks along:	Both sides of the approach		Left-Turn						
	Crosswalk on Approach?	Yes		Left-Through		Weekday AM Peak		Weekday PM Peak		
	On-Street Bike Facilities?	No		Through		Left	25	Left	34	
	Multi-Use Path?	No		Left-Through-Right	1	Through	0	Through	0	
	Scheduled Bus Service?	No		Through-Right		Right	114	Right	119	
	Bus Stop on Approach?	No		Right-Turn		Daily Truck %		2.0%		
Approach #3	Direction			Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes		
	Sidewalks along:			Left-Turn						
	Crosswalk on Approach?			Left-Through		Weekday AM Peak		Weekday PM Peak		
	On-Street Bike Facilities?			Through		Left		Left		
	Multi-Use Path?			Left-Through-Right		Through		Through		
	Scheduled Bus Service?			Through-Right		Right		Right		
	Bus Stop on Approach?			Right-Turn		Daily Truck %				

Crash History (Existing Intersections Only)
Append the most recent five-years of crash data for the intersection from the CAR System. If the crash data evidences any issues relating to safety performance, discuss briefly here:

Control Strategy Evaluation								
Provide a brief justification as to why each of the following control strategies should be advanced or not. Justification should consider potential environmental impacts.								
Control Strategy	CAP-X Outputs				SPICE Outputs		Strategy to be Advanced?	Justification
	V/C Ratio		Ped Accom. Score	Bike Accom. Score	Crash Prediction Rank	SSI Rank		
	Weekday AM Peak	Weekday PM Peak						
Two-Way Stop-Control	2.65	>10	2.91	4.17	2	2	Yes	
Roundabout (2-lane)	0.59	0.71	5.04	4.67	1	1	Yes	

Resolution						
<i>To be filled out by FDOT District Traffic Operations Engineer and District Design Engineer</i>						
Project Determination						
Comments						
DTE Name			Signature		Date	
DDE Name			Signature		Date	

**Florida Department of Transportation
Intersection Control Evaluation (ICE) Form**

Intersection Control Evaluation Form 750-010-30

Stage 2: Initial Control Strategy Assessment

To fulfill the requirements of Stage 2 (Intersection Control Strategy) of FDOT's ICE procedures, complete the following form and append all supporting documentation. Completed forms are to be submitted to the District Traffic Operations Engineer (DTOE) and District Design Engineer (DDE) for the project's approval.

Project Name	Julloch Rd at Amour de Flame Way / Worchester	FDOT Project #		Date	01/09/24
Submitted By	Scott Bickar and Robert Watson	Agency/Company	Dewberry Engineers Inc.	Email	
List all viable intersection control strategies identified in Stage 1 (Screening):					
Two-Way Stop-Control		Roundabout (2-lane)			

Operational Analyses									
Summarize the results of the peak hour analysis performed for each control strategy. Select analysis year based on guidance in the ICE procedures document. Refer to Exhibit 19-8 of the <i>Highway Capacity Manual, 6th Edition</i> (HCM6) to determine the appropriate LOS based on intersection delay (<i>hover over this cell for Exhibit 19-8</i>).									
Design Vehicle					Control Vehicle				
Opening Year	2028								
Control Strategy	Peak Hour		Weekday AM Peak	Peak Hour		Weekday PM Peak	Peak Hour		
	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated?
Two-Way Stop-Control	A	2.0	Yes	A	3.0	Yes			
Roundabout (2-lane)	A	5.5	Yes	A	6.5	Yes			
Design Year	2048								
Control Strategy	Peak Hour		Weekday AM Peak	Peak Hour		Weekday PM Peak	Peak Hour		
	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated?
Two-Way Stop-Control	A	7.4	Yes	E	57.8	Yes			
Roundabout (2-lane)	A	9.2	Yes	B	12.2	Yes			
Provide any additional discussion necessary regarding the results of the operational analysis:									

Safety Performance							
Enter the most recent five (5) years of crash data from the CAR System.				Most recent year of crash data available			2022
Crash Type		2018	2019	2020	2021	2022	Total
Combined	Total						
	Fatal/Injury						
	PDO						
Single-Vehicle	Total	1	1	0	0	0	2
	Fatal/Injury	1	0	0	0	0	1
	PDO	0	1	0	0	0	1
Multi-Vehicle	Total	0	2	1	5	1	9
	Fatal/Injury	0	1	1	3	0	5
	PDO	0	1	0	2	1	4
Vehicle-Pedestrian	Fatal/Injury	0	0	0	0	0	0
Vehicle-Bicycle	Fatal/Injury	0	0	0	0	0	0
Total	All	1	3	1	5	1	11

Apply the FDOT SPICE Tool to model anticipated safety performance of each control strategy. For intersection types not accommodated in the tool, manually apply crash modification factors detailed in the ICE procedures document or qualitatively describe anticipated safety impacts.

Control Strategy	Anticipated Impact on Safety Performance	Opening Year			Design Year		
		Predicted Total Crashes	Predicted Fatal+Injury Crashes	SSI Score	Predicted Total Crashes	Predicted Fatal+Injury Crashes	SSI Score
Two-Way Stop-Control	Less total crashes and slightly more fatalities/injuries compared to the roundabout.	7.12	2.96	98	10.76	4.70	95
Roundabout (2-lane)	More total crashes but slightly less fatalities/injuries due to lower speeds when compared to the two-way stop control.	9.56	1.69	99	16.25	3.03	99

Costs and Benefit/Cost Ratios						
Remaining cognizant of the current level of detail of each control strategy's conceptual design, provide a cost estimate for each. You may want to include costs for preliminary engineering, required right-of-way acquisitions, construction, and a contingency. Apply the FDOT ICE Tool to determine the delay benefit-cost ratio (B/C), safety B/C, overall B/C, and net-present value for each control strategy.						
Control Strategy	ROW Costs (\$)	Construction Costs (\$)	FDOT ICE Tool Outputs			
			Delay B/C	Safety B/C	Overall B/C	Net Present Value
Two-Way Stop-Control	\$0	\$1,115,000				
Roundabout (2-lane)	\$0	\$1,283,000	14.17	26.57	40.74	\$8,995,370

Multimodal Accommodations			
Note the existing/anticipated level of pedestrian/bicyclist activity at the study intersection during a typical day. After filling in the daily number of pedestrians crossing, the activity level field will auto-populate.			
Daily # of peds. crossing (all approaches):	50	Pedestrian Volume by Activity Level	
Daily # of bicyclists crossing (all approaches):		Low (0 < peds/day < 240)	
Summarize the ability of each viable control strategy to accommodate the existing/anticipated level of:			
Control Strategy	Pedestrians and Bicyclists	Transit Services	Freight Needs
Two-Way Stop-Control			
Roundabout (2-lane)			

Environmental, Utility, and Right-of-Way Impacts	
Summarize any issues related to environmental, utility, or right-of-way (including relocation) impacts specific to each control strategy. Be sure to consider the NEPA requirements for each control type.	
Two-Way Stop-Control	
Roundabout (2-lane)	More space needed to construct, more environmental, utility, and right-of-way impacts compared to the two-way stop.

Public Input/Feedback (if appropriate)
Summarize any agency or public input regarding the control strategies:

Control Strategy Evaluation		
Provide a brief justification as to why each of the following is either viable or not viable. If a single control strategy is recommended, select it as the only strategy to be advanced.		
Control Strategy	Strategy to be Advanced?	Justification
Two-Way Stop-Control	Yes	Provides acceptable LOS through the design year of 2048. Lower total crash rates compared to the roundabout.
Roundabout (2-lane)	No	Right-of-way can not be acquired to fit the 2 lane roundabout due to size constraints from nearby developments.

Resolution				
<i>To be filled out by FDOT District Traffic Operations Engineer and District Design Engineer</i>				
Project Determination				
Comments				
DTOE Name		Signature		Date
DDE Name		Signature		Date

Florida Department of Transportation
Intersection Control Evaluation (ICE) Form
Stage 1: Screening

Intersection Control Evaluation Form 750-010-30

To fulfill the requirements of Stage 1 (Screening) of FDOT's ICE procedures, complete the following form and append all supporting documentation. Completed forms are to be submitted to the District Traffic Operations Engineer (DTOE) and District Design Engineer (DDE) for the project's approval.

Project Name	McCulloch Rd at N Tanner Rd / Old Lockwood Rd		FDOT Project #			
Submitted By	Scott Bickar and Robert Watson		Agency/Company	Dewberry Engineers Inc.	Date	1/9/2024
Email		FDOT District	District 5	County	Orange	
Project Locality (City/Town/Village)			Orlando			
Intersection Type	At-Grade Intersection		FDOT Context Classification	C4 - Urban General		
Project Funding Source		Federal	Project Type	Corridor Improvement Project		
Project Purpose <i>(What is the catalyst for this project and why is it being undertaken?)</i>	To accommodate future traffic volume increase in the area, McCulloch Rd will be widened from a two lane undivided road to a 4 lane divided road. The widening area will be from Lockwood/Orion Blvd to N Tanner Rd/Old Lockwood Rd. McCulloch Rd west of Orion Blvd is already 4 lane divided with a multi-use trail which will be extended to Tanner Rd.					
Project Setting Description <i>(Describe the area surrounding the intersection)</i>	McCulloch Rd is located adjacent to UCF and several residential developments making it a high traffic road for the area.					
Multimodal Context <i>(Describe the pedestrian, bicycle, and transit activity in the area and the potential for activity based on surrounding land uses and development patterns)</i>	Pedestrian and bicycle activity along McCulloch Rd is moderate because of students/faculty going to and from the UCF campus. The highest activity level is at the intersection of McCulloch Rd and Orion Blvd as Orion Blvd leads directly into the UCF campus.					

Major Street Information										
Route #:		Route Name(s)	McCulloch Rd				Milepost			
Existing Control Type	Signal		Existing AADT	7,750	Design Year AADT	17,350				
Design Vehicle			Control Vehicle							
Primary Functional Classification			Urban Minor Arterial			Design Speed (mph)	35			
Secondary Functional Classification (if app.)						Target Speed (mph) [if app.]				
Approach #1	Direction	Eastbound		Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes		
	Sidewalks along:	Both sides of the approach		Left-Turn						
	Crosswalk on Approach?	Yes		Left-Through	1	Weekday AM Peak		Weekday PM Peak		
	On-Street Bike Facilities?	No		Through	1	Left	110	Left	155	
	Multi-Use Path?	Yes		Left-Through-Right		Through	49	Through	117	
	Scheduled Bus Service?	No		Through-Right		Right	388	Right	1,310	
	Bus Stop on Approach?	No		Right-Turn	1	Daily Truck %		2.0%		
Approach #2	Direction	Westbound		Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes		
	Sidewalks along:	One side of the approach		Left-Turn	1					
	Crosswalk on Approach?	No		Left-Through		Weekday AM Peak		Weekday PM Peak		
	On-Street Bike Facilities?	No		Through	1	Left	81	Left	43	
	Multi-Use Path?	No		Left-Through-Right		Through	72	Through	87	
	Scheduled Bus Service?	No		Through-Right		Right	34	Right	11	
	Bus Stop on Approach?	No		Right-Turn		Daily Truck %		2.0%		

Minor Street Information										
Route #:		Route Name(s)	N Tanner Rd / Old Lockwood Rd				Milepost (if app.)			
Existing Control Type	Signal		Existing AADT	10,400		Design Year AADT	23,250			
Design Vehicle			Control Vehicle							
Primary Functional Classification			Urban Minor Arterial			Design Speed (mph)	35			
Secondary Functional Classification (if app.)						Target Speed (mph) [if app.]				
Approach #1	Direction	Northbound		Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes		
	Sidewalks along:	Both sides of the approach		Left-Turn	1					
	Crosswalk on Approach?	Yes		Left-Through		Weekday AM Peak		Weekday PM Peak		
	On-Street Bike Facilities?	Yes		Through	1	Left	1,203	Left	913	
	Multi-Use Path?	No		Left-Through-Right		Through	334	Through	411	
	Scheduled Bus Service?	No		Through-Right		Right	52	Right	52	
	Bus Stop on Approach?	No		Right-Turn		Daily Truck %		2.0%		
Approach #2	Direction	Southbound		Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes		
	Sidewalks along:	One side of the approach		Left-Turn	1					
	Crosswalk on Approach?	No		Left-Through		Weekday AM Peak		Weekday PM Peak		
	On-Street Bike Facilities?	No		Through	1	Left	20	Left	25	
	Multi-Use Path?	No		Left-Through-Right		Through	182	Through	469	
	Scheduled Bus Service?	No		Through-Right		Right	85	Right	130	
	Bus Stop on Approach?	No		Right-Turn		Daily Truck %		2.0%		
Approach #3	Direction			Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes		
	Sidewalks along:			Left-Turn						
	Crosswalk on Approach?			Left-Through		Weekday AM Peak		Weekday PM Peak		
	On-Street Bike Facilities?			Through		Left		Left		
	Multi-Use Path?			Left-Through-Right		Through		Through		
	Scheduled Bus Service?			Through-Right		Right		Right		
	Bus Stop on Approach?			Right-Turn		Daily Truck %				

Crash History (Existing Intersections Only)
Append the most recent five-years of crash data for the intersection from the CAR System. If the crash data evidences any issues relating to safety performance, discuss briefly here:

Control Strategy Evaluation								
Provide a brief justification as to why each of the following control strategies should be advanced or not. Justification should consider potential environmental impacts.								
Control Strategy	CAP-X Outputs				SPICE Outputs		Strategy to be Advanced?	Justification
	V/C Ratio		Ped Accom. Score	Bike Accom. Score	Crash Prediction Rank	SSI Rank		
	Weekday AM Peak	Weekday PM Peak						
Signalized Control	1.06	1.34	5.02	4.62	1	2	Yes	High scores for ped and bike accommodations, acceptable V/C ratio.
Roundabout (2-lane)	1.33	1.50	4.87	4.50	2	1	Yes	High scores for ped and bike accommodations, acceptable V/C ratio.

Resolution						
<i>To be filled out by FDOT District Traffic Operations Engineer and District Design Engineer</i>						
Project Determination						
Comments						
DTE Name			Signature		Date	
DDE Name			Signature		Date	

**Florida Department of Transportation
Intersection Control Evaluation (ICE) Form**

Intersection Control Evaluation Form 750-010-30

Stage 2: Initial Control Strategy Assessment

To fulfill the requirements of Stage 2 (Intersection Control Strategy) of FDOT's ICE procedures, complete the following form and append all supporting documentation. Completed forms are to be submitted to the District Traffic Operations Engineer (DTOE) and District Design Engineer (DDE) for the project's approval.

Project Name	IcCulloch Rd at N Tanner Rd / Old Lockwood Rd	FDOT Project #		Date	01/09/24
Submitted By	Scott Bickar and Robert Watson	Agency/Company	Dewberry Engineers Inc.	Email	
List all viable intersection control strategies identified in Stage 1 (Screening):					
Signalized Control		Roundabout (2-lane)			

Operational Analyses									
Summarize the results of the peak hour analysis performed for each control strategy. Select analysis year based on guidance in the ICE procedures document. Refer to Exhibit 19-8 of the <i>Highway Capacity Manual, 6th Edition</i> (HCM6) to determine the appropriate LOS based on intersection delay (<i>hover over this cell for Exhibit 19-8</i>).									
Design Vehicle					Control Vehicle				
Opening Year	2028								
Control Strategy	Peak Hour		Weekday AM Peak	Peak Hour		Weekday PM Peak	Peak Hour		
	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated?
Signalized Control	B	18.3	Yes	B	12.7	Yes			
Roundabout (2-lane)	B	11.2	Yes	B	13.9	Yes			
Design Year	2048								
Control Strategy	Peak Hour		Weekday AM Peak	Peak Hour		Weekday PM Peak	Peak Hour		
	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated?
Signalized Control	C	23.1	Yes	D	36.6	Yes			
Roundabout (2-lane)	F	134.5	No	F	176.6	No			
Provide any additional discussion necessary regarding the results of the operational analysis:									

Safety Performance							
Enter the most recent five (5) years of crash data from the CAR System.				Most recent year of crash data available			2022
Crash Type		2018	2019	2020	2021	2022	Total
Combined	Total						
	Fatal/Injury						
	PDO						
Single-Vehicle	Total	1	0	0	1	0	2
	Fatal/Injury	1	0	0	0	0	1
	PDO	0	0	0	1	0	1
Multi-Vehicle	Total	9	9	4	10	12	44
	Fatal/Injury	4	1	1	4	5	15
	PDO	5	8	3	6	7	29
Vehicle-Pedestrian	Fatal/Injury	1	0	0	0	0	1
Vehicle-Bicycle	Fatal/Injury	0	0	0	0	0	0
Total	All	11	9	4	11	12	47

Apply the FDOT SPICE Tool to model anticipated safety performance of each control strategy. For intersection types not accommodated in the tool, manually apply crash modification factors detailed in the ICE procedures document or qualitatively describe anticipated safety impacts.

Control Strategy	Anticipated Impact on Safety Performance	Opening Year			Design Year		
		Predicted Total Crashes	Predicted Fatal+Injury Crashes	SSI Score	Predicted Total Crashes	Predicted Fatal+Injury Crashes	SSI Score
Signalized Control	Lower total crashes and lower fatalities/injuries compared to the roundabout.	3.83	1.30	97	7.39	2.53	91
Roundabout (2-lane)	Higher total crashes and higher fatalities/injuries compared to the signalized intersection.	9.49	1.68	99	17.49	3.29	97

Costs and Benefit/Cost Ratios						
Remaining cognizant of the current level of detail of each control strategy's conceptual design, provide a cost estimate for each. You may want to include costs for preliminary engineering, required right-of-way acquisitions, construction, and a contingency. Apply the FDOT ICE Tool to determine the delay benefit-cost ratio (B/C), safety B/C, overall B/C, and net-present value for each control strategy.						
Control Strategy	ROW Costs (\$)	Construction Costs (\$)	FDOT ICE Tool Outputs			
			Delay B/C	Safety B/C	Overall B/C	Net Present Value
Signalized Control	\$0	\$1,943,000	34.81	4.63	39.44	\$26,223,431
Roundabout (2-lane)	\$0	\$1,286,000				

Multimodal Accommodations			
Note the existing/anticipated level of pedestrian/bicyclist activity at the study intersection during a typical day. After filling in the daily number of pedestrians crossing, the activity level field will auto-populate.			
Daily # of peds. crossing (all approaches):	240	Pedestrian Volume by Activity Level	
Daily # of bicyclists crossing (all approaches):		Med Low (240 ≤ peds/day < 700)	
Summarize the ability of each viable control strategy to accommodate the existing/anticipated level of:			
Control Strategy	Pedestrians and Bicyclists	Transit Services	Freight Needs
Signalized Control			
Roundabout (2-lane)			

Environmental, Utility, and Right-of-Way Impacts	
Summarize any issues related to environmental, utility, or right-of-way (including relocation) impacts specific to each control strategy. Be sure to consider the NEPA requirements for each control type.	
Signalized Control	Less delay, less pollution.
Roundabout (2-lane)	More space needed, more environmental, utility, and right-of-way impacts.

Public Input/Feedback (if appropriate)
Summarize any agency or public input regarding the control strategies:

Control Strategy Evaluation		
Provide a brief justification as to why each of the following is either viable or not viable. If a single control strategy is recommended, select it as the only strategy to be advanced.		
Control Strategy	Strategy to be Advanced?	Justification
Signalized Control	Yes	Acceptable LOS through the design year of 2048. Lower environmental and right-of-way impacts and less crashes/fatalities than the roundabout.
Roundabout (2-lane)	No	LOS of F in design year. More crashes/fatalities and higher costs compared to signal.

Resolution				
<i>To be filled out by FDOT District Traffic Operations Engineer and District Design Engineer</i>				
Project Determination				
Comments				
DTOE Name		Signature		Date
DDE Name		Signature		Date