

TRANSPORTATION IMPACT ANALYSIS

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APPENDIX A

Level of Service Descriptions and LOS Tables

**LEVEL OF SERVICE (LOS) DESCRIPTION
UNSIGNALIZED INTERSECTIONS WITH TWO-WAY STOP CONTROL (TWSC)**

TWSC intersections are widely used and stop signs are used to control vehicle movements at such intersections. At TWSC intersections, the stop-controlled approaches are referred to as the minor street approaches; they can be either public streets or private driveways. The intersection approaches that are not controlled by stop signs are referred to as the major street approaches. A three-leg intersection is considered to be a standard type of TWSC intersection if the single minor street approach (i.e. the stem of the T configuration) is controlled by a stop sign. Three-leg intersections where two of the three approaches are controlled by stop signs are a special form of unsignalized intersection control.

At TWSC intersections, drivers on the controlled approaches are required to select gaps in the major street flow through which to execute crossing or turning maneuvers on the basis of judgement. In the presence of a queue, each driver on the controlled approach must use some time to move into the front-of-queue position and prepare to evaluate gaps in the major street flow. Capacity analysis at TWSC intersections depends on a clear description and understanding of the interaction of drivers on the minor or stop-controlled approach with drivers on the major street. Both gap acceptance and empirical models have been developed to describe this interaction.

Thus, the capacity of the controlled legs is based on three factors:

- the distribution of gaps in the major street traffic stream,;
- driver judgement in selecting gaps through which to execute the desired maneuvers; and
- the follow-up time required by each driver in a queue.

The delay experienced by a motorist is made up of a number of factors that relate to control, geometrics, traffic and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions, in the absence of incident, control, traffic or geometric delay. Average control delay for any particular minor movement is a function of the capacity of the approach and the degree of saturation and referred to as level of service.

LEVEL OF SERVICE (LOS) CRITERIA FOR TWSC INTERSECTIONS
(Reference Highway Capacity Manual 2000)

Level of Service	Control Delay (seconds / vehicle)
A	0 - 10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

LEVEL OF SERVICE (LOS) DESCRIPTION UNSIGNALIZED INTERSECTIONS WITH ALL-WAY STOP CONTROL (AWSC)

AWSC intersections require every vehicle to stop at the intersection before proceeding. Since each driver must stop, the judgement as to whether to proceed into the intersection is a function of traffic conditions on the other approaches. While giving priority to the driver on the right is a recognized rule in some areas, it is not a good descriptor of actual intersection operations. What happens is the development of a consensus of right-of-way that alternates between the drivers on the intersection approaches, a consensus that depends primarily on the intersection geometry and the arrival patterns at the stop line.

If no traffic is present on the other approaches, a driver can proceed immediately after the stop is made. If there is traffic on one or more of the other approaches, a driver proceeds only after determining that there are no vehicles currently in the intersection and that it is the driver's turn to proceed. Since no traffic signal controls the stream movement or allocates the right-of-way to each conflicting stream, the rate of departure is controlled by the interaction between the traffic streams themselves.

For AWSC intersections, the average control delay (in seconds per vehicle) is used as the primary measure of performance. Control delay is the increased time of travel for a vehicle approaching and passing through an AWSC intersection, compared with a free-flow vehicle if it were not required to slow down or stop at the intersection.

The criteria for AWSC intersections have different threshold values than do those for signalized intersections, primarily because drivers expect different levels of performance from different kinds of traffic control devices (i.e traffic signals, two way stop or all way stop, etc.). The expectation is that a signalized intersection is designed to carry higher traffic volumes than an AWSC intersection and a higher level of control delay is acceptable at a signalized intersection for the same LOS.

For AWSC analysis using the HCM 2000 method, the LOS shown reflects the weighted average of the delay on each of the approaches.

LEVEL OF SERVICE (LOS) CRITERIA FOR AWSC INTERSECTIONS (Reference Highway Capacity Manual 2000)

Level of Service	Control Delay (seconds / vehicle)
A	0 - 10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

LEVEL OF SERVICE (LOS) DESCRIPTION SIGNALIZED INTERSECTIONS

The capacity of an urban street is related primarily to the signal timing and the geometric characteristics of the facility as well as to the composition of traffic on the facility. Geometrics are a fixed characteristic of a facility. Thus, while traffic composition may vary somewhat over time, the capacity of a facility is generally a stable value that can be significantly improved only by initiating geometric improvements. A traffic signal essentially allocates time among conflicting traffic movements that seek to use the same space. The way in which time is allocated significantly affects the operation and the capacity of the intersection and its approaches.

The methodology for signalized intersection is designed to consider individual intersection approaches and individual lane groups within approaches. A lane group consists of one or more lanes on an intersection approach. The outputs from application of the method described in the HCM 2000 are reported on the basis of each lane. For a given lane group at a signalized intersection, three indications are displayed: green, yellow and red. The red indication may include a short period during which all indications are red, referred to as an all-red interval and the yellow indication forms the change and clearance interval between two green phases.

The methodology for analyzing the capacity and level of service must consider a wide variety of prevailing conditions, including the amount and distribution of traffic movements, traffic composition, geometric characteristics, and details of intersection signalization. The methodology addresses the capacity, LOS, and other performance measures for lane groups and the intersection approaches and the LOS for the intersection as a whole.

Capacity is evaluated in terms of the ratio of demand flow rate to capacity (v/c ratio), whereas LOS is evaluated on the basis of control delay per vehicle (in seconds per vehicle). The methodology does not take into account the potential impact of downstream congestion on intersection operation, nor does the methodology detect and adjust for the impacts of turn-pocket overflows on through traffic and intersection operation.

LEVEL OF SERVICE (LOS) CRITERIA FOR SIGNALIZED INTERSECTIONS (Reference Highway Capacity Manual 2000)

Level of Service	Control Delay (seconds / vehicle)
A	<10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Grass Valley SOI Area

Intersection Level of Service Summary

SIGNALIZED INTERSECTIONS

N-S Street	E-W Street	Existing Intersection Control	LOS Threshold	Existing Condition			Existing + Background			Existing + Background + Project			Cumulative			Cumulative + Project			
				PM Peak Hour			PM Peak Hour			PM Peak Hour			PM Peak Hour			PM Peak Hour			
				V/C Ratio	Delay (Secs.)	LOS	V/C Ratio	Delay (Secs.)	LOS	V/C Ratio	Delay (Secs.)	LOS	V/C Ratio	Delay (Secs.)	LOS	V/C Ratio	Delay (Secs.)	LOS	
1	Nevada City Highway	Brunswick Road	Signal	Grass Valley LOS D	0.51	27.4	C	0.54	28.0	C	0.55	28.3	C	0.74	59.2	E	0.77	62.3	E
					<i>Mitigation: Modify Signal Timing</i>			0.76	41.8	D									
2	SR 20-49 SB Ramps	Brunswick Road	Signal	Caltrans LOS C/D	0.69	21.8	C	0.74	25.1	C	0.76	27.2	C	0.77	49.7	D	0.79	53.5	D
3	SR 20-49 NB Ramps	Brunswick Road	Signal	Caltrans LOS C/D	0.48	16.9	B	0.56	17.6	B	0.61	18.1	B	0.99	39.8	D	1.04	47.8	D
4	Sutton Way	Brunswick Road	Signal	Grass Valley LOS D	0.69	26.7	C	0.78	34.8	C	0.81	37.1	D	0.85	39.3	D	0.91	42.0	D
8	SR 49 SB Ramps	McKnight Way	Signal	Grass Valley LOS D	0.59	21.4	C	0.65	23.1	C	0.68	23.6	C	0.86	29.1	C	0.89	30.7	C
					<i>Mitigation: Roundabout</i>			0.73	13.7	B	0.74	14.2	B						
9	SR 49 NB Ramps	McKnight Way	Signal	Grass Valley LOS D	0.60	25.4	C	0.65	28.5	C	0.67	30.5	C	0.77	58.0	E	0.80	67.5	E
					<i>Mitigation: Roundabout Installed w/ Int #5,7,8,10</i>			0.60	9.1	A	0.77	16.9	C	0.79	18.3	C			

UNSIGNALIZED INTERSECTIONS

N-S Street	E-W Street	Existing Intersection Control	LOS Threshold	Existing Condition			Existing + Background			Existing + Background + Project			Cumulative			Cumulative + Project		
				PM Peak Hour			PM Peak Hour			PM Peak Hour			PM Peak Hour			PM Peak Hour		
				V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS
5	Brunswick Road	Idaho Maryland Road	Stop Sign (EB & WB) (Worst Approach)	Grass Valley LOS D	7.4	A	1915.5	F	1948.5	F	1788.3	F	1820.5	F				
					73.5	F	error	F	error	F	error	F						
<i>Mitigation: Roundabout Installed w/ Int #7,8,9,10</i>			0.48	7.9	A	0.51	8.3	A	0.61	10.6	B	0.64	11.2	B				
6	McCourtney Road	Personeni Road	Signal	Grass Valley LOS D	0.1	A	0.1	A	0.1	A	1.2	A	1.3	A				
					13.6	B	13.7	B	13.8	B	19.4	C	20.3	C				
7	Taylorville Road	McKnight Way	Stop Sign (2-way) (Worst Approach)	Grass Valley LOS D	0.4	A	0.4	A	0.4	A	0.5	A	0.5	A				
					14.2	B	15.5	C	15.5	C	18.3	C	18.4	C				
<i>Mitigation: Roundabout Installed w/ Int #5,8,9,10</i>			0.73	13.7	B	0.74	14.2	B										
10	La Barr Meadows Road	McKnight Way	Stop Sign (3-way) (Worst Approach)	Grass Valley LOS D	22.5	C	29.4	D	37.9	E	219.5	F	241.5	F				
					29.5	D	41.3	E	57.0	F	305.4	F	325.3	F				
<i>Mitigation: Roundabout Installed w/ Int #5,7,8,9</i>			0.60	9.1	A	0.77	16.9	C	0.79	18.3	C							
20	Brunswick Road	Town Talk Rd Driveway to Site 7, 8	Stop Sign (EB) (Worst Approach)	Grass Valley LOS D			0.5	A	2.2	A	0.7	A	4.9	A				
							20.3	C	20.3	C	45.9	E	48.2	E	148.5	F		
Meets Signal Warrant?								No	No	No	0.85	14.8	B					
			0.85	14.8	B	Yes	Yes											
21	Brunswick Road	Triple Crown Driveway to Site 3-6 & 9	Stop Sign (WB) (Worst Approach)	Grass Valley LOS D			3.9	A	32.0	D	17.9	C	441.9	F				
							61.6	F	448.8	F	428.3	F	7522.2	F				
<i>Mitigation: Signalize</i>			0.72	11.0	B	0.85	14.8	B										
Meets Signal Warrant?					No	Yes	No	Yes										
22	McCourtney Road	Driveway to Site 1	Stop Sign (WB) (Worst Approach)	Grass Valley LOS D			0.5	A	1.1	A	0.4	A	1.1	A				
							11.5	B	12.0	B	27.0	D	30.4	D				
27	Brunswick Road	Loma Rica Road	Stop Sign (WB) (Worst Approach)	Grass Valley LOS D	5.5	A	7.8	A	8.2	A	15.5	C	17.2	C				
					18.0	C	25.5	D	27.3	D	57.3	F	64.3	F				
<i>Mitigation: Signalize</i>			17.8	B	18.2	B												
Meets Signal Warrant?			Yes	Yes														

- NOTES:
- NB, SB, EB, WB = Northbound, Southbound, Eastbound, Westbound
 - Analysis performed using ICU methodologies for signalized intersections and HCM 2000 methodologies for unsignalized intersections.
 - Overall level of service standard for the Grass Valley is LOS D. Overall level of service standard for Caltrans is the LOS C/D threshold.
 - Intersection improvements are highlighted.
 - The overall delay for some intersections actually decreases with the addition of background and project trips. The reduction in delay occurs because the "intersection delay" is the weighted average of all approaches. When traffic volumes increase for an approach that has a free movement (zero delay) or very low delay, the "intersection delay" decreases.
 - The asterisk (*) indicates that the delay was beyond the capabilities of Synchro.

Yellow : Deficient LOS
 Red : Project Impact

Penn Valley Area Intersection Level of Service Summary

SIGNALIZED INTERSECTIONS

N-S Street	E-W Street	Existing Intersection Control	LOS Threshold	Existing Condition			Existing + Background			Existing + Background + Project			Cumulative			Cumulative + Project			
				PM Peak Hour			PM Peak Hour			PM Peak Hour			PM Peak Hour			PM Peak Hour			
				V/C Ratio	Delay (Secs.)	LOS	V/C Ratio	Delay (Secs.)	LOS	V/C Ratio	Delay (Secs.)	LOS	V/C Ratio	Delay (Secs.)	LOS	V/C Ratio	Delay (Secs.)	LOS	
11	Pleasant Valley Road	SR-20	Signal	Caltrans LOS C/D	0.58	23.8	C	0.61	25.3	C	0.62	25.5	C	0.63	26.6	C	0.65	28.0	C
13	Penn Valley Drive	SR-20	Signal	Caltrans LOS C/D	0.52	17.7	B	0.56	17.4	B	0.65	22.0	C	0.62	19.7	B	0.71	26.0	C

UNSIGNALIZED INTERSECTIONS

N-S Street	E-W Street	Existing Intersection Control	LOS Threshold	Existing Condition			Existing + Background			Existing + Background + Project			Cumulative			Cumulative + Project			
				PM Peak Hour			PM Peak Hour			PM Peak Hour			PM Peak Hour			PM Peak Hour			
				V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS	
12	Cattle Drive	SR-20	Stop Sign (SB) (Worst Approach)	Caltrans LOS C/D	1.0	27.6	A D	1.0	29.3	A D	1.0	31.2	A D	1.5	32.9	A D	1.5	34.9	A D
14	Spenceville Road	Penn Valley Drive	Stop Sign (3-way) (Worst Approach)	Nevada County LOS C	10.2	10.5	B B	10.6	11.1	B B	13.3	14.8	B B	11.8	12.6	B B	15.5	18.2	C C
23	Driveway to Site 10,11, 13	Penn Valley Drive	Stop Sign (SB) (Worst Approach)	Nevada County LOS C	0.0	0.0	A A	0.5	10.9	A B	2.3	13.2	A B	0.5	11.0	A B	2.3	13.4	A B
24	Driveway to Site 12	Penn Valley Drive	Stop Sign (NB) (Worst Approach)	Nevada County LOS C	1.4	9.7	A A	1.4	9.7	A A	1.4	10.0	A B	1.4	9.7	A A	1.5	10.2	A B

NOTES:

1. NB, SB, EB, WB = Northbound, Southbound, Eastbound, Westbound
2. Analysis performed using ICU methodologies for signalized intersections and HCM 2000 methodologies for unsignalized intersections.
3. Overall level of service standard for Nevada County is LOS C. Overall level of service standard for Caltrans is the LOS C/D threshold.
4. Intersection improvements are highlighted.
5. The overall delay for some intersections actually decreases with the addition of background and project trips. The reduction in delay occurs because the "intersection delay" is the weighted average of all approaches. When traffic volumes increase for an approach that has a free movement (zero delay) or very low delay, the "intersection delay" decreases.
6. The asterisk (*) indicates that the delay was beyond the capabilities of Synchro.

Lake of the Pines Area Intersection Level of Service Summary

SIGNALIZED INTERSECTIONS

N-S Street	E-W Street	Existing Intersection Control	LOS Threshold	Existing Condition			Existing + Background			Existing + Background + Project			Cumulative			Cumulative + Project		
				PM Peak Hour			PM Peak Hour			PM Peak Hour			PM Peak Hour			PM Peak Hour		
				V/C Ratio	Delay (Secs.)	LOS	V/C Ratio	Delay (Secs.)	LOS	V/C Ratio	Delay (Secs.)	LOS	V/C Ratio	Delay (Secs.)	LOS	V/C Ratio	Delay (Secs.)	LOS
16	SR-49 Combie Road	Signal <i>Mitigation: Add 1 SBL Lane</i>	Caltrans LOS C/D	0.72	31.5	C	0.99	98.6	F	1.02	105.9	F	1.14	121.1	F	1.15	136.3	F
							0.78	33.9	C	0.80	35.0	C	0.90	44.2	D	0.92	47.2	D
18	Hacienda Drive	Combie Road <i>Mitigation: Add 1 SBR Lane</i>	Nevada County LOS C	0.68	25.7	C	0.81	33.0	C	0.82	33.7	C	0.86	39.8	D	0.86	39.9	D

UNSIGNALIZED INTERSECTIONS

N-S Street	E-W Street	Existing Intersection Control	LOS Threshold	Existing Condition			Existing + Background			Existing + Background + Project			Cumulative			Cumulative + Project		
				PM Peak Hour			PM Peak Hour			PM Peak Hour			PM Peak Hour			PM Peak Hour		
				V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS	V/C Ratio	Delay (sec)	LOS
15	SR-49	Cameo Drive Stop Sign (WB) (Worst Approach)	Caltrans LOS C/D	0.1	16.3	A	0.2	24.2	A	0.3	27.1	A	0.3	34.2	A	0.4	34.4	A
17	Rosewood / Armstrong Road	Combie Road Stop Sign (NB & SB) (Worst Approach) <i>Mitigation: Signalize Meets Signal Warrants?</i>	Nevada County LOS C	3.4	53.2	A	12.8	444.5	B	15.6	615.2	C	63.9	1979.0	F	484.0	4689.5	F
							0.67	12.0	B	0.68	12.3	B	0.76	14.8	B	0.77	15.2	B
19	SR-49	Woodridge Drive Stop Sign (WB) (Worst Approach) <i>Meets Signal Warrant?</i>	Caltrans LOS C/D	0.0	23.0	A	1.8	26.3	A	1.9	27.7	A	2.9	44.6	A	3.1	48.1	A
26	Driveway to Site 18	Combie Road Stop Sign (NB) (Worst Approach)	Nevada County LOS C				2.7	8.6	A	4.0	8.7	A	2.3	8.6	A	3.7	8.7	A
28	Higgins Road	Combie Road Stop Sign (NB & SB) (Worst Approach) <i>Mitigation: Signalize & Add 1 EBT Lane Meets Signal Warrants?</i>	Nevada County LOS C	2.5	20.8	A	68.6	313.2	F	1085.5	5137.4	F	126.1	566.9	F	138.1	630.9	F
							0.80	24.3	C	0.81	25.0	C	0.91	31.2	C	0.92	32.8	C

NOTES:

- NB, SB, EB, WB = Northbound, Southbound, Eastbound, Westbound
- Analysis performed using ICU methodologies for signalized intersections and HCM 2000 methodologies for unsignalized intersections.
- Overall level of service standard for Nevada County is LOS C. Overall level of service standard for Caltrans is the LOS C/D threshold.
- Intersection improvements are highlighted.
- The overall delay for some intersections actually decreases with the addition of background and project trips. The reduction in delay occurs because the "intersection delay" is the weighted average of all approaches. When traffic volumes increase for an approach that has a free movement (zero delay) or very low delay, the "intersection delay" decreases.
- The asterisk (*) indicates that the delay was beyond the capabilities of Synchro.

Yellow : Deficient LOS
Red : Project Impact

APPENDIX B

Existing Transit Routes

General Information

Gold Country Stage provides regularly scheduled fixed route bus service to Grass Valley, Nevada City and surrounding communities. Regional service is available to Auburn. Our main Transit Center transfer hub is located at Tinley and Bank Streets in Grass Valley.

This guide has been prepared to help you use Gold Country Stage for your transportation needs. We are committed to providing safe, courteous, convenient and reliable transit service, and to make your ride comfortable and enjoyable. Thank you for riding Gold Country Stage!

Days & Hours of Bus Service

Currently Gold Country Stage routes run Monday through Friday and there is no Saturday or Sunday service. If weekend service is available in the future, a supplemental schedule will be added to the Riders Guide. Please check individual routes for specific time schedules.

Times indicated in **BOLD** are PM.

No service is provided on:

- New Year's Day
- Martin Luther King's Birthday
- President's Day
- Memorial Day
- Independence Day
- Labor Day
- Veteran's Day
- Thanksgiving Day
- Day after Thanksgiving
- Christmas Day

Wheelchair Lifts & Bike Racks

All Gold Country Stage buses are equipped with accessible wheelchair lifts and employ tie downs. All Gold Country Stage buses are equipped with front-mounted bike racks, available on a first-come, first-served basis. Passengers must be able to load and unload their bikes without assistance and Gold Country Stage is not responsible for damage to bicycles. Lost bicycles will be locked and stored at the Gold Country Stage office and must be claimed within 30 days. (See Lost & Found information.)

Transit Connections

Gold Country Stage Route 5 travels to the Auburn Station for connections to Placer County Transit, Auburn Transit, Sacramento Light Rail, and Amtrak. Through bus service **IS CONNECTING SCHEDULES ALLOW!** (Amtrak schedules subject to change without notification.) Please call these transportation services for current schedule information. Placer County Transit.....(800) 889-2877 or (530) 885-2877 Auburn Transit.....(530) 906-3700 Amtrak.....(800) 872-7245

Rider's Guide

- System Map
- Bus Schedules
- General Information

Office Hours:
8:00 AM to 5:00 PM
Monday through Friday

Office Site: 13081 John Bauer Avenue
Grass Valley, CA 95945

Mailing Address: 950 Maidu Avenue
Nevada City, CA 95959

(530) 477-0103 x 0
(888) 660-7433

TDD # (530) 271-2107

www.goldcountrystage.com

(e-mail) goldcountrystage@co.nevada.ca.us

EFFECTIVE: SEPTEMBER 10, 2012

"BE LIKE US...RIDE THE BUS!"

ROUTE 1 NEVADA CITY

Grass Valley to Nevada City

Tinley St Transit Center @ Bank St (Depart)	East Main Street & Grass Valley City Hall	East Main Street & Idaho-Maryland	Chapel Drive & Jefferies Drive	Nevada City Hwy Fowler Center	Howe Hollow Rd. @ ON DEMAND	Zion Street & Anquil Seven Hills	Grass Street Bridge & Union Street	Nevada Street & Willow Valley Rd @ ON DEMAND	County Government Center (Arrive)
7:00	7:02	7:04	7:08	7:12	7:15	7:17	7:20	7:27	7:27
8:00	8:02	8:04	8:08	8:12		8:17	8:20	8:23	8:27
9:00	9:02	9:04	9:08	9:12	9:15	9:17	9:20	9:27	9:27
10:00	10:02	10:04	10:08	10:12		10:17	10:20	10:27	10:27
11:00	11:02	11:04	11:08	11:12		11:17	11:20	11:27	11:27
12:00	12:02	12:04	12:08	12:12		12:17	12:20	12:23	12:27
1:00	1:02	1:04	1:08	1:12		1:17	1:20	1:27	1:27
2:00	2:02	2:04	2:08	2:12		2:17	2:20	2:27	2:27
3:00	3:02	3:04	3:08	3:12	3:15	3:17	3:20	3:27	3:27
4:00	4:02	4:04	4:08	4:12		4:17	4:20	4:23	4:27
5:00	5:02	5:04	5:08	5:12	5:15	5:17	5:20	5:27	5:27
6:00	6:02	6:04	6:08	6:12		6:17	6:20	6:23	6:27

ROUTE 1 GRASS VALLEY

Nevada City to Grass Valley (Arrive)

County Government Center (Depart)	Broad Street @ National Hotel	Zion Street & Seven Hills	Nevada City Hwy Fowler Center	Dorsey Drive & Jefferies Drive	East Main Street & Central Street	Tinley St Transit Center @ Bank St (Arrive)
6:30	6:34	6:37	6:44	6:47	6:49	6:51
7:30	7:34	7:37	7:44	7:47	7:49	7:51
8:30	8:34	8:37	8:44	8:47	8:49	8:51
9:30	9:34	9:37	9:44	9:47	9:49	9:51
10:30	10:34	10:37	10:44	10:47	10:49	10:51
11:30	11:34	11:37	11:44	11:47	11:49	11:51
12:30	12:34	12:37	12:44	12:47	12:49	12:51
1:30	1:34	1:37	1:44	1:47	1:49	1:51
2:30	2:34	2:37	2:44	2:47	2:49	2:51
3:30	3:34	3:37	3:44	3:47	3:49	3:51
4:30	4:34	4:37	4:44	4:47	4:49	4:51
5:30	5:34	5:37	5:44	5:47	5:49	5:51

Route 1 serves New Mohawk Rd. and Nevada St. (on times indicated) as ON-DEMAND stops only. (SHADED AREAS)

Please see ON-DEMAND instructions under the "How To Ride The Bus" section of the Rider's Guide

* Route 3 continues onto Route 2 at Tinley Transit Center at 7:30am, 9:30am, 11:30am, 2:30pm, 4:30pm, and 4:30pm.
► Route 3 continues to Loma Rica stops at 8:25am, 10:25am, 12:25pm, 1:25pm, 3:25pm, and 5:25pm.
Route 3 serves Butler Street, Fairgrounds Gate 3 & Railroad Avenue as ON-DEMAND ONLY (SHADED AREAS) Please see specific route schedules and ON-DEMAND instructions in the "How To Ride The Bus" section.

ROUTE 2 RIDGE ROAD

Grass Valley to Ridge Road 'Loop' Back to Grass Valley

Tinley St Transit Center @ Bank St (Depart)	Alta Street & Ridge Road	Hughes Road & Rockwood	East Main St. (Pre-Demand Stop)	Sierra College Drive	Ridge Road & Veneta	Sierra Dr. - NU	Alta Street Drive (Bishop Ranch)	Ridge Road & Morgan Ranch Drive	City Hall	Tinley St Transit Center @ Bank St (Arrive)
7:30	7:34	7:36	7:38	7:40	7:42	7:45	7:47	7:49	7:53	7:55
9:30	9:34	9:36	9:38	9:40	9:42	9:45	9:47	9:49	9:53	9:55
11:30	11:34	11:36	11:38	11:40	11:42	11:45	11:47	11:49	11:53	11:55
2:30	2:34	2:36	2:38	2:40	2:42	2:45	2:47	2:49	2:53	2:55
4:30	4:34	4:36	4:38	4:40	4:42	4:45	4:47	4:49	4:53	4:55

The Route 2 bus continues onto Route 3 at Tinley St. Transit Center @ Bank St. (see specific route schedules)

ROUTE 3 GRASS VALLEY LOOP

Tinley St Transit Center @ Bank St (Depart)	Downtown Salween Main Street	Church & Neal Street	Brighton Street & Milne Park	Butler Street	Fairgrounds Gate 3 - ON DEMAND	Enterprise Gate 3 - ON DEMAND	Rice Creek Shopping Center	Grass Valley Shopping Center	Whiting Street (Church & Chert)	Colfax Avenue & Ophir Street	Tinley St Transit Center @ Bank St (Arrive)
7:00	7:03	7:05	7:09	7:10	7:11	7:13	7:16	7:20	7:23	7:25	
8:00	8:03	8:05	8:09	8:10	8:11	8:13	8:16	8:20	8:23	8:25	
9:00	9:03	9:05	9:09	9:10	9:11	9:13	9:16	9:20	9:23	9:25	
10:00	10:03	10:05	10:09	10:10	10:11	10:13	10:16	10:20	10:23	10:25	
11:00	11:03	11:05	11:09	11:10	11:11	11:13	11:16	11:20	11:23	11:25	
12:00	12:03	12:05	12:09	12:10	12:11	12:13	12:16	12:20	12:23	12:25	
1:00	1:03	1:05	1:09	1:10	1:11	1:13	1:16	1:20	1:23	1:25	
2:00	2:03	2:05	2:09	2:10	2:11	2:13	2:16	2:20	2:23	2:25	
3:00	3:03	3:05	3:09	3:10	3:11	3:13	3:16	3:20	3:23	3:25	
4:00	4:03	4:05	4:09	4:10	4:11	4:13	4:16	4:20	4:23	4:25	
5:00	5:03	5:05	5:09	5:10	5:11	5:13	5:16	5:20	5:23	5:25	

ROUTE 3 GRASS VALLEY to Loma Rica

East Main St. Grass Valley City Hall	Richard Avenue - ON DEMAND	Crown Point Circle	Whispering Pines Loma Rica	Loma Rica Dr. (PDE)	Her Co Airport, GC Stage Office (Arrive)	Nevada, CA Stage Office (Depart)	Loma Rica Dr. (PDE)	Whispering Pines Loma Rica	East Main St. & Loma Rica	Tinley St Transit Center @ Bank St (Arrive)
8:25	8:28	8:31	8:34	8:37	8:40	8:41	8:42	8:45	8:50	8:53
10:25	10:28	10:31	10:34	10:37	10:40	10:41	10:42	10:45	10:50	10:53
12:25	12:28	12:31	12:34	12:37	12:40	12:41	12:42	12:45	12:50	12:53
1:25	1:28	1:31	1:34	1:37	1:40	1:41	1:42	1:45	1:50	1:53
3:25	3:28	3:31	3:34	3:37	3:40	3:41	3:42	3:45	3:50	3:53
5:25	5:28	5:31	5:34	5:37	5:40	5:41	5:42	5:45	5:50	5:53

Paratransit Services

The County of Nevada Transit Services administers a door-to-door paratransit service for persons with disabilities who are unable to use the fixed route bus system, as mandated by the Americans with Disabilities Act (ADA). The service area includes Grass Valley, Nevada City, Penn Valley, Lake Wildwood, and other local areas. The paratransit service is currently provided by Gold Country Telecare. In order to become eligible for paratransit service, a passenger must complete an ADA application form and be certified as eligible. Forms are available through Gold Country Stage (530) 477-0103, online at www.goldcountrystage.com and through Gold Country Telecare (530) 272-1710, online at www.goldcountrytelecare.org.

Reservations for paratransit trips must be made the day before the requested ride (or up to several days in advance, call Telecare for details.) There is no same day service. Reservations are made by calling Gold Country Telecare (530) 272-1710. You will be asked to make a reservation for the return trip at the same time you make your original reservation. Please contact Gold Country Telecare for current fares.

How To Ride The Bus Policies

- Please arrive at the bus stop at least five minutes before your bus is scheduled to leave.
- For passenger safety, driver is required to stop at authorized bus stops only.
- Please allow passengers to exit the bus before you board. Seats closest to the front of the bus are reserved for seniors and disabled passengers.
- **HAVE EXACT FARE READY. DRIVERS DO NOT CARRY CHANGE!**
- Please avoid using excessive amounts of coins.
- **PLEASE REQUEST TRANSFER UPON BOARDING BUS!**
- Limit **CARRY-ONS** to the size and number you can personally handle, that do not block aisles, adjacent seating, or wheelchair designated areas, and allow for safe boarding and passenger egressment.
- To ensure a pleasant ride at all, smoking, eating, drinking, playing of loud music or loud cell phone conversation is not allowed. Shirts and shoes are required.
- **ANY RE-CYCLE ITEMS MUST BE SECURED IN LEAK-PROOF BAG OR CONTAINER IF ITEMS LEAK THEY WILL BE REMOVED FROM THE BUS!**

ROUTE 4 BRUNSWICK BASIN

Grass Valley to Brunswick Basin

Tinley St Transit Center @ Bank St (Depart)	East Main St. & Grass Valley City Hall	Berrhill	Reverend & Hughes Rd - ON DEMAND	Sierra College	Lake Center - ON DEMAND	Sierra Nevada Memorial Hospital - ON DEMAND	Hospital Diagnostic Center - ON DEMAND	Shopping Center	Gold Country Shopping Center	Hospital House	Nevada City Hwy Fowler Center (Arrive)
6:30	6:32	6:34	6:39	6:43	6:45	6:47	6:49	6:53	6:55	7:00	7:06
7:30	7:32	7:34	7:39	7:43	7:45	7:47	7:49	7:53	7:55	8:00	8:06
8:30	8:32	8:34	8:39	8:43	8:45	8:47	8:49	8:53	8:55	9:00	9:06
9:30	9:32	9:34	9:39	9:43	9:45	9:47	9:49	9:53	9:55	10:00	10:06
10:30	10:32	10:34	10:39	10:43	10:45	10:47	10:49	10:53	10:55	11:00	11:06
11:30	11:32	11:34	11:39	11:43	11:45	11:47	11:49	11:53	11:55	12:00	12:06
12:30	12:32	12:34	12:39	12:43	12:45	12:47	12:49	12:53	12:55	1:00	1:06
1:30	1:32	1:34	1:37	1:39	1:43	1:45	1:47	1:49	1:53	2:00	2:06
2:30	2:32	2:34	2:37	2:39	2:43	2:45	2:47	2:49	2:53	3:00	3:06
3:30	3:32	3:34	3:37	3:39	3:43	3:45	3:47	3:49	3:53	4:00	4:06
4:30	4:32	4:34	4:37	4:39	4:43	4:45	4:47	4:49	4:53	4:55	5:00

(ON TIMES INDICATED) Route 4 serves Rockwood and Hughes Road, Lilton Drive, Sierra Nevada Memorial Hospital, and Hospital Diagnostic Center as ON-DEMAND stops only. (SHADED AREAS) Please see ON-DEMAND instructions under the "How To Ride The Bus" section of the Rider's Guide.

ROUTE 5 AUBURN - Regional Route

Grass Valley to Auburn

Sacramento & Adams Nevada City (Depart)	Tinley St Transit Center @ Bank St (Depart)	East Main St. & Grass Valley City Hall	HWY 49 & Mt. Airy - Forest Springs MHP - ON DEMAND	Alta Sierra Drive & Willow Valley Road - ON DEMAND	HWY 49 & Loma Rica Road - ON DEMAND	HWY 49 & Combe Higgins Village	Lake Center	Lake of the Pines	Alta Sierra Drive & Willow Valley Road - ON DEMAND	HWY 49 & Mt. Airy - Forest Springs MHP - ON DEMAND	HWY 49 (Dir to Hwy)	Auburn Station (Arrive)
5:50	6:00	6:02	6:10	6:15	6:18	6:24	6:28	6:40	6:42	6:50		6:50
7:00	7:02	7:04	7:10	7:15	7:18	7:24	7:28	7:40	7:42	7:50		7:50
8:00	8:02	8:04	8:10	8:15	8:18	8:24	8:28	8:40	8:42	8:50		8:50
9:00	9:02	9:04	9:10	9:15	9:18	9:24	9:28	9:40	9:42	9:50		9:50
10:00	10:02	10:04	10:10	10:15	10:18	10:24	10:28	10:40	10:42	10:50		10:50
11:00	11:02	11:04	11:10	11:15	11:18	11:24	11:28	11:40	11:42	11:50		11:50
12:00	12:02	12:04	12:10	12:15	12:18	12:24	12:28	12:40	12:42	12:50		12:50
1:00	1:02	1:04	1:10	1:15	1:18	1:24	1:28	1:40	1:42	1:50		1:50
2:00	2:02	2:04	2:10	2:15	2:18	2:24	2:28	2:40	2:42	2:50		2:50
3:00	3:02	3:04	3:10	3:15	3:18	3:24	3:28	3:40	3:42	3:50		3:50
4:00	4:02	4:04	4:10	4:15	4:18	4:24	4:28	4:40	4:42	4:50		4:50

ROUTE 5 AUBURN - Regional Route

Auburn to Grass Valley

Auburn Station (Depart)	HWY 49 (Dir to Hwy)	Professional Drive - ON DEMAND	HWY 49 & Mt. Airy - Forest Springs MHP - ON DEMAND	Lake Center	Lake of the Pines	HWY 49 & Loma Rica Road	Alta Sierra Drive & Willow Valley Road	HWY 49 & Mt. Airy - Forest Springs MHP - ON DEMAND	Tinley St Transit Center @ Bank St (Arrive)
7:00	7:08	7:10	7:18						

Legend

- Route 1
- Route 2
- Route 3 GV Loop
- Route 3 Loma Rica
- Route 4
- Route 5
- Route 6

T Transfer Point

On Demand Stop
(Symbol matches route color)

Rough & Ready

Zone 2

Zone 1

Route 6

Wildwood Center

Bitney Springs Rd

Rough & Ready Hwy

Penn Valley

Bitney Springs Rd

Zone 2

Zone 1

Rough & Ready Hwy

Squirrel Creek

ON-DEMAND Stop

Walker Dr

Butler St. ON-DEMAND Stop

Lyman Gilmore School

W Main St

6

Alta Sierra

Mountain Air MHP ON-DEMAND

Forest Springs MHP ON-DEMAND

Little Valley Rd

Alta

Sierra Dr

Little Valley Rd

49

Route 5

Lake of the Pines

Brewer Rd

Bear River High School

Combie Rd

Higgins Village

Lake Center

49

Auburn

Professional Dr. ON-DEMAND Stop

Sutter Auburn Faith Hospital

Dewitt Center (County Government Offices)

Atwood Rd

Kemper Rd

Drive-in Way

Education St

Bell Rd

Rock Creek Center

Auburn Village

New Airport Rd

Nevada St

49

Route 5

Amtrak Depot

Fulweiler Ave

Elm Ave

Nevada City

Grass Valley

Cedar Ridge

Route 1 (Red): Eric Rood Government Center, Madelyn Helling Library, Nevada City City Hall, Nevada City High School, Sierra College, Nevada County Country Club, Diagnostic Center, Grass Valley City Hall, Tinley Street Transit Center @ Bank Street, Sierra Nevada Memorial Hospital, Nevada County Country Club, Sierra College, Nevada Union High School, Nevada City High School, Fowler Center, Gold Country Center, Glenbrook Center, Nevada City Hwy, Dorsey Dr, Sutter Way, Nevada City City Hall, Nevada City High School, Sierra College, Nevada County Country Club, Diagnostic Center, Grass Valley City Hall, Tinley Street Transit Center @ Bank Street, Sierra Nevada Memorial Hospital, Nevada County Country Club, Sierra College, Nevada Union High School, Nevada City High School, Fowler Center, Gold Country Center, Glenbrook Center, Nevada City Hwy, Dorsey Dr, Sutter Way.

Route 2 (Blue): Ridge Rd, Sierra College, Nevada Union High School, Nevada City High School, Fowler Center, Gold Country Center, Glenbrook Center, Nevada City Hwy, Dorsey Dr, Sutter Way, Nevada City City Hall, Nevada City High School, Sierra College, Nevada County Country Club, Diagnostic Center, Grass Valley City Hall, Tinley Street Transit Center @ Bank Street, Sierra Nevada Memorial Hospital, Nevada County Country Club, Sierra College, Nevada Union High School, Nevada City High School, Fowler Center, Gold Country Center, Glenbrook Center, Nevada City Hwy, Dorsey Dr, Sutter Way.

Route 3 (Green): Whispering Pines Ln, HSA, Jig, Crown Point, Idaho, Maryland Rd, E Bennett Rd, John Bauer Ave, Loma Rica Dr, Gold Country Stage Office, Nevada County Airport, Gold Country Stage Office, Idaho, Maryland Rd, E Bennett Rd, John Bauer Ave, Loma Rica Dr, Gold Country Stage Office, Nevada County Airport, Gold Country Stage Office.

Route 4 (Brown): Ridge Rd, Sierra College, Nevada Union High School, Nevada City High School, Fowler Center, Gold Country Center, Glenbrook Center, Nevada City Hwy, Dorsey Dr, Sutter Way, Nevada City City Hall, Nevada City High School, Sierra College, Nevada County Country Club, Diagnostic Center, Grass Valley City Hall, Tinley Street Transit Center @ Bank Street, Sierra Nevada Memorial Hospital, Nevada County Country Club, Sierra College, Nevada Union High School, Nevada City High School, Fowler Center, Gold Country Center, Glenbrook Center, Nevada City Hwy, Dorsey Dr, Sutter Way.

Route 5 (Orange): Mckinnon Way, Pine Creek Center, Grass Valley Center, Alison Ranch Rd, Freeman Ln, Mill St, Church St, Neal St, Colfax Ave, Race St, E Empire St, Mckinnon Way, Pine Creek Center, Grass Valley Center, Alison Ranch Rd, Freeman Ln, Mill St, Church St, Neal St, Colfax Ave, Race St, E Empire St.

Route 6 (Purple): Bitney Springs Rd, Rough & Ready Hwy, Squirrel Creek, ON-DEMAND Stop, Walker Dr, Butler St. ON-DEMAND Stop, Lyman Gilmore School, W Main St, 6, Squirrel Creek, ON-DEMAND Stop, Walker Dr, Butler St. ON-DEMAND Stop, Lyman Gilmore School, W Main St.

Transfer Points (T): Nevada City City Hall, Nevada City High School, Sierra College, Nevada County Country Club, Diagnostic Center, Grass Valley City Hall, Tinley Street Transit Center @ Bank Street, Sierra Nevada Memorial Hospital, Nevada County Country Club, Sierra College, Nevada Union High School, Nevada City High School, Fowler Center, Gold Country Center, Glenbrook Center, Nevada City Hwy, Dorsey Dr, Sutter Way.

On Demand Stops (Star): Nevada St ON DEMAND Stop, New Mohawk ON DEMAND Stop, Rockwood ON DEMAND Stop Rt. 4, Diagnostic Center ON DEMAND Stop, Sierra Nevada Memorial Hospital ON DEMAND Stop No. Bound Only, Railroad Ave ON DEMAND STOP Rt. 3 Loma Rica, Butler St. ON-DEMAND Stop, Gate 3 ON DEMAND Stop, Mountain Air MHP ON-DEMAND, Forest Springs MHP ON-DEMAND, Professional Dr. ON-DEMAND Stop.

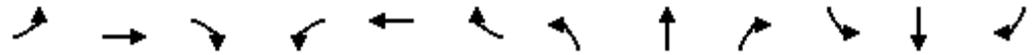


APPENDIX C

Intersection Level of Service Calculations: Existing Conditions

HCM Signalized Intersection Capacity Analysis
 1: Nevada City Highway & Brunswick Road

Existing PM Peak Hour
 1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↙	↘	↗	↖	↑	↗	↖	↘	↙
Volume (vph)	10	24	7	301	20	517	4	239	303	505	251	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	1.00	1.00	0.97	1.00	
Frbp, ped/bikes		1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.99		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1788		1698	1704	1596	1805	1881	1556	3433	1862	
Flt Permitted		0.99		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1788		1698	1704	1596	1805	1881	1556	3433	1862	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	11	26	8	324	22	556	4	257	326	543	270	1
RTOR Reduction (vph)	0	7	0	0	0	354	0	0	234	0	0	0
Lane Group Flow (vph)	0	38	0	172	174	202	4	257	92	543	271	0
Confl. Peds. (#/hr)	3					3	11		3	3		11
Heavy Vehicles (%)	0%	0%	14%	1%	5%	0%	0%	1%	2%	2%	2%	0%
Turn Type	Split	NA		Split	NA	pm+ov	Split	NA	Perm	Split	NA	
Protected Phases	6	6		8	8	4	2	2		4	4	
Permitted Phases						8			2			
Actuated Green, G (s)		16.0		13.5	13.5	32.7	25.3	25.3	25.3	19.2	19.2	
Effective Green, g (s)		16.0		13.5	13.5	32.7	25.3	25.3	25.3	19.2	19.2	
Actuated g/C Ratio		0.18		0.15	0.15	0.36	0.28	0.28	0.28	0.21	0.21	
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		317		254	255	650	507	528	437	732	397	
v/s Ratio Prot		c0.02		0.10	c0.10	0.07	0.00	c0.14		c0.16	0.15	
v/s Ratio Perm						0.06			0.06			
v/c Ratio		0.12		0.68	0.68	0.31	0.01	0.49	0.21	0.74	0.68	
Uniform Delay, d1		31.1		36.2	36.2	20.6	23.3	26.9	24.7	33.1	32.6	
Progression Factor		1.00		0.72	0.71	0.42	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.8		6.7	7.0	0.3	0.0	3.2	1.1	4.1	4.8	
Delay (s)		31.9		32.6	32.9	8.9	23.3	30.1	25.8	37.2	37.4	
Level of Service		C		C	C	A	C	C	C	D	D	
Approach Delay (s)		31.9			18.1			27.7			37.2	
Approach LOS		C			B			C			D	

Intersection Summary		
HCM 2000 Control Delay	27.4	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.51	C
Actuated Cycle Length (s)	90.0	Sum of lost time (s)
Intersection Capacity Utilization	59.0%	16.0
Analysis Period (min)	15	ICU Level of Service
c Critical Lane Group		B

HCM Signalized Intersection Capacity Analysis

2: Maltman Drive/SR 20-49 SB Ramps & Brunswick Road

Existing PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑		↖		↖	↖↖	↑	↖
Volume (vph)	0	772	60	132	583	0	48	0	317	378	60	207
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0		4.0	4.0	4.0	4.0
Lane Util. Factor		0.95		1.00	0.95		1.00		1.00	0.97	1.00	1.00
Frbp, ped/bikes		1.00		1.00	1.00		1.00		0.99	1.00	1.00	1.00
Flpb, ped/bikes		1.00		1.00	1.00		1.00		1.00	1.00	1.00	1.00
Frt		0.99		1.00	1.00		1.00		0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00		0.95		1.00	0.95	1.00	1.00
Satd. Flow (prot)		3494		1770	3610		1805		1603	3400	1881	1599
Flt Permitted		1.00		0.95	1.00		0.95		1.00	0.95	1.00	1.00
Satd. Flow (perm)		3494		1770	3610		1805		1603	3400	1881	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	839	65	143	634	0	52	0	345	411	65	225
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	47	0	0	155
Lane Group Flow (vph)	0	898	0	143	634	0	52	0	298	411	65	70
Confl. Peds. (#/hr)			9						9			
Heavy Vehicles (%)	0%	1%	13%	2%	0%	0%	0%	0%	0%	3%	1%	1%
Turn Type		NA		Prot	NA		Prot		custom	Split	NA	Perm
Protected Phases		4		3	8		2		3	6	6	
Permitted Phases									2			6
Actuated Green, G (s)		25.5		14.9	44.4		5.6		20.5	28.0	28.0	28.0
Effective Green, g (s)		25.5		14.9	44.4		5.6		20.5	28.0	28.0	28.0
Actuated g/C Ratio		0.28		0.17	0.49		0.06		0.23	0.31	0.31	0.31
Clearance Time (s)		4.0		4.0	4.0		4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0		3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		989		293	1780		112		436	1057	585	497
v/s Ratio Prot		c0.26		0.08	0.18		0.03		c0.11	c0.12	0.03	
v/s Ratio Perm									0.07			0.04
v/c Ratio		0.91		0.49	0.36		0.46		0.68	0.39	0.11	0.14
Uniform Delay, d1		31.1		34.1	14.0		40.8		31.8	24.3	22.1	22.3
Progression Factor		0.37		0.75	0.57		1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2		9.7		5.1	0.1		3.0		4.4	1.1	0.4	0.6
Delay (s)		21.2		30.8	8.0		43.8		36.2	25.4	22.5	22.9
Level of Service		C		C	A		D		D	C	C	C
Approach Delay (s)		21.2			12.2			37.2			24.3	
Approach LOS		C			B			D			C	

Intersection Summary

HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	64.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

3: SR 20-49 NB Ramps & Brunswick Road

Existing PM Peak Hour

1/9/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑↑	↘	↗
Volume (vph)	796	0	0	1291	234	315
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			0.91	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3574			5136	1805	1553
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3574			5136	1805	1553
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	829	0	0	1345	244	328
RTOR Reduction (vph)	0	0	0	0	0	58
Lane Group Flow (vph)	829	0	0	1345	244	270
Heavy Vehicles (%)	1%	0%	0%	1%	0%	4%
Turn Type	NA			NA	NA	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Actuated Green, G (s)	42.0			42.0	40.0	40.0
Effective Green, g (s)	42.0			42.0	40.0	40.0
Actuated g/C Ratio	0.47			0.47	0.44	0.44
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	1667			2396	802	690
v/s Ratio Prot	0.23			0.26	0.14	
v/s Ratio Perm						0.17
v/c Ratio	0.50			0.56	0.30	0.39
Uniform Delay, d1	16.7			17.3	16.1	16.8
Progression Factor	0.82			1.00	1.00	1.00
Incremental Delay, d2	0.2			1.0	1.0	1.7
Delay (s)	13.9			18.3	17.0	18.5
Level of Service	B			B	B	B
Approach Delay (s)	13.9			18.3	17.9	
Approach LOS	B			B	B	

Intersection Summary

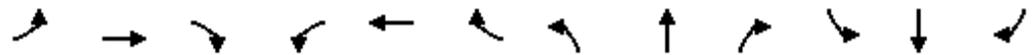
HCM 2000 Control Delay	16.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Sutton Way & Brunswick Road

Existing PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↑↑	↖	↖	↑↑		↖↗	↖		↖	↑	↖
Volume (vph)	226	502	436	170	564	24	467	83	135	60	70	266
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95		0.97	1.00		1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.92	1.00	1.00		1.00	1.00		1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.91		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3467	3471	1480	1787	3486		3467	1689		1787	1881	1524
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3467	3471	1480	1787	3486		3467	1689		1787	1881	1524
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	238	528	459	179	594	25	492	87	142	63	74	280
RTOR Reduction (vph)	0	0	356	0	5	0	0	85	0	0	0	56
Lane Group Flow (vph)	238	528	103	179	614	0	492	144	0	63	74	224
Confl. Peds. (#/hr)	1		32	32		1	36					36
Heavy Vehicles (%)	1%	4%	0%	1%	3%	0%	1%	2%	2%	1%	1%	2%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases			4									6
Actuated Green, G (s)	7.1	14.6	14.6	8.0	15.5		11.6	22.8		3.6	14.8	21.9
Effective Green, g (s)	7.1	14.6	14.6	8.0	15.5		11.6	22.8		3.6	14.8	21.9
Actuated g/C Ratio	0.11	0.22	0.22	0.12	0.24		0.18	0.35		0.06	0.23	0.34
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	378	779	332	219	831		618	592		98	428	607
v/s Ratio Prot	0.07	0.15		c0.10	c0.18		c0.14	0.09		0.04	0.04	c0.04
v/s Ratio Perm			0.07									0.11
v/c Ratio	0.63	0.68	0.31	0.82	0.74		0.80	0.24		0.64	0.17	0.37
Uniform Delay, d1	27.7	23.0	21.0	27.8	22.9		25.6	15.0		30.1	20.2	16.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.3	2.4	0.5	20.5	3.5		7.0	1.0		13.5	0.9	0.4
Delay (s)	31.0	25.4	21.5	48.3	26.4		32.6	16.0		43.6	21.1	16.7
Level of Service	C	C	C	D	C		C	B		D	C	B
Approach Delay (s)		25.0			31.3			27.3			21.5	
Approach LOS		C			C			C			C	

Intersection Summary		
HCM 2000 Control Delay	26.7	HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio	0.69	
Actuated Cycle Length (s)	65.0	Sum of lost time (s) 16.0
Intersection Capacity Utilization	63.3%	ICU Level of Service B
Analysis Period (min)	15	
c Critical Lane Group		

HCM Unsignalized Intersection Capacity Analysis
5: Brunswick Road & Idaho-Maryland Road

Existing PM Peak Hour
1/9/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	173	13	0	67	205	458	33	113	478	7
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	188	14	0	73	223	498	36	123	520	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)						1						
Median type								TWLTL			None	
Median storage (veh)								2				
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1709	1745	520	1915	1734	516	527			534		
vC1, stage 1 conf vol	765	765		961	961							
vC2, stage 2 conf vol	943	979		953	773							
vCu, unblocked vol	1709	1745	520	1915	1734	516	527			534		
tC, single (s)	7.1	6.5	6.2	7.2	6.8	6.3	4.1			4.2		
tC, 2 stage (s)	6.1	5.5		6.2	5.8							
tF (s)	3.5	4.0	3.3	3.6	4.3	3.4	2.2			2.3		
p0 queue free %	100	100	66	40	100	87	79			87		
cM capacity (veh/h)	90	130	552	24	93	542	1040			976		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3					
Volume Total	188	87	223	534	123	520	8					
Volume Left	0	14	223	0	123	0	0					
Volume Right	188	73	0	36	0	0	8					
cSH	552	132	1040	1700	976	1700	1700					
Volume to Capacity	0.34	0.66	0.21	0.31	0.13	0.31	0.00					
Queue Length 95th (ft)	37	89	20	0	11	0	0					
Control Delay (s)	14.8	73.5	9.4	0.0	9.2	0.0	0.0					
Lane LOS	B	F	A		A							
Approach Delay (s)	14.8	73.5	2.8		1.7							
Approach LOS	B	F										
Intersection Summary												
Average Delay			7.4									
Intersection Capacity Utilization			49.8%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
6: McCourtney Road & Personeni Road

Existing PM Peak Hour
1/9/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	4	1	1	265	400	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	4	1	1	291	440	0
Pedestrians				1		
Lane Width (ft)				12.0		
Walking Speed (ft/s)				4.0		
Percent Blockage				0		
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	733	441	440			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	733	441	440			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	390	620	1131			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	5	292	440			
Volume Left	4	1	0			
Volume Right	1	0	0			
cSH	488	1131	1700			
Volume to Capacity	0.01	0.00	0.26			
Queue Length 95th (ft)	1	0	0			
Control Delay (s)	13.6	0.0	0.0			
Lane LOS	B	A				
Approach Delay (s)	13.6	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			31.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
7: Taylorville Road & McKnight Way

Existing PM Peak Hour
1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑		↑	↑				↑			↑
Volume (veh/h)	0	706	11	17	519	256	0	0	33	0	0	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	767	12	18	564	278	0	0	36	0	0	9
Pedestrians								3				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								0				
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)					172							
pX, platoon unblocked	0.87						0.87	0.87		0.87	0.87	0.87
vC, conflicting volume	842			782			1386	1656	265	1032	1523	703
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	741			782			1369	1680	265	960	1526	580
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			100	100	95	100	100	98
cM capacity (veh/h)	758			842			89	81	738	173	100	401

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1
Volume Total	307	307	165	18	842	36	9
Volume Left	0	0	0	18	0	0	0
Volume Right	0	0	12	0	278	36	9
cSH	1700	1700	1700	842	1700	738	401
Volume to Capacity	0.18	0.18	0.10	0.02	0.50	0.05	0.02
Queue Length 95th (ft)	0	0	0	2	0	4	2
Control Delay (s)	0.0	0.0	0.0	9.4	0.0	10.1	14.2
Lane LOS				A		B	B
Approach Delay (s)	0.0			0.2		10.1	14.2
Approach LOS						B	B

Intersection Summary

Average Delay	0.4
Intersection Capacity Utilization	52.9%
ICU Level of Service	A
Analysis Period (min)	15

HCM Signalized Intersection Capacity Analysis

8: 49 SB Off-Ramp & McKnight Way

Existing PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑	↑	↑						↑	↑
Volume (vph)	0	558	181	52	367	0	0	0	0	374	0	425
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5	3.5	3.0	3.5						4.6	4.6
Lane Util. Factor		0.95	1.00	1.00	1.00						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3610	1615	1787	1900						1770	1615
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3610	1615	1787	1900						1770	1615
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.94	0.94
Adj. Flow (vph)	0	594	193	55	390	0	0	0	0	407	0	452
RTOR Reduction (vph)	0	0	137	0	0	0	0	0	0	0	0	224
Lane Group Flow (vph)	0	594	56	55	390	0	0	0	0	0	407	228
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%	2%	2%	2%	2%	3%	0%
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		2		1	2						4	12
Permitted Phases			2							4	12	4
Actuated Green, G (s)		23.3	23.3	16.0	42.3						30.2	30.2
Effective Green, g (s)		23.3	23.3	16.0	39.3						30.2	30.2
Actuated g/C Ratio		0.29	0.29	0.20	0.49						0.38	0.38
Clearance Time (s)		3.5	3.5	3.0								
Vehicle Extension (s)		3.0	3.0	4.7								
Lane Grp Cap (vph)		1051	470	357	933						668	609
v/s Ratio Prot		c0.16		0.03	c0.21							
v/s Ratio Perm			0.03								0.23	0.14
v/c Ratio		0.57	0.12	0.15	0.42						0.61	0.37
Uniform Delay, d1		24.1	20.8	26.4	13.0						20.1	18.1
Progression Factor		1.00	1.00	1.69	1.02						1.00	1.00
Incremental Delay, d2		2.2	0.5	0.4	0.5						1.6	0.4
Delay (s)		26.3	21.3	45.0	13.8						21.7	18.4
Level of Service		C	C	D	B						C	B
Approach Delay (s)		25.0			17.6			0.0			20.0	
Approach LOS		C			B			A			B	

Intersection Summary

HCM 2000 Control Delay	21.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	15.6
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

9: 49 NB Off-Ramp/49 NB On-Ramp & McKnight Way

Existing PM Peak Hour

1/9/2013



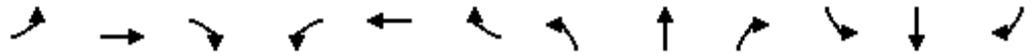
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	247	685	0	0	280	187	139	0	68	0	0	0
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			4.0	4.0		4.6	4.6			
Lane Util. Factor	1.00	1.00			0.95	1.00		1.00	1.00			
Frbp, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00			
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00			
Frt	1.00	1.00			1.00	0.85		1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00			
Satd. Flow (prot)	1787	1863			3574	1568		1787	1538			
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00			
Satd. Flow (perm)	1787	1863			3574	1568		1787	1538			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	268	745	0	0	304	203	151	0	74	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	160	0	0	46	0	0	0
Lane Group Flow (vph)	268	745	0	0	304	43	0	151	28	0	0	0
Confl. Peds. (#/hr)			3	3								
Heavy Vehicles (%)	1%	2%	0%	0%	1%	3%	1%	0%	5%	2%	2%	2%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	5	5 6			6			8 16				
Permitted Phases						6	8 16		8 16			
Actuated Green, G (s)	21.9	41.8			16.9	16.9		30.2	30.2			
Effective Green, g (s)	21.9	41.8			16.9	16.9		30.2	30.2			
Actuated g/C Ratio	0.27	0.52			0.21	0.21		0.38	0.38			
Clearance Time (s)	3.0				4.0	4.0						
Vehicle Extension (s)	4.7				3.0	3.0						
Lane Grp Cap (vph)	489	973			755	331		674	580			
v/s Ratio Prot	0.15	c0.40			0.09							
v/s Ratio Perm						0.03		0.08	0.02			
v/c Ratio	0.55	0.77			0.40	0.13		0.22	0.05			
Uniform Delay, d1	24.8	15.2			27.2	25.6		16.9	15.8			
Progression Factor	1.48	1.24			1.00	1.00		1.00	1.00			
Incremental Delay, d2	1.7	3.6			0.4	0.2		0.2	0.0			
Delay (s)	38.3	22.4			27.6	25.8		17.1	15.8			
Level of Service	D	C			C	C		B	B			
Approach Delay (s)		26.6			26.8			16.7			0.0	
Approach LOS		C			C			B			A	

Intersection Summary

HCM 2000 Control Delay	25.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	15.6
Intersection Capacity Utilization	67.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 10: La Barr Meadows Road/S Auburn Street & McKnight Way

Existing PM Peak Hour
 1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↔		↖	↗			↕	↗
Sign Control		Yield			Stop			Stop			Stop	
Volume (vph)	191	105	457	26	60	15	238	96	7	19	114	169
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	203	112	486	28	64	16	253	102	7	20	121	180
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2					
Volume Total (vph)	315	486	107	253	110	141	180					
Volume Left (vph)	203	0	28	253	0	20	0					
Volume Right (vph)	0	486	16	0	7	0	180					
Hadj (s)	0.35	-0.63	0.03	0.53	0.02	0.17	-0.68					
Departure Headway (s)	7.3	6.3	7.9	8.2	7.7	8.0	7.1					
Degree Utilization, x	0.64	0.86	0.24	0.58	0.23	0.31	0.36					
Capacity (veh/h)	482	560	428	420	449	429	482					
Control Delay (s)	21.3	34.8	13.4	20.6	11.8	13.4	12.8					
Approach Delay (s)	29.5		13.4	18.0		13.1						
Approach LOS	D		B	C		B						
Intersection Summary												
Delay			22.5									
Level of Service			C									
Intersection Capacity Utilization			51.7%	ICU Level of Service		A						
Analysis Period (min)			15									

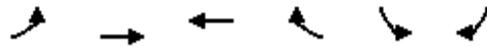
HCM Signalized Intersection Capacity Analysis
 11: Pleasant Valley Road & SR-20

Existing PM Peak Hour
 1/9/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	108	307	38	23	292	397	33	152	18	203	124	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. 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
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1810	1583	1805	1810	1599	1752	1881	1615	1736	1863	1564
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	1810	1583	1805	1810	1599	1752	1881	1615	1736	1863	1564
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	116	330	41	25	314	427	35	163	19	218	133	76
RTOR Reduction (vph)	0	0	25	0	0	295	0	0	16	0	0	51
Lane Group Flow (vph)	116	330	16	25	314	132	35	163	3	218	133	25
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	0%	5%	2%	0%	5%	1%	3%	1%	0%	4%	2%	1%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	7.4	27.7	27.7	1.5	21.8	21.8	1.8	10.9	10.9	14.5	23.6	23.6
Effective Green, g (s)	7.4	27.7	27.7	1.5	21.8	21.8	1.8	10.9	10.9	14.5	23.6	23.6
Actuated g/C Ratio	0.10	0.39	0.39	0.02	0.31	0.31	0.03	0.15	0.15	0.21	0.33	0.33
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	189	710	621	38	558	493	44	290	249	356	622	522
v/s Ratio Prot	c0.06	0.18		0.01	c0.17		0.02	c0.09		c0.13	0.07	
v/s Ratio Perm			0.01			0.08			0.00			0.02
v/c Ratio	0.61	0.46	0.03	0.66	0.56	0.27	0.80	0.56	0.01	0.61	0.21	0.05
Uniform Delay, d1	30.2	15.9	13.2	34.3	20.4	18.4	34.2	27.6	25.3	25.5	16.8	15.9
Progression 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
Incremental Delay, d2	5.8	0.5	0.0	34.3	1.3	0.3	62.9	2.5	0.0	3.1	0.2	0.0
Delay (s)	36.0	16.4	13.2	68.6	21.7	18.7	97.1	30.1	25.3	28.6	17.0	15.9
Level of Service	D	B	B	E	C	B	F	C	C	C	B	B
Approach Delay (s)		20.8			21.6			40.5			22.7	
Approach LOS		C			C			D			C	
Intersection Summary												
HCM 2000 Control Delay			23.8			HCM 2000 Level of Service		C				
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			70.6			Sum of lost time (s)		16.0				
Intersection Capacity Utilization			53.9%			ICU Level of Service		A				
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
 12: SR-20 & Cattle Drive

Existing PM Peak Hour
 1/9/2013



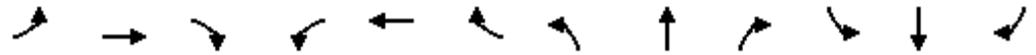
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	6	529	723	17	32	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	6	545	745	18	33	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	763				1312	754
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	763				1312	754
tC, single (s)	4.3				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.4
p0 queue free %	99				81	97
cM capacity (veh/h)	790				173	399

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	6	545	763	45
Volume Left	6	0	0	33
Volume Right	0	0	18	12
cSH	790	1700	1700	204
Volume to Capacity	0.01	0.32	0.45	0.22
Queue Length 95th (ft)	1	0	0	21
Control Delay (s)	9.6	0.0	0.0	27.6
Lane LOS	A			D
Approach Delay (s)	0.1		0.0	27.6
Approach LOS				D

Intersection Summary			
Average Delay		1.0	
Intersection Capacity Utilization		49.1%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis
 13: Penn Valley Drive & SR-20

Existing PM Peak Hour
 1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↗	↘	↘	↗	↘	↘	↗	↘	↘	↗	↘
Volume (vph)	58	439	49	236	605	36	59	77	125	19	61	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.8	4.0	3.0	6.8	4.0	3.0	4.8	3.0	3.0	4.8	4.8
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	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3438	1583	1770	3539	1615	1752	1792	1583	1805	1845	1509
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3438	1583	1770	3539	1615	1752	1792	1583	1805	1845	1509
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	61	462	52	248	637	38	62	81	132	20	64	69
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	89	0	0	57
Lane Group Flow (vph)	61	462	52	248	637	38	62	81	43	20	64	12
Heavy Vehicles (%)	0%	5%	2%	2%	2%	0%	3%	6%	2%	0%	3%	7%
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	custom	Prot	NA	custom
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			Free			Free			8			4
Actuated Green, G (s)	3.2	15.8	53.6	10.3	22.9	53.6	2.7	9.1	17.5	0.8	7.2	9.1
Effective Green, g (s)	3.2	15.8	53.6	10.3	22.9	53.6	2.7	9.1	17.5	0.8	7.2	9.1
Actuated g/C Ratio	0.06	0.29	1.00	0.19	0.43	1.00	0.05	0.17	0.33	0.01	0.13	0.17
Clearance Time (s)	3.0	6.8		3.0	6.8		3.0	4.8	3.0	3.0	4.8	4.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	107	1013	1583	340	1511	1615	88	304	516	26	247	256
v/s Ratio Prot	0.03	0.13		c0.14	c0.18		c0.04	c0.05	0.02	0.01	0.03	
v/s Ratio Perm			c0.03			0.02			0.01			0.01
v/c Ratio	0.57	0.46	0.03	0.73	0.42	0.02	0.70	0.27	0.08	0.77	0.26	0.05
Uniform Delay, d1	24.5	15.4	0.0	20.3	10.7	0.0	25.1	19.3	12.5	26.3	20.8	18.6
Progression 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
Incremental Delay, d2	7.1	0.3	0.0	7.6	0.2	0.0	22.5	0.5	0.1	80.9	0.6	0.1
Delay (s)	31.7	15.7	0.0	28.0	10.9	0.0	47.6	19.8	12.6	107.2	21.4	18.7
Level of Service	C	B	A	C	B	A	D	B	B	F	C	B
Approach Delay (s)		16.0			15.0			22.6			31.4	
Approach LOS		B			B			C			C	

Intersection Summary

HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	53.6	Sum of lost time (s)	17.6
Intersection Capacity Utilization	48.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 14: Spenceville Road & Penn Valley Drive

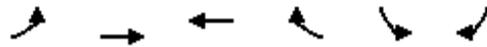
Existing PM Peak Hour
 1/9/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	96	77	70	127	153	148
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	107	86	78	141	170	164
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total (vph)	192	219	334			
Volume Left (vph)	107	78	0			
Volume Right (vph)	86	0	164			
Hadj (s)	-0.15	0.09	-0.28			
Departure Headway (s)	5.0	4.9	4.4			
Degree Utilization, x	0.27	0.30	0.41			
Capacity (veh/h)	657	699	778			
Control Delay (s)	9.9	10.0	10.5			
Approach Delay (s)	9.9	10.0	10.5			
Approach LOS	A	A	B			
Intersection Summary						
Delay			10.2			
Level of Service			B			
Intersection Capacity Utilization			49.1%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 23: Penn Valley & Site 10,11,12 Dway

Existing PM Peak Hour
 1/9/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Volume (veh/h)	0	148	188	0	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	161	204	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	204				365	204
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	204				365	204
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1367				634	836

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	161	204	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1367	1700	1700
Volume to Capacity	0.00	0.12	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay		0.0	
Intersection Capacity Utilization		13.2%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 24: Broken Oak & Penn Valley

Existing PM Peak Hour
 1/9/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	←	→
Volume (veh/h)	136	15	32	152	7	16
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	148	16	35	165	8	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			164		391	156
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			164		391	156
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		99	98
cM capacity (veh/h)			1414		598	890

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	164	200	25
Volume Left	0	35	8
Volume Right	16	0	17
cSH	1700	1414	1279
Volume to Capacity	0.10	0.02	0.02
Queue Length 95th (ft)	0	2	1
Control Delay (s)	0.0	1.5	9.7
Lane LOS		A	A
Approach Delay (s)	0.0	1.5	9.7
Approach LOS			A

Intersection Summary			
Average Delay		1.4	
Intersection Capacity Utilization		31.2%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 27: Brunswick Road & Loma Rica Rd

Existing PM Peak Hour
 2/25/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	75	313	383	37	127	537
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	82	340	416	40	138	584
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			None		
Median storage veh	2					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1296	436			457	
vC1, stage 1 conf vol	436					
vC2, stage 2 conf vol	860					
vCu, unblocked vol	1296	436			457	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	75	45			87	
cM capacity (veh/h)	332	620			1104	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	82	340	457	138	584
Volume Left	82	0	0	138	0
Volume Right	0	340	40	0	0
cSH	332	620	1700	1104	1700
Volume to Capacity	0.25	0.55	0.27	0.13	0.34
Queue Length 95th (ft)	24	83	0	11	0
Control Delay (s)	19.3	17.6	0.0	8.7	0.0
Lane LOS	C	C		A	
Approach Delay (s)	18.0		0.0	1.7	
Approach LOS	C				

Intersection Summary					
Average Delay			5.5		
Intersection Capacity Utilization			48.4%	ICU Level of Service	A
Analysis Period (min)			15		

HCM Unsignalized Intersection Capacity Analysis
 15: SR-49 & Cameo Drive

Existing PM Peak Hour
 1/16/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↕	↗	↘	↕
Volume (veh/h)	2	4	1156	6	4	792
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	2	4	1192	6	4	816
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			None
Median storage veh			2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2016	596			1198	
vC1, stage 1 conf vol	1192					
vC2, stage 2 conf vol	825					
vCu, unblocked vol	2016	596			1198	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	99			99	
cM capacity (veh/h)	209	447			578	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	6	596	596	6	4	816
Volume Left	2	0	0	0	4	0
Volume Right	4	0	0	6	0	0
cSH	324	1700	1700	1700	578	1700
Volume to Capacity	0.02	0.35	0.35	0.00	0.01	0.48
Queue Length 95th (ft)	1	0	0	0	1	0
Control Delay (s)	16.3	0.0	0.0	0.0	11.3	0.0
Lane LOS	C				B	
Approach Delay (s)	16.3	0.0			0.1	
Approach LOS	C					

Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			51.7%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
16: SR-49 & Wolf Road/Combie Road

Existing PM Peak Hour

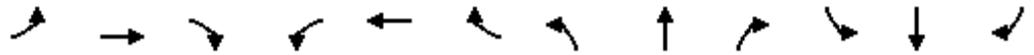
1/16/2013

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (vph)	31	87	91	256	90	226	152	905	543	227	543	24	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1703	1881	1553	3433	1845	1568	1770	3505	1599	1752	3471	1553	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1703	1881	1553	3433	1845	1568	1770	3505	1599	1752	3471	1553	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	34	95	99	278	98	246	165	984	590	247	590	26	
RTOR Reduction (vph)	0	0	88	0	0	186	0	0	189	0	0	16	
Lane Group Flow (vph)	34	95	11	278	98	60	165	984	401	247	590	10	
Heavy Vehicles (%)	6%	1%	4%	2%	3%	3%	2%	3%	1%	3%	4%	4%	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov	Prot	NA	pm+ov	
Protected Phases	7	4		3	8		5	2	3	1	6	7	
Permitted Phases			4			8			2			6	
Actuated Green, G (s)	2.5	8.3	8.3	12.0	17.8	17.8	10.0	27.0	39.0	8.6	25.6	28.1	
Effective Green, g (s)	2.5	8.3	8.3	12.0	17.8	17.8	10.0	27.0	39.0	8.6	25.6	28.1	
Actuated g/C Ratio	0.03	0.11	0.11	0.17	0.25	0.25	0.14	0.37	0.54	0.12	0.35	0.39	
Clearance Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5	
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	3.0	
Lane Grp Cap (vph)	58	215	178	569	453	385	244	1307	861	208	1227	602	
v/s Ratio Prot	0.02	c0.05		c0.08	0.05		0.09	c0.28	0.08	c0.14	0.17	0.00	
v/s Ratio Perm			0.01			0.04			0.17			0.01	
v/c Ratio	0.59	0.44	0.06	0.49	0.22	0.16	0.68	0.75	0.47	1.19	0.48	0.02	
Uniform Delay, d1	34.4	29.9	28.6	27.4	21.7	21.4	29.7	19.8	10.3	31.9	18.2	13.6	
Progression 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	
Incremental Delay, d2	14.2	1.4	0.2	0.7	0.2	0.2	7.2	4.0	0.4	122.2	1.4	0.0	
Delay (s)	48.7	31.3	28.7	28.1	22.0	21.6	36.9	23.8	10.7	154.1	19.6	13.7	
Level of Service	D	C	C	C	C	C	D	C	B	F	B	B	
Approach Delay (s)		32.8			24.6			20.6			57.9		
Approach LOS		C			C			C			E		
Intersection Summary													
HCM 2000 Control Delay			31.5		HCM 2000 Level of Service				C				
HCM 2000 Volume to Capacity ratio			0.72										
Actuated Cycle Length (s)			72.4		Sum of lost time (s)				16.5				
Intersection Capacity Utilization			63.2%		ICU Level of Service				B				
Analysis Period (min)			15										

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 17: Rosewood Rd/Armstrong Rd & Combie Road

Existing PM Peak Hour
 2/27/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	59	752	12	3	465	46	4	0	3	62	1	77
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	66	836	13	3	517	51	4	0	3	69	1	86
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)					955							
pX, platoon unblocked	0.89						0.89	0.89		0.89	0.89	0.89
vC, conflicting volume	568			849			1583	1548	424	1101	1529	542
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	456			849			1593	1554	424	1053	1532	427
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	93			100			91	100	99	55	99	83
cM capacity (veh/h)	983			785			50	93	578	152	96	514

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	66	557	292	3	568	8	70	86
Volume Left	66	0	0	3	0	4	69	0
Volume Right	0	0	13	0	51	3	0	86
cSH	983	1700	1700	785	1700	82	150	514
Volume to Capacity	0.07	0.33	0.17	0.00	0.33	0.09	0.47	0.17
Queue Length 95th (ft)	5	0	0	0	0	8	54	15
Control Delay (s)	8.9	0.0	0.0	9.6	0.0	53.2	48.4	13.4
Lane LOS	A			A		F	E	B
Approach Delay (s)	0.6			0.1		53.2	29.1	
Approach LOS						F	D	

Intersection Summary		
Average Delay		3.4
Intersection Capacity Utilization	46.0%	ICU Level of Service
Analysis Period (min)		15
		A

HCM Signalized Intersection Capacity Analysis
 18: Combie Road & Magnolia Road & Hacienda Drive

Existing PM Peak Hour
 2/27/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	61	568	188	81	322	48	121	14	133	52	14	71
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.98			1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.98	
Satd. Flow (prot)	1752	1881	1583	1787	1831			1803	1583		1699	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.98	
Satd. Flow (perm)	1752	1881	1583	1787	1831			1803	1583		1699	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	69	638	211	91	362	54	136	16	149	58	16	80
RTOR Reduction (vph)	0	0	123	0	5	0	0	0	125	0	40	0
Lane Group Flow (vph)	69	638	88	91	411	0	0	152	24	0	114	0
Heavy Vehicles (%)	3%	1%	2%	1%	2%	0%	1%	0%	2%	0%	0%	4%
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	Perm	Split	NA	
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4						2			
Actuated Green, G (s)	6.1	32.6	32.6	6.3	32.8			12.5	12.5		11.0	
Effective Green, g (s)	6.1	32.6	32.6	6.3	32.8			12.5	12.5		11.0	
Actuated g/C Ratio	0.08	0.42	0.42	0.08	0.42			0.16	0.16		0.14	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	136	782	658	143	766			287	252		238	
v/s Ratio Prot	0.04	c0.34		c0.05	0.22			c0.08			c0.07	
v/s Ratio Perm			0.06						0.02			
v/c Ratio	0.51	0.82	0.13	0.64	0.54			0.53	0.09		0.48	
Uniform Delay, d1	34.7	20.2	14.2	34.9	17.1			30.3	28.1		31.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	3.0	6.6	0.1	8.9	0.7			1.8	0.2		1.5	
Delay (s)	37.7	26.8	14.3	43.9	17.8			32.0	28.3		32.6	
Level of Service	D	C	B	D	B			C	C		C	
Approach Delay (s)		24.7			22.5			30.2			32.6	
Approach LOS		C			C			C			C	

Intersection Summary

HCM 2000 Control Delay	25.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	78.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 19: SR-49 & Woodridge Drive

Existing PM Peak Hour
 2/27/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↵	↶	↕	↶	↵	↕
Volume (veh/h)	2	2	1598	1	1	889
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	2	2	1614	1	1	898
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			None
Median storage veh			2			
Upstream signal (ft)						1119
pX, platoon unblocked	0.94					
vC, conflicting volume	2065	807			1615	
vC1, stage 1 conf vol	1614					
vC2, stage 2 conf vol	451					
vCu, unblocked vol	2004	807			1615	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	99			100	
cM capacity (veh/h)	146	329			409	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	2	2	807	807	1	1	449	449
Volume Left	2	0	0	0	0	1	0	0
Volume Right	0	2	0	0	1	0	0	0
cSH	146	329	1700	1700	1700	409	1700	1700
Volume to Capacity	0.01	0.01	0.47	0.47	0.00	0.00	0.26	0.26
Queue Length 95th (ft)	1	0	0	0	0	0	0	0
Control Delay (s)	30.1	16.0	0.0	0.0	0.0	13.8	0.0	0.0
Lane LOS	D	C				B		
Approach Delay (s)	23.0		0.0			0.0		
Approach LOS	C							

Intersection Summary			
Average Delay		0.0	
Intersection Capacity Utilization	54.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
 27: Brunswick Road & Loma Rica Rd

Existing PM Peak Hour
 2/25/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	75	313	383	37	127	537
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	82	340	416	40	138	584
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			None
Median storage veh			2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1296	436			457	
vC1, stage 1 conf vol	436					
vC2, stage 2 conf vol	860					
vCu, unblocked vol	1296	436			457	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	75	45			87	
cM capacity (veh/h)	332	620			1104	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	82	340	457	138	584
Volume Left	82	0	0	138	0
Volume Right	0	340	40	0	0
cSH	332	620	1700	1104	1700
Volume to Capacity	0.25	0.55	0.27	0.13	0.34
Queue Length 95th (ft)	24	83	0	11	0
Control Delay (s)	19.3	17.6	0.0	8.7	0.0
Lane LOS	C	C		A	
Approach Delay (s)	18.0		0.0	1.7	
Approach LOS	C				

Intersection Summary					
Average Delay			5.5		
Intersection Capacity Utilization			48.4%	ICU Level of Service	A
Analysis Period (min)			15		

HCM Unsignalized Intersection Capacity Analysis
28: Higgins Road & Combie Road

Existing PM Peak Hour
2/26/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	733	10	50	505	0	67	0	80	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	814	11	56	561	0	74	0	89	0	0	0
Pedestrians								1				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								0				
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage (veh)		2										
Upstream signal (ft)		640										
pX, platoon unblocked												
vC, conflicting volume	561			815			1213	1493	821	1581	1488	281
vC1, stage 1 conf vol							821	821		672	672	
vC2, stage 2 conf vol							392	672		909	815	
vCu, unblocked vol	561			815			1213	1493	821	1581	1488	281
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			93			75	100	72	100	100	100
cM capacity (veh/h)	1006			807			300	299	317	146	276	717
Direction, Lane #	EB 1	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1					
Volume Total	826	56	374	187	74	89	0					
Volume Left	0	56	0	0	74	0	0					
Volume Right	11	0	0	0	0	89	0					
cSH	1700	807	1700	1700	300	317	1700					
Volume to Capacity	0.49	0.07	0.22	0.11	0.25	0.28	0.00					
Queue Length 95th (ft)	0	6	0	0	24	28	0					
Control Delay (s)	0.0	9.8	0.0	0.0	20.9	20.7	0.0					
Lane LOS		A			C	C	A					
Approach Delay (s)	0.0	0.9			20.8		0.0					
Approach LOS					C		A					
Intersection Summary												
Average Delay				2.5								
Intersection Capacity Utilization			51.9%		ICU Level of Service			A				
Analysis Period (min)			15									

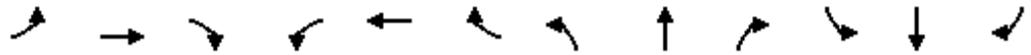
APPENDIX D

Intersection Level of Service Calculations: Existing plus Background
Projects with Current General Plan Land Use Designations Conditions

HCM Signalized Intersection Capacity Analysis
 1: Nevada City Highway & Brunswick Road

Existing +Background PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕	↕	↕	↑	↕	↕	↕	↕
Volume (vph)	10	24	7	331	20	574	4	241	317	557	255	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	1.00	1.00	0.97	1.00	
Frbp, ped/bikes		1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.99		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1788		1698	1704	1596	1805	1881	1556	3433	1862	
Flt Permitted		0.99		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1788		1698	1704	1596	1805	1881	1556	3433	1862	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	11	26	8	356	22	617	4	259	341	599	274	1
RTOR Reduction (vph)	0	7	0	0	0	364	0	0	248	0	0	0
Lane Group Flow (vph)	0	38	0	189	189	253	4	259	93	599	275	0
Confl. Peds. (#/hr)	3					3	11		3	3		11
Heavy Vehicles (%)	0%	0%	14%	1%	5%	0%	0%	1%	2%	2%	2%	0%
Turn Type	Split	NA		Split	NA	pm+ov	Split	NA	Perm	Split	NA	
Protected Phases	6	6		8	8	4	2	2		4	4	
Permitted Phases						8			2			
Actuated Green, G (s)		16.0		13.9	13.9	33.4	24.6	24.6	24.6	19.5	19.5	
Effective Green, g (s)		16.0		13.9	13.9	33.4	24.6	24.6	24.6	19.5	19.5	
Actuated g/C Ratio		0.18		0.15	0.15	0.37	0.27	0.27	0.27	0.22	0.22	
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		317		262	263	663	493	514	425	743	403	
v/s Ratio Prot		c0.02		c0.11	0.11	0.08	0.00	c0.14		c0.17	0.15	
v/s Ratio Perm						0.08			0.06			
v/c Ratio		0.12		0.72	0.72	0.38	0.01	0.50	0.22	0.81	0.68	
Uniform Delay, d1		31.1		36.2	36.2	20.7	23.8	27.6	25.3	33.5	32.4	
Progression Factor		1.00		0.71	0.71	0.36	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.8		8.9	8.6	0.3	0.0	3.5	1.2	6.4	4.7	
Delay (s)		31.9		34.5	34.2	7.8	23.8	31.1	26.5	39.8	37.1	
Level of Service		C		C	C	A	C	C	C	D	D	
Approach Delay (s)		31.9			17.9			28.4			39.0	
Approach LOS		C			B			C			D	

Intersection Summary		
HCM 2000 Control Delay	28.0	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.54	C
Actuated Cycle Length (s)	90.0	Sum of lost time (s)
Intersection Capacity Utilization	62.5%	16.0
Analysis Period (min)	15	ICU Level of Service
c Critical Lane Group		B

HCM Signalized Intersection Capacity Analysis
 2: Maltman Drive/SR 20-49 SB Ramps & Brunswick Road

Existing +Background PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑		↖		↖	↖↖	↑	↖
Volume (vph)	0	847	60	170	656	0	48	0	326	439	60	220
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0		4.0	4.0	4.0	4.0
Lane Util. Factor		0.95		1.00	0.95		1.00		1.00	0.97	1.00	1.00
Frbp, ped/bikes		1.00		1.00	1.00		1.00		0.99	1.00	1.00	1.00
Flpb, ped/bikes		1.00		1.00	1.00		1.00		1.00	1.00	1.00	1.00
Frt		0.99		1.00	1.00		1.00		0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00		0.95		1.00	0.95	1.00	1.00
Satd. Flow (prot)		3501		1770	3610		1805		1603	3400	1881	1599
Flt Permitted		1.00		0.95	1.00		0.95		1.00	0.95	1.00	1.00
Satd. Flow (perm)		3501		1770	3610		1805		1603	3400	1881	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	921	65	185	713	0	52	0	354	477	65	239
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	47	0	0	165
Lane Group Flow (vph)	0	980	0	185	713	0	52	0	307	477	65	74
Confl. Peds. (#/hr)			9						9			
Heavy Vehicles (%)	0%	1%	13%	2%	0%	0%	0%	0%	0%	3%	1%	1%
Turn Type		NA		Prot	NA		Prot		custom	Split	NA	Perm
Protected Phases		4		3	8		2		3	6	6	
Permitted Phases									2			6
Actuated Green, G (s)		26.0		14.4	44.4		5.6		20.0	28.0	28.0	28.0
Effective Green, g (s)		26.0		14.4	44.4		5.6		20.0	28.0	28.0	28.0
Actuated g/C Ratio		0.29		0.16	0.49		0.06		0.22	0.31	0.31	0.31
Clearance Time (s)		4.0		4.0	4.0		4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0		3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		1011		283	1780		112		427	1057	585	497
v/s Ratio Prot		c0.28		0.10	0.20		0.03		c0.11	c0.14	0.03	
v/s Ratio Perm									0.08			0.05
v/c Ratio		0.97		0.65	0.40		0.46		0.72	0.45	0.11	0.15
Uniform Delay, d1		31.6		35.5	14.4		40.8		32.4	24.8	22.1	22.4
Progression Factor		0.38		0.76	0.58		1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2		17.5		10.3	0.1		3.0		5.7	1.4	0.4	0.6
Delay (s)		29.4		37.4	8.4		43.8		38.1	26.2	22.5	23.0
Level of Service		C		D	A		D		D	C	C	C
Approach Delay (s)		29.4			14.4			38.8			24.9	
Approach LOS		C			B			D			C	

Intersection Summary			
HCM 2000 Control Delay	25.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: SR 20-49 NB Ramps & Brunswick Road

Existing +Background PM Peak Hour
1/9/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑↑	↘	↗
Volume (vph)	841	0	0	1411	236	376
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			0.91	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3574			5136	1805	1553
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3574			5136	1805	1553
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	876	0	0	1470	246	392
RTOR Reduction (vph)	0	0	0	0	0	50
Lane Group Flow (vph)	876	0	0	1470	246	342
Heavy Vehicles (%)	1%	0%	0%	1%	0%	4%
Turn Type	NA			NA	NA	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Actuated Green, G (s)	42.0			42.0	40.0	40.0
Effective Green, g (s)	42.0			42.0	40.0	40.0
Actuated g/C Ratio	0.47			0.47	0.44	0.44
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	1667			2396	802	690
v/s Ratio Prot	0.25			c0.29	0.14	
v/s Ratio Perm						c0.22
v/c Ratio	0.53			0.61	0.31	0.50
Uniform Delay, d1	17.0			17.9	16.1	17.8
Progression Factor	0.81			1.00	1.00	1.00
Incremental Delay, d2	0.3			1.2	1.0	2.5
Delay (s)	13.9			19.1	17.1	20.3
Level of Service	B			B	B	C
Approach Delay (s)	13.9			19.1	19.1	
Approach LOS	B			B	B	

Intersection Summary

HCM 2000 Control Delay	17.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

4: Sutton Way & Brunswick Road

Existing +Background PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↑↑	↖	↖	↑↑		↖↗	↖		↖	↑	↖
Volume (vph)	227	676	442	229	719	40	500	89	216	74	75	268
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95		0.97	1.00		1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.91	1.00	1.00		1.00	1.00		1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.89		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3467	3471	1472	1787	3480		3467	1665		1787	1881	1520
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3467	3471	1472	1787	3480		3467	1665		1787	1881	1520
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	239	712	465	241	757	42	526	94	227	78	79	282
RTOR Reduction (vph)	0	0	359	0	6	0	0	120	0	0	0	52
Lane Group Flow (vph)	239	712	106	241	793	0	526	201	0	78	79	230
Confl. Peds. (#/hr)	1		32	32		1	36					36
Heavy Vehicles (%)	1%	4%	0%	1%	3%	0%	1%	2%	2%	1%	1%	2%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases			4									6
Actuated Green, G (s)	7.5	16.0	16.0	10.0	18.5		11.8	21.8		6.2	16.2	23.7
Effective Green, g (s)	7.5	16.0	16.0	10.0	18.5		11.8	21.8		6.2	16.2	23.7
Actuated g/C Ratio	0.11	0.23	0.23	0.14	0.26		0.17	0.31		0.09	0.23	0.34
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	371	793	336	255	919		584	518		158	435	601
v/s Ratio Prot	0.07	0.21		c0.13	c0.23		c0.15	0.12		0.04	0.04	c0.04
v/s Ratio Perm			0.07									0.11
v/c Ratio	0.64	0.90	0.32	0.95	0.86		0.90	0.39		0.49	0.18	0.38
Uniform Delay, d1	30.0	26.2	22.5	29.7	24.5		28.5	18.9		30.4	21.6	17.6
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.8	12.8	0.5	41.2	8.4		17.0	2.2		2.4	0.9	0.4
Delay (s)	33.8	39.1	23.0	70.9	33.0		45.5	21.1		32.8	22.5	18.0
Level of Service	C	D	C	E	C		D	C		C	C	B
Approach Delay (s)		32.9			41.8			36.3			21.4	
Approach LOS		C			D			D			C	

Intersection Summary

HCM 2000 Control Delay	34.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
5: Brunswick Road & Idaho-Maryland Road

Existing +Background PM Peak Hour

1/9/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	214	185	0	259	227	553	100	183	561	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	233	201	0	282	247	601	109	199	610	43
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)						1						
Median type								TWLTL				None
Median storage (veh)								2				
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2102	2211	610	2389	2200	655	653			710		
vC1, stage 1 conf vol	1008	1008		1149	1149							
vC2, stage 2 conf vol	1095	1203		1240	1051							
vCu, unblocked vol	2102	2211	610	2389	2200	655	653			710		
tC, single (s)	7.1	6.5	6.2	7.2	6.8	6.3	4.1			4.2		
tC, 2 stage (s)	6.1	5.5		6.2	5.8							
tF (s)	3.5	4.0	3.3	3.6	4.3	3.4	2.2			2.3		
p0 queue free %	100	100	53	0	100	37	74			76		
cM capacity (veh/h)	9	25	491	7	20	450	934			836		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3					
Volume Total	233	483	247	710	199	610	43					
Volume Left	0	201	247	0	199	0	0					
Volume Right	233	282	0	109	0	0	43					
cSH	491	17	934	1700	836	1700	1700					
Volume to Capacity	0.47	27.90	0.26	0.42	0.24	0.36	0.03					
Queue Length 95th (ft)	63	Err	27	0	23	0	0					
Control Delay (s)	18.8	Err	10.2	0.0	10.6	0.0	0.0					
Lane LOS	C	F	B		B							
Approach Delay (s)	18.8	Err	2.6		2.5							
Approach LOS	C	F										
Intersection Summary												
Average Delay			1915.5									
Intersection Capacity Utilization			65.6%		ICU Level of Service					C		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
6: McCourtney Road & Personeni Road

Existing +Background PM Peak Hour
1/9/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	4	1	1	267	404	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	4	1	1	293	444	0
Pedestrians				1		
Lane Width (ft)				12.0		
Walking Speed (ft/s)				4.0		
Percent Blockage				0		
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	740	445	444			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	740	445	444			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	387	617	1127			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	5	295	444			
Volume Left	4	1	0			
Volume Right	1	0	0			
cSH	484	1127	1700			
Volume to Capacity	0.01	0.00	0.26			
Queue Length 95th (ft)	1	0	0			
Control Delay (s)	13.7	0.0	0.0			
Lane LOS	B	A				
Approach Delay (s)	13.7	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			31.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
7: Taylorville Road & McKnight Way

Existing +Background PM Peak Hour
1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑		↖	↗				↗			↖
Volume (veh/h)	0	764	11	23	592	256	0	0	36	0	0	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	830	12	25	643	278	0	0	39	0	0	9
Pedestrians								3				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								0				
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)					172							
pX, platoon unblocked	0.84						0.84	0.84		0.84	0.84	0.84
vC, conflicting volume	922			845			1542	1811	286	1149	1678	783
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	809			845			1550	1872	286	1080	1713	643
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	95	100	100	98
cM capacity (veh/h)	691			798			63	59	715	135	74	352

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1
Volume Total	332	332	178	25	922	39	9
Volume Left	0	0	0	25	0	0	0
Volume Right	0	0	12	0	278	39	9
cSH	1700	1700	1700	798	1700	715	352
Volume to Capacity	0.20	0.20	0.10	0.03	0.54	0.05	0.02
Queue Length 95th (ft)	0	0	0	2	0	4	2
Control Delay (s)	0.0	0.0	0.0	9.7	0.0	10.3	15.5
Lane LOS				A		B	C
Approach Delay (s)	0.0			0.3		10.3	15.5
Approach LOS						B	C

Intersection Summary

Average Delay	0.4
Intersection Capacity Utilization	56.7%
ICU Level of Service	B
Analysis Period (min)	15

HCM Signalized Intersection Capacity Analysis
8: 49 SB Off-Ramp & McKnight Way

Existing +Background PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑	↑	↑						↑	↑
Volume (vph)	0	612	189	63	417	0	0	0	0	390	0	454
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5	3.5	3.0	3.5						4.6	4.6
Lane Util. Factor		0.95	1.00	1.00	1.00						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3610	1615	1787	1900						1770	1615
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3610	1615	1787	1900						1770	1615
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.94	0.94
Adj. Flow (vph)	0	651	201	67	444	0	0	0	0	424	0	483
RTOR Reduction (vph)	0	0	148	0	0	0	0	0	0	0	0	187
Lane Group Flow (vph)	0	651	53	67	444	0	0	0	0	0	424	296
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%	2%	2%	2%	2%	3%	0%
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		2		1	2 1						4 12	
Permitted Phases			2							4 12		4 12
Actuated Green, G (s)		21.1	21.1	16.9	41.0						31.5	31.5
Effective Green, g (s)		21.1	21.1	16.9	38.0						31.5	31.5
Actuated g/C Ratio		0.26	0.26	0.21	0.48						0.39	0.39
Clearance Time (s)		3.5	3.5	3.0								
Vehicle Extension (s)		3.0	3.0	4.7								
Lane Grp Cap (vph)		952	425	377	902						696	635
v/s Ratio Prot		c0.18		0.04	c0.23							
v/s Ratio Perm			0.03								0.24	0.18
v/c Ratio		0.68	0.12	0.18	0.49						0.61	0.47
Uniform Delay, d1		26.5	22.4	25.9	14.4						19.3	18.0
Progression Factor		1.00	1.00	1.73	1.07						1.00	1.00
Incremental Delay, d2		4.0	0.6	0.4	0.7						1.5	0.5
Delay (s)		30.4	23.0	45.2	16.2						20.9	18.6
Level of Service		C	C	D	B						C	B
Approach Delay (s)		28.7			20.0			0.0			19.6	
Approach LOS		C			B			A			B	

Intersection Summary

HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	15.6
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 9: 49 NB Off-Ramp/49 NB On-Ramp & McKnight Way

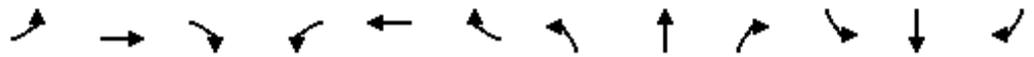
Existing +Background PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	264	737	0	0	329	198	151	0	84	0	0	0
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			4.0	4.0		4.6	4.6			
Lane Util. Factor	1.00	1.00			0.95	1.00		1.00	1.00			
Frbp, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00			
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00			
Frt	1.00	1.00			1.00	0.85		1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00			
Satd. Flow (prot)	1787	1863			3574	1568		1787	1538			
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00			
Satd. Flow (perm)	1787	1863			3574	1568		1787	1538			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	287	801	0	0	358	215	164	0	91	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	172	0	0	55	0	0	0
Lane Group Flow (vph)	287	801	0	0	358	43	0	164	36	0	0	0
Confl. Peds. (#/hr)			3	3								
Heavy Vehicles (%)	1%	2%	0%	0%	1%	3%	1%	0%	5%	2%	2%	2%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	5	5 6			6			8 16				
Permitted Phases						6	8 16		8 16			
Actuated Green, G (s)	21.5	40.5			16.0	16.0		31.5	31.5			
Effective Green, g (s)	21.5	40.5			16.0	16.0		31.5	31.5			
Actuated g/C Ratio	0.27	0.51			0.20	0.20		0.39	0.39			
Clearance Time (s)	3.0				4.0	4.0						
Vehicle Extension (s)	4.7				3.0	3.0						
Lane Grp Cap (vph)	480	943			714	313		703	605			
v/s Ratio Prot	0.16	c0.43			0.10							
v/s Ratio Perm						0.03		0.09	0.02			
v/c Ratio	0.60	0.85			0.50	0.14		0.23	0.06			
Uniform Delay, d1	25.5	17.1			28.5	26.3		16.2	15.1			
Progression Factor	1.52	1.29			1.00	1.00		1.00	1.00			
Incremental Delay, d2	2.2	6.3			0.6	0.2		0.2	0.0			
Delay (s)	41.0	28.4			29.0	26.5		16.4	15.1			
Level of Service	D	C			C	C		B	B			
Approach Delay (s)		31.7			28.1			15.9			0.0	
Approach LOS		C			C			B			A	

Intersection Summary		
HCM 2000 Control Delay	28.5	HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio	0.65	
Actuated Cycle Length (s)	80.0	Sum of lost time (s) 15.6
Intersection Capacity Utilization	72.3%	ICU Level of Service C
Analysis Period (min)	15	
c Critical Lane Group		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕		↗	↕			↕	↗
Sign Control		Yield			Stop			Stop			Stop	
Volume (vph)	235	105	481	26	60	15	255	100	7	19	119	212
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	250	112	512	28	64	16	271	106	7	20	127	226

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	362	512	107	271	114	147	226
Volume Left (vph)	250	0	28	271	0	20	0
Volume Right (vph)	0	512	16	0	7	0	226
Hadj (s)	0.37	-0.63	0.03	0.53	0.02	0.17	-0.68
Departure Headway (s)	7.6	6.6	8.3	8.5	8.0	8.2	7.4
Degree Utilization, x	0.77	0.94	0.25	0.64	0.25	0.34	0.46
Capacity (veh/h)	457	534	414	421	445	430	482
Control Delay (s)	30.2	49.2	14.0	24.3	12.5	14.2	15.3
Approach Delay (s)	41.3		14.0	20.8		14.9	
Approach LOS	E		B	C		B	

Intersection Summary	
Delay	29.4
Level of Service	D
Intersection Capacity Utilization	53.4%
ICU Level of Service	A
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
 20: Brunswick Road & Dwy Sites 7,8

Existing +Background PM Peak Hour
 1/9/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	17	583	10	27	873
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	18	634	11	29	949
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1647	639			645	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1647	639			645	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	96			97	
cM capacity (veh/h)	106	476			941	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	7	18	645	29	949
Volume Left	7	0	0	29	0
Volume Right	0	18	11	0	0
cSH	106	476	1700	941	1700
Volume to Capacity	0.06	0.04	0.38	0.03	0.56
Queue Length 95th (ft)	5	3	0	2	0
Control Delay (s)	41.3	12.9	0.0	9.0	0.0
Lane LOS	E	B		A	
Approach Delay (s)	20.3		0.0	0.3	
Approach LOS	C				

Intersection Summary					
Average Delay			0.5		
Intersection Capacity Utilization			55.9%	ICU Level of Service	B
Analysis Period (min)			15		

HCM Unsignalized Intersection Capacity Analysis
 21: Brunswick Road & Dwy Sites 3-6 and 9

Existing +Background PM Peak Hour
 1/9/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	68	22	39	525	762	117
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	24	42	571	828	127
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1547	892	955			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1547	892	955			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	38	93	94			
cM capacity (veh/h)	118	341	720			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1
Volume Total	74	24	42	571	955
Volume Left	74	0	42	0	0
Volume Right	0	24	0	0	127
cSH	118	341	720	1700	1700
Volume to Capacity	0.62	0.07	0.06	0.34	0.56
Queue Length 95th (ft)	79	6	5	0	0
Control Delay (s)	76.2	16.4	10.3	0.0	0.0
Lane LOS	F	C	B		
Approach Delay (s)	61.6		0.7		0.0
Approach LOS	F				

Intersection Summary					
Average Delay			3.9		
Intersection Capacity Utilization			57.6%	ICU Level of Service	B
Analysis Period (min)			15		

HCM Unsignalized Intersection Capacity Analysis
22: Dwy Site 2

Existing +Background PM Peak Hour
1/9/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	2	18	344	2	29	597
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	20	374	2	32	649
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1087	375			376	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1087	375			376	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	97			97	
cM capacity (veh/h)	233	671			1182	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	2	20	376	32	649
Volume Left	2	0	0	32	0
Volume Right	0	20	2	0	0
cSH	233	671	1700	1182	1700
Volume to Capacity	0.01	0.03	0.22	0.03	0.38
Queue Length 95th (ft)	1	2	0	2	0
Control Delay (s)	20.6	10.5	0.0	8.1	0.0
Lane LOS	C	B		A	
Approach Delay (s)	11.5		0.0	0.4	
Approach LOS	B				

Intersection Summary					
Average Delay			0.5		
Intersection Capacity Utilization			41.4%	ICU Level of Service	A
Analysis Period (min)			15		

HCM Signalized Intersection Capacity Analysis
 11: Pleasant Valley Road & SR-20

Ext + Bkgrd PM Peak Hour

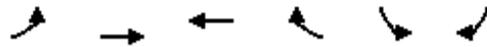
1/16/2013

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (vph)	108	320	42	23	299	405	35	156	18	218	130	71	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. 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	
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1805	1810	1583	1805	1810	1599	1752	1881	1615	1736	1863	1563	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1805	1810	1583	1805	1810	1599	1752	1881	1615	1736	1863	1563	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Adj. Flow (vph)	120	356	47	26	332	450	39	173	20	242	144	79	
RTOR Reduction (vph)	0	0	30	0	0	325	0	0	16	0	0	50	
Lane Group Flow (vph)	120	356	17	26	332	125	39	173	4	242	144	29	
Confl. Peds. (#/hr)							1					1	
Heavy Vehicles (%)	0%	5%	2%	0%	5%	1%	3%	1%	0%	4%	2%	1%	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	
Protected Phases	7	4		3	8		5	2		1	6		
Permitted Phases			4			8			2			6	
Actuated Green, G (s)	7.7	26.7	26.7	1.6	20.6	20.6	3.0	14.8	14.8	14.9	26.7	26.7	
Effective Green, g (s)	7.7	26.7	26.7	1.6	20.6	20.6	3.0	14.8	14.8	14.9	26.7	26.7	
Actuated g/C Ratio	0.10	0.36	0.36	0.02	0.28	0.28	0.04	0.20	0.20	0.20	0.36	0.36	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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	3.0	
Lane Grp Cap (vph)	187	653	571	39	503	445	71	376	323	349	672	563	
v/s Ratio Prot	c0.07	0.20		0.01	c0.18		0.02	c0.09		c0.14	0.08		
v/s Ratio Perm			0.01			0.08			0.00			0.02	
v/c Ratio	0.64	0.55	0.03	0.67	0.66	0.28	0.55	0.46	0.01	0.69	0.21	0.05	
Uniform Delay, d1	31.8	18.8	15.3	35.9	23.6	20.9	34.8	26.1	23.7	27.4	16.4	15.4	
Progression 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	
Incremental Delay, d2	7.3	0.9	0.0	35.5	3.2	0.3	8.4	0.9	0.0	5.9	0.2	0.0	
Delay (s)	39.1	19.8	15.3	71.5	26.8	21.3	43.3	27.0	23.8	33.3	16.5	15.4	
Level of Service	D	B	B	E	C	C	D	C	C	C	B	B	
Approach Delay (s)		23.8			25.2			29.4			25.1		
Approach LOS		C			C			C			C		
Intersection Summary													
HCM 2000 Control Delay			25.3									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.61										
Actuated Cycle Length (s)			74.0									Sum of lost time (s)	16.0
Intersection Capacity Utilization			55.3%									ICU Level of Service	B
Analysis Period (min)			15										
c	Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
 12: SR-20 & Cattle Drive

Ext + Bkgrd PM Peak Hour

1/16/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↑	↗		↙	↘
Volume (veh/h)	6	556	739	17	32	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	6	573	762	18	33	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	779				1356	771
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	779				1356	771
tC, single (s)	4.3				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.4
p0 queue free %	99				80	97
cM capacity (veh/h)	779				162	391

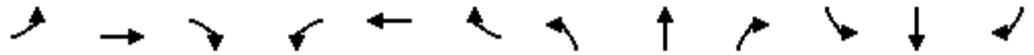
Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	6	573	779	45
Volume Left	6	0	0	33
Volume Right	0	0	18	12
cSH	779	1700	1700	193
Volume to Capacity	0.01	0.34	0.46	0.23
Queue Length 95th (ft)	1	0	0	22
Control Delay (s)	9.7	0.0	0.0	29.3
Lane LOS	A			D
Approach Delay (s)	0.1		0.0	29.3
Approach LOS				D

Intersection Summary			
Average Delay		1.0	
Intersection Capacity Utilization		49.9%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis
13: Penn Valley Drive & SR-20

Ext + Bkgrd PM Peak Hour

1/16/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	58	466	49	256	621	40	59	81	137	27	67	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.8	4.0	3.0	6.8	4.0	3.0	4.8	3.0	3.0	4.8	4.8
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	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3438	1583	1770	3539	1615	1752	1792	1583	1805	1845	1509
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3438	1583	1770	3539	1615	1752	1792	1583	1805	1845	1509
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	62	496	52	272	661	43	63	86	146	29	71	70
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	98	0	0	60
Lane Group Flow (vph)	62	496	52	272	661	43	63	86	48	29	71	10
Heavy Vehicles (%)	0%	5%	2%	2%	2%	0%	3%	6%	2%	0%	3%	7%
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	custom	Prot	NA	custom
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			Free			Free			8			4
Actuated Green, G (s)	3.1	15.4	53.0	10.5	22.8	53.0	2.6	7.8	17.4	1.7	6.9	7.8
Effective Green, g (s)	3.1	15.4	53.0	10.5	22.8	53.0	2.6	7.8	17.4	1.7	6.9	7.8
Actuated g/C Ratio	0.06	0.29	1.00	0.20	0.43	1.00	0.05	0.15	0.33	0.03	0.13	0.15
Clearance Time (s)	3.0	6.8		3.0	6.8		3.0	4.8	3.0	3.0	4.8	4.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	105	998	1583	350	1522	1615	85	263	519	57	240	222
v/s Ratio Prot	0.03	0.14		c0.15	c0.19		c0.04	c0.05	0.02	0.02	0.04	
v/s Ratio Perm			c0.03			0.03			0.01			0.01
v/c Ratio	0.59	0.50	0.03	0.78	0.43	0.03	0.74	0.33	0.09	0.51	0.30	0.05
Uniform Delay, d1	24.3	15.6	0.0	20.1	10.6	0.0	24.9	20.2	12.3	25.2	20.9	19.4
Progression 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
Incremental Delay, d2	8.6	0.4	0.0	10.4	0.2	0.0	28.9	0.7	0.1	7.0	0.7	0.1
Delay (s)	32.9	16.0	0.0	30.5	10.8	0.0	53.8	21.0	12.4	32.2	21.5	19.5
Level of Service	C	B	A	C	B	A	D	C	B	C	C	B
Approach Delay (s)		16.3			15.8			23.7			22.5	
Approach LOS		B			B			C			C	

Intersection Summary

HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	53.0	Sum of lost time (s)	17.6
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 14: Spenceville Road & Penn Valley Drive

Ext + Bkgrd PM Peak Hour

1/16/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	112	78	72	127	153	174
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	124	87	80	141	170	193
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total (vph)	211	221	363			
Volume Left (vph)	124	80	0			
Volume Right (vph)	87	0	193			
Hadj (s)	-0.12	0.09	-0.30			
Departure Headway (s)	5.1	5.0	4.5			
Degree Utilization, x	0.30	0.31	0.45			
Capacity (veh/h)	642	682	769			
Control Delay (s)	10.3	10.2	11.1			
Approach Delay (s)	10.3	10.2	11.1			
Approach LOS	B	B	B			
Intersection Summary						
Delay			10.6			
Level of Service			B			
Intersection Capacity Utilization			51.5%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 15: SR-49 & Cameo Drive

Existing + Bkgrd PM Peak Hour
 3/1/2013

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	7	6	1335	15	8	1009
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	7	1451	16	9	1097
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			None		
Median storage (veh)	2					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2565	726			1467	
vC1, stage 1 conf vol	1451					
vC2, stage 2 conf vol	1114					
vCu, unblocked vol	2565	726			1467	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	98			98	
cM capacity (veh/h)	146	367			456	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	14	726	726	16	9	1097
Volume Left	8	0	0	0	9	0
Volume Right	7	0	0	16	0	0
cSH	202	1700	1700	1700	456	1700
Volume to Capacity	0.07	0.43	0.43	0.01	0.02	0.65
Queue Length 95th (ft)	6	0	0	0	1	0
Control Delay (s)	24.2	0.0	0.0	0.0	13.1	0.0
Lane LOS	C				B	
Approach Delay (s)	24.2	0.0			0.1	
Approach LOS	C					
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			63.1%	ICU Level of Service	B	
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
 16: SR-49 & Wolf Road/Combie Road

Existing + Bkgrd PM Peak Hour

3/1/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	163	93	368	141	285	187	1034	591	405	586	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1703	1881	1553	3433	1845	1568	1770	3505	1599	1752	3471	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1703	1881	1553	3433	1845	1568	1770	3505	1599	1752	3471	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	34	177	101	400	153	310	203	1124	642	440	637	27
RTOR Reduction (vph)	0	0	83	0	0	209	0	0	113	0	0	18
Lane Group Flow (vph)	34	177	18	400	153	101	203	1124	529	440	637	9
Heavy Vehicles (%)	6%	1%	4%	2%	3%	3%	2%	3%	1%	3%	4%	4%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	2.6	14.0	14.0	14.4	25.8	25.8	10.6	26.7	41.1	8.5	24.6	27.2
Effective Green, g (s)	2.6	14.0	14.0	14.4	25.8	25.8	10.6	26.7	41.1	8.5	24.6	27.2
Actuated g/C Ratio	0.03	0.17	0.17	0.18	0.32	0.32	0.13	0.33	0.51	0.11	0.31	0.34
Clearance Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5
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	3.0
Lane Grp Cap (vph)	55	328	271	617	594	505	234	1168	820	185	1066	527
v/s Ratio Prot	0.02	c0.09		c0.12	0.08		0.11	c0.32	0.12	c0.25	0.18	0.00
v/s Ratio Perm			0.01			0.06			0.21			0.01
v/c Ratio	0.62	0.54	0.07	0.65	0.26	0.20	0.87	0.96	0.65	2.38	0.60	0.02
Uniform Delay, d1	38.3	30.1	27.6	30.5	20.1	19.7	34.1	26.2	14.2	35.8	23.5	17.6
Progression 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
Incremental Delay, d2	18.9	1.7	0.1	2.4	0.2	0.2	26.9	18.7	1.8	636.6	2.5	0.0
Delay (s)	57.2	31.8	27.7	32.9	20.3	19.9	61.0	44.9	15.9	672.4	26.0	17.6
Level of Service	E	C	C	C	C	B	E	D	B	F	C	B
Approach Delay (s)		33.2			26.0			37.1			283.4	
Approach LOS		C			C			D			F	

Intersection Summary

HCM 2000 Control Delay	98.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	80.1	Sum of lost time (s)	16.5
Intersection Capacity Utilization	85.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 17: Rosewood Rd/Armstrong Rd & Combie Road

Existing + Bkgrd PM Peak Hour

3/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	59	979	18	6	692	46	8	0	4	62	1	77
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	66	1088	20	7	769	51	9	0	4	69	1	86
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)					955							
pX, platoon unblocked	0.77						0.77	0.77		0.77	0.77	0.77
vC, conflicting volume	820			1108			2097	2062	554	1487	2047	794
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	621			1108			2272	2227	554	1483	2207	588
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	91			99			23	100	99	0	96	76
cM capacity (veh/h)	739			626			11	30	476	61	31	350

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	66	725	383	7	820	13	70	86
Volume Left	66	0	0	7	0	9	69	0
Volume Right	0	0	20	0	51	4	0	86
cSH	739	1700	1700	626	1700	17	60	350
Volume to Capacity	0.09	0.43	0.23	0.01	0.48	0.78	1.16	0.24
Queue Length 95th (ft)	7	0	0	1	0	50	144	24
Control Delay (s)	10.3	0.0	0.0	10.8	0.0	444.5	279.6	18.6
Lane LOS	B			B		F	F	C
Approach Delay (s)	0.6			0.1		444.5	136.1	
Approach LOS						F	F	

Intersection Summary

Average Delay	12.8
Intersection Capacity Utilization	59.9%
ICU Level of Service	B
Analysis Period (min)	15

HCM Signalized Intersection Capacity Analysis
 18: Combie Road & Magnolia Road & Hacienda Drive

Existing + Bkgrd PM Peak Hour

3/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	75	690	258	86	448	51	168	17	136	58	21	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.98			1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.98	
Satd. Flow (prot)	1752	1881	1583	1787	1838			1801	1583		1701	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.98	
Satd. Flow (perm)	1752	1881	1583	1787	1838			1801	1583		1701	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	84	775	290	97	503	57	189	19	153	65	24	96
RTOR Reduction (vph)	0	0	140	0	4	0	0	0	128	0	40	0
Lane Group Flow (vph)	84	775	150	97	556	0	0	208	25	0	145	0
Heavy Vehicles (%)	3%	1%	2%	1%	2%	0%	1%	0%	2%	0%	0%	4%
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	Perm	Split	NA	
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4						2			
Actuated Green, G (s)	6.5	40.8	40.8	6.7	41.0			14.6	14.6		12.4	
Effective Green, g (s)	6.5	40.8	40.8	6.7	41.0			14.6	14.6		12.4	
Actuated g/C Ratio	0.07	0.45	0.45	0.07	0.45			0.16	0.16		0.14	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	125	848	713	132	832			290	255		233	
v/s Ratio Prot	0.05	c0.41		c0.05	0.30			c0.12			c0.09	
v/s Ratio Perm			0.09						0.02			
v/c Ratio	0.67	0.91	0.21	0.73	0.67			0.72	0.10		0.62	
Uniform Delay, d1	41.0	23.2	15.1	41.0	19.4			36.0	32.3		36.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	13.3	14.1	0.1	19.0	2.0			8.2	0.2		5.1	
Delay (s)	54.3	37.3	15.2	60.0	21.5			44.2	32.5		42.0	
Level of Service	D	D	B	E	C			D	C		D	
Approach Delay (s)		33.0			27.2			39.2			42.0	
Approach LOS		C			C			D			D	

Intersection Summary

HCM 2000 Control Delay	33.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 19: SR-49 & Woodridge Drive

Existing + Bkgrd PM Peak Hour

3/1/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↘	↗	↕
Volume (veh/h)	0	186	1626	136	33	1014
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	0	188	1642	137	33	1024
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			None
Median storage veh			2			
Upstream signal (ft)						1119
pX, platoon unblocked	0.90					
vC, conflicting volume	2221	821			1780	
vC1, stage 1 conf vol	1642					
vC2, stage 2 conf vol	579					
vCu, unblocked vol	2139	821			1780	
tC, single (s)	6.8	*6.5			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	47			91	
cM capacity (veh/h)	139	352			354	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	188	821	821	137	33	512	512
Volume Left	0	0	0	0	33	0	0
Volume Right	188	0	0	137	0	0	0
cSH	352	1700	1700	1700	354	1700	1700
Volume to Capacity	0.53	0.48	0.48	0.08	0.09	0.30	0.30
Queue Length 95th (ft)	75	0	0	0	8	0	0
Control Delay (s)	26.3	0.0	0.0	0.0	16.2	0.0	0.0
Lane LOS	D				C		
Approach Delay (s)	26.3	0.0			0.5		
Approach LOS	D						

Intersection Summary			
Average Delay		1.8	
Intersection Capacity Utilization		63.1%	ICU Level of Service B
Analysis Period (min)		15	

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis
 20: Brunswick Road & Dwy Sites 7,8

Existing +Background PM Peak Hour
 1/9/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	17	583	10	27	873
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	18	634	11	29	949
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1647	639			645	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1647	639			645	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	96			97	
cM capacity (veh/h)	106	476			941	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	7	18	645	29	949
Volume Left	7	0	0	29	0
Volume Right	0	18	11	0	0
cSH	106	476	1700	941	1700
Volume to Capacity	0.06	0.04	0.38	0.03	0.56
Queue Length 95th (ft)	5	3	0	2	0
Control Delay (s)	41.3	12.9	0.0	9.0	0.0
Lane LOS	E	B		A	
Approach Delay (s)	20.3		0.0	0.3	
Approach LOS	C				

Intersection Summary					
Average Delay			0.5		
Intersection Capacity Utilization			55.9%	ICU Level of Service	B
Analysis Period (min)			15		

HCM Unsignalized Intersection Capacity Analysis
 21: Brunswick Road & Dwy Sites 3-6 and 9

Existing +Background PM Peak Hour
 1/9/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	68	22	39	525	762	117
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	24	42	571	828	127
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1547	892	955			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1547	892	955			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	38	93	94			
cM capacity (veh/h)	118	341	720			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1
Volume Total	74	24	42	571	955
Volume Left	74	0	42	0	0
Volume Right	0	24	0	0	127
cSH	118	341	720	1700	1700
Volume to Capacity	0.62	0.07	0.06	0.34	0.56
Queue Length 95th (ft)	79	6	5	0	0
Control Delay (s)	76.2	16.4	10.3	0.0	0.0
Lane LOS	F	C	B		
Approach Delay (s)	61.6		0.7		0.0
Approach LOS	F				

Intersection Summary					
Average Delay			3.9		
Intersection Capacity Utilization			57.6%	ICU Level of Service	B
Analysis Period (min)			15		

HCM Unsignalized Intersection Capacity Analysis
22: Dwy Site 2

Existing +Background PM Peak Hour
1/9/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	2	18	344	2	29	597
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	20	374	2	32	649
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1087	375			376	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1087	375			376	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	97			97	
cM capacity (veh/h)	233	671			1182	

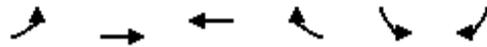
Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	2	20	376	32	649
Volume Left	2	0	0	32	0
Volume Right	0	20	2	0	0
cSH	233	671	1700	1182	1700
Volume to Capacity	0.01	0.03	0.22	0.03	0.38
Queue Length 95th (ft)	1	2	0	2	0
Control Delay (s)	20.6	10.5	0.0	8.1	0.0
Lane LOS	C	B		A	
Approach Delay (s)	11.5		0.0	0.4	
Approach LOS	B				

Intersection Summary					
Average Delay			0.5		
Intersection Capacity Utilization			41.4%	ICU Level of Service	A
Analysis Period (min)			15		

HCM Unsignalized Intersection Capacity Analysis
 23: Penn Valley & Site 10,11,12 Dway

Ext + Bkgrd PM Peak Hour

1/16/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Volume (veh/h)	6	166	227	16	9	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	180	247	17	10	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	264				449	255
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	264				449	255
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	99
cM capacity (veh/h)	1300				565	783

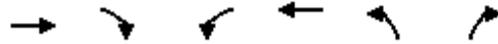
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	187	264	14
Volume Left	7	0	10
Volume Right	0	17	4
cSH	1300	1700	816
Volume to Capacity	0.01	0.16	0.02
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.3	0.0	10.9
Lane LOS	A		B
Approach Delay (s)	0.3	0.0	10.9
Approach LOS			B

Intersection Summary			
Average Delay		0.5	
Intersection Capacity Utilization		23.6%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 24: Broken Oak & Penn Valley

Ext + Bkgrd PM Peak Hour

1/16/2013



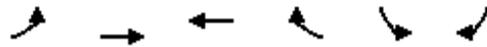
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	↻
Volume (veh/h)	146	17	14	156	9	32
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	162	19	16	173	10	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			181		376	172
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			181		376	172
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		98	96
cM capacity (veh/h)			1394		618	872

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	181	189	46
Volume Left	0	16	10
Volume Right	19	0	36
cSH	1700	1394	1117
Volume to Capacity	0.11	0.01	0.04
Queue Length 95th (ft)	0	1	3
Control Delay (s)	0.0	0.7	9.7
Lane LOS		A	A
Approach Delay (s)	0.0	0.7	9.7
Approach LOS			A

Intersection Summary			
Average Delay		1.4	
Intersection Capacity Utilization	29.8%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 26: Combie Road & Dwy Site 18

Existing + Bkgrd PM Peak Hour
 3/1/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	27	52	28	1	1	16
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	29	57	30	1	1	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	32				146	31
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	32				146	31
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				100	98
cM capacity (veh/h)	1581				830	1043

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	29	57	32	18
Volume Left	29	0	0	1
Volume Right	0	0	1	17
cSH	1581	1700	1700	1028
Volume to Capacity	0.02	0.03	0.02	0.02
Queue Length 95th (ft)	1	0	0	1
Control Delay (s)	7.3	0.0	0.0	8.6
Lane LOS	A			A
Approach Delay (s)	2.5		0.0	8.6
Approach LOS				A

Intersection Summary			
Average Delay		2.7	
Intersection Capacity Utilization		18.2%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 27: Brunswick Road & Loma Rica Rd

Existing +Background PM Peak Hour
 2/25/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	83	375	423	49	207	611
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	90	408	460	53	225	664
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			None
Median storage veh			2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1601	486			513	
vC1, stage 1 conf vol	486					
vC2, stage 2 conf vol	1114					
vCu, unblocked vol	1601	486			513	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	61	30			79	
cM capacity (veh/h)	231	581			1052	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	90	408	513	225	664
Volume Left	90	0	0	225	0
Volume Right	0	408	53	0	0
cSH	231	581	1700	1052	1700
Volume to Capacity	0.39	0.70	0.30	0.21	0.39
Queue Length 95th (ft)	44	140	0	20	0
Control Delay (s)	30.2	24.5	0.0	9.3	0.0
Lane LOS	D	C		A	
Approach Delay (s)	25.5		0.0	2.4	
Approach LOS	D				

Intersection Summary					
Average Delay			7.8		
Intersection Capacity Utilization			55.1%	ICU Level of Service	B
Analysis Period (min)			15		

HCM Unsignalized Intersection Capacity Analysis
28: Higgins Road & Combie Road

Existing + Bkgrd PM Peak Hour

3/1/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					 						 	
Volume (veh/h)	0	838	217	255	546	0	255	0	252	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	911	236	277	593	0	277	0	274	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage (veh)		2										
Upstream signal (ft)		683										
pX, platoon unblocked				0.94			0.94	0.94	0.94	0.94	0.94	0.94
vC, conflicting volume	593			911			1880	2177	1029	2451	2059	297
vC1, stage 1 conf vol							1029	1029		1148	1148	
vC2, stage 2 conf vol							851	1148		1303	911	
vCu, unblocked vol	593			872			1905	2222	997	2514	2096	297
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			62			0	100	0	0	100	100
cM capacity (veh/h)	979			721			151	142	227	0	63	700
Direction, Lane #	EB 1	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1					
Volume Total	1147	277	396	198	277	274	0					
Volume Left	0	277	0	0	277	0	0					
Volume Right	236	0	0	0	0	274	0					
cSH	1700	721	1700	1700	151	227	1700					
Volume to Capacity	0.67	0.38	0.23	0.12	1.84	1.20	0.00					
Queue Length 95th (ft)	0	45	0	0	521	336	0					
Control Delay (s)	0.0	13.1	0.0	0.0	454.2	170.5	0.0					
Lane LOS		B			F	F	A					
Approach Delay (s)	0.0	4.2			313.2		0.0					
Approach LOS					F		A					
Intersection Summary												
Average Delay				68.6								
Intersection Capacity Utilization			95.5%		ICU Level of Service		F					
Analysis Period (min)			15									

APPENDIX E

Intersection Level of Service Calculations: Existing plus Background Projects plus Project Conditions

HCM Signalized Intersection Capacity Analysis
 1: Nevada City Highway & Brunswick Road

Ex + Bkg + Proj PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↖	↖	↖	↑	↗	↗	↗	↗
Volume (vph)	10	24	7	333	20	581	4	241	322	573	255	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	1.00	1.00	0.97	1.00	
Frbp, ped/bikes		1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.99		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1788		1698	1704	1596	1805	1881	1556	3433	1862	
Flt Permitted		0.99		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1788		1698	1704	1596	1805	1881	1556	3433	1862	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	11	26	8	358	22	625	4	259	346	616	274	1
RTOR Reduction (vph)	0	7	0	0	0	363	0	0	252	0	0	0
Lane Group Flow (vph)	0	38	0	190	190	262	4	259	94	616	275	0
Confl. Peds. (#/hr)	3					3	11		3	3		11
Heavy Vehicles (%)	0%	0%	14%	1%	5%	0%	0%	1%	2%	2%	2%	0%
Turn Type	Split	NA		Split	NA	pm+ov	Split	NA	Perm	Split	NA	
Protected Phases	6	6		8	8	4	2	2		4	4	
Permitted Phases						8			2			
Actuated Green, G (s)		16.0		13.9	13.9	33.5	24.5	24.5	24.5	19.6	19.6	
Effective Green, g (s)		16.0		13.9	13.9	33.5	24.5	24.5	24.5	19.6	19.6	
Actuated g/C Ratio		0.18		0.15	0.15	0.37	0.27	0.27	0.27	0.22	0.22	
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		317		262	263	665	491	512	423	747	405	
v/s Ratio Prot		c0.02		c0.11	0.11	0.09	0.00	c0.14		c0.18	0.15	
v/s Ratio Perm						0.08			0.06			
v/c Ratio		0.12		0.73	0.72	0.39	0.01	0.51	0.22	0.82	0.68	
Uniform Delay, d1		31.1		36.2	36.2	20.8	23.9	27.6	25.4	33.6	32.3	
Progression Factor		1.00		0.71	0.71	0.36	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.8		9.1	8.9	0.4	0.0	3.5	1.2	7.4	4.5	
Delay (s)		31.9		34.7	34.5	7.8	23.9	31.2	26.6	40.9	36.8	
Level of Service		C		C	C	A	C	C	C	D	D	
Approach Delay (s)		31.9			17.9			28.5			39.7	
Approach LOS		C			B			C			D	

Intersection Summary

HCM 2000 Control Delay	28.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

2: Maltman Drive/SR 20-49 SB Ramps & Brunswick Road

Ex + Bkg + Proj PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑		↖		↖	↖↖	↑	↖
Volume (vph)	0	864	64	195	665	0	48	0	326	463	60	220
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0		4.0	4.0	4.0	4.0
Lane Util. Factor		0.95		1.00	0.95		1.00		1.00	0.97	1.00	1.00
Frbp, ped/bikes		1.00		1.00	1.00		1.00		0.99	1.00	1.00	1.00
Flpb, ped/bikes		1.00		1.00	1.00		1.00		1.00	1.00	1.00	1.00
Frt		0.99		1.00	1.00		1.00		0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00		0.95		1.00	0.95	1.00	1.00
Satd. Flow (prot)		3497		1770	3610		1805		1603	3400	1881	1599
Flt Permitted		1.00		0.95	1.00		0.95		1.00	0.95	1.00	1.00
Satd. Flow (perm)		3497		1770	3610		1805		1603	3400	1881	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	939	70	212	723	0	52	0	354	503	65	239
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	47	0	0	165
Lane Group Flow (vph)	0	1003	0	212	723	0	52	0	307	503	65	74
Confl. Peds. (#/hr)			9						9			
Heavy Vehicles (%)	0%	1%	13%	2%	0%	0%	0%	0%	0%	3%	1%	1%
Turn Type		NA		Prot	NA		Prot		custom	Split	NA	Perm
Protected Phases		4		3	8		2		3	6	6	
Permitted Phases									2			6
Actuated Green, G (s)		26.0		14.4	44.4		5.6		20.0	28.0	28.0	28.0
Effective Green, g (s)		26.0		14.4	44.4		5.6		20.0	28.0	28.0	28.0
Actuated g/C Ratio		0.29		0.16	0.49		0.06		0.22	0.31	0.31	0.31
Clearance Time (s)		4.0		4.0	4.0		4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0		3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		1010		283	1780		112		427	1057	585	497
v/s Ratio Prot		c0.29		0.12	0.20		0.03		c0.11	c0.15	0.03	
v/s Ratio Perm									0.08			0.05
v/c Ratio		0.99		0.75	0.41		0.46		0.72	0.48	0.11	0.15
Uniform Delay, d1		31.9		36.1	14.4		40.8		32.4	25.1	22.1	22.4
Progression Factor		0.37		0.77	0.58		1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2		22.4		15.3	0.1		3.0		5.7	1.5	0.4	0.6
Delay (s)		34.2		43.1	8.6		43.8		38.1	26.6	22.5	23.0
Level of Service		C		D	A		D		D	C	C	C
Approach Delay (s)		34.2			16.4			38.8			25.2	
Approach LOS		C			B			D			C	

Intersection Summary

HCM 2000 Control Delay	27.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	70.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 3: SR 20-49 NB Ramps & Brunswick Road

Ex + Bkg + Proj PM Peak Hour
 1/9/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑↑	↘	↗
Volume (vph)	881	0	0	1443	238	435
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			0.91	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3574			5136	1805	1553
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3574			5136	1805	1553
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	918	0	0	1503	248	453
RTOR Reduction (vph)	0	0	0	0	0	44
Lane Group Flow (vph)	918	0	0	1503	248	409
Heavy Vehicles (%)	1%	0%	0%	1%	0%	4%
Turn Type	NA			NA	NA	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Actuated Green, G (s)	42.0			42.0	40.0	40.0
Effective Green, g (s)	42.0			42.0	40.0	40.0
Actuated g/C Ratio	0.47			0.47	0.44	0.44
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	1667			2396	802	690
v/s Ratio Prot	0.26			c0.29	0.14	
v/s Ratio Perm						c0.26
v/c Ratio	0.55			0.63	0.31	0.59
Uniform Delay, d1	17.2			18.1	16.1	18.9
Progression Factor	0.80			1.00	1.00	1.00
Incremental Delay, d2	0.4			1.3	1.0	3.7
Delay (s)	14.1			19.4	17.1	22.6
Level of Service	B			B	B	C
Approach Delay (s)	14.1			19.4	20.6	
Approach LOS	B			B	C	

Intersection Summary

HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Sutton Way & Brunswick Road

Ex + Bkg + Proj PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	230	773	442	265	754	42	500	89	292	79	75	274
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95		0.97	1.00		1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.90	1.00	1.00		1.00	1.00		1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.89		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3467	3471	1456	1787	3480		3467	1649		1787	1881	1520
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3467	3471	1456	1787	3480		3467	1649		1787	1881	1520
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	242	814	465	279	794	44	526	94	307	83	79	288
RTOR Reduction (vph)	0	0	342	0	5	0	0	144	0	0	0	82
Lane Group Flow (vph)	242	814	123	279	833	0	526	257	0	83	79	206
Confl. Peds. (#/hr)	1		32	32		1	36					36
Heavy Vehicles (%)	1%	4%	0%	1%	3%	0%	1%	2%	2%	1%	1%	2%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases			4									6
Actuated Green, G (s)	10.3	20.0	20.0	13.9	23.6		13.8	25.3		4.8	16.3	26.6
Effective Green, g (s)	10.3	20.0	20.0	13.9	23.6		13.8	25.3		4.8	16.3	26.6
Actuated g/C Ratio	0.13	0.25	0.25	0.17	0.30		0.17	0.32		0.06	0.20	0.33
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	446	867	364	310	1026		598	521		107	383	581
v/s Ratio Prot	0.07	c0.23		c0.16	0.24		c0.15	c0.16		c0.05	0.04	0.05
v/s Ratio Perm			0.08									0.09
v/c Ratio	0.54	0.94	0.34	0.90	0.81		0.88	0.49		0.78	0.21	0.35
Uniform Delay, d1	32.6	29.4	24.6	32.4	26.1		32.3	22.2		37.1	26.5	20.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.4	17.4	0.6	27.3	5.0		13.9	3.3		28.9	1.2	0.4
Delay (s)	34.0	46.8	25.1	59.7	31.1		46.2	25.5		65.9	27.7	20.6
Level of Service	C	D	C	E	C		D	C		E	C	C
Approach Delay (s)		38.1			38.3			37.2			30.2	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM 2000 Control Delay	37.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	77.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
5: Brunswick Road & Idaho-Maryland Road

Ex + Bkg + Proj PM Peak Hour

1/9/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	214	185	0	283	227	588	100	193	576	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	233	201	0	308	247	639	109	210	626	43
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)						1						
Median type								TWLTL			None	
Median storage (veh)								2				
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2178	2287	626	2465	2276	693	670			748		
vC1, stage 1 conf vol	1046	1046		1187	1187							
vC2, stage 2 conf vol	1133	1241		1278	1089							
vCu, unblocked vol	2178	2287	626	2465	2276	693	670			748		
tC, single (s)	7.1	6.5	6.2	7.2	6.8	6.3	4.1			4.2		
tC, 2 stage (s)	6.1	5.5		6.2	5.8							
tF (s)	3.5	4.0	3.3	3.6	4.3	3.4	2.2			2.3		
p0 queue free %	100	100	52	0	100	28	73			74		
cM capacity (veh/h)	6	22	480	6	18	428	921			809		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3					
Volume Total	233	509	247	748	210	626	43					
Volume Left	0	201	247	0	210	0	0					
Volume Right	233	308	0	109	0	0	43					
cSH	480	15	921	1700	809	1700	1700					
Volume to Capacity	0.48	33.12	0.27	0.44	0.26	0.37	0.03					
Queue Length 95th (ft)	65	Err	27	0	26	0	0					
Control Delay (s)	19.3	Err	10.3	0.0	11.0	0.0	0.0					
Lane LOS	C	F	B		B							
Approach Delay (s)	19.3	Err	2.6		2.6							
Approach LOS	C	F										
Intersection Summary												
Average Delay			1948.5									
Intersection Capacity Utilization			68.0%	ICU Level of Service	C							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
6: McCourtney Road & Personeni Road

Ex + Bkg + Proj PM Peak Hour
1/9/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	4	1	1	272	410	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	4	1	1	299	451	0
Pedestrians				1		
Lane Width (ft)				12.0		
Walking Speed (ft/s)				4.0		
Percent Blockage				0		
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	752	452	451			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	752	452	451			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	381	612	1121			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	5	300	451			
Volume Left	4	1	0			
Volume Right	1	0	0			
cSH	476	1121	1700			
Volume to Capacity	0.01	0.00	0.27			
Queue Length 95th (ft)	1	0	0			
Control Delay (s)	13.8	0.0	0.0			
Lane LOS	B	A				
Approach Delay (s)	13.8	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			31.9%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
7: Taylorville Road & McKnight Way

Ex + Bkg + Proj PM Peak Hour
1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑		↖	↗				↗			↖
Volume (veh/h)	0	774	11	23	596	256	0	0	36	0	0	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	841	12	25	648	278	0	0	39	0	0	9
Pedestrians								3				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								0				
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)					172							
pX, platoon unblocked	0.83						0.83	0.83		0.83	0.83	0.83
vC, conflicting volume	926			856			1557	1826	289	1157	1693	787
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	812			856			1568	1892	289	1088	1732	645
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	94	100	100	98
cM capacity (veh/h)	687			791			60	57	711	133	72	350

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1
Volume Total	337	337	180	25	926	39	9
Volume Left	0	0	0	25	0	0	0
Volume Right	0	0	12	0	278	39	9
cSH	1700	1700	1700	791	1700	711	350
Volume to Capacity	0.20	0.20	0.11	0.03	0.54	0.06	0.02
Queue Length 95th (ft)	0	0	0	2	0	4	2
Control Delay (s)	0.0	0.0	0.0	9.7	0.0	10.4	15.5
Lane LOS				A		B	C
Approach Delay (s)	0.0			0.3		10.4	15.5
Approach LOS						B	C

Intersection Summary

Average Delay	0.4
Intersection Capacity Utilization	57.0%
ICU Level of Service	B
Analysis Period (min)	15

HCM Signalized Intersection Capacity Analysis
 8: 49 SB Off-Ramp & McKnight Way

Ex + Bkg + Proj PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗	↘	↑						↖	↗
Volume (vph)	0	621	190	68	419	0	0	0	0	420	0	456
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5	3.5	3.0	3.5						4.6	4.6
Lane Util. Factor		0.95	1.00	1.00	1.00						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3610	1615	1787	1900						1770	1615
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3610	1615	1787	1900						1770	1615
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.94	0.94
Adj. Flow (vph)	0	661	202	72	446	0	0	0	0	457	0	485
RTOR Reduction (vph)	0	0	150	0	0	0	0	0	0	0	0	183
Lane Group Flow (vph)	0	661	52	72	446	0	0	0	0	0	457	302
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%	2%	2%	2%	2%	3%	0%
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		2		1	2 1						4 12	
Permitted Phases			2							4 12		4 12
Actuated Green, G (s)		20.6	20.6	16.8	40.4						32.1	32.1
Effective Green, g (s)		20.6	20.6	16.8	37.4						32.1	32.1
Actuated g/C Ratio		0.26	0.26	0.21	0.47						0.40	0.40
Clearance Time (s)		3.5	3.5	3.0								
Vehicle Extension (s)		3.0	3.0	4.7								
Lane Grp Cap (vph)		929	415	375	888						710	648
v/s Ratio Prot		c0.18		0.04	c0.23							
v/s Ratio Perm			0.03								0.26	0.19
v/c Ratio		0.71	0.13	0.19	0.50						0.64	0.47
Uniform Delay, d1		27.0	22.8	26.0	14.8						19.3	17.6
Progression Factor		1.00	1.00	1.74	1.05						1.00	1.00
Incremental Delay, d2		4.6	0.6	0.4	0.8						2.0	0.5
Delay (s)		31.6	23.4	45.6	16.4						21.3	18.2
Level of Service		C	C	D	B						C	B
Approach Delay (s)		29.7			20.5			0.0			19.7	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	23.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	15.6
Intersection Capacity Utilization	75.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 9: 49 NB Off-Ramp/49 NB On-Ramp & McKnight Way

Ex + Bkg + Proj PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑			↑↑	↗		↖	↗			
Volume (vph)	269	771	0	0	335	216	151	0	94	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			4.0	4.0		4.6	4.6			
Lane Util. Factor	1.00	1.00			0.95	1.00		1.00	1.00			
Frbp, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00			
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00			
Frt	1.00	1.00			1.00	0.85		1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00			
Satd. Flow (prot)	1787	1863			3574	1568		1787	1538			
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00			
Satd. Flow (perm)	1787	1863			3574	1568		1787	1538			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	292	838	0	0	364	235	164	0	102	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	188	0	0	58	0	0	0
Lane Group Flow (vph)	292	838	0	0	364	47	0	164	44	0	0	0
Confl. Peds. (#/hr)			3	3								
Heavy Vehicles (%)	1%	2%	0%	0%	1%	3%	1%	0%	5%	2%	2%	2%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	5	5 6			6			8 16				
Permitted Phases						6	8 16		8 16			
Actuated Green, G (s)	20.9	39.9			16.0	16.0		32.1	32.1			
Effective Green, g (s)	20.9	39.9			16.0	16.0		32.1	32.1			
Actuated g/C Ratio	0.26	0.50			0.20	0.20		0.40	0.40			
Clearance Time (s)	3.0				4.0	4.0						
Vehicle Extension (s)	4.7				3.0	3.0						
Lane Grp Cap (vph)	466	929			714	313		717	617			
v/s Ratio Prot	0.16	c0.45			0.10							
v/s Ratio Perm						0.03		0.09	0.03			
v/c Ratio	0.63	0.90			0.51	0.15		0.23	0.07			
Uniform Delay, d1	26.1	18.3			28.5	26.4		15.8	14.8			
Progression Factor	1.49	1.28			1.00	1.00		1.00	1.00			
Incremental Delay, d2	2.6	9.8			0.6	0.2		0.2	0.0			
Delay (s)	41.4	33.2			29.1	26.6		16.0	14.8			
Level of Service	D	C			C	C		B	B			
Approach Delay (s)		35.3			28.1			15.5			0.0	
Approach LOS		D			C			B			A	

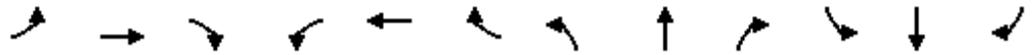
Intersection Summary

HCM 2000 Control Delay	30.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	15.6
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 10: La Barr Meadows Road/S Auburn Street & McKnight Way

Ex + Bkg + Proj PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕		↗	↕			↕	↗
Sign Control		Yield			Stop			Stop			Stop	
Volume (vph)	238	105	522	26	60	15	274	104	7	19	128	218
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	253	112	555	28	64	16	291	111	7	20	136	232

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	365	555	107	291	118	156	232
Volume Left (vph)	253	0	28	291	0	20	0
Volume Right (vph)	0	555	16	0	7	0	232
Hadj (s)	0.38	-0.63	0.03	0.53	0.02	0.17	-0.68
Departure Headway (s)	7.7	6.7	8.4	8.4	7.9	8.2	7.4
Degree Utilization, x	0.78	1.04	0.25	0.68	0.26	0.36	0.47
Capacity (veh/h)	451	539	408	416	442	427	478
Control Delay (s)	32.3	73.2	14.2	26.6	12.5	14.5	15.6
Approach Delay (s)	57.0		14.2	22.6		15.1	
Approach LOS	F		B	C		C	

Intersection Summary	
Delay	37.9
Level of Service	E
Intersection Capacity Utilization	58.7%
ICU Level of Service	B
Analysis Period (min)	15

HCM Signalized Intersection Capacity Analysis
 11: Pleasant Valley Road & SR-20

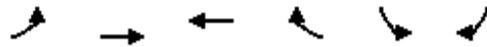
Ext + Bkgrd + Proj PM Peak Hour

1/9/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (vph)	108	335	55	23	305	412	41	167	18	234	154	71	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. 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	
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1805	1810	1583	1805	1810	1599	1752	1881	1615	1736	1863	1563	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1805	1810	1583	1805	1810	1599	1752	1881	1615	1736	1863	1563	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	
Adj. Flow (vph)	116	360	59	25	328	443	44	180	19	252	166	76	
RTOR Reduction (vph)	0	0	38	0	0	320	0	0	15	0	0	48	
Lane Group Flow (vph)	116	360	21	25	328	123	44	180	4	252	166	28	
Confl. Peds. (#/hr)							1					1	
Heavy Vehicles (%)	0%	5%	2%	0%	5%	1%	3%	1%	0%	4%	2%	1%	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	
Protected Phases	7	4		3	8		5	2		1	6		
Permitted Phases			4			8			2			6	
Actuated Green, G (s)	7.6	26.7	26.7	1.6	20.7	20.7	3.0	15.0	15.0	15.3	27.3	27.3	
Effective Green, g (s)	7.6	26.7	26.7	1.6	20.7	20.7	3.0	15.0	15.0	15.3	27.3	27.3	
Actuated g/C Ratio	0.10	0.36	0.36	0.02	0.28	0.28	0.04	0.20	0.20	0.21	0.37	0.37	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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	3.0	
Lane Grp Cap (vph)	183	647	566	38	502	443	70	378	324	356	681	571	
v/s Ratio Prot	c0.06	0.20		0.01	c0.18		0.03	c0.10		c0.15	0.09		
v/s Ratio Perm			0.01			0.08			0.00			0.02	
v/c Ratio	0.63	0.56	0.04	0.66	0.65	0.28	0.63	0.48	0.01	0.71	0.24	0.05	
Uniform Delay, d1	32.2	19.2	15.6	36.2	23.8	21.1	35.3	26.3	23.9	27.6	16.5	15.3	
Progression 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	
Incremental Delay, d2	7.0	1.0	0.0	34.3	3.0	0.3	16.3	0.9	0.0	6.3	0.2	0.0	
Delay (s)	39.2	20.2	15.6	70.5	26.8	21.4	51.6	27.3	23.9	33.9	16.7	15.3	
Level of Service	D	C	B	E	C	C	D	C	C	C	B	B	
Approach Delay (s)		23.8			25.2			31.4			25.2		
Approach LOS		C			C			C			C		
Intersection Summary													
HCM 2000 Control Delay			25.6									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.62										
Actuated Cycle Length (s)			74.6									Sum of lost time (s)	16.0
Intersection Capacity Utilization			57.1%									ICU Level of Service	B
Analysis Period (min)			15										
c Critical Lane Group													

HCM Unsignalized Intersection Capacity Analysis
 12: SR-20 & Cattle Drive

Ext + Bkgrd + Proj PM Peak Hour
 1/9/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↑	↗		↙	↘
Volume (veh/h)	6	587	752	17	32	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	6	605	775	18	33	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	793				1402	784
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	793				1402	784
tC, single (s)	4.3				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.4
p0 queue free %	99				78	97
cM capacity (veh/h)	769				152	384

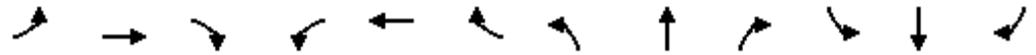
Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	6	605	793	45
Volume Left	6	0	0	33
Volume Right	0	0	18	12
cSH	769	1700	1700	182
Volume to Capacity	0.01	0.36	0.47	0.25
Queue Length 95th (ft)	1	0	0	24
Control Delay (s)	9.7	0.0	0.0	31.2
Lane LOS	A			D
Approach Delay (s)	0.1		0.0	31.2
Approach LOS				D

Intersection Summary			
Average Delay		1.0	
Intersection Capacity Utilization		50.6%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis
13: Penn Valley Drive & SR-20

Ext + Bkgrd + Proj PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↗	↘	↘	↗	↘	↘	↗	↘	↘	↗	↘
Volume (vph)	58	497	49	329	634	43	59	92	173	35	91	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.8	4.0	3.0	6.8	4.0	3.0	4.8	3.0	3.0	4.8	4.8
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	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3438	1583	1770	3539	1615	1752	1792	1583	1805	1845	1509
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3438	1583	1770	3539	1615	1752	1792	1583	1805	1845	1509
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	61	523	52	346	667	45	62	97	182	37	96	69
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	120	0	0	59
Lane Group Flow (vph)	61	523	52	346	667	45	62	97	62	37	96	10
Heavy Vehicles (%)	0%	5%	2%	2%	2%	0%	3%	6%	2%	0%	3%	7%
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	custom	Prot	NA	custom
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			Free			Free			8			4
Actuated Green, G (s)	3.0	14.4	52.4	10.9	22.3	52.4	2.5	7.9	17.9	1.6	7.0	7.9
Effective Green, g (s)	3.0	14.4	52.4	10.9	22.3	52.4	2.5	7.9	17.9	1.6	7.0	7.9
Actuated g/C Ratio	0.06	0.27	1.00	0.21	0.43	1.00	0.05	0.15	0.34	0.03	0.13	0.15
Clearance Time (s)	3.0	6.8		3.0	6.8		3.0	4.8	3.0	3.0	4.8	4.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	103	944	1583	368	1506	1615	83	270	540	55	246	227
v/s Ratio Prot	0.03	c0.15		c0.20	0.19		c0.04	c0.05	0.02	0.02	0.05	
v/s Ratio Perm			c0.03			0.03			0.02			0.01
v/c Ratio	0.59	0.55	0.03	0.94	0.44	0.03	0.75	0.36	0.12	0.67	0.39	0.05
Uniform Delay, d1	24.1	16.3	0.0	20.4	10.7	0.0	24.6	20.0	11.8	25.1	20.7	19.0
Progression 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
Incremental Delay, d2	8.8	0.7	0.0	31.8	0.2	0.0	30.2	0.8	0.1	27.8	1.0	0.1
Delay (s)	32.9	17.0	0.0	52.3	10.9	0.0	54.8	20.8	11.9	53.0	21.8	19.1
Level of Service	C	B	A	D	B	A	D	C	B	D	C	B
Approach Delay (s)		17.1			23.9			22.2			26.6	
Approach LOS		B			C			C			C	

Intersection Summary

HCM 2000 Control Delay	22.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	52.4	Sum of lost time (s)	17.6
Intersection Capacity Utilization	54.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 14: Spenceville Road & Penn Valley Drive

Ext + Bkgrd + Proj PM Peak Hour
 1/9/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	159	82	81	127	153	271
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	177	91	90	141	170	301
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total (vph)	268	231	471			
Volume Left (vph)	177	90	0			
Volume Right (vph)	91	0	301			
Hadj (s)	-0.07	0.10	-0.36			
Departure Headway (s)	5.5	5.4	4.7			
Degree Utilization, x	0.41	0.35	0.61			
Capacity (veh/h)	600	629	741			
Control Delay (s)	12.4	11.3	14.8			
Approach Delay (s)	12.4	11.3	14.8			
Approach LOS	B	B	B			
Intersection Summary						
Delay			13.3			
Level of Service			B			
Intersection Capacity Utilization			60.3%	ICU Level of Service	B	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 15: SR-49 & Cameo Drive

Existing + Bkgrd + Proj PM Peak Hour

3/1/2013

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	12	8	1364	26	12	1033
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	9	1483	28	13	1123
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			None		
Median storage veh	2					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2632	741			1511	
vC1, stage 1 conf vol	1483					
vC2, stage 2 conf vol	1149					
vCu, unblocked vol	2632	741			1511	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	98			97	
cM capacity (veh/h)	139	359			439	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	22	741	741	28	13	1123
Volume Left	13	0	0	0	13	0
Volume Right	9	0	0	28	0	0
cSH	184	1700	1700	1700	439	1700
Volume to Capacity	0.12	0.44	0.44	0.02	0.03	0.66
Queue Length 95th (ft)	10	0	0	0	2	0
Control Delay (s)	27.1	0.0	0.0	0.0	13.5	0.0
Lane LOS	D				B	
Approach Delay (s)	27.1	0.0			0.2	
Approach LOS	D					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			64.4%		ICU Level of Service	C
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
16: SR-49 & Wolf Road/Combie Road

Existing + Bkgrd + Proj PM Peak Hour

3/1/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	168	93	374	143	295	187	1062	603	420	599	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1703	1881	1553	3433	1845	1568	1770	3505	1599	1752	3471	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1703	1881	1553	3433	1845	1568	1770	3505	1599	1752	3471	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	36	183	101	407	155	321	203	1154	655	457	651	28
RTOR Reduction (vph)	0	0	83	0	0	207	0	0	109	0	0	19
Lane Group Flow (vph)	36	183	18	407	155	114	203	1154	546	457	651	9
Heavy Vehicles (%)	6%	1%	4%	2%	3%	3%	2%	3%	1%	3%	4%	4%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	2.6	14.2	14.2	14.5	26.1	26.1	10.6	26.7	41.2	8.5	24.6	27.2
Effective Green, g (s)	2.6	14.2	14.2	14.5	26.1	26.1	10.6	26.7	41.2	8.5	24.6	27.2
Actuated g/C Ratio	0.03	0.18	0.18	0.18	0.32	0.32	0.13	0.33	0.51	0.11	0.31	0.34
Clearance Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5
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	3.0
Lane Grp Cap (vph)	55	332	274	619	598	509	233	1163	819	185	1062	525
v/s Ratio Prot	0.02	c0.10		0.12	0.08		0.11	c0.33	c0.12	c0.26	0.19	0.00
v/s Ratio Perm			0.01			0.07			0.22			0.01
v/c Ratio	0.65	0.55	0.07	0.66	0.26	0.22	0.87	0.99	0.67	2.47	0.61	0.02
Uniform Delay, d1	38.5	30.2	27.6	30.6	20.0	19.8	34.2	26.7	14.5	36.0	23.8	17.7
Progression 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
Incremental Delay, d2	24.6	2.0	0.1	2.5	0.2	0.2	27.9	24.6	2.1	677.6	2.6	0.0
Delay (s)	63.1	32.2	27.7	33.2	20.3	20.0	62.2	51.4	16.6	713.5	26.5	17.7
Level of Service	E	C	C	C	C	C	E	D	B	F	C	B
Approach Delay (s)		34.2			26.1			41.1			302.7	
Approach LOS		C			C			D			F	

Intersection Summary

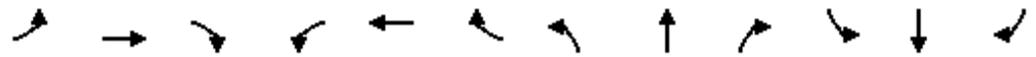
HCM 2000 Control Delay	105.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	80.4	Sum of lost time (s)	16.5
Intersection Capacity Utilization	87.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 17: Rosewood Rd/Armstrong Rd & Combie Road

Existing + Bkgrd + Proj PM Peak Hour

3/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	59	1007	22	7	710	46	9	0	4	62	1	77
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	66	1119	24	8	789	51	10	0	4	69	1	86
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)					955							
pX, platoon unblocked	0.77						0.77	0.77		0.77	0.77	0.77
vC, conflicting volume	840			1143			2153	2118	572	1525	2104	814
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	642			1143			2349	2303	572	1533	2286	609
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	91			99			0	100	99	0	96	75
cM capacity (veh/h)	722			607			10	26	463	56	27	337

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	66	746	397	8	840	14	70	86
Volume Left	66	0	0	8	0	10	69	0
Volume Right	0	0	24	0	51	4	0	86
cSH	722	1700	1700	607	1700	14	55	337
Volume to Capacity	0.09	0.44	0.23	0.01	0.49	1.03	1.27	0.25
Queue Length 95th (ft)	7	0	0	1	0	59	154	25
Control Delay (s)	10.5	0.0	0.0	11.0	0.0	615.2	335.0	19.3
Lane LOS	B			B		F	F	C
Approach Delay (s)	0.6			0.1		615.2	161.4	
Approach LOS						F	F	

Intersection Summary

Average Delay	15.6
Intersection Capacity Utilization	60.9%
ICU Level of Service	B
Analysis Period (min)	15

HCM Signalized Intersection Capacity Analysis
 18: Combie Road & Magnolia Road & Hacienda Drive

Existing + Bkgrd + Proj PM Peak Hour

3/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	75	692	284	92	455	51	180	17	139	58	22	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.98			1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.98	
Satd. Flow (prot)	1752	1881	1583	1787	1838			1801	1583		1701	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.98	
Satd. Flow (perm)	1752	1881	1583	1787	1838			1801	1583		1701	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	84	778	319	103	511	57	202	19	156	65	25	97
RTOR Reduction (vph)	0	0	153	0	4	0	0	0	131	0	40	0
Lane Group Flow (vph)	84	778	166	103	564	0	0	221	25	0	147	0
Heavy Vehicles (%)	3%	1%	2%	1%	2%	0%	1%	0%	2%	0%	0%	4%
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	Perm	Split	NA	
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4						2			
Actuated Green, G (s)	6.6	42.1	42.1	6.8	42.3			15.1	15.1		12.5	
Effective Green, g (s)	6.6	42.1	42.1	6.8	42.3			15.1	15.1		12.5	
Actuated g/C Ratio	0.07	0.46	0.46	0.07	0.46			0.16	0.16		0.14	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	125	856	720	131	840			294	258		229	
v/s Ratio Prot	0.05	c0.41		c0.06	0.31			c0.12			c0.09	
v/s Ratio Perm			0.11						0.02			
v/c Ratio	0.67	0.91	0.23	0.79	0.67			0.75	0.10		0.64	
Uniform Delay, d1	41.9	23.4	15.3	42.1	19.7			36.9	32.9		37.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	13.3	13.3	0.2	26.0	2.1			10.3	0.2		6.1	
Delay (s)	55.2	36.7	15.5	68.1	21.8			47.3	33.1		43.9	
Level of Service	E	D	B	E	C			D	C		D	
Approach Delay (s)		32.3			28.9			41.4			43.9	
Approach LOS		C			C			D			D	

Intersection Summary

HCM 2000 Control Delay	33.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	92.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 19: SR-49 & Woodridge Drive

Existing + Bkgrd + Proj PM Peak Hour

3/1/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗	↘	↕
Volume (veh/h)	0	187	1665	139	35	1031
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	0	189	1682	140	35	1041
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			None
Median storage (veh)			2			
Upstream signal (ft)						1119
pX, platoon unblocked	0.90					
vC, conflicting volume	2273	841			1822	
vC1, stage 1 conf vol	1682					
vC2, stage 2 conf vol	591					
vCu, unblocked vol	2191	841			1822	
tC, single (s)	6.8	*6.5			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	45			90	
cM capacity (veh/h)	132	343			341	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	189	841	841	140	35	521	521
Volume Left	0	0	0	0	35	0	0
Volume Right	189	0	0	140	0	0	0
cSH	343	1700	1700	1700	341	1700	1700
Volume to Capacity	0.55	0.49	0.49	0.08	0.10	0.31	0.31
Queue Length 95th (ft)	79	0	0	0	9	0	0
Control Delay (s)	27.7	0.0	0.0	0.0	16.8	0.0	0.0
Lane LOS	D				C		
Approach Delay (s)	27.7	0.0			0.6		
Approach LOS	D						

Intersection Summary			
Average Delay		1.9	
Intersection Capacity Utilization		64.3%	ICU Level of Service C
Analysis Period (min)		15	

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis
 20: Brunswick Road & Dwy Sites 7,8

Ex + Bkg + Proj PM Peak Hour

1/9/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	18	53	763	36	106	971
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	58	829	39	115	1055
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2135	849			868	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2135	849			868	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	58	84			85	
cM capacity (veh/h)	46	361			776	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	20	58	868	115	1055
Volume Left	20	0	0	115	0
Volume Right	0	58	39	0	0
cSH	46	361	1700	776	1700
Volume to Capacity	0.42	0.16	0.51	0.15	0.62
Queue Length 95th (ft)	38	14	0	13	0
Control Delay (s)	131.6	16.9	0.0	10.4	0.0
Lane LOS	F	C		B	
Approach Delay (s)	45.9		0.0	1.0	
Approach LOS	E				

Intersection Summary					
Average Delay			2.2		
Intersection Capacity Utilization			61.5%	ICU Level of Service	B
Analysis Period (min)			15		

HCM Unsignalized Intersection Capacity Analysis
 21: Brunswick Road & Dwy Sites 3-6 and 9

Ex + Bkg + Proj PM Peak Hour
 1/9/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	106	35	72	799	774	215
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	115	38	78	868	841	234
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1983	958	1075			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1983	958	1075			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	88	88			
cM capacity (veh/h)	59	312	649			
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	
Volume Total	115	38	78	868	1075	
Volume Left	115	0	78	0	0	
Volume Right	0	38	0	0	234	
cSH	59	312	649	1700	1700	
Volume to Capacity	1.94	0.12	0.12	0.51	0.63	
Queue Length 95th (ft)	273	10	10	0	0	
Control Delay (s)	591.0	18.1	11.3	0.0	0.0	
Lane LOS	F	C	B			
Approach Delay (s)	448.8		0.9		0.0	
Approach LOS	F					
Intersection Summary						
Average Delay			32.0			
Intersection Capacity Utilization			72.4%	ICU Level of Service	C	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
22: Dwy Site 2

Ex + Bkg + Proj PM Peak Hour
1/9/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	4	39	346	4	79	597
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	42	376	4	86	649
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1199	378			380	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1199	378			380	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	94			93	
cM capacity (veh/h)	190	668			1178	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	4	42	380	86	649
Volume Left	4	0	0	86	0
Volume Right	0	42	4	0	0
cSH	190	668	1700	1178	1700
Volume to Capacity	0.02	0.06	0.22	0.07	0.38
Queue Length 95th (ft)	2	5	0	6	0
Control Delay (s)	24.4	10.7	0.0	8.3	0.0
Lane LOS	C	B		A	
Approach Delay (s)	12.0		0.0	1.0	
Approach LOS	B				

Intersection Summary					
Average Delay			1.1		
Intersection Capacity Utilization			41.4%	ICU Level of Service	A
Analysis Period (min)			15		

HCM Unsignalized Intersection Capacity Analysis
 23: Penn Valley & Site 10,11,12 Dway

Ext + Bkgrd + Proj PM Peak Hour
 1/9/2013



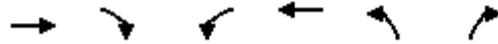
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↔		↕	↕
Volume (veh/h)	47	168	234	115	57	23
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	51	183	254	125	62	25
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	379				602	317
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	379				602	317
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				86	97
cM capacity (veh/h)	1179				443	724

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	234	379	87
Volume Left	51	0	62
Volume Right	0	125	25
cSH	1179	1700	622
Volume to Capacity	0.04	0.22	0.14
Queue Length 95th (ft)	3	0	12
Control Delay (s)	2.1	0.0	13.2
Lane LOS	A		B
Approach Delay (s)	2.1	0.0	13.2
Approach LOS			B

Intersection Summary			
Average Delay		2.3	
Intersection Capacity Utilization		44.1%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 24: Broken Oak & Penn Valley

Ext + Bkgrd + Proj PM Peak Hour
 1/9/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	↖	↗
Volume (veh/h)	187	18	21	175	9	34
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	208	20	23	194	10	38
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			228		459	218
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			228		459	218
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		98	95
cM capacity (veh/h)			1340		550	822

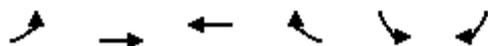
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	228	218	48
Volume Left	0	23	10
Volume Right	20	0	38
cSH	1700	1340	1040
Volume to Capacity	0.13	0.02	0.05
Queue Length 95th (ft)	0	1	4
Control Delay (s)	0.0	1.0	10.0
Lane LOS		A	B
Approach Delay (s)	0.0	1.0	10.0
Approach LOS			B

Intersection Summary			
Average Delay		1.4	
Intersection Capacity Utilization		34.6%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 26: Combie Road & Dwy Site 18

Existing + Bkgrd + Proj PM Peak Hour

1/16/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	59	52	28	3	2	28
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	64	57	30	3	2	30
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	34				217	32
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	34				217	32
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				100	97
cM capacity (veh/h)	1578				740	1042

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	64	57	34	33
Volume Left	64	0	0	2
Volume Right	0	0	3	30
cSH	1578	1700	1700	1014
Volume to Capacity	0.04	0.03	0.02	0.03
Queue Length 95th (ft)	3	0	0	2
Control Delay (s)	7.4	0.0	0.0	8.7
Lane LOS	A			A
Approach Delay (s)	3.9		0.0	8.7
Approach LOS				A

Intersection Summary			
Average Delay		4.0	
Intersection Capacity Utilization		19.9%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
28: Higgins Road & Combie Road

Existing + Bkgrd + Proj PM Peak Hour

3/1/2013

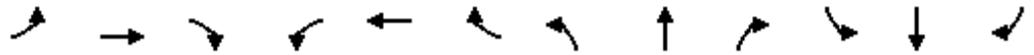
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					 							
Volume (veh/h)	0	869	218	258	562	0	257	0	253	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	945	237	280	611	0	279	0	275	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		755										
pX, platoon unblocked				0.95			0.95	0.95	0.95	0.95	0.95	0.95
vC, conflicting volume	611			945			1929	2235	1063	2510	2116	305
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	611			916			1951	2272	1041	2561	2148	305
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			60			0	100	0	0	100	100
cM capacity (veh/h)	964			704			25	23	216	0	27	691
Direction, Lane #	EB 1	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1					
Volume Total	1182	280	407	204	279	275	0					
Volume Left	0	280	0	0	279	0	0					
Volume Right	237	0	0	0	0	275	0					
cSH	1700	704	1700	1700	25	216	1700					
Volume to Capacity	0.70	0.40	0.24	0.12	11.06	1.27	0.00					
Queue Length 95th (ft)	0	48	0	0	Err	363	0					
Control Delay (s)	0.0	13.5	0.0	0.0	Err	199.0	0.0					
Lane LOS		B			F	F	A					
Approach Delay (s)	0.0	4.2			5137.4		0.0					
Approach LOS					F		A					
Intersection Summary												
Average Delay			1085.5									
Intersection Capacity Utilization			97.5%		ICU Level of Service		F					
Analysis Period (min)			15									

APPENDIX F

Intersection Level of Service Calculations: Cumulative with Current General Plan Land Use Designations Conditions

HCM Signalized Intersection Capacity Analysis
 1: Nevada City Highway & Brunswick Road

Cumulative PM Peak Hour
 1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↙	↘	↗	↖	↑	↗	↖	↘	↙
Volume (vph)	10	34	13	338	24	802	12	332	263	838	291	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	1.00	1.00	0.97	1.00	
Frbp, ped/bikes		1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.99		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1770		1698	1704	1596	1805	1881	1556	3433	1861	
Flt Permitted		0.99		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1770		1698	1704	1596	1805	1881	1556	3433	1861	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	11	37	14	363	26	862	13	357	283	901	313	2
RTOR Reduction (vph)	0	12	0	0	0	319	0	0	154	0	0	0
Lane Group Flow (vph)	0	50	0	192	197	543	13	357	129	901	315	0
Confl. Peds. (#/hr)	3					3	11		3	3		11
Heavy Vehicles (%)	0%	0%	14%	1%	5%	0%	0%	1%	2%	2%	2%	0%
Turn Type	Split	NA		Split	NA	pm+ov	Split	NA	Perm	Split	NA	
Protected Phases	6	6		8	8	4	2	2		4	4	
Permitted Phases						8			2			
Actuated Green, G (s)		16.0		14.1	14.1	34.1	23.9	23.9	23.9	20.0	20.0	
Effective Green, g (s)		16.0		14.1	14.1	34.1	23.9	23.9	23.9	20.0	20.0	
Actuated g/C Ratio		0.18		0.16	0.16	0.38	0.27	0.27	0.27	0.22	0.22	
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		314		266	266	675	479	499	413	762	413	
v/s Ratio Prot		c0.03		0.11	0.12	c0.18	0.01	c0.19		c0.26	0.17	
v/s Ratio Perm						0.16			0.08			
v/c Ratio		0.16		0.72	0.74	0.80	0.03	0.72	0.31	1.18	0.76	
Uniform Delay, d1		31.3		36.1	36.2	25.0	24.4	30.0	26.5	35.0	32.8	
Progression Factor		1.00		0.72	0.72	0.71	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		1.1		8.3	9.5	6.2	0.1	8.5	2.0	95.3	8.1	
Delay (s)		32.4		34.2	35.4	23.9	24.6	38.5	28.4	130.3	40.9	
Level of Service		C		C	D	C	C	D	C	F	D	
Approach Delay (s)		32.4			27.3			33.8			107.1	
Approach LOS		C			C			C			F	

Intersection Summary		
HCM 2000 Control Delay	59.2	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.76	E
Actuated Cycle Length (s)	90.0	Sum of lost time (s)
Intersection Capacity Utilization	80.8%	16.0
Analysis Period (min)	15	ICU Level of Service
c Critical Lane Group		D

HCM Signalized Intersection Capacity Analysis

2: Maltman Drive/SR 20-49 SB Ramps & Brunswick Road

Cumulative PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑		↖		↖	↖↖	↑	↖
Volume (vph)	0	1072	50	191	894	0	54	0	338	274	50	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0		4.0	4.0	4.0	4.0
Lane Util. Factor		0.95		1.00	0.95		1.00		1.00	0.97	1.00	1.00
Frbp, ped/bikes		1.00		1.00	1.00		1.00		0.99	1.00	1.00	1.00
Flpb, ped/bikes		1.00		1.00	1.00		1.00		1.00	1.00	1.00	1.00
Frt		0.99		1.00	1.00		1.00		0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00		0.95		1.00	0.95	1.00	1.00
Satd. Flow (prot)		3525		1770	3610		1805		1601	3400	1881	1599
Flt Permitted		1.00		0.95	1.00		0.95		1.00	0.95	1.00	1.00
Satd. Flow (perm)		3525		1770	3610		1805		1601	3400	1881	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1165	54	208	972	0	59	0	367	298	54	243
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	46	0	0	174
Lane Group Flow (vph)	0	1215	0	208	972	0	59	0	321	298	54	69
Confl. Peds. (#/hr)			9						9			
Heavy Vehicles (%)	0%	1%	13%	2%	0%	0%	0%	0%	0%	3%	1%	1%
Turn Type		NA		Prot	NA		Prot		custom	Split	NA	Perm
Protected Phases		4		3	8		2		3	6	6	
Permitted Phases									2			6
Actuated Green, G (s)		26.0		15.2	45.2		7.2		22.4	25.6	25.6	25.6
Effective Green, g (s)		26.0		15.2	45.2		7.2		22.4	25.6	25.6	25.6
Actuated g/C Ratio		0.29		0.17	0.50		0.08		0.25	0.28	0.28	0.28
Clearance Time (s)		4.0		4.0	4.0		4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0		3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		1018		298	1813		144		469	967	535	454
v/s Ratio Prot		c0.34		0.12	0.27		0.03		c0.12	c0.09	0.03	
v/s Ratio Perm									0.09			0.04
v/c Ratio		1.19		0.70	0.54		0.41		0.68	0.31	0.10	0.15
Uniform Delay, d1		32.0		35.2	15.3		39.4		30.6	25.3	23.7	24.1
Progression Factor		0.31		0.79	0.65		1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2		89.8		11.7	0.3		1.9		4.1	0.8	0.4	0.7
Delay (s)		99.6		39.7	10.2		41.3		34.7	26.1	24.1	24.8
Level of Service		F		D	B		D		C	C	C	C
Approach Delay (s)		99.6			15.4			35.6			25.4	
Approach LOS		F			B			D			C	

Intersection Summary

HCM 2000 Control Delay	49.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	70.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: SR 20-49 NB Ramps & Brunswick Road

Cumulative PM Peak Hour
1/9/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑↑	↘	↗
Volume (vph)	849	0	0	1880	377	817
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			0.91	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3574			5136	1805	1553
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3574			5136	1805	1553
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	884	0	0	1958	393	851
RTOR Reduction (vph)	0	0	0	0	0	49
Lane Group Flow (vph)	884	0	0	1958	393	802
Heavy Vehicles (%)	1%	0%	0%	1%	0%	4%
Turn Type	NA			NA	NA	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Actuated Green, G (s)	42.0			42.0	40.0	40.0
Effective Green, g (s)	42.0			42.0	40.0	40.0
Actuated g/C Ratio	0.47			0.47	0.44	0.44
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	1667			2396	802	690
v/s Ratio Prot	0.25			c0.38	0.22	
v/s Ratio Perm						c0.52
v/c Ratio	0.53			0.82	0.49	1.16
Uniform Delay, d1	17.0			20.7	17.8	25.0
Progression Factor	0.75			1.00	1.00	1.00
Incremental Delay, d2	0.3			3.2	2.1	88.5
Delay (s)	13.0			23.9	19.9	113.5
Level of Service	B			C	B	F
Approach Delay (s)	13.0			23.9	83.9	
Approach LOS	B			C	F	

Intersection Summary

HCM 2000 Control Delay	39.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

4: Sutton Way & Brunswick Road

Cumulative PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	246	879	541	228	966	29	568	75	195	108	69	346
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95		0.97	1.00		1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.91	1.00	1.00		1.00	1.00		1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.89		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3467	3471	1464	1787	3491		3467	1661		1787	1881	1530
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3467	3471	1464	1787	3491		3467	1661		1787	1881	1530
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	251	897	552	233	986	30	580	77	199	110	70	353
RTOR Reduction (vph)	0	0	393	0	3	0	0	119	0	0	0	60
Lane Group Flow (vph)	251	897	159	233	1013	0	580	157	0	110	70	293
Confl. Peds. (#/hr)	1		32	32		1	36					36
Heavy Vehicles (%)	1%	4%	0%	1%	3%	0%	1%	2%	2%	1%	1%	2%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases			4									6
Actuated Green, G (s)	6.2	20.0	20.0	10.0	23.8		21.6	21.3		7.7	7.4	13.6
Effective Green, g (s)	6.2	20.0	20.0	10.0	23.8		21.6	21.3		7.7	7.4	13.6
Actuated g/C Ratio	0.08	0.27	0.27	0.13	0.32		0.29	0.28		0.10	0.10	0.18
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	286	925	390	238	1107		998	471		183	185	359
v/s Ratio Prot	0.07	0.26		c0.13	c0.29		c0.17	0.09		0.06	0.04	c0.07
v/s Ratio Perm			0.11									0.12
v/c Ratio	0.88	0.97	0.41	0.98	0.92		0.58	0.33		0.60	0.38	0.82
Uniform Delay, d1	34.0	27.2	22.6	32.4	24.6		22.8	21.2		32.2	31.6	29.5
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	24.7	22.2	0.7	51.8	11.5		0.9	1.9		5.5	5.8	13.4
Delay (s)	58.7	49.4	23.3	84.2	36.2		23.7	23.1		37.6	37.4	42.9
Level of Service	E	D	C	F	D		C	C		D	D	D
Approach Delay (s)		42.3			45.1			23.5			41.1	
Approach LOS		D			D			C			D	

Intersection Summary

HCM 2000 Control Delay	39.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	79.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
5: Brunswick Road & Idaho-Maryland Road

Cumulative PM Peak Hour
1/9/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	240	192	0	294	184	796	110	192	622	93
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	261	209	0	320	200	865	120	209	676	101
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)						1						
Median type								TWLTL			None	
Median storage (veh)								2				
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2359	2478	676	2679	2520	925	777			985		
vC1, stage 1 conf vol	1093	1093		1325	1325							
vC2, stage 2 conf vol	1265	1385		1354	1195							
vCu, unblocked vol	2359	2478	676	2679	2520	925	777			985		
tC, single (s)	7.1	6.5	6.2	7.2	6.8	6.3	4.1			4.2		
tC, 2 stage (s)	6.1	5.5		6.2	5.8							
tF (s)	3.5	4.0	3.3	3.6	4.3	3.4	2.2			2.3		
p0 queue free %	0	100	42	0	100	0	76			68		
cM capacity (veh/h)	0	16	450	3	12	314	839			656		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3					
Volume Total	261	528	200	985	209	676	101					
Volume Left	0	209	200	0	209	0	0					
Volume Right	261	320	0	120	0	0	101					
cSH	450	8	839	1700	656	1700	1700					
Volume to Capacity	0.58	62.31	0.24	0.58	0.32	0.40	0.06					
Queue Length 95th (ft)	90	Err	23	0	34	0	0					
Control Delay (s)	23.5	Err	10.6	0.0	13.0	0.0	0.0					
Lane LOS	C	F	B		B							
Approach Delay (s)	23.5	Err	1.8		2.8							
Approach LOS	C	F										
Intersection Summary												
Average Delay			1788.3									
Intersection Capacity Utilization			79.8%	ICU Level of Service	D							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
6: McCourtney Road & Personeni Road

Cumulative PM Peak Hour
1/9/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	27	22	20	378	623	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	30	24	22	415	685	7
Pedestrians				1		
Lane Width (ft)				12.0		
Walking Speed (ft/s)				4.0		
Percent Blockage				0		
Right turn flare (veh)		2				
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1147	689	691			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1147	689	691			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	95	98			
cM capacity (veh/h)	217	449	913			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	54	437	691			
Volume Left	30	22	0			
Volume Right	24	0	7			
cSH	393	913	1700			
Volume to Capacity	0.14	0.02	0.41			
Queue Length 95th (ft)	12	2	0			
Control Delay (s)	19.4	0.7	0.0			
Lane LOS	C	A				
Approach Delay (s)	19.4	0.7	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization		46.5%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
7: Taylorville Road & McKnight Way

Cumulative PM Peak Hour
1/9/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  		 	 				 			 
Volume (veh/h)	0	984	40	30	676	301	0	0	40	0	0	19
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1070	43	33	735	327	0	0	43	0	0	21
Pedestrians								3				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								0				
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)					172							
pX, platoon unblocked	0.74						0.74	0.74		0.74	0.74	0.74
vC, conflicting volume	1062			1116			1915	2221	381	1364	2080	898
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	910			1116			2059	2472	381	1316	2281	689
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			100	100	93	100	100	93
cM capacity (veh/h)	562			632			22	21	621	78	28	291
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1					
Volume Total	428	428	257	33	1062	43	21					
Volume Left	0	0	0	33	0	0	0					
Volume Right	0	0	43	0	327	43	21					
cSH	1700	1700	1700	632	1700	621	291					
Volume to Capacity	0.25	0.25	0.15	0.05	0.62	0.07	0.07					
Queue Length 95th (ft)	0	0	0	4	0	6	6					
Control Delay (s)	0.0	0.0	0.0	11.0	0.0	11.2	18.3					
Lane LOS				B		B	C					
Approach Delay (s)	0.0			0.3		11.2	18.3					
Approach LOS						B	C					
Intersection Summary												
Average Delay			0.5									
Intersection Capacity Utilization		63.9%		ICU Level of Service	B							
Analysis Period (min)		15										

HCM Signalized Intersection Capacity Analysis
 8: 49 SB Off-Ramp & McKnight Way

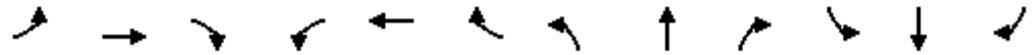
Cumulative PM Peak Hour
 1/9/2013

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑	↗	↖	↑						↖	↗	
Volume (vph)	0	632	397	100	550	0	0	0	0	575	0	457	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		3.5	3.5	3.0	3.5						4.6	4.6	
Lane Util. Factor		0.95	1.00	1.00	1.00						1.00	1.00	
Frt		1.00	0.85	1.00	1.00						1.00	0.85	
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00	
Satd. Flow (prot)		3610	1615	1787	1900						1770	1615	
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00	
Satd. Flow (perm)		3610	1615	1787	1900						1770	1615	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.94	0.94	
Adj. Flow (vph)	0	672	422	106	585	0	0	0	0	625	0	486	
RTOR Reduction (vph)	0	0	329	0	0	0	0	0	0	0	0	116	
Lane Group Flow (vph)	0	672	93	106	585	0	0	0	0	0	625	370	
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%	2%	2%	2%	2%	3%	0%	
Turn Type		NA	Perm	Prot	NA						Perm	NA	Perm
Protected Phases		2		1	2							4	12
Permitted Phases			2								4	12	4
Actuated Green, G (s)		17.7	17.7	17.1	37.8						34.7	34.7	
Effective Green, g (s)		17.7	17.7	17.1	34.8						34.7	34.7	
Actuated g/C Ratio		0.22	0.22	0.21	0.43						0.43	0.43	
Clearance Time (s)		3.5	3.5	3.0									
Vehicle Extension (s)		3.0	3.0	4.7									
Lane Grp Cap (vph)		798	357	381	826						767	700	
v/s Ratio Prot		c0.19		0.06	c0.31								
v/s Ratio Perm			0.06								0.35	0.23	
v/c Ratio		0.84	0.26	0.28	0.71						0.81	0.53	
Uniform Delay, d1		29.8	25.7	26.3	18.5						19.8	16.6	
Progression Factor		1.00	1.00	1.78	1.30						1.00	1.00	
Incremental Delay, d2		10.5	1.8	0.6	2.5						6.7	0.7	
Delay (s)		40.3	27.5	47.4	26.5						26.5	17.4	
Level of Service		D	C	D	C						C	B	
Approach Delay (s)		35.4			29.7			0.0			22.5		
Approach LOS		D			C			A			C		
Intersection Summary													
HCM 2000 Control Delay			29.1			HCM 2000 Level of Service					C		
HCM 2000 Volume to Capacity ratio			0.86										
Actuated Cycle Length (s)			80.0			Sum of lost time (s)				15.6			
Intersection Capacity Utilization			103.5%			ICU Level of Service				G			
Analysis Period (min)			15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 9: 49 NB Off-Ramp/49 NB On-Ramp & McKnight Way

Cumulative PM Peak Hour
 1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑			↑↑	↗		↘	↗			
Volume (vph)	279	923	0	0	513	480	137	0	140	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			4.0	4.0		4.6	4.6			
Lane Util. Factor	1.00	1.00			0.95	1.00		1.00	1.00			
Frbp, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00			
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00			
Frt	1.00	1.00			1.00	0.85		1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00			
Satd. Flow (prot)	1787	1863			3574	1568		1787	1538			
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00			
Satd. Flow (perm)	1787	1863			3574	1568		1787	1538			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	303	1003	0	0	558	522	149	0	152	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	418	0	0	33	0	0	0
Lane Group Flow (vph)	303	1003	0	0	558	104	0	149	119	0	0	0
Confl. Peds. (#/hr)			3	3								
Heavy Vehicles (%)	1%	2%	0%	0%	1%	3%	1%	0%	5%	2%	2%	2%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	5	5 6			6			8 16				
Permitted Phases						6	8 16		8 16			
Actuated Green, G (s)	18.3	37.3			16.0	16.0		34.7	34.7			
Effective Green, g (s)	18.3	37.3			16.0	16.0		34.7	34.7			
Actuated g/C Ratio	0.23	0.47			0.20	0.20		0.43	0.43			
Clearance Time (s)	3.0				4.0	4.0						
Vehicle Extension (s)	4.7				3.0	3.0						
Lane Grp Cap (vph)	408	868			714	313		775	667			
v/s Ratio Prot	0.17	c0.54			0.16							
v/s Ratio Perm						0.07		0.08	0.08			
v/c Ratio	0.74	1.16			0.78	0.33		0.19	0.18			
Uniform Delay, d1	28.7	21.4			30.3	27.4		14.0	13.9			
Progression Factor	1.39	1.19			1.00	1.00		1.00	1.00			
Incremental Delay, d2	4.7	77.7			5.6	0.6		0.1	0.1			
Delay (s)	44.6	103.2			35.9	28.1		14.1	14.0			
Level of Service	D	F			D	C		B	B			
Approach Delay (s)		89.6			32.1			14.1			0.0	
Approach LOS		F			C			B			A	

Intersection Summary		
HCM 2000 Control Delay	58.0	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.77	E
Actuated Cycle Length (s)	80.0	Sum of lost time (s)
Intersection Capacity Utilization	101.5%	15.6
Analysis Period (min)	15	ICU Level of Service
c Critical Lane Group		G

HCM Unsignalized Intersection Capacity Analysis
 10: La Barr Meadows Road/S Auburn Street & McKnight Way

Cumulative PM Peak Hour
 1/9/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Yield			Stop			Stop			Stop	
Volume (vph)	240	80	743	27	60	17	720	290	10	20	220	213
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	255	85	790	29	64	18	766	309	11	21	234	227
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2					
Volume Total (vph)	340	790	111	766	319	255	227					
Volume Left (vph)	255	0	29	766	0	21	0					
Volume Right (vph)	0	790	18	0	11	0	227					
Hadj (s)	0.40	-0.63	0.02	0.53	0.04	0.15	-0.68					
Departure Headway (s)	8.6	7.6	9.4	8.8	8.3	9.0	8.1					
Degree Utilization, x	0.82	1.67	0.29	1.87	0.74	0.64	0.51					
Capacity (veh/h)	409	478	376	415	425	389	426					
Control Delay (s)	38.8	328.2	16.1	420.2	30.0	25.1	18.2					
Approach Delay (s)	241.1		16.1	305.4		21.8						
Approach LOS	F		C	F		C						
Intersection Summary												
Delay			219.5									
Level of Service			F									
Intersection Capacity Utilization			86.8%	ICU Level of Service								E
Analysis Period (min)			15									

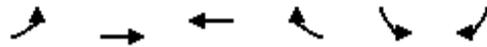
HCM Signalized Intersection Capacity Analysis
 11: Pleasant Valley Road & SR-20

Cumulative PM Peak Hour
 1/9/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	112	330	52	25	305	411	45	170	25	246	140	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. 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
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1810	1583	1805	1810	1599	1752	1881	1615	1736	1863	1563
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	1810	1583	1805	1810	1599	1752	1881	1615	1736	1863	1563
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	120	355	56	27	328	442	48	183	27	265	151	83
RTOR Reduction (vph)	0	0	36	0	0	320	0	0	22	0	0	52
Lane Group Flow (vph)	120	355	20	27	328	122	48	183	5	265	151	31
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	0%	5%	2%	0%	5%	1%	3%	1%	0%	4%	2%	1%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	7.7	26.8	26.8	1.6	20.7	20.7	3.0	15.1	15.1	15.8	27.9	27.9
Effective Green, g (s)	7.7	26.8	26.8	1.6	20.7	20.7	3.0	15.1	15.1	15.8	27.9	27.9
Actuated g/C Ratio	0.10	0.36	0.36	0.02	0.27	0.27	0.04	0.20	0.20	0.21	0.37	0.37
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	184	644	563	38	497	439	69	377	323	364	690	579
v/s Ratio Prot	c0.07	0.20		0.01	c0.18		0.03	c0.10		c0.15	0.08	
v/s Ratio Perm			0.01			0.08			0.00			0.02
v/c Ratio	0.65	0.55	0.04	0.71	0.66	0.28	0.70	0.49	0.02	0.73	0.22	0.05
Uniform Delay, d1	32.5	19.4	15.8	36.6	24.2	21.4	35.7	26.7	24.1	27.7	16.2	15.2
Progression 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
Incremental Delay, d2	8.0	1.0	0.0	47.3	3.2	0.3	26.2	1.0	0.0	7.1	0.2	0.0
Delay (s)	40.5	20.5	15.8	83.9	27.4	21.8	61.9	27.6	24.2	34.9	16.4	15.3
Level of Service	D	C	B	F	C	C	E	C	C	C	B	B
Approach Delay (s)		24.5			26.2			33.7			26.0	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			26.6			HCM 2000 Level of Service		C				
HCM 2000 Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			75.3			Sum of lost time (s)		16.0				
Intersection Capacity Utilization			58.2%			ICU Level of Service		B				
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
 12: SR-20 & Cattle Drive

Cumulative PM Peak Hour
 1/9/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↗	↖		↘	↘
Volume (veh/h)	6	601	721	25	43	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	6	620	743	26	44	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	769				1388	756
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	769				1388	756
tC, single (s)	4.3				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.4
p0 queue free %	99				71	95
cM capacity (veh/h)	786				155	398

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	6	620	769	65
Volume Left	6	0	0	44
Volume Right	0	0	26	21
cSH	786	1700	1700	193
Volume to Capacity	0.01	0.36	0.45	0.34
Queue Length 95th (ft)	1	0	0	35
Control Delay (s)	9.6	0.0	0.0	32.9
Lane LOS	A			D
Approach Delay (s)	0.1		0.0	32.9
Approach LOS				D

Intersection Summary			
Average Delay		1.5	
Intersection Capacity Utilization		49.7%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis
13: Penn Valley Drive & SR-20

Cumulative PM Peak Hour
1/9/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	72	519	53	268	608	42	66	102	139	50	72	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.8	4.0	3.0	6.8	4.0	3.0	4.8	3.0	3.0	4.8	4.8
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	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3438	1583	1770	3539	1615	1752	1792	1583	1805	1845	1509
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3438	1583	1770	3539	1615	1752	1792	1583	1805	1845	1509
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	76	546	56	282	640	44	69	107	146	53	76	79
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	98	0	0	69
Lane Group Flow (vph)	76	546	56	282	640	44	69	107	48	53	76	10
Heavy Vehicles (%)	0%	5%	2%	2%	2%	0%	3%	6%	2%	0%	3%	7%
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	custom	Prot	NA	custom
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			Free			Free			8			4
Actuated Green, G (s)	3.1	15.8	53.5	10.6	23.3	53.5	2.6	6.9	17.5	2.6	6.9	6.9
Effective Green, g (s)	3.1	15.8	53.5	10.6	23.3	53.5	2.6	6.9	17.5	2.6	6.9	6.9
Actuated g/C Ratio	0.06	0.30	1.00	0.20	0.44	1.00	0.05	0.13	0.33	0.05	0.13	0.13
Clearance Time (s)	3.0	6.8		3.0	6.8		3.0	4.8	3.0	3.0	4.8	4.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	104	1015	1583	350	1541	1615	85	231	517	87	237	194
v/s Ratio Prot	0.04	c0.16		c0.16	0.18		c0.04	c0.06	0.02	0.03	0.04	
v/s Ratio Perm			0.04			0.03			0.01			0.01
v/c Ratio	0.73	0.54	0.04	0.81	0.42	0.03	0.81	0.46	0.09	0.61	0.32	0.05
Uniform Delay, d1	24.8	15.8	0.0	20.5	10.4	0.0	25.2	21.6	12.5	25.0	21.2	20.4
Progression 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
Incremental Delay, d2	23.0	0.6	0.0	12.7	0.2	0.0	42.4	1.5	0.1	11.5	0.8	0.1
Delay (s)	47.8	16.3	0.0	33.1	10.6	0.0	67.6	23.1	12.6	36.5	22.0	20.5
Level of Service	D	B	A	C	B	A	E	C	B	D	C	C
Approach Delay (s)		18.5			16.7			27.8			25.1	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			19.7	HCM 2000 Level of Service				B				
HCM 2000 Volume to Capacity ratio			0.62									
Actuated Cycle Length (s)			53.5	Sum of lost time (s)				17.6				
Intersection Capacity Utilization			52.5%	ICU Level of Service				A				
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
 14: Spenceville Road & Penn Valley Drive

Cumulative PM Peak Hour
 1/9/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	124	81	84	154	178	186
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	138	90	93	171	198	207

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	228	264	404
Volume Left (vph)	138	93	0
Volume Right (vph)	90	0	207
Hadj (s)	-0.11	0.09	-0.29
Departure Headway (s)	5.4	5.2	4.6
Degree Utilization, x	0.34	0.38	0.52
Capacity (veh/h)	612	664	745
Control Delay (s)	11.2	11.3	12.6
Approach Delay (s)	11.2	11.3	12.6
Approach LOS	B	B	B

Intersection Summary			
Delay		11.8	
Level of Service		B	
Intersection Capacity Utilization		56.2%	ICU Level of Service
Analysis Period (min)		15	B

HCM Unsignalized Intersection Capacity Analysis
 15: SR-49 & Cameo Drive

Cumulative PM Peak Hour
 3/1/2013

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	11	8	1571	15	10	1232
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	9	1708	16	11	1339
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			None		
Median storage (veh)	2					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3068	854			1724	
vC1, stage 1 conf vol	1708					
vC2, stage 2 conf vol	1361					
vCu, unblocked vol	3068	854			1724	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	97			97	
cM capacity (veh/h)	104	302			363	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	21	854	854	16	11	1339
Volume Left	12	0	0	0	11	0
Volume Right	9	0	0	16	0	0
cSH	144	1700	1700	1700	363	1700
Volume to Capacity	0.14	0.50	0.50	0.01	0.03	0.79
Queue Length 95th (ft)	12	0	0	0	2	0
Control Delay (s)	34.2	0.0	0.0	0.0	15.2	0.0
Lane LOS	D				C	
Approach Delay (s)	34.2	0.0			0.1	
Approach LOS	D					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			74.8%	ICU Level of Service	D	
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
 16: SR-49 & Wolf Road/Combie Road

Cumulative PM Peak Hour
 3/1/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	42	175	103	415	158	313	210	1231	704	435	755	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1703	1881	1553	3433	1845	1568	1770	3505	1599	1752	3471	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1703	1881	1553	3433	1845	1568	1770	3505	1599	1752	3471	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	46	190	112	451	172	340	228	1338	765	473	821	58
RTOR Reduction (vph)	0	0	93	0	0	199	0	0	102	0	0	38
Lane Group Flow (vph)	46	190	19	451	172	141	228	1338	663	473	821	20
Heavy Vehicles (%)	6%	1%	4%	2%	3%	3%	2%	3%	1%	3%	4%	4%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	3.5	13.7	13.7	15.3	25.5	25.5	10.5	26.6	41.9	8.5	24.6	28.1
Effective Green, g (s)	3.5	13.7	13.7	15.3	25.5	25.5	10.5	26.6	41.9	8.5	24.6	28.1
Actuated g/C Ratio	0.04	0.17	0.17	0.19	0.32	0.32	0.13	0.33	0.52	0.11	0.31	0.35
Clearance Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5
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	3.0
Lane Grp Cap (vph)	73	319	263	651	583	496	230	1156	831	184	1059	541
v/s Ratio Prot	0.03	c0.10		0.13	0.09		0.13	c0.38	c0.15	c0.27	0.24	0.00
v/s Ratio Perm			0.01			0.09			0.26			0.01
v/c Ratio	0.63	0.60	0.07	0.69	0.30	0.28	0.99	1.16	0.80	2.57	0.78	0.04
Uniform Delay, d1	37.9	30.9	28.1	30.5	20.8	20.7	35.0	27.0	15.9	36.0	25.5	17.3
Progression 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
Incremental Delay, d2	16.4	3.0	0.1	3.2	0.3	0.3	56.7	80.9	5.4	722.5	5.6	0.0
Delay (s)	54.3	33.9	28.2	33.7	21.1	21.0	91.7	107.9	21.3	758.5	31.0	17.4
Level of Service	D	C	C	C	C	C	F	F	C	F	C	B
Approach Delay (s)		34.8			26.9			77.9			285.0	
Approach LOS		C			C			E			F	

Intersection Summary

HCM 2000 Control Delay	121.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	80.6	Sum of lost time (s)	16.5
Intersection Capacity Utilization	94.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 17: Rosewood Rd/Armstrong Rd & Combie Road

Cumulative PM Peak Hour
 3/1/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 						 				
Volume (veh/h)	107	1041	20	10	753	69	11	0	6	91	2	102
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	116	1132	22	11	818	75	12	0	7	99	2	111
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)					955							
pX, platoon unblocked	0.72						0.72	0.72		0.72	0.72	0.72
vC, conflicting volume	893			1153			2327	2290	577	1683	2264	856
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	654			1153			2654	2602	577	1755	2565	602
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	83			98			0	100	99	0	86	65
cM capacity (veh/h)	676			613			4	15	465	34	15	321
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1	SB 2				
Volume Total	116	754	399	11	893	18	99	113				
Volume Left	116	0	0	11	0	12	99	0				
Volume Right	0	0	22	0	75	7	0	111				
cSH	676	1700	1700	613	1700	6	34	233				
Volume to Capacity	0.17	0.44	0.23	0.02	0.53	2.93	2.95	0.49				
Queue Length 95th (ft)	15	0	0	1	0	88	286	61				
Control Delay (s)	11.4	0.0	0.0	11.0	0.0	1979.0	1129.7	34.3				
Lane LOS	B			B		F	F	D				
Approach Delay (s)	1.0			0.1		1979.0	545.5					
Approach LOS						F	F					
Intersection Summary												
Average Delay				63.9								
Intersection Capacity Utilization			Err%		ICU Level of Service			H				
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis
 18: Combie Road & Magnolia Road & Hacienda Drive

Cumulative PM Peak Hour

3/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	75	775	265	97	534	60	169	19	149	58	22	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.98			1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.98	
Satd. Flow (prot)	1752	1881	1583	1787	1838			1802	1583		1702	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.98	
Satd. Flow (perm)	1752	1881	1583	1787	1838			1802	1583		1702	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	82	842	288	105	580	65	184	21	162	63	24	93
RTOR Reduction (vph)	0	0	140	0	4	0	0	0	127	0	45	0
Lane Group Flow (vph)	82	842	148	105	641	0	0	205	35	0	135	0
Heavy Vehicles (%)	3%	1%	2%	1%	2%	0%	1%	0%	2%	0%	0%	4%
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	7	4		3	8		2	2	3	6	6	
Permitted Phases			4						2			
Actuated Green, G (s)	4.7	38.2	38.2	5.0	38.5			13.4	18.4		11.4	
Effective Green, g (s)	4.7	38.2	38.2	5.0	38.5			13.4	18.4		11.4	
Actuated g/C Ratio	0.06	0.45	0.45	0.06	0.46			0.16	0.22		0.14	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	98	855	719	106	842			287	346		230	
v/s Ratio Prot	0.05	c0.45		c0.06	0.35			c0.11	0.01		c0.08	
v/s Ratio Perm			0.09						0.02			
v/c Ratio	0.84	0.98	0.21	0.99	0.76			0.71	0.10		0.59	
Uniform Delay, d1	39.3	22.6	13.8	39.5	18.9			33.5	26.2		34.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	43.2	26.8	0.1	84.2	4.1			8.2	0.1		3.8	
Delay (s)	82.4	49.4	13.9	123.7	23.0			41.7	26.3		37.9	
Level of Service	F	D	B	F	C			D	C		D	
Approach Delay (s)		43.2			37.1			34.9			37.9	
Approach LOS		D			D			C			D	

Intersection Summary

HCM 2000 Control Delay	39.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	84.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 19: SR-49 & Woodridge Drive

Cumulative PM Peak Hour
 3/1/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗	↖	↕
Volume (veh/h)	0	199	1946	136	66	1207
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	0	201	1966	137	67	1219
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						1119
pX, platoon unblocked	0.86					
vC, conflicting volume	2709	983			2103	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2661	983			2103	
tC, single (s)	6.8	*6.5			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	28			75	
cM capacity (veh/h)	12	281			265	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	201	983	983	137	67	610	610
Volume Left	0	0	0	0	67	0	0
Volume Right	201	0	0	137	0	0	0
cSH	281	1700	1700	1700	265	1700	1700
Volume to Capacity	0.72	0.58	0.58	0.08	0.25	0.36	0.36
Queue Length 95th (ft)	126	0	0	0	24	0	0
Control Delay (s)	44.6	0.0	0.0	0.0	23.1	0.0	0.0
Lane LOS	E				C		
Approach Delay (s)	44.6	0.0			1.2		
Approach LOS	E						

Intersection Summary			
Average Delay		2.9	
Intersection Capacity Utilization		72.8%	ICU Level of Service C
Analysis Period (min)		15	

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis
 20: Brunswick Road & Dwy Sites 7,8

Cumulative PM Peak Hour
 1/9/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	17	1109	10	27	996
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	18	1205	11	29	1083
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2352	1211			1216	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2352	1211			1216	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	83	92			95	
cM capacity (veh/h)	37	222			573	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	7	18	1216	29	1083
Volume Left	7	0	0	29	0
Volume Right	0	18	11	0	0
cSH	37	222	1700	573	1700
Volume to Capacity	0.17	0.08	0.72	0.05	0.64
Queue Length 95th (ft)	14	7	0	4	0
Control Delay (s)	120.6	22.7	0.0	11.6	0.0
Lane LOS	F	C		B	
Approach Delay (s)	48.2		0.0	0.3	
Approach LOS	E				

Intersection Summary					
Average Delay			0.7		
Intersection Capacity Utilization			69.0%	ICU Level of Service	C
Analysis Period (min)			15		

HCM Unsignalized Intersection Capacity Analysis
 21: Brunswick Road & Dwy Sites 3-6 and 9

Cumulative PM Peak Hour
 1/9/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	68	22	39	1051	885	117
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	24	42	1142	962	127
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2253	1026	1089			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2253	1026	1089			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	92	93			
cM capacity (veh/h)	43	285	641			
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	
Volume Total	74	24	42	1142	1089	
Volume Left	74	0	42	0	0	
Volume Right	0	24	0	0	127	
cSH	43	285	641	1700	1700	
Volume to Capacity	1.74	0.08	0.07	0.67	0.64	
Queue Length 95th (ft)	189	7	5	0	0	
Control Delay (s)	560.9	18.8	11.0	0.0	0.0	
Lane LOS	F	C	B			
Approach Delay (s)	428.3		0.4		0.0	
Approach LOS	F					
Intersection Summary						
Average Delay			17.9			
Intersection Capacity Utilization			65.7%	ICU Level of Service	C	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 22: Dwy Site 2

Cumulative PM Peak Hour
 1/9/2013



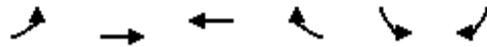
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	2	18	1018	2	29	961
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	20	1107	2	32	1045
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2215	1108			1109	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2215	1108			1109	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	92			95	
cM capacity (veh/h)	46	255			630	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	2	20	1109	32	1045
Volume Left	2	0	0	32	0
Volume Right	0	20	2	0	0
cSH	46	255	1700	630	1700
Volume to Capacity	0.05	0.08	0.65	0.05	0.61
Queue Length 95th (ft)	4	6	0	4	0
Control Delay (s)	87.6	20.3	0.0	11.0	0.0
Lane LOS	F	C		B	
Approach Delay (s)	27.0		0.0	0.3	
Approach LOS	D				

Intersection Summary					
Average Delay			0.4		
Intersection Capacity Utilization			63.7%	ICU Level of Service	B
Analysis Period (min)			15		

HCM Unsignalized Intersection Capacity Analysis
 23: Penn Valley & Site 10,11,12 Dway

Cumulative PM Peak Hour
 1/9/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↔		↕	↕
Volume (veh/h)	6	168	239	16	9	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	7	185	263	18	10	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	280				469	271
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	280				469	271
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	99
cM capacity (veh/h)	1282				550	767

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	191	280	14
Volume Left	7	0	10
Volume Right	0	18	4
cSH	1282	1700	794
Volume to Capacity	0.01	0.16	0.02
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.3	0.0	11.1
Lane LOS	A		B
Approach Delay (s)	0.3	0.0	11.1
Approach LOS			B

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		23.7%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 24: Broken Oak & Penn Valley

Cumulative PM Peak Hour
 1/9/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	↶	↷
Volume (veh/h)	148	17	15	162	9	32
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	164	19	17	180	10	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			183		387	174
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			183		387	174
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		98	96
cM capacity (veh/h)			1392		609	870

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	183	197	46
Volume Left	0	17	10
Volume Right	19	0	36
cSH	1700	1392	1114
Volume to Capacity	0.11	0.01	0.04
Queue Length 95th (ft)	0	1	3
Control Delay (s)	0.0	0.7	9.7
Lane LOS		A	A
Approach Delay (s)	0.0	0.7	9.7
Approach LOS			A

Intersection Summary			
Average Delay		1.4	
Intersection Capacity Utilization		31.0%	ICU Level of Service
Analysis Period (min)		15	A

HCM Unsignalized Intersection Capacity Analysis
 26: Combie Road & Dwy Site 18

Cumulative PM Peak Hour
 3/1/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	27	61	39	1	1	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	29	66	42	1	1	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	43				168	43
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	43				168	43
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				100	98
cM capacity (veh/h)	1565				807	1027

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	29	66	43	17
Volume Left	29	0	0	1
Volume Right	0	0	1	16
cSH	1565	1700	1700	1010
Volume to Capacity	0.02	0.04	0.03	0.02
Queue Length 95th (ft)	1	0	0	1
Control Delay (s)	7.3	0.0	0.0	8.6
Lane LOS	A			A
Approach Delay (s)	2.3		0.0	8.6
Approach LOS				A

Intersection Summary			
Average Delay		2.3	
Intersection Capacity Utilization		18.2%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 28: Higgins Road & Combie Road

Cumulative PM Peak Hour
 3/1/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	876	268	284	576	0	310	0	254	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	952	291	309	626	0	337	0	276	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage (veh)		2										
Upstream signal (ft)		707										
pX, platoon unblocked				0.94			0.94	0.94	0.94	0.94	0.94	0.94
vC, conflicting volume	626			952			2028	2341	1098	2617	2196	313
vC1, stage 1 conf vol							1098	1098		1243	1243	
vC2, stage 2 conf vol							930	1243		1374	952	
vCu, unblocked vol	626			914			2065	2400	1070	2695	2244	313
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			55			0	100	0	0	100	100
cM capacity (veh/h)	951			693			125	118	203	0	22	683
Direction, Lane #	EB 1	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1					
Volume Total	1243	309	417	209	337	276	0					
Volume Left	0	309	0	0	337	0	0					
Volume Right	291	0	0	0	0	276	0					
cSH	1700	693	1700	1700	125	203	1700					
Volume to Capacity	0.73	0.45	0.25	0.12	2.69	1.36	0.00					
Queue Length 95th (ft)	0	57	0	0	765	393	0					
Control Delay (s)	0.0	14.3	0.0	0.0	837.8	236.3	0.0					
Lane LOS		B			F	F	A					
Approach Delay (s)	0.0	4.7			566.9		0.0					
Approach LOS					F		A					
Intersection Summary												
Average Delay				126.1								
Intersection Capacity Utilization			105.3%		ICU Level of Service		G					
Analysis Period (min)			15									

APPENDIX G

Intersection Level of Service Calculations: Cumulative plus Project Conditions

HCM Signalized Intersection Capacity Analysis
 1: Nevada City Highway & Brunswick Road

Cumulative + Proj PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕	↕	↕	↕	↕	↕	↕	↕
Volume (vph)	10	34	13	340	24	809	12	332	268	854	291	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	1.00	1.00	0.97	1.00	
Frbp, ped/bikes		1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Fr t		0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Fl t Protected		0.99		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1770		1698	1704	1596	1805	1881	1556	3433	1861	
Fl t Permitted		0.99		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1770		1698	1704	1596	1805	1881	1556	3433	1861	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	11	37	14	366	26	870	13	357	288	918	313	2
RTOR Reduction (vph)	0	12	0	0	0	319	0	0	157	0	0	0
Lane Group Flow (vph)	0	50	0	194	198	551	13	357	131	918	315	0
Confl. Peds. (#/hr)	3					3	11		3	3		11
Heavy Vehicles (%)	0%	0%	14%	1%	5%	0%	0%	1%	2%	2%	2%	0%
Turn Type	Split	NA		Split	NA	pm+ov	Split	NA	Perm	Split	NA	
Protected Phases	6	6		8	8	4	2	2		4	4	
Permitted Phases						8			2			
Actuated Green, G (s)		16.0		14.2	14.2	34.2	23.8	23.8	23.8	20.0	20.0	
Effective Green, g (s)		16.0		14.2	14.2	34.2	23.8	23.8	23.8	20.0	20.0	
Actuated g/C Ratio		0.18		0.16	0.16	0.38	0.26	0.26	0.26	0.22	0.22	
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		314		267	268	677	477	497	411	762	413	
v/s Ratio Prot		c0.03		0.11	0.12	c0.18	0.01	c0.19		c0.27	0.17	
v/s Ratio Perm						0.16			0.08			
v/c Ratio		0.16		0.73	0.74	0.81	0.03	0.72	0.32	1.20	0.76	
Uniform Delay, d1		31.3		36.1	36.1	25.0	24.5	30.1	26.6	35.0	32.8	
Progression Factor		1.00		0.74	0.74	0.70	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		1.1		8.4	9.1	6.7	0.1	8.6	2.0	104.4	8.1	
Delay (s)		32.4		35.0	35.7	24.2	24.6	38.7	28.6	139.4	40.9	
Level of Service		C		C	D	C	C	D	C	F	D	
Approach Delay (s)		32.4			27.7			34.0			114.2	
Approach LOS		C			C			C			F	

Intersection Summary

HCM 2000 Control Delay	62.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

2: Maltman Drive/SR 20-49 SB Ramps & Brunswick Road

Cumulative + Proj PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑		↖		↖	↖↖	↑	↖
Volume (vph)	0	1089	54	216	903	0	54	0	338	298	50	224
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0		4.0	4.0	4.0	4.0
Lane Util. Factor		0.95		1.00	0.95		1.00		1.00	0.97	1.00	1.00
Frbp, ped/bikes		1.00		1.00	1.00		1.00		0.99	1.00	1.00	1.00
Flpb, ped/bikes		1.00		1.00	1.00		1.00		1.00	1.00	1.00	1.00
Fr _t		0.99		1.00	1.00		1.00		0.85	1.00	1.00	0.85
Fl _t Protected		1.00		0.95	1.00		0.95		1.00	0.95	1.00	1.00
Satd. Flow (prot)		3521		1770	3610		1805		1601	3400	1881	1599
Fl _t Permitted		1.00		0.95	1.00		0.95		1.00	0.95	1.00	1.00
Satd. Flow (perm)		3521		1770	3610		1805		1601	3400	1881	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1184	59	235	982	0	59	0	367	324	54	243
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	46	0	0	174
Lane Group Flow (vph)	0	1239	0	235	982	0	59	0	321	324	54	69
Confl. Peds. (#/hr)			9						9			
Heavy Vehicles (%)	0%	1%	13%	2%	0%	0%	0%	0%	0%	3%	1%	1%
Turn Type		NA		Prot	NA		Prot		custom	Split	NA	Perm
Protected Phases		4		3	8		2		3	6	6	
Permitted Phases									2			6
Actuated Green, G (s)		26.0		15.2	45.2		7.2		22.4	25.6	25.6	25.6
Effective Green, g (s)		26.0		15.2	45.2		7.2		22.4	25.6	25.6	25.6
Actuated g/C Ratio		0.29		0.17	0.50		0.08		0.25	0.28	0.28	0.28
Clearance Time (s)		4.0		4.0	4.0		4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0		3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		1017		298	1813		144		469	967	535	454
v/s Ratio Prot		c0.35		c0.13	0.27		0.03		c0.12	c0.10	0.03	
v/s Ratio Perm									0.09			0.04
v/c Ratio		1.22		0.79	0.54		0.41		0.68	0.34	0.10	0.15
Uniform Delay, d ₁		32.0		35.9	15.3		39.4		30.6	25.5	23.7	24.1
Progression Factor		0.31		0.78	0.62		1.00		1.00	1.00	1.00	1.00
Incremental Delay, d ₂		99.0		17.3	0.3		1.9		4.1	0.9	0.4	0.7
Delay (s)		108.9		45.2	9.8		41.3		34.7	26.4	24.1	24.8
Level of Service		F		D	A		D		C	C	C	C
Approach Delay (s)		108.9			16.6			35.6			25.6	
Approach LOS		F			B			D			C	

Intersection Summary

HCM 2000 Control Delay	53.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: SR 20-49 NB Ramps & Brunswick Road

Cumulative + Proj PM Peak Hour
1/9/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑↑	↘	↗
Volume (vph)	889	0	0	1912	379	876
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			0.91	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3574			5136	1805	1553
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3574			5136	1805	1553
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	926	0	0	1992	395	912
RTOR Reduction (vph)	0	0	0	0	0	43
Lane Group Flow (vph)	926	0	0	1992	395	869
Heavy Vehicles (%)	1%	0%	0%	1%	0%	4%
Turn Type	NA			NA	NA	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Actuated Green, G (s)	42.0			42.0	40.0	40.0
Effective Green, g (s)	42.0			42.0	40.0	40.0
Actuated g/C Ratio	0.47			0.47	0.44	0.44
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	1667			2396	802	690
v/s Ratio Prot	0.26			c0.39	0.22	
v/s Ratio Perm						c0.56
v/c Ratio	0.56			0.83	0.49	1.26
Uniform Delay, d1	17.3			20.9	17.8	25.0
Progression Factor	0.74			0.93	1.00	1.00
Incremental Delay, d2	0.4			1.7	2.2	128.1
Delay (s)	13.2			21.1	19.9	153.1
Level of Service	B			C	B	F
Approach Delay (s)	13.2			21.1	112.8	
Approach LOS	B			C	F	

Intersection Summary

HCM 2000 Control Delay	47.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Sutton Way & Brunswick Road

Cumulative + Proj PM Peak Hour

1/9/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	249	976	541	264	1001	31	568	75	271	113	69	352
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95		0.97	1.00		1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.89	1.00	1.00		1.00	1.00		1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.88		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3467	3471	1440	1787	3491		3467	1644		1787	1881	1516
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3467	3471	1440	1787	3491		3467	1644		1787	1881	1516
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	262	1027	569	278	1054	33	598	79	285	119	73	371
RTOR Reduction (vph)	0	0	295	0	3	0	0	144	0	0	0	76
Lane Group Flow (vph)	262	1027	274	278	1084	0	598	220	0	119	73	295
Confl. Peds. (#/hr)	1		32	32		1	36					36
Heavy Vehicles (%)	1%	4%	0%	1%	3%	0%	1%	2%	2%	1%	1%	2%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases			4									6
Actuated Green, G (s)	10.9	27.0	27.0	15.0	31.1		16.0	23.3		8.7	16.0	26.9
Effective Green, g (s)	10.9	27.0	27.0	15.0	31.1		16.0	23.3		8.7	16.0	26.9
Actuated g/C Ratio	0.12	0.30	0.30	0.17	0.35		0.18	0.26		0.10	0.18	0.30
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	419	1041	432	297	1206		616	425		172	334	520
v/s Ratio Prot	0.08	c0.30		c0.16	c0.31		c0.17	0.13		0.07	0.04	c0.07
v/s Ratio Perm			0.19									0.13
v/c Ratio	0.63	0.99	0.63	0.94	0.90		0.97	0.52		0.69	0.22	0.57
Uniform Delay, d1	37.6	31.3	27.2	37.0	28.0		36.8	28.5		39.4	31.7	26.6
Progression Factor	0.93	0.91	0.87	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.3	15.3	1.3	35.3	9.1		28.9	4.5		11.4	1.5	1.4
Delay (s)	36.1	43.8	24.9	72.4	37.1		65.7	33.0		50.7	33.2	28.0
Level of Service	D	D	C	E	D		E	C		D	C	C
Approach Delay (s)		36.9			44.3			53.3			33.5	
Approach LOS		D			D			D			C	
Intersection Summary												
HCM 2000 Control Delay			42.0			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.91									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			84.5%			ICU Level of Service				E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
5: Brunswick Road & Idaho-Maryland Road

Cumulative + Proj PM Peak Hour

1/9/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	240	192	0	318	184	831	110	202	637	93
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	261	209	0	346	200	903	120	220	692	101
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)						1						
Median type								TWLTL			None	
Median storage (veh)								2				
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2435	2554	692	2755	2596	963	793			1023		
vC1, stage 1 conf vol	1132	1132		1363	1363							
vC2, stage 2 conf vol	1303	1423		1392	1233							
vCu, unblocked vol	2435	2554	692	2755	2596	963	793			1023		
tC, single (s)	7.1	6.5	6.2	7.2	6.8	6.3	4.1			4.2		
tC, 2 stage (s)	6.1	5.5		6.2	5.8							
tF (s)	3.5	4.0	3.3	3.6	4.3	3.4	2.2			2.3		
p0 queue free %	0	100	41	0	100	0	76			65		
cM capacity (veh/h)	0	13	440	3	10	298	828			634		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3					
Volume Total	261	554	200	1023	220	692	101					
Volume Left	0	209	200	0	220	0	0					
Volume Right	261	346	0	120	0	0	101					
cSH	440	7	828	1700	634	1700	1700					
Volume to Capacity	0.59	75.48	0.24	0.60	0.35	0.41	0.06					
Queue Length 95th (ft)	93	Err	24	0	39	0	0					
Control Delay (s)	24.4	Err	10.7	0.0	13.7	0.0	0.0					
Lane LOS	C	F	B		B							
Approach Delay (s)	24.4	Err	1.8		3.0							
Approach LOS	C	F										
Intersection Summary												
Average Delay			1820.5									
Intersection Capacity Utilization			82.2%		ICU Level of Service					E		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
6: McCourtney Road & Personeni Road

Cumulative + Proj PM Peak Hour
1/9/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	31	22	21	381	630	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	34	24	23	419	692	7
Pedestrians				1		
Lane Width (ft)				12.0		
Walking Speed (ft/s)				4.0		
Percent Blockage				0		
Right turn flare (veh)		2				
Median type				None	None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1160	697	699			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1160	697	699			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	84	95	97			
cM capacity (veh/h)	212	444	907			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	58	442	699			
Volume Left	34	23	0			
Volume Right	24	0	7			
cSH	363	907	1700			
Volume to Capacity	0.16	0.03	0.41			
Queue Length 95th (ft)	14	2	0			
Control Delay (s)	20.3	0.8	0.0			
Lane LOS	C	A				
Approach Delay (s)	20.3	0.8	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			47.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
7: Taylorville Road & McKnight Way

Cumulative + Proj PM Peak Hour
1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑		↖	↗				↗			↖
Volume (veh/h)	0	994	40	30	680	301	0	0	40	0	0	19
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1080	43	33	739	327	0	0	43	0	0	21
Pedestrians								3				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								0				
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)					172							
pX, platoon unblocked	0.74						0.74	0.74		0.74	0.74	0.74
vC, conflicting volume	1066			1127			1930	2237	385	1372	2095	903
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	912			1127			2083	2498	385	1326	2306	691
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			100	100	93	100	100	93
cM capacity (veh/h)	557			626			21	20	618	76	27	289

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1
Volume Total	432	432	260	33	1066	43	21
Volume Left	0	0	0	33	0	0	0
Volume Right	0	0	43	0	327	43	21
cSH	1700	1700	1700	626	1700	618	289
Volume to Capacity	0.25	0.25	0.15	0.05	0.63	0.07	0.07
Queue Length 95th (ft)	0	0	0	4	0	6	6
Control Delay (s)	0.0	0.0	0.0	11.1	0.0	11.3	18.4
Lane LOS				B		B	C
Approach Delay (s)	0.0			0.3		11.3	18.4
Approach LOS						B	C

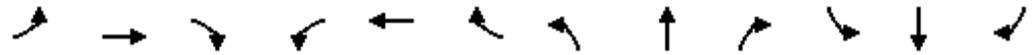
Intersection Summary

Average Delay	0.5
Intersection Capacity Utilization	64.1%
ICU Level of Service	C
Analysis Period (min)	15

HCM Signalized Intersection Capacity Analysis
8: 49 SB Off-Ramp & McKnight Way

Cumulative + Proj PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑	↗	↖	↑						↖	↗	
Volume (vph)	0	641	398	105	552	0	0	0	0	605	0	459	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		3.5	3.5	3.0	3.5						4.6	4.6	
Lane Util. Factor		0.95	1.00	1.00	1.00						1.00	1.00	
Frt		1.00	0.85	1.00	1.00						1.00	0.85	
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00	
Satd. Flow (prot)		3610	1615	1787	1900						1770	1615	
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00	
Satd. Flow (perm)		3610	1615	1787	1900						1770	1615	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.94	0.94	
Adj. Flow (vph)	0	682	423	112	587	0	0	0	0	658	0	488	
RTOR Reduction (vph)	0	0	333	0	0	0	0	0	0	0	0	113	
Lane Group Flow (vph)	0	682	90	112	587	0	0	0	0	0	658	375	
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%	2%	2%	2%	2%	3%	0%	
Turn Type		NA	Perm	Prot	NA						Perm	NA	Perm
Protected Phases		2		1	2 1							4 12	
Permitted Phases			2							4 12		4 12	
Actuated Green, G (s)		17.1	17.1	17.2	37.3						35.2	35.2	
Effective Green, g (s)		17.1	17.1	17.2	34.3						35.2	35.2	
Actuated g/C Ratio		0.21	0.21	0.21	0.43						0.44	0.44	
Clearance Time (s)		3.5	3.5	3.0									
Vehicle Extension (s)		3.0	3.0	4.7									
Lane Grp Cap (vph)		771	345	384	814						778	710	
v/s Ratio Prot		c0.19		0.06	c0.31								
v/s Ratio Perm			0.06								0.37	0.23	
v/c Ratio		0.88	0.26	0.29	0.72						0.85	0.53	
Uniform Delay, d1		30.5	26.2	26.3	18.9						20.0	16.3	
Progression Factor		1.00	1.00	1.79	1.29						1.00	1.00	
Incremental Delay, d2		14.1	1.8	0.6	2.8						8.4	0.7	
Delay (s)		44.6	28.0	47.6	27.2						28.4	17.1	
Level of Service		D	C	D	C						C	B	
Approach Delay (s)		38.2			30.5			0.0			23.6		
Approach LOS		D			C			A			C		

Intersection Summary

HCM 2000 Control Delay	30.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	15.6
Intersection Capacity Utilization	107.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 9: 49 NB Off-Ramp/49 NB On-Ramp & McKnight Way

Cumulative + Proj PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	284	957	0	0	519	498	137	0	150	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0			4.0	4.0		4.6	4.6			
Lane Util. Factor	1.00	1.00			0.95	1.00		1.00	1.00			
Frbp, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00			
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00			
Frt	1.00	1.00			1.00	0.85		1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00			
Satd. Flow (prot)	1787	1863			3574	1568		1787	1538			
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00			
Satd. Flow (perm)	1787	1863			3574	1568		1787	1538			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	309	1040	0	0	564	541	149	0	163	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	433	0	0	31	0	0	0
Lane Group Flow (vph)	309	1040	0	0	564	108	0	149	132	0	0	0
Confl. Peds. (#/hr)			3	3								
Heavy Vehicles (%)	1%	2%	0%	0%	1%	3%	1%	0%	5%	2%	2%	2%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	5	5 6			6			8 16				
Permitted Phases						6	8 16		8 16			
Actuated Green, G (s)	17.8	36.8			16.0	16.0		35.2	35.2			
Effective Green, g (s)	17.8	36.8			16.0	16.0		35.2	35.2			
Actuated g/C Ratio	0.22	0.46			0.20	0.20		0.44	0.44			
Clearance Time (s)	3.0				4.0	4.0						
Vehicle Extension (s)	4.7				3.0	3.0						
Lane Grp Cap (vph)	397	856			714	313		786	676			
v/s Ratio Prot	0.17	c0.56			0.16							
v/s Ratio Perm						0.07		0.08	c0.09			
v/c Ratio	0.78	1.21			0.79	0.35		0.19	0.20			
Uniform Delay, d1	29.2	21.6			30.4	27.5		13.7	13.7			
Progression Factor	1.37	1.17			1.00	1.00		1.00	1.00			
Incremental Delay, d2	5.4	102.2			5.8	0.7		0.1	0.1			
Delay (s)	45.4	127.5			36.2	28.2		13.8	13.9			
Level of Service	D	F			D	C		B	B			
Approach Delay (s)		108.7			32.3			13.8			0.0	
Approach LOS		F			C			B			A	

Intersection Summary

HCM 2000 Control Delay	67.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	15.6
Intersection Capacity Utilization	105.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 10: La Barr Meadows Road/S Auburn Street & McKnight Way

Cumulative + Proj PM Peak Hour

1/9/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Yield			Stop			Stop			Stop	
Volume (vph)	243	80	784	27	60	17	739	294	10	20	229	219
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	259	85	834	29	64	18	786	313	11	21	244	233
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2					
Volume Total (vph)	344	834	111	786	323	265	233					
Volume Left (vph)	259	0	29	786	0	21	0					
Volume Right (vph)	0	834	18	0	11	0	233					
Hadj (s)	0.41	-0.63	0.02	0.53	0.04	0.15	-0.68					
Departure Headway (s)	8.7	7.6	9.4	8.8	8.3	9.0	8.2					
Degree Utilization, x	0.83	1.77	0.29	1.93	0.75	0.66	0.53					
Capacity (veh/h)	407	476	374	414	423	389	426					
Control Delay (s)	40.5	373.2	16.2	446.3	31.2	26.6	18.7					
Approach Delay (s)	276.1		16.2	325.3		22.9						
Approach LOS	F		C	F		C						
Intersection Summary												
Delay			241.5									
Level of Service			F									
Intersection Capacity Utilization			88.4%		ICU Level of Service					E		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis
 11: Pleasant Valley Road & SR-20

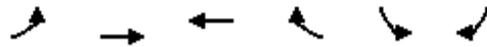
Cumulative + Proj PM Peak Hour

1/9/2013

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (vph)	112	345	65	25	311	418	51	181	25	262	164	77	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. 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	
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1805	1810	1583	1805	1810	1599	1752	1881	1615	1736	1863	1563	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1805	1810	1583	1805	1810	1599	1752	1881	1615	1736	1863	1563	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	
Adj. Flow (vph)	120	371	70	27	334	449	55	195	27	282	176	83	
RTOR Reduction (vph)	0	0	45	0	0	327	0	0	22	0	0	52	
Lane Group Flow (vph)	120	371	25	27	334	122	55	195	5	282	176	31	
Confl. Peds. (#/hr)							1					1	
Heavy Vehicles (%)	0%	5%	2%	0%	5%	1%	3%	1%	0%	4%	2%	1%	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	
Protected Phases	7	4		3	8		5	2		1	6		
Permitted Phases			4			8			2			6	
Actuated Green, G (s)	7.8	27.1	27.1	1.6	20.9	20.9	3.1	15.6	15.6	16.5	29.0	29.0	
Effective Green, g (s)	7.8	27.1	27.1	1.6	20.9	20.9	3.1	15.6	15.6	16.5	29.0	29.0	
Actuated g/C Ratio	0.10	0.35	0.35	0.02	0.27	0.27	0.04	0.20	0.20	0.21	0.38	0.38	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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	3.0	
Lane Grp Cap (vph)	183	638	558	37	492	435	70	382	328	372	703	590	
v/s Ratio Prot	c0.07	0.21		0.01	c0.18		0.03	c0.10		c0.16	0.09		
v/s Ratio Perm			0.02			0.08			0.00			0.02	
v/c Ratio	0.66	0.58	0.04	0.73	0.68	0.28	0.79	0.51	0.02	0.76	0.25	0.05	
Uniform Delay, d1	33.2	20.2	16.3	37.4	25.0	22.0	36.5	27.2	24.5	28.3	16.4	15.2	
Progression 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	
Incremental Delay, d2	8.2	1.4	0.0	52.2	3.7	0.4	42.6	1.2	0.0	8.6	0.2	0.0	
Delay (s)	41.4	21.6	16.4	89.6	28.7	22.4	79.1	28.4	24.5	36.9	16.6	15.2	
Level of Service	D	C	B	F	C	C	E	C	C	D	B	B	
Approach Delay (s)		25.2			27.2			38.1			26.9		
Approach LOS		C			C			D			C		
Intersection Summary													
HCM 2000 Control Delay			28.0									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.65										
Actuated Cycle Length (s)			76.8									Sum of lost time (s)	16.0
Intersection Capacity Utilization			59.9%									ICU Level of Service	B
Analysis Period (min)			15										
c Critical Lane Group													

HCM Unsignalized Intersection Capacity Analysis
 12: SR-20 & Cattle Drive

Cumulative + Proj PM Peak Hour
 1/9/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	6	632	734	25	43	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	1.00	1.00
Hourly flow rate (vph)	6	652	757	26	43	20
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	782				1434	770
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	782				1434	770
tC, single (s)	4.3				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.4
p0 queue free %	99				70	95
cM capacity (veh/h)	777				146	391

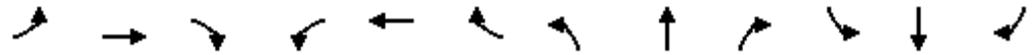
Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	6	652	782	63
Volume Left	6	0	0	43
Volume Right	0	0	26	20
cSH	777	1700	1700	182
Volume to Capacity	0.01	0.38	0.46	0.35
Queue Length 95th (ft)	1	0	0	36
Control Delay (s)	9.7	0.0	0.0	34.9
Lane LOS	A			D
Approach Delay (s)	0.1		0.0	34.9
Approach LOS				D

Intersection Summary			
Average Delay		1.5	
Intersection Capacity Utilization		50.4%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis
13: Penn Valley Drive & SR-20

Cumulative + Proj PM Peak Hour

1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	72	550	53	341	621	45	66	113	175	58	96	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.8	4.0	3.0	6.8	4.0	3.0	4.8	3.0	3.0	4.8	4.8
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	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3438	1583	1770	3539	1615	1752	1792	1583	1805	1845	1509
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3438	1583	1770	3539	1615	1752	1792	1583	1805	1845	1509
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	76	579	56	359	654	47	69	119	184	61	101	79
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	85	0	0	68
Lane Group Flow (vph)	76	579	56	359	654	47	69	119	99	61	101	11
Heavy Vehicles (%)	0%	5%	2%	2%	2%	0%	3%	6%	2%	0%	3%	7%
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	NA	custom	Prot	NA	custom
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			Free			Free			8			4
Actuated Green, G (s)	3.0	15.1	53.2	10.9	23.0	53.2	2.5	7.1	18.0	2.5	7.1	7.1
Effective Green, g (s)	3.0	15.1	53.2	10.9	23.0	53.2	2.5	7.1	18.0	2.5	7.1	7.1
Actuated g/C Ratio	0.06	0.28	1.00	0.20	0.43	1.00	0.05	0.13	0.34	0.05	0.13	0.13
Clearance Time (s)	3.0	6.8		3.0	6.8		3.0	4.8	3.0	3.0	4.8	4.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	101	975	1583	362	1530	1615	82	239	535	84	246	201
v/s Ratio Prot	0.04	c0.17		c0.20	0.18		c0.04	c0.07	0.04	0.03	0.05	
v/s Ratio Perm			0.04			0.03			0.02			0.01
v/c Ratio	0.75	0.59	0.04	0.99	0.43	0.03	0.84	0.50	0.18	0.73	0.41	0.05
Uniform Delay, d1	24.7	16.4	0.0	21.1	10.5	0.0	25.2	21.4	12.4	25.0	21.1	20.1
Progression 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
Incremental Delay, d2	26.7	1.0	0.0	44.9	0.2	0.0	50.7	1.6	0.2	26.6	1.1	0.1
Delay (s)	51.4	17.4	0.0	66.0	10.7	0.0	75.8	23.0	12.6	51.6	22.2	20.2
Level of Service	D	B	A	E	B	A	E	C	B	D	C	C
Approach Delay (s)		19.7			29.0			27.7			29.0	
Approach LOS		B			C			C			C	

Intersection Summary

HCM 2000 Control Delay	26.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	53.2	Sum of lost time (s)	17.6
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 14: Spenceville Road & Penn Valley Drive

Cumulative + Proj PM Peak Hour
 1/9/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	171	85	93	154	178	283
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	190	94	103	171	198	314
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total (vph)	284	274	512			
Volume Left (vph)	190	103	0			
Volume Right (vph)	94	0	314			
Hadj (s)	-0.06	0.10	-0.35			
Departure Headway (s)	5.8	5.6	4.9			
Degree Utilization, x	0.46	0.43	0.69			
Capacity (veh/h)	565	602	717			
Control Delay (s)	13.6	12.7	18.2			
Approach Delay (s)	13.6	12.7	18.2			
Approach LOS	B	B	C			
Intersection Summary						
Delay			15.5			
Level of Service			C			
Intersection Capacity Utilization			65.2%	ICU Level of Service	C	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 15: SR-49 & Cameo Drive

Cumulative + Proj PM Peak Hour

3/1/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↕	↗	↘	↕
Volume (veh/h)	16	10	1600	26	14	1256
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	17	11	1702	28	15	1336
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			None
Median storage veh			2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3068	851			1730	
vC1, stage 1 conf vol	1702					
vC2, stage 2 conf vol	1366					
vCu, unblocked vol	3068	851			1730	
tC, single (s)	*6.7	*6.4			4.1	
tC, 2 stage (s)	5.7					
tF (s)	3.5	3.3			2.2	
p0 queue free %	84	97			96	
cM capacity (veh/h)	111	345			361	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	28	851	851	28	15	1336
Volume Left	17	0	0	0	15	0
Volume Right	11	0	0	28	0	0
cSH	150	1700	1700	1700	361	1700
Volume to Capacity	0.19	0.50	0.50	0.02	0.04	0.79
Queue Length 95th (ft)	16	0	0	0	3	0
Control Delay (s)	34.4	0.0	0.0	0.0	15.4	0.0
Lane LOS	D				C	
Approach Delay (s)	34.4	0.0			0.2	
Approach LOS	D					

Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			76.1%		ICU Level of Service	D
Analysis Period (min)			15			

* User Entered Value

HCM Signalized Intersection Capacity Analysis
16: SR-49 & Wolf Road/Combie Road

Cumulative + Proj PM Peak Hour

3/1/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	180	103	421	160	323	210	1259	716	450	768	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1703	1881	1553	3433	1845	1568	1770	3505	1599	1752	3471	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1703	1881	1553	3433	1845	1568	1770	3505	1599	1752	3471	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	48	196	112	458	174	351	228	1368	778	489	835	59
RTOR Reduction (vph)	0	0	92	0	0	185	0	0	120	0	0	38
Lane Group Flow (vph)	48	196	20	458	174	166	228	1368	658	489	835	21
Heavy Vehicles (%)	6%	1%	4%	2%	3%	3%	2%	3%	1%	3%	4%	4%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	3.5	14.1	14.1	14.1	24.7	24.7	10.5	27.6	41.7	7.5	24.6	28.1
Effective Green, g (s)	3.5	14.1	14.1	14.1	24.7	24.7	10.5	27.6	41.7	7.5	24.6	28.1
Actuated g/C Ratio	0.04	0.18	0.18	0.18	0.31	0.31	0.13	0.35	0.52	0.09	0.31	0.35
Clearance Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5
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	3.0
Lane Grp Cap (vph)	74	332	274	606	571	485	232	1212	835	164	1070	546
v/s Ratio Prot	0.03	c0.10		0.13	0.09		0.13	c0.39	c0.14	c0.28	0.24	0.00
v/s Ratio Perm			0.01			0.11			0.27			0.01
v/c Ratio	0.65	0.59	0.07	0.76	0.30	0.34	0.98	1.13	0.79	2.98	0.78	0.04
Uniform Delay, d1	37.5	30.2	27.4	31.2	21.0	21.3	34.6	26.1	15.5	36.1	25.1	17.0
Progression 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
Incremental Delay, d2	17.9	2.8	0.1	5.3	0.3	0.4	53.9	68.9	5.0	908.0	5.7	0.0
Delay (s)	55.5	33.0	27.5	36.6	21.3	21.7	88.4	95.0	20.4	944.1	30.8	17.0
Level of Service	E	C	C	D	C	C	F	F	C	F	C	B
Approach Delay (s)		34.3			28.6			69.9			353.1	
Approach LOS		C			C			E			F	

Intersection Summary

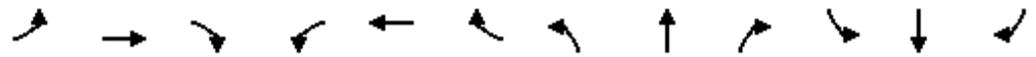
HCM 2000 Control Delay	136.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	79.8	Sum of lost time (s)	16.5
Intersection Capacity Utilization	96.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 17: Rosewood Rd/Armstrong Rd & Combie Road

Cumulative + Proj PM Peak Hour

3/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	107	1069	24	11	771	69	12	0	6	91	2	102
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	119	1188	27	12	857	77	13	0	7	101	2	113
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)					955							
pX, platoon unblocked	0.72						0.72	0.72		0.72	0.72	0.72
vC, conflicting volume	933			1214			2434	2397	607	1758	2372	895
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	708			1214			2807	2754	607	1860	2719	654
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	82			98			0	100	98	0	82	62
cM capacity (veh/h)	644			581			3	11	444	27	12	296

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	119	792	423	12	933	20	101	116
Volume Left	119	0	0	12	0	13	101	0
Volume Right	0	0	27	0	77	7	0	113
cSH	644	1700	1700	581	1700	4	27	204
Volume to Capacity	0.18	0.47	0.25	0.02	0.55	4.79	3.68	0.57
Queue Length 95th (ft)	17	0	0	2	0	Err	Err	77
Control Delay (s)	11.9	0.0	0.0	11.3	0.0	Err	Err	43.6
Lane LOS	B			B		F	F	E
Approach Delay (s)	1.1			0.1		Err	4689.5	
Approach LOS						F	F	

Intersection Summary		
Average Delay		484.0
Intersection Capacity Utilization	Err%	ICU Level of Service
Analysis Period (min)		15

HCM Signalized Intersection Capacity Analysis
 18: Combie Road & Magnolia Road & Hacienda Drive

Cumulative + Proj PM Peak Hour

3/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	75	777	291	103	541	60	181	19	152	58	23	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.99			1.00	0.85		0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.98	
Satd. Flow (prot)	1752	1881	1583	1787	1839			1802	1583		1702	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.96	1.00		0.98	
Satd. Flow (perm)	1752	1881	1583	1787	1839			1802	1583		1702	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	82	845	316	112	588	65	197	21	165	63	25	95
RTOR Reduction (vph)	0	0	140	0	4	0	0	0	139	0	40	0
Lane Group Flow (vph)	82	845	176	112	649	0	0	218	26	0	143	0
Heavy Vehicles (%)	3%	1%	2%	1%	2%	0%	1%	0%	2%	0%	0%	4%
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA	Perm	Split	NA	
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4						2			
Actuated Green, G (s)	6.8	43.1	43.1	8.7	45.0			15.0	15.0		12.4	
Effective Green, g (s)	6.8	43.1	43.1	8.7	45.0			15.0	15.0		12.4	
Actuated g/C Ratio	0.07	0.45	0.45	0.09	0.47			0.16	0.16		0.13	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	125	851	716	163	869			283	249		221	
v/s Ratio Prot	0.05	c0.45		c0.06	0.35			c0.12			c0.08	
v/s Ratio Perm			0.11						0.02			
v/c Ratio	0.66	0.99	0.25	0.69	0.75			0.77	0.10		0.65	
Uniform Delay, d1	43.1	25.9	16.0	41.9	20.5			38.4	34.3		39.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	11.7	29.0	0.2	11.4	3.5			12.2	0.2		6.4	
Delay (s)	54.8	54.8	16.2	53.3	24.0			50.6	34.5		45.7	
Level of Service	D	D	B	D	C			D	C		D	
Approach Delay (s)		45.0			28.3			43.7			45.7	
Approach LOS		D			C			D			D	

Intersection Summary

HCM 2000 Control Delay	39.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	95.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 19: SR-49 & Woodridge Drive

Cumulative + Proj PM Peak Hour

3/1/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗	↖	↕
Volume (veh/h)	0	200	1985	139	68	1224
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	0	202	2005	140	69	1236
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						1119
pX, platoon unblocked	0.81					
vC, conflicting volume	2761	1003			2005	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2706	1003			2005	
tC, single (s)	6.8	*6.5			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	26			76	
cM capacity (veh/h)	11	273			289	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	202	1003	1003	140	69	618	618
Volume Left	0	0	0	0	69	0	0
Volume Right	202	0	0	140	0	0	0
cSH	273	1700	1700	1700	289	1700	1700
Volume to Capacity	0.74	0.59	0.59	0.08	0.24	0.36	0.36
Queue Length 95th (ft)	133	0	0	0	23	0	0
Control Delay (s)	48.1	0.0	0.0	0.0	21.3	0.0	0.0
Lane LOS	E					C	
Approach Delay (s)	48.1	0.0			1.1		
Approach LOS	E						

Intersection Summary			
Average Delay		3.1	
Intersection Capacity Utilization		73.9%	ICU Level of Service D
Analysis Period (min)		15	

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis
 20: Brunswick Road & Dwy Sites 7,8

Cumulative + Proj PM Peak Hour
 1/9/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	18	53	1147	36	106	1094
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	58	1247	39	115	1189
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2686	1266			1286	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2686	1266			1286	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	72			79	
cM capacity (veh/h)	19	206			539	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	20	58	1286	115	1189
Volume Left	20	0	0	115	0
Volume Right	0	58	39	0	0
cSH	19	206	1700	539	1700
Volume to Capacity	1.03	0.28	0.76	0.21	0.70
Queue Length 95th (ft)	69	27	0	20	0
Control Delay (s)	500.1	29.1	0.0	13.5	0.0
Lane LOS	F	D		B	
Approach Delay (s)	148.5		0.0	1.2	
Approach LOS	F				

Intersection Summary					
Average Delay			4.9		
Intersection Capacity Utilization			81.8%	ICU Level of Service	D
Analysis Period (min)			15		

HCM Unsignalized Intersection Capacity Analysis
 21: Brunswick Road & Dwy Sites 3-6 and 9

Cumulative + Proj PM Peak Hour
 1/9/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	106	35	72	1077	897	215
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	115	38	78	1171	975	234
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2419	1092	1209			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2419	1092	1209			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	85	86			
cM capacity (veh/h)	31	261	577			
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	
Volume Total	115	38	78	1171	1209	
Volume Left	115	0	78	0	0	
Volume Right	0	38	0	0	234	
cSH	31	261	577	1700	1700	
Volume to Capacity	3.73	0.15	0.14	0.69	0.71	
Queue Length 95th (ft)	Err	13	12	0	0	
Control Delay (s)	Err	21.1	12.2	0.0	0.0	
Lane LOS	F	C	B			
Approach Delay (s)	7522.2		0.8		0.0	
Approach LOS	F					
Intersection Summary						
Average Delay			441.9			
Intersection Capacity Utilization			72.8%		ICU Level of Service	C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
22: Dwy Site 2

Cumulative + Proj PM Peak Hour
1/9/2013



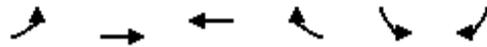
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	4	39	1004	4	79	961
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	42	1091	4	86	1045
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2310	1093			1096	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2310	1093			1096	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	88	84			87	
cM capacity (veh/h)	36	260			637	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	4	42	1096	86	1045
Volume Left	4	0	0	86	0
Volume Right	0	42	4	0	0
cSH	36	260	1700	637	1700
Volume to Capacity	0.12	0.16	0.64	0.13	0.61
Queue Length 95th (ft)	9	14	0	12	0
Control Delay (s)	117.3	21.5	0.0	11.5	0.0
Lane LOS	F	C		B	
Approach Delay (s)	30.4		0.0	0.9	
Approach LOS	D				

Intersection Summary					
Average Delay			1.1		
Intersection Capacity Utilization			70.8%	ICU Level of Service	C
Analysis Period (min)			15		

HCM Unsignalized Intersection Capacity Analysis
 23: Penn Valley & Site 10,11,12 Dway

Cumulative + Proj PM Peak Hour
 1/9/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	47	170	246	115	57	23
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	51	185	267	125	62	25
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	392				617	330
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	392				617	330
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				86	96
cM capacity (veh/h)	1166				434	712

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	236	392	87
Volume Left	51	0	62
Volume Right	0	125	25
cSH	1166	1700	609
Volume to Capacity	0.04	0.23	0.14
Queue Length 95th (ft)	3	0	12
Control Delay (s)	2.1	0.0	13.4
Lane LOS	A		B
Approach Delay (s)	2.1	0.0	13.4
Approach LOS			B

Intersection Summary			
Average Delay		2.3	
Intersection Capacity Utilization	44.8%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 24: Broken Oak & Penn Valley

Cumulative + Proj PM Peak Hour
 1/9/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	↻
Volume (veh/h)	189	22	23	181	12	37
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	210	24	26	201	13	41
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			234		474	222
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			234		474	222
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		98	95
cM capacity (veh/h)			1333		538	817

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	234	227	54
Volume Left	0	26	13
Volume Right	24	0	41
cSH	1700	1333	1082
Volume to Capacity	0.14	0.02	0.05
Queue Length 95th (ft)	0	1	4
Control Delay (s)	0.0	1.0	10.2
Lane LOS		A	B
Approach Delay (s)	0.0	1.0	10.2
Approach LOS			B

Intersection Summary			
Average Delay		1.5	
Intersection Capacity Utilization		35.4%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 26: Combie Road & Dwy Site 18

Cumulative + Proj PM Peak Hour
 3/1/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	59	61	39	3	2	29
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	64	66	42	3	2	32
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	46				239	44
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	46				239	44
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				100	97
cM capacity (veh/h)	1562				719	1026

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	64	66	46	34
Volume Left	64	0	0	2
Volume Right	0	0	3	32
cSH	1562	1700	1700	999
Volume to Capacity	0.04	0.04	0.03	0.03
Queue Length 95th (ft)	3	0	0	3
Control Delay (s)	7.4	0.0	0.0	8.7
Lane LOS	A			A
Approach Delay (s)	3.6		0.0	8.7
Approach LOS				A

Intersection Summary			
Average Delay		3.7	
Intersection Capacity Utilization		19.9%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 27: Brunswick Road & Loma Rica Road

Cumulative + Proj PM Peak Hour
 2/25/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶	↶	↷		↶	↷
Volume (veh/h)	105	405	566	88	282	648
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	114	440	615	96	307	704
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			None
Median storage (veh)			2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1980	663			711	
vC1, stage 1 conf vol	663					
vC2, stage 2 conf vol	1317					
vCu, unblocked vol	1980	663			711	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	26	5			66	
cM capacity (veh/h)	154	461			889	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	114	440	711	307	704
Volume Left	114	0	0	307	0
Volume Right	0	440	96	0	0
cSH	154	461	1700	889	1700
Volume to Capacity	0.74	0.95	0.42	0.34	0.41
Queue Length 95th (ft)	112	290	0	39	0
Control Delay (s)	75.5	61.4	0.0	11.2	0.0
Lane LOS	F	F		B	
Approach Delay (s)	64.3		0.0	3.4	
Approach LOS	F				

Intersection Summary					
Average Delay			17.2		
Intersection Capacity Utilization			66.9%	ICU Level of Service	C
Analysis Period (min)			15		

HCM Unsignalized Intersection Capacity Analysis
 28: Higgins Road & Combie Road

Cumulative + Proj PM Peak Hour
 3/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↻		↻	↻↻		↻		↻		↻	
Volume (veh/h)	0	907	269	287	592	0	312	0	255	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	986	292	312	643	0	339	0	277	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh		2										
Upstream signal (ft)		718										
pX, platoon unblocked				0.93			0.93	0.93	0.93	0.93	0.93	
vC, conflicting volume	643			986			2078	2399	1132	2677	2253	322
vC1, stage 1 conf vol							1132	1132		1267	1267	
vC2, stage 2 conf vol							946	1267		1409	986	
vCu, unblocked vol	643			949			2119	2464	1106	2761	2308	322
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			54			0	100	0	0	100	100
cM capacity (veh/h)	937			671			118	111	191	0	19	674

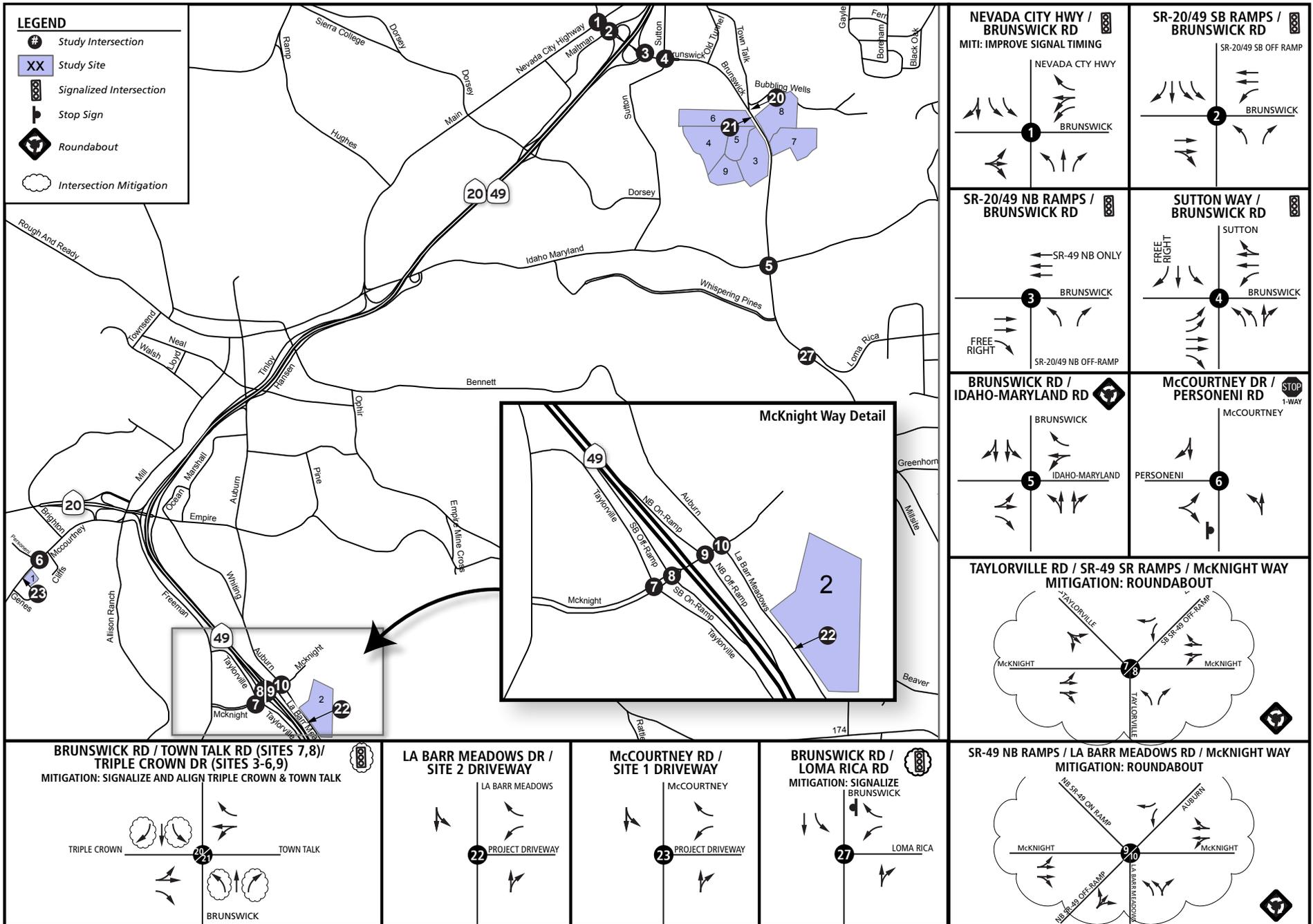
Direction, Lane #	EB 1	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	1278	312	429	214	339	277	0
Volume Left	0	312	0	0	339	0	0
Volume Right	292	0	0	0	0	277	0
cSH	1700	671	1700	1700	118	191	1700
Volume to Capacity	0.75	0.46	0.25	0.13	2.87	1.45	0.00
Queue Length 95th (ft)	0	62	0	0	791	422	0
Control Delay (s)	0.0	14.9	0.0	0.0	922.4	274.2	0.0
Lane LOS		B			F	F	A
Approach Delay (s)	0.0	4.9			630.9		0.0
Approach LOS					F		A

Intersection Summary

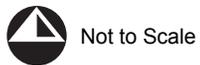
Average Delay	138.1
Intersection Capacity Utilization	107.3%
ICU Level of Service	G
Analysis Period (min)	15

APPENDIX H

Mitigated Conditions Intersection Geometry: Cumulative plus Project Conditions



Source: RBF Consulting 2013

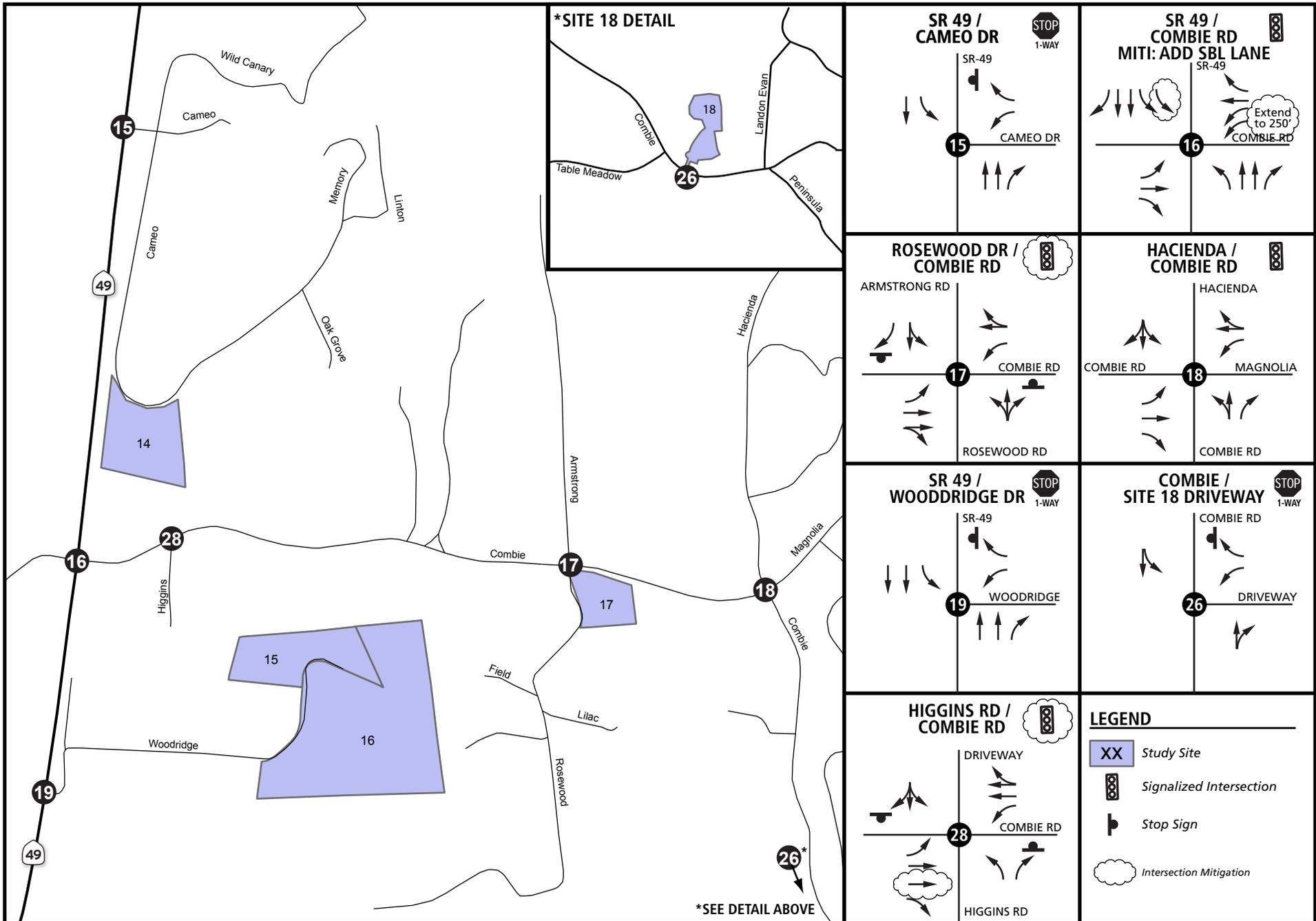


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GRASS VALLEY SOI STUDY AREA
 COUNTY OF NEVADA: 2009-2014 HOUSING ELEMENT REZONE PROGRAM IMPLEMENTATION EIR

Intersection Mitigations - Cumulative plus Project Conditions

FIGURE 5.2.14-3A



Source: RBF Consulting 2013



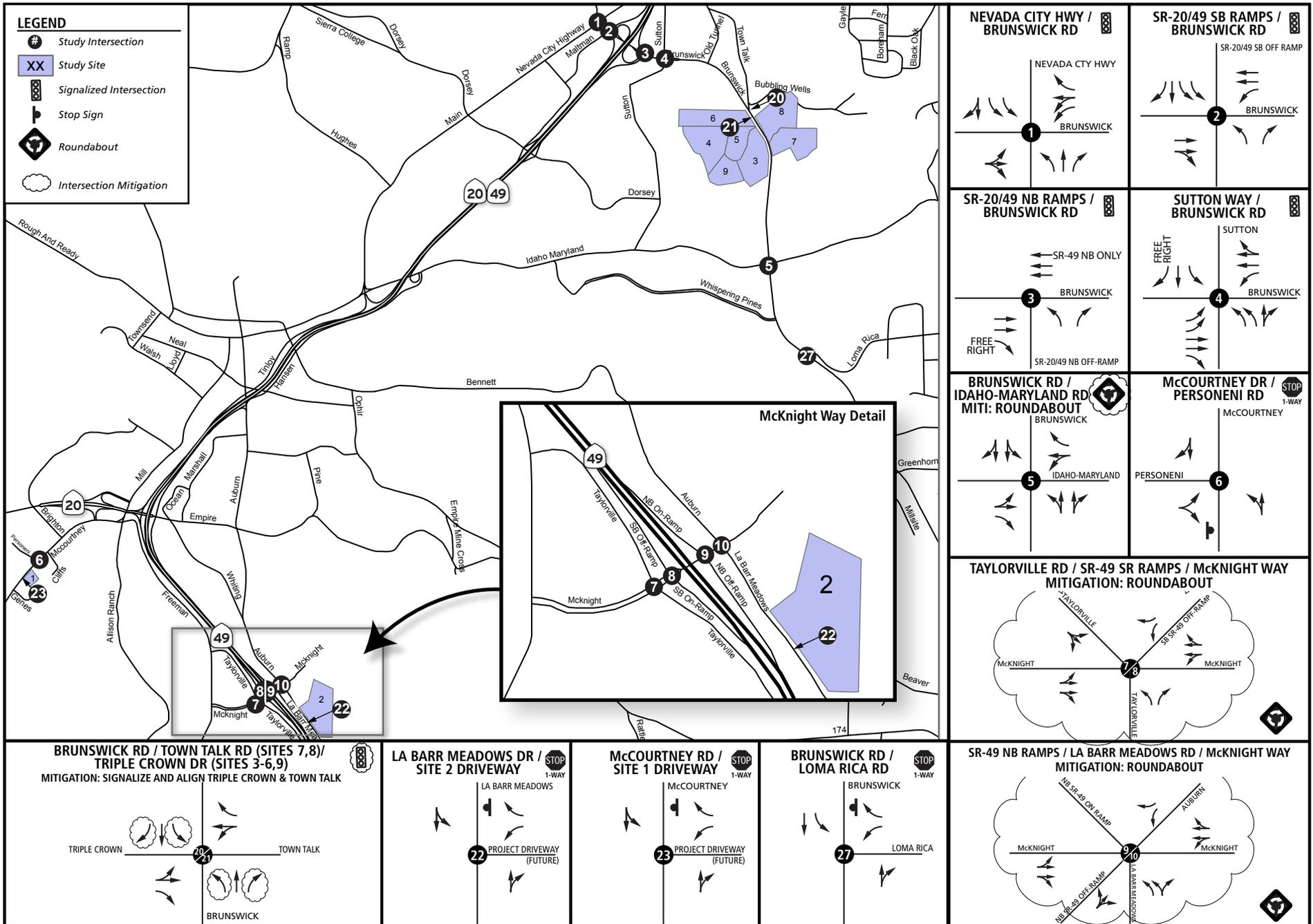
Not to Scale

Intersection Mitigations - Existing plus Background plus Project Conditions

4/212013 • JN 131242-18945

LAKE OF THE PINES STUDY AREA
 COUNTY OF NEVADA: 2009-2014 HOUSING ELEMENT REZONE PROGRAM IMPLEMENTATION EIR

FIGURE 4.15-7B



Source: RBF Consulting 2013



Not to Scale

Intersection Mitigations - Existing plus Background plus Project Conditions

4/21/2013 • JN 131242-18945

GRASS VALLEY SOI STUDY AREA
 COUNTY OF NEVADA: 2009-2014 HOUSING ELEMENT REZONE PROGRAM IMPLEMENTATION EIR

FIGURE 4.15-7A

APPENDIX I

Intersection Level of Service Calculations: Mitigated Conditions

HCM Signalized Intersection Capacity Analysis
 1: Nevada City Highway & Brunswick Road

Cumulative + Proj Mitigated PM Peak Hour

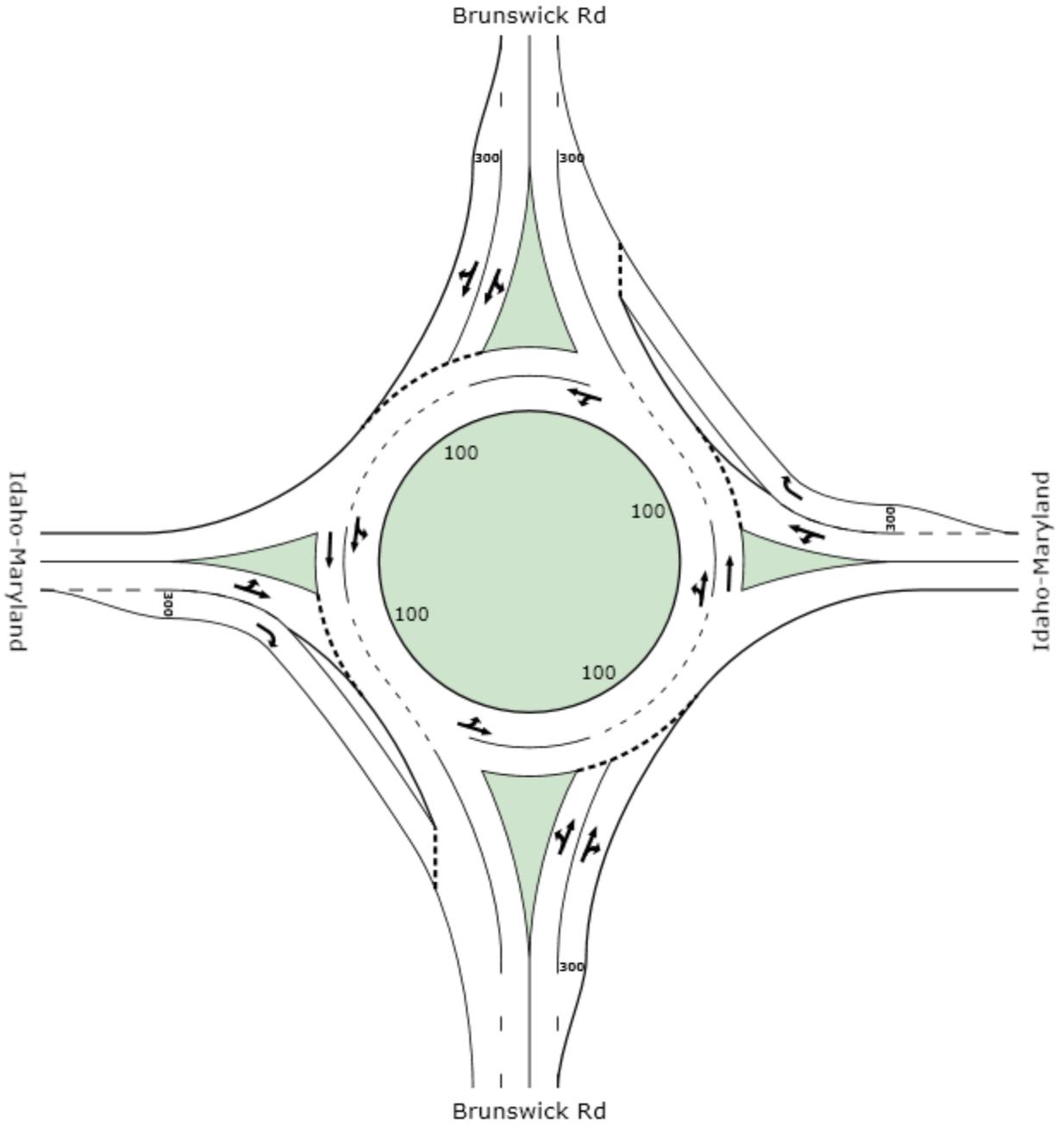
1/9/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗	↖	↖	↑	↖	↖↗	↖	↖
Volume (vph)	10	34	13	340	24	809	12	332	268	854	291	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	1.00	1.00	0.97	1.00	
Frbp, ped/bikes		1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.99		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1770		1698	1704	1598	1805	1881	1556	3433	1861	
Flt Permitted		0.99		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1770		1698	1704	1598	1805	1881	1556	3433	1861	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	11	37	14	366	26	870	13	357	288	918	313	2
RTOR Reduction (vph)	0	12	0	0	0	303	0	0	158	0	0	0
Lane Group Flow (vph)	0	50	0	194	198	567	13	357	130	918	315	0
Confl. Peds. (#/hr)	3					3	11		3	3		11
Heavy Vehicles (%)	0%	0%	14%	1%	5%	0%	0%	1%	2%	2%	2%	0%
Turn Type	Split	NA		Split	NA	pm+ov	Split	NA	Perm	Split	NA	
Protected Phases	6	6		8	8	4	2	2		4	4	
Permitted Phases						8			2			
Actuated Green, G (s)		16.0		14.2	14.2	38.2	19.8	19.8	19.8	24.0	24.0	
Effective Green, g (s)		16.0		14.2	14.2	38.2	19.8	19.8	19.8	24.0	24.0	
Actuated g/C Ratio		0.18		0.16	0.16	0.42	0.22	0.22	0.22	0.27	0.27	
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		314		267	268	749	397	413	342	915	496	
v/s Ratio Prot		c0.03		0.11	0.12	c0.20	0.01	c0.19		c0.27	0.17	
v/s Ratio Perm						0.15			0.08			
v/c Ratio		0.16		0.73	0.74	0.76	0.03	0.86	0.38	1.00	0.64	
Uniform Delay, d1		31.3		36.1	36.1	22.0	27.6	33.8	29.9	33.0	29.1	
Progression Factor		1.00		0.74	0.74	0.92	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		1.1		8.4	9.1	3.9	0.2	20.7	3.2	30.5	2.7	
Delay (s)		32.4		35.0	35.7	24.1	27.7	54.5	33.1	63.5	31.8	
Level of Service		C		C	D	C	C	D	C	E	C	
Approach Delay (s)		32.4			27.6			44.6			55.4	
Approach LOS		C			C			D			E	

Intersection Summary

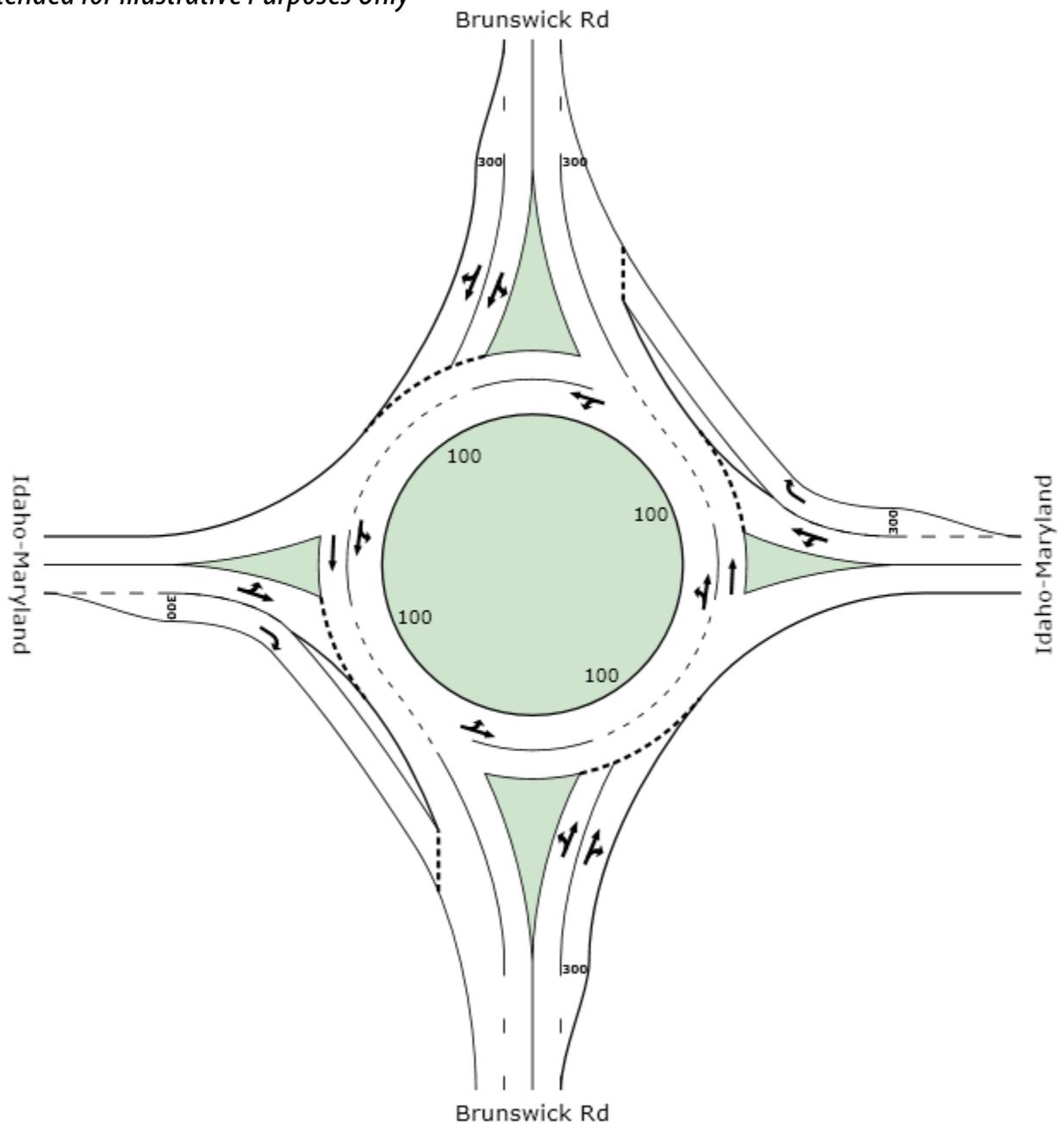
HCM 2000 Control Delay	41.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Brunswick Rd / Idaho-Maryland Rd SIDRA Intersection Roundabout Layout



**Intended for Illustrative Purposes Only*



MOVEMENT SUMMARY

Site: Brunswick / Idaho-Maryland
(E+B)

PM Peak Hour
Existing + Background Mitigation
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Brunswick Rd											
3L	L	215	2.0	0.479	8.5	LOS A	3.0	76.2	0.64	0.87	26.0
8T	T	577	2.0	0.479	7.6	LOS A	3.0	76.2	0.62	0.69	28.9
8R	R	91	2.0	0.315	6.4	LOS A	1.8	44.9	0.59	0.72	29.4
Approach		884	2.0	0.479	7.7	LOS A	3.0	76.2	0.62	0.73	28.2
East: Idaho-Maryland											
1L	L	146	2.0	0.378	11.1	LOS B	1.9	48.3	0.77	1.00	24.8
6T	T	90	2.0	0.378	11.1	LOS B	1.9	48.3	0.77	0.90	26.6
6R	R	275	2.0	0.329	8.0	LOS A	1.5	38.8	0.67	0.83	28.5
Approach		511	2.0	0.378	9.5	LOS A	1.9	48.3	0.72	0.89	26.9
North: Brunswick Rd											
7L	L	166	2.0	0.370	7.5	LOS A	2.1	53.4	0.65	0.88	26.5
4T	T	480	2.0	0.370	7.3	LOS A	2.1	53.4	0.63	0.71	29.1
4R	R	122	2.0	0.370	7.2	LOS A	2.0	49.8	0.61	0.76	28.9
Approach		768	2.0	0.370	7.3	LOS A	2.1	53.4	0.63	0.76	28.4
West: Idaho-Maryland											
5L	L	135	2.0	0.303	8.7	LOS A	1.4	36.4	0.72	0.95	25.8
2T	T	83	2.0	0.303	8.7	LOS A	1.4	36.4	0.72	0.83	27.9
2R	R	228	2.0	0.252	6.6	LOS A	1.1	29.2	0.62	0.78	29.4
Approach		446	2.0	0.303	7.6	LOS A	1.4	36.4	0.67	0.84	27.9
All Vehicles		2609	2.0	0.479	7.9	LOS A	3.0	76.2	0.65	0.79	27.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 2010.

HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: Brunswick / Idaho-Maryland
(C)

PM Peak Hour
Cumulative Mitigation
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Brunswick Rd											
3L	L	238	2.0	0.611	11.1	LOS B	5.2	131.0	0.74	0.94	25.0
8T	T	789	2.0	0.611	9.6	LOS A	5.2	131.0	0.70	0.76	27.8
8R	R	101	2.0	0.402	7.5	LOS A	2.4	61.8	0.64	0.74	28.8
Approach		1128	2.0	0.611	9.7	LOS A	5.2	131.0	0.70	0.80	27.2
East: Idaho-Maryland											
1L	L	153	2.0	0.489	16.0	LOS C	2.6	66.6	0.82	1.06	22.9
6T	T	98	2.0	0.489	16.0	LOS C	2.6	66.6	0.82	0.98	24.3
6R	R	317	2.0	0.443	11.2	LOS B	2.3	59.4	0.75	0.93	26.7
Approach		568	2.0	0.489	13.3	LOS B	2.6	66.6	0.78	0.97	25.1
North: Brunswick Rd											
7L	L	217	2.0	0.541	10.6	LOS B	4.1	103.3	0.77	0.99	25.1
4T	T	764	2.0	0.541	10.4	LOS B	4.1	103.3	0.74	0.86	27.3
4R	R	101	2.0	0.541	10.3	LOS B	3.8	96.6	0.73	0.89	27.3
Approach		1083	2.0	0.541	10.4	LOS B	4.1	103.3	0.75	0.89	26.8
West: Idaho-Maryland											
5L	L	91	2.0	0.293	10.4	LOS B	1.2	30.7	0.73	0.97	25.1
2T	T	75	2.0	0.293	10.4	LOS B	1.2	30.7	0.73	0.85	27.0
2R	R	161	2.0	0.232	7.9	LOS A	1.0	24.5	0.68	0.83	28.6
Approach		327	2.0	0.293	9.2	LOS A	1.2	30.7	0.71	0.87	27.1
All Vehicles		3107	2.0	0.611	10.6	LOS B	5.2	131.0	0.73	0.87	26.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 2010.

HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: Brunswick / Idaho-Maryland
(C+P)

PM Peak Hour
Cumulative + Project Mitigation
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Brunswick Rd											
3L	L	238	2.0	0.639	11.9	LOS B	5.7	145.2	0.77	0.96	24.7
8T	T	827	2.0	0.639	10.2	LOS B	5.7	145.2	0.72	0.79	27.4
8R	R	101	2.0	0.420	7.8	LOS A	2.6	65.2	0.66	0.76	28.6
Approach		1166	2.0	0.639	10.3	LOS B	5.7	145.2	0.73	0.82	26.9
East: Idaho-Maryland											
1L	L	153	2.0	0.508	17.1	LOS C	2.7	69.7	0.82	1.07	22.5
6T	T	98	2.0	0.508	17.1	LOS C	2.7	69.7	0.82	0.99	23.8
6R	R	343	2.0	0.496	12.7	LOS B	2.8	70.5	0.78	0.96	26.0
Approach		595	2.0	0.508	14.6	LOS B	2.8	70.5	0.80	0.99	24.6
North: Brunswick Rd											
7L	L	228	2.0	0.554	10.9	LOS B	4.3	108.7	0.78	0.99	25.0
4T	T	780	2.0	0.554	10.7	LOS B	4.3	108.7	0.75	0.87	27.2
4R	R	101	2.0	0.554	10.5	LOS B	4.0	101.7	0.74	0.90	27.1
Approach		1110	2.0	0.554	10.7	LOS B	4.3	108.7	0.76	0.90	26.6
West: Idaho-Maryland											
5L	L	91	2.0	0.301	10.8	LOS B	1.2	31.6	0.73	0.97	25.0
2T	T	75	2.0	0.301	10.8	LOS B	1.2	31.6	0.73	0.85	26.8
2R	R	163	2.0	0.239	8.1	LOS A	1.0	25.2	0.69	0.84	28.4
Approach		329	2.0	0.301	9.5	LOS A	1.2	31.6	0.71	0.88	27.0
All Vehicles		3200	2.0	0.639	11.2	LOS B	5.7	145.2	0.75	0.89	26.3

Level of Service (LOS) Method: Delay & v/c (HCM 2010).

Roundabout LOS Method: Same as Sign Control.

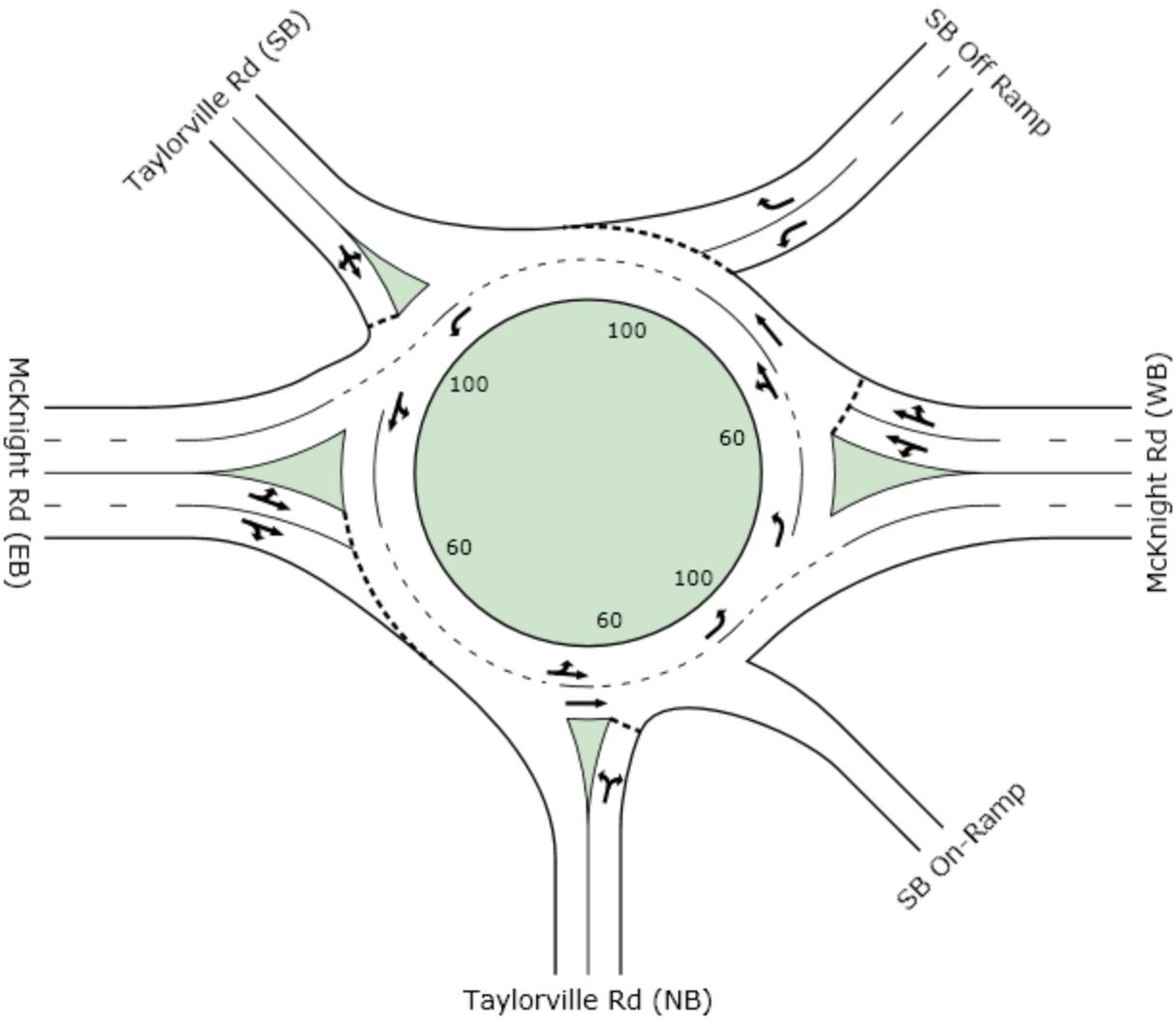
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 2010.

HCM Delay Model used. Geometric Delay not included.



MOVEMENT SUMMARY

Site: McKnight / Taylorville
Cumulative PM

McKnight Way / Taylorville Rd - McKnight Way / SR 49 SB Ramps
Cumulative Mitigation - PM Peak Hour
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Taylorville Rd (NB)											
3	L	12	2.1	0.168	14.4	LOS B	0.6	14.6	0.83	0.96	23.3
18	R	42	2.4	0.168	14.4	LOS B	0.6	14.6	0.83	0.93	24.4
Approach		54	2.3	0.168	14.4	LOS B	0.6	14.6	0.83	0.93	24.2
East: McKnight Rd (WB)											
1	L	126	2.8	0.215	4.0	LOS A	1.3	32.9	0.09	0.86	27.4
6	T	389	2.0	0.215	4.0	LOS A	1.3	32.9	0.08	0.42	31.3
16	R	163	3.0	0.215	4.0	LOS A	1.2	29.6	0.08	0.46	31.2
Approach		679	2.4	0.215	4.0	LOS A	1.3	32.9	0.08	0.51	30.4
North East: SB Off Ramp											
1X	L	616	3.0	0.731	18.6	LOS C	6.7	170.9	0.89	1.15	21.5
16X	R	337	3.0	0.429	10.1	LOS B	2.5	63.0	0.75	0.91	27.5
Approach		953	3.0	0.731	15.6	LOS C	6.7	170.9	0.84	1.06	23.2
North West: Taylorville Rd (SB)											
7X	L	5	3.0	0.050	8.8	LOS A	0.2	4.5	0.73	0.95	26.1
4X	T	5	3.0	0.050	8.8	LOS A	0.2	4.5	0.73	0.85	27.6
14X	R	12	3.0	0.050	8.8	LOS A	0.2	4.5	0.73	0.88	27.4
Approach		22	3.0	0.050	8.8	LOS A	0.2	4.5	0.73	0.89	27.1
West: McKnight Rd (EB)											
5	L	1	3.0	0.697	18.8	LOS C	6.1	154.1	0.90	1.18	22.0
2	T	626	2.0	0.697	18.6	LOS C	6.1	154.1	0.90	1.12	23.3
12	R	442	2.9	0.697	17.8	LOS C	5.7	145.9	0.87	1.10	23.4
Approach		1069	2.4	0.697	18.2	LOS C	6.1	154.1	0.89	1.11	23.3
All Vehicles		2777	2.6	0.731	13.7	LOS B	6.7	170.9	0.67	0.94	24.7

Level of Service (LOS) Method: Delay & v/c (HCM 2010).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 2010.

HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: McKnight / Taylorville
Cumulative + Proj PM

McKnight Way / Taylorville Rd - McKnight Way / SR 49 SB Ramps
Cumulative + Project Mitigation - PM Peak Hour
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Taylorville Rd (NB)											
3	L	12	2.1	0.172	14.8	LOS B	0.6	14.9	0.83	0.96	23.2
18	R	42	2.4	0.172	14.8	LOS B	0.6	14.9	0.83	0.93	24.3
Approach		54	2.3	0.172	14.8	LOS B	0.6	14.9	0.83	0.94	24.0
East: McKnight Rd (WB)											
1	L	132	2.8	0.219	4.0	LOS A	1.3	33.6	0.09	0.86	27.4
6	T	397	2.0	0.219	4.0	LOS A	1.3	33.6	0.08	0.42	31.3
16	R	163	3.0	0.219	4.0	LOS A	1.2	30.3	0.08	0.46	31.2
Approach		692	2.4	0.219	4.0	LOS A	1.3	33.6	0.08	0.51	30.4
North East: SB Off Ramp											
1X	L	616	3.0	0.740	19.3	LOS C	6.8	174.9	0.90	1.16	21.3
16X	R	347	3.0	0.449	10.6	LOS B	2.6	67.5	0.76	0.92	27.2
Approach		963	3.0	0.740	16.1	LOS C	6.8	174.9	0.85	1.07	23.0
North West: Taylorville Rd (SB)											
7X	L	5	3.0	0.050	8.9	LOS A	0.2	4.5	0.73	0.95	26.0
4X	T	5	3.0	0.050	8.9	LOS A	0.2	4.5	0.73	0.86	27.6
14X	R	12	3.0	0.050	8.9	LOS A	0.2	4.5	0.73	0.88	27.4
Approach		22	3.0	0.050	8.9	LOS A	0.2	4.5	0.73	0.89	27.1
West: McKnight Rd (EB)											
5	L	1	3.0	0.714	19.7	LOS C	6.4	162.5	0.91	1.19	21.7
2	T	643	2.0	0.714	19.5	LOS C	6.4	162.5	0.91	1.14	22.9
12	R	445	2.9	0.714	18.6	LOS C	6.0	153.9	0.88	1.12	23.1
Approach		1089	2.4	0.714	19.1	LOS C	6.4	162.5	0.90	1.13	23.0
All Vehicles		2820	2.6	0.740	14.2	LOS B	6.8	174.9	0.68	0.95	24.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).

Roundabout LOS Method: Same as Sign Control.

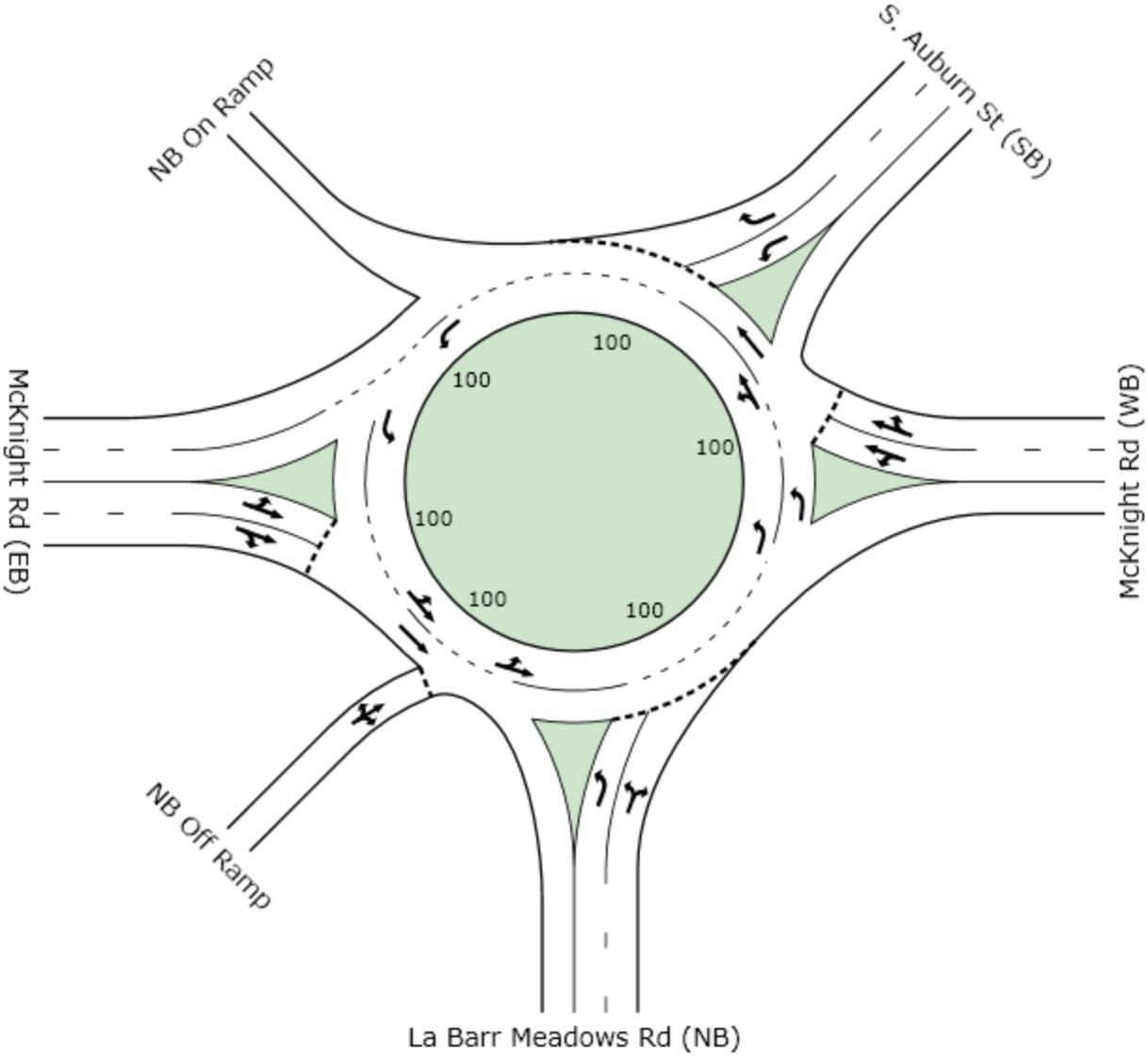
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 2010.

HCM Delay Model used. Geometric Delay not included.



MOVEMENT SUMMARY

Site: McKnight / La Barr Ext + Proj
PM

McKnight Way / La Barr Meadows Road - McKnight Way / SR 49 NB Ramps
Existing + Background + Project Mitigation - PM Peak Hour
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: La Barr Meadows Rd (NB)											
3	L	298	2.0	0.278	8.1	LOS A	1.3	33.0	0.70	0.93	26.1
18	R	121	2.0	0.278	7.7	LOS A	1.2	31.1	0.67	0.80	28.6
Approach		418	2.0	0.278	8.0	LOS A	1.3	33.0	0.69	0.89	26.7
East: McKnight Rd (WB)											
1	L	28	2.0	0.098	8.0	LOS A	0.4	10.0	0.71	0.95	26.2
6	T	33	2.0	0.098	7.8	LOS A	0.4	10.0	0.70	0.82	28.6
16	R	49	2.0	0.098	7.3	LOS A	0.4	9.4	0.67	0.83	29.0
Approach		110	2.0	0.098	7.6	LOS A	0.4	10.0	0.69	0.86	28.1
North East: S. Auburn St (SB)											
1X	L	160	2.0	0.233	8.0	LOS A	1.0	26.7	0.71	0.91	26.1
16X	R	241	2.0	0.323	8.7	LOS A	1.5	37.2	0.70	0.85	28.2
Approach		401	2.0	0.323	8.4	LOS A	1.5	37.2	0.70	0.87	27.3
West: McKnight Rd (EB)											
5	L	496	2.0	0.419	6.7	LOS A	2.7	68.1	0.46	0.71	26.5
2	T	71	2.0	0.419	6.7	LOS A	2.7	68.1	0.46	0.50	29.2
12	R	564	2.0	0.425	6.8	LOS A	3.0	76.0	0.50	0.59	28.8
Approach		1130	2.0	0.425	6.7	LOS A	3.0	76.0	0.48	0.63	27.7
South West: NB Off Ramp											
5X	L	152	2.0	0.599	21.1	LOS C	3.2	82.4	0.85	1.11	21.0
2X	T	33	2.0	0.599	21.1	LOS C	3.2	82.4	0.85	1.04	22.1
12X	R	102	2.0	0.599	21.1	LOS C	3.2	82.4	0.85	1.07	21.9
Approach		287	2.0	0.599	21.1	LOS C	3.2	82.4	0.85	1.08	21.4
All Vehicles		2347	2.0	0.599	9.1	LOS A	3.2	82.4	0.61	0.79	26.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 2010.

HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: McKnight / La Barr
Cumulative PM

McKnight Way / La Barr Meadows Road - McKnight Way / SR 49 NB Ramps
Cumulative Mitigation - PM Peak Hour
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: La Barr Meadows Rd (NB)											
3	L	766	2.0	0.727	20.4	LOS C	6.6	166.9	0.91	1.18	21.4
18	R	319	2.0	0.727	19.6	LOS C	6.3	159.1	0.89	1.12	22.9
Approach		1085	2.0	0.727	20.2	LOS C	6.6	166.9	0.90	1.16	21.8
East: McKnight Rd (WB)											
1	L	21	2.0	0.181	17.4	LOS C	0.6	16.4	0.86	0.98	22.6
6	T	32	2.0	0.181	17.0	LOS C	0.6	16.4	0.86	0.91	24.0
16	R	53	2.0	0.181	14.7	LOS B	0.6	15.8	0.83	0.91	25.0
Approach		106	2.0	0.181	15.9	LOS C	0.6	16.4	0.84	0.93	24.1
North East: S. Auburn St (SB)											
1X	L	255	2.0	0.520	17.6	LOS C	2.6	66.3	0.82	1.05	22.3
16X	R	223	2.0	0.519	19.7	LOS C	2.7	68.3	0.85	1.03	23.0
Approach		479	2.0	0.520	18.6	LOS C	2.7	68.3	0.83	1.04	22.6
West: McKnight Rd (EB)											
5	L	505	2.0	0.478	8.0	LOS A	3.4	85.2	0.62	0.76	25.9
2	T	74	2.0	0.478	8.0	LOS A	3.4	85.2	0.62	0.61	28.2
12	R	691	2.0	0.554	9.2	LOS A	4.0	102.3	0.63	0.69	27.5
Approach		1271	2.0	0.554	8.7	LOS A	4.0	102.3	0.63	0.71	26.8
South West: NB Off Ramp											
5X	L	149	2.0	0.767	37.8	LOS E	4.8	121.5	0.93	1.24	17.1
2X	T	32	2.0	0.767	37.8	LOS E	4.8	121.5	0.93	1.21	17.4
12X	R	117	2.0	0.767	37.8	LOS E	4.8	121.5	0.93	1.22	17.3
Approach		298	2.0	0.767	37.8	LOS E	4.8	121.5	0.93	1.23	17.2
All Vehicles		3239	2.0	0.767	16.9	LOS C	6.6	166.9	0.78	0.96	23.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 2010.

HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: McKnight / La Barr
Cumulative + Proj PM

McKnight Way / La Barr Meadows Road - McKnight Way / SR 49 NB Ramps
Cumulative + Project Mitigation - PM Peak Hour
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: La Barr Meadows Rd (NB)											
3	L	804	2.0	0.788	25.2	LOS D	8.0	202.9	0.94	1.25	20.0
18	R	330	2.0	0.788	24.1	LOS C	7.6	194.0	0.93	1.21	21.2
Approach		1135	2.0	0.788	24.9	LOS C	8.0	202.9	0.94	1.24	20.3
East: McKnight Rd (WB)											
1	L	22	2.0	0.201	19.4	LOS C	0.7	17.9	0.87	0.98	21.9
6	T	33	2.0	0.201	18.9	LOS C	0.7	17.9	0.87	0.92	23.2
16	R	54	2.0	0.201	16.2	LOS C	0.7	17.4	0.85	0.92	24.3
Approach		109	2.0	0.201	17.7	LOS C	0.7	17.9	0.86	0.93	23.4
North East: S. Auburn St (SB)											
1X	L	282	2.0	0.607	22.1	LOS C	3.3	83.2	0.86	1.10	20.9
16X	R	238	2.0	0.589	23.9	LOS C	3.2	81.4	0.88	1.08	21.4
Approach		520	2.0	0.607	22.9	LOS C	3.3	83.2	0.87	1.09	21.1
West: McKnight Rd (EB)											
5	L	534	2.0	0.517	8.8	LOS A	3.7	94.3	0.67	0.78	25.5
2	T	76	2.0	0.517	8.8	LOS A	3.7	94.3	0.67	0.65	27.6
12	R	741	2.0	0.609	10.5	LOS B	5.2	130.9	0.70	0.75	26.8
Approach		1351	2.0	0.609	9.8	LOS A	5.2	130.9	0.68	0.76	26.3
South West: NB Off Ramp											
5X	L	154	2.0	0.534	24.0	LOS C	2.4	61.2	0.88	1.09	20.2
2X	T	34	2.0	0.534	24.0	LOS C	2.4	61.2	0.88	1.04	21.1
12X	R	129	2.0	0.435	23.3	LOS C	1.9	47.1	0.88	1.03	21.2
Approach		317	2.0	0.534	23.7	LOS C	2.4	61.2	0.88	1.06	20.6
All Vehicles		3432	2.0	0.788	18.3	LOS C	8.0	202.9	0.82	1.00	22.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).

Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 2010.

HCM Delay Model used. Geometric Delay not included.

HCM Signalized Intersection Capacity Analysis
16: SR-49 & Wolf Road/Combie Road

Existing + Backgrnd - Mitigated
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	163	93	368	141	285	187	1034	591	405	586	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1703	1881	1553	3433	1845	1568	1770	3505	1599	3400	3471	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1703	1881	1553	3433	1845	1568	1770	3505	1599	3400	3471	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	34	177	101	400	153	310	199	1100	629	431	623	27
RTOR Reduction (vph)	0	0	86	0	0	228	0	0	79	0	0	16
Lane Group Flow (vph)	34	177	15	400	153	82	199	1100	550	431	623	11
Heavy Vehicles (%)	6%	1%	4%	2%	3%	3%	2%	3%	1%	3%	4%	4%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	3.5	14.8	14.8	14.7	26.0	26.0	15.5	37.5	52.2	15.0	37.0	40.5
Effective Green, g (s)	3.5	14.8	14.8	14.7	26.0	26.0	15.5	37.5	52.2	15.0	37.0	40.5
Actuated g/C Ratio	0.04	0.15	0.15	0.15	0.26	0.26	0.16	0.38	0.53	0.15	0.38	0.41
Clearance Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5
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	3.0
Lane Grp Cap (vph)	60	282	233	512	487	413	278	1334	847	517	1303	638
v/s Ratio Prot	0.02	c0.09		c0.12	0.08		0.11	c0.31	0.10	c0.13	0.18	0.00
v/s Ratio Perm			0.01			0.05			0.25			0.01
v/c Ratio	0.57	0.63	0.07	0.78	0.31	0.20	0.72	0.82	0.65	0.83	0.48	0.02
Uniform Delay, d1	46.8	39.3	35.9	40.4	29.1	28.2	39.4	27.5	16.6	40.5	23.4	17.2
Progression 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
Incremental Delay, d2	11.7	4.3	0.1	7.6	0.4	0.2	8.5	5.9	1.7	11.1	1.3	0.0
Delay (s)	58.4	43.6	36.0	48.0	29.5	28.4	47.9	33.4	18.3	51.6	24.7	17.2
Level of Service	E	D	D	D	C	C	D	C	B	D	C	B
Approach Delay (s)		42.8			37.6			30.0			35.2	
Approach LOS		D			D			C			D	

Intersection Summary

HCM 2000 Control Delay	33.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	98.5	Sum of lost time (s)	16.5
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
16: SR-49 & Wolf Road/Combie Road

Existing + Backgrnd + Proj - Mitigated
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				 				 		 	 	
Volume (vph)	33	168	93	374	143	295	187	1062	603	420	599	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1703	1881	1553	3433	1845	1568	1770	3505	1599	3400	3471	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1703	1881	1553	3433	1845	1568	1770	3505	1599	3400	3471	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	36	183	101	407	155	321	199	1130	641	447	637	28
RTOR Reduction (vph)	0	0	86	0	0	236	0	0	75	0	0	17
Lane Group Flow (vph)	36	183	15	407	155	85	199	1130	566	447	637	11
Heavy Vehicles (%)	6%	1%	4%	2%	3%	3%	2%	3%	1%	3%	4%	4%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	3.5	15.0	15.0	14.8	26.3	26.3	15.6	37.5	52.3	15.2	37.1	40.6
Effective Green, g (s)	3.5	15.0	15.0	14.8	26.3	26.3	15.6	37.5	52.3	15.2	37.1	40.6
Actuated g/C Ratio	0.04	0.15	0.15	0.15	0.27	0.27	0.16	0.38	0.53	0.15	0.37	0.41
Clearance Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5
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	3.0
Lane Grp Cap (vph)	60	285	235	513	490	416	278	1327	844	522	1300	636
v/s Ratio Prot	0.02	c0.10		c0.12	0.08		0.11	c0.32	0.10	c0.13	0.18	0.00
v/s Ratio Perm			0.01			0.05			0.25			0.01
v/c Ratio	0.60	0.64	0.07	0.79	0.32	0.20	0.72	0.85	0.67	0.86	0.49	0.02
Uniform Delay, d1	47.1	39.5	36.0	40.6	29.1	28.2	39.6	28.2	17.0	40.8	23.7	17.4
Progression 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
Incremental Delay, d2	15.1	4.9	0.1	8.2	0.4	0.2	8.5	7.0	2.1	13.0	1.3	0.0
Delay (s)	62.2	44.4	36.1	48.9	29.5	28.5	48.1	35.2	19.2	53.8	25.0	17.4
Level of Service	E	D	D	D	C	C	D	D	B	D	C	B
Approach Delay (s)		43.8			38.1			31.3			36.4	
Approach LOS		D			D			C			D	

Intersection Summary

HCM 2000 Control Delay	35.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	99.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	75.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 16: SR-49 & Wolf Road/Combie Road

Cumulative - Mitigated
 3/1/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	42	175	103	415	158	313	210	1231	704	435	755	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1703	1881	1553	3433	1845	1568	1770	3505	1599	3400	3471	1553
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1703	1881	1553	3433	1845	1568	1770	3505	1599	3400	3471	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	46	190	112	451	172	340	228	1338	765	473	821	58
RTOR Reduction (vph)	0	0	95	0	0	214	0	0	67	0	0	34
Lane Group Flow (vph)	46	190	17	451	172	126	228	1338	698	473	821	24
Heavy Vehicles (%)	6%	1%	4%	2%	3%	3%	2%	3%	1%	3%	4%	4%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	3.6	15.6	15.6	15.5	27.5	27.5	16.1	41.4	56.9	13.5	38.8	42.4
Effective Green, g (s)	3.6	15.6	15.6	15.5	27.5	27.5	16.1	41.4	56.9	13.5	38.8	42.4
Actuated g/C Ratio	0.04	0.15	0.15	0.15	0.27	0.27	0.16	0.40	0.56	0.13	0.38	0.41
Clearance Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5
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	3.0
Lane Grp Cap (vph)	59	286	236	519	495	420	278	1415	887	447	1313	642
v/s Ratio Prot	0.03	c0.10		c0.13	0.09		0.13	c0.38	0.12	c0.14	0.24	0.00
v/s Ratio Perm			0.01			0.08			0.32			0.01
v/c Ratio	0.78	0.66	0.07	0.87	0.35	0.30	0.82	0.95	0.79	1.06	0.63	0.04
Uniform Delay, d1	49.1	41.0	37.2	42.5	30.3	29.8	41.8	29.5	18.0	44.5	25.9	17.9
Progression 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
Incremental Delay, d2	46.8	5.7	0.1	14.4	0.4	0.4	17.3	14.0	4.7	58.8	2.3	0.0
Delay (s)	95.8	46.7	37.4	56.9	30.7	30.3	59.1	43.5	22.7	103.3	28.2	17.9
Level of Service	F	D	D	E	C	C	E	D	C	F	C	B
Approach Delay (s)		50.2			42.8			38.2			54.0	
Approach LOS		D			D			D			D	

Intersection Summary

HCM 2000 Control Delay	44.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	102.5	Sum of lost time (s)	16.5
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
16: SR-49 & Wolf Road/Combie Road

Cumulative + Proj - Mitigated

3/1/2013

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (vph)	44	180	103	421	160	323	210	1259	716	450	768	54	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1703	1881	1553	3433	1845	1568	1770	3505	1599	3400	3471	1553	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1703	1881	1553	3433	1845	1568	1770	3505	1599	3400	3471	1553	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	48	196	112	458	174	351	228	1368	778	489	835	59	
RTOR Reduction (vph)	0	0	95	0	0	212	0	0	64	0	0	35	
Lane Group Flow (vph)	48	196	17	458	174	139	228	1368	714	489	835	24	
Heavy Vehicles (%)	6%	1%	4%	2%	3%	3%	2%	3%	1%	3%	4%	4%	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov	Prot	NA	pm+ov	
Protected Phases	7	4		3	8		5	2	3	1	6	7	
Permitted Phases			4			8			2			6	
Actuated Green, G (s)	3.6	15.8	15.8	15.5	27.7	27.7	16.1	41.4	56.9	13.5	38.8	42.4	
Effective Green, g (s)	3.6	15.8	15.8	15.5	27.7	27.7	16.1	41.4	56.9	13.5	38.8	42.4	
Actuated g/C Ratio	0.04	0.15	0.15	0.15	0.27	0.27	0.16	0.40	0.55	0.13	0.38	0.41	
Clearance Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5	
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	3.0	
Lane Grp Cap (vph)	59	289	238	518	497	422	277	1412	885	446	1311	641	
v/s Ratio Prot	0.03	c0.10		c0.13	0.09		0.13	c0.39	0.12	c0.14	0.24	0.00	
v/s Ratio Perm			0.01			0.09			0.32			0.01	
v/c Ratio	0.81	0.68	0.07	0.88	0.35	0.33	0.82	0.97	0.81	1.10	0.64	0.04	
Uniform Delay, d1	49.2	41.0	37.2	42.7	30.2	30.1	41.9	30.0	18.5	44.6	26.2	18.0	
Progression 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	
Incremental Delay, d2	55.7	6.2	0.1	16.3	0.4	0.5	17.6	17.6	5.4	71.3	2.4	0.0	
Delay (s)	104.9	47.2	37.3	59.0	30.7	30.5	59.5	47.6	23.9	115.9	28.6	18.0	
Level of Service	F	D	D	E	C	C	E	D	C	F	C	B	
Approach Delay (s)		51.9			43.8			41.0			59.0		
Approach LOS		D			D			D			E		
Intersection Summary													
HCM 2000 Control Delay			47.2									HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.92										
Actuated Cycle Length (s)			102.7									Sum of lost time (s)	16.5
Intersection Capacity Utilization			84.1%									ICU Level of Service	E
Analysis Period (min)			15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 17: Rosewood Rd/Armstrong Rd & Combie Road

Existing + Backgrnd - Mitigated
 PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	979	18	6	692	46	8	0	4	62	1	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	1.00			1.00			1.00	1.00
Frt	1.00	1.00		1.00	0.99			0.96			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.95	1.00
Satd. Flow (prot)	1805	3531		1805	1848			1760			1811	1615
Flt Permitted	0.95	1.00		0.95	1.00			0.83			0.72	1.00
Satd. Flow (perm)	1805	3531		1805	1848			1518			1368	1615
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	66	1088	20	7	769	51	9	0	4	69	1	86
RTOR Reduction (vph)	0	2	0	0	3	0	0	11	0	0	0	72
Lane Group Flow (vph)	66	1106	0	7	817	0	0	2	0	0	70	14
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		6
Actuated Green, G (s)	2.4	33.8		0.6	32.0			9.0			9.0	9.0
Effective Green, g (s)	2.4	33.8		0.6	32.0			9.0			9.0	9.0
Actuated g/C Ratio	0.04	0.61		0.01	0.58			0.16			0.16	0.16
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	78	2154		19	1067			246			222	262
v/s Ratio Prot	c0.04	0.31		0.00	c0.44							
v/s Ratio Perm								0.00			c0.05	0.01
v/c Ratio	0.85	0.51		0.37	0.77			0.01			0.32	0.05
Uniform Delay, d1	26.3	6.1		27.2	8.9			19.5			20.5	19.6
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	53.3	0.2		11.7	3.3			0.0			0.8	0.1
Delay (s)	79.7	6.3		38.9	12.2			19.5			21.3	19.7
Level of Service	E	A		D	B			B			C	B
Approach Delay (s)		10.5			12.4			19.5			20.4	
Approach LOS		B			B			B			C	

Intersection Summary

HCM 2000 Control Delay	12.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	55.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 17: Rosewood Rd/Armstrong Rd & Combie Road

Existing + Backgrnd + Proj - Mitigated
 PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	1007	22	7	710	46	9	0	4	62	1	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	1.00			1.00			1.00	1.00
Frt	1.00	1.00		1.00	0.99			0.96			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.95	1.00
Satd. Flow (prot)	1805	3530		1805	1848			1764			1811	1615
Flt Permitted	0.95	1.00		0.95	1.00			0.83			0.72	1.00
Satd. Flow (perm)	1805	3530		1805	1848			1509			1367	1615
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	66	1119	24	8	789	51	10	0	4	69	1	86
RTOR Reduction (vph)	0	2	0	0	3	0	0	12	0	0	0	72
Lane Group Flow (vph)	66	1141	0	8	837	0	0	2	0	0	70	14
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		6
Actuated Green, G (s)	2.4	34.8		0.6	33.0			9.0			9.0	9.0
Effective Green, g (s)	2.4	34.8		0.6	33.0			9.0			9.0	9.0
Actuated g/C Ratio	0.04	0.62		0.01	0.59			0.16			0.16	0.16
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	76	2178		19	1081			240			218	257
v/s Ratio Prot	c0.04	0.32		0.00	c0.45							
v/s Ratio Perm								0.00			c0.05	0.01
v/c Ratio	0.87	0.52		0.42	0.77			0.01			0.32	0.05
Uniform Delay, d1	26.8	6.1		27.7	8.9			19.9			21.0	20.1
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	60.2	0.2		14.4	3.5			0.0			0.9	0.1
Delay (s)	87.0	6.3		42.1	12.4			20.0			21.9	20.2
Level of Service	F	A		D	B			B			C	C
Approach Delay (s)		10.7			12.7			20.0			20.9	
Approach LOS		B			B			B			C	

Intersection Summary

HCM 2000 Control Delay	12.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	56.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 17: Rosewood Rd/Armstrong Rd & Combie Road

Cumulative - Mitigated
 3/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	1041	20	10	753	69	11	0	6	91	2	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	1.00			1.00			1.00	1.00
Frt	1.00	1.00		1.00	0.99			0.95			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.95	1.00
Satd. Flow (prot)	1805	3531		1805	1842			1750			1811	1615
Flt Permitted	0.95	1.00		0.95	1.00			0.83			0.72	1.00
Satd. Flow (perm)	1805	3531		1805	1842			1500			1361	1615
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	119	1157	22	11	837	77	12	0	7	101	2	113
RTOR Reduction (vph)	0	1	0	0	4	0	0	16	0	0	0	96
Lane Group Flow (vph)	119	1178	0	11	910	0	0	3	0	0	103	17
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		6
Actuated Green, G (s)	7.2	48.5		0.7	42.0			10.7			10.7	10.7
Effective Green, g (s)	7.2	48.5		0.7	42.0			10.7			10.7	10.7
Actuated g/C Ratio	0.10	0.67		0.01	0.58			0.15			0.15	0.15
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	180	2381		17	1075			223			202	240
v/s Ratio Prot	c0.07	0.33		0.01	c0.49							
v/s Ratio Perm								0.00			c0.08	0.01
v/c Ratio	0.66	0.49		0.65	0.85			0.01			0.51	0.07
Uniform Delay, d1	31.2	5.7		35.5	12.3			26.1			28.2	26.3
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	8.8	0.2		62.0	6.3			0.0			2.0	0.1
Delay (s)	40.0	5.9		97.5	18.6			26.1			30.2	26.4
Level of Service	D	A		F	B			C			C	C
Approach Delay (s)		9.0			19.5			26.1			28.2	
Approach LOS		A			B			C			C	

Intersection Summary

HCM 2000 Control Delay	14.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	71.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	67.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 17: Rosewood Rd/Armstrong Rd & Combie Road

Cumulative + Proj - Mitigated
 3/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	1069	24	11	771	69	12	0	6	91	2	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	1.00			1.00			1.00	1.00
Frt	1.00	1.00		1.00	0.99			0.95			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.95	1.00
Satd. Flow (prot)	1805	3529		1805	1843			1753			1811	1615
Flt Permitted	0.95	1.00		0.95	1.00			0.82			0.72	1.00
Satd. Flow (perm)	1805	3529		1805	1843			1491			1360	1615
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	119	1188	27	12	857	77	13	0	7	101	2	113
RTOR Reduction (vph)	0	2	0	0	4	0	0	17	0	0	0	96
Lane Group Flow (vph)	119	1213	0	12	930	0	0	3	0	0	103	17
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		6
Actuated Green, G (s)	7.1	49.3		0.7	42.9			10.7			10.7	10.7
Effective Green, g (s)	7.1	49.3		0.7	42.9			10.7			10.7	10.7
Actuated g/C Ratio	0.10	0.68		0.01	0.59			0.15			0.15	0.15
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	176	2393		17	1087			219			200	237
v/s Ratio Prot	c0.07	0.34		0.01	c0.50							
v/s Ratio Perm								0.00			c0.08	0.01
v/c Ratio	0.68	0.51		0.71	0.86			0.01			0.52	0.07
Uniform Delay, d1	31.7	5.7		35.9	12.3			26.5			28.6	26.7
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	9.8	0.2		84.0	6.8			0.0			2.2	0.1
Delay (s)	41.5	5.9		119.9	19.1			26.5			30.8	26.8
Level of Service	D	A		F	B			C			C	C
Approach Delay (s)		9.1			20.4			26.5			28.7	
Approach LOS		A			C			C			C	

Intersection Summary

HCM 2000 Control Delay	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	72.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 21: Brunswick Road & Dwy Sites 3-6 and 9

Ex + Bkg + Proj PM Peak Hour Mitigation

1/10/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	106	35	72	799	774	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1770	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	115	38	78	868	841	234
RTOR Reduction (vph)	0	33	0	0	0	87
Lane Group Flow (vph)	115	5	78	868	841	147
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	7.2	7.2	2.9	40.4	33.5	33.5
Effective Green, g (s)	7.2	7.2	2.9	40.4	33.5	33.5
Actuated g/C Ratio	0.13	0.13	0.05	0.73	0.60	0.60
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	229	204	92	1353	1122	953
v/s Ratio Prot	c0.06		0.04	c0.47	c0.45	
v/s Ratio Perm		0.00				0.09
v/c Ratio	0.50	0.02	0.85	0.64	0.75	0.15
Uniform Delay, d1	22.5	21.1	26.1	3.9	8.0	4.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	0.0	47.8	1.1	2.8	0.1
Delay (s)	24.3	21.2	73.9	4.9	10.8	4.9
Level of Service	C	C	E	A	B	A
Approach Delay (s)	23.5			10.6	9.5	
Approach LOS	C			B	A	

Intersection Summary

HCM 2000 Control Delay	11.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	55.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 21: Brunswick Road & Dwy Sites 3-6 and 9

Cumulative + Proj Mitigated PM Peak Hour

1/9/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	106	35	72	1077	897	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1770	1863	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	115	38	78	1171	975	234
RTOR Reduction (vph)	0	33	0	0	0	47
Lane Group Flow (vph)	115	5	78	1171	975	187
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4				6
Actuated Green, G (s)	7.8	7.8	2.9	49.6	42.7	42.7
Effective Green, g (s)	7.8	7.8	2.9	49.6	42.7	42.7
Actuated g/C Ratio	0.12	0.12	0.04	0.76	0.65	0.65
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	211	188	78	1412	1216	1033
v/s Ratio Prot	c0.06		0.04	c0.63	0.52	
v/s Ratio Perm		0.00				0.12
v/c Ratio	0.55	0.02	1.00	0.83	0.80	0.18
Uniform Delay, d1	27.1	25.4	31.3	5.1	8.3	4.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.9	0.1	101.9	4.2	3.9	0.1
Delay (s)	30.0	25.5	133.2	9.3	12.2	4.6
Level of Service	C	C	F	A	B	A
Approach Delay (s)	28.9			17.1	10.7	
Approach LOS	C			B	B	

Intersection Summary

HCM 2000 Control Delay	14.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	65.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

28: Higgins Road & Combie Road

Existing + Backgrnd - Mitigated
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 						 	
Volume (vph)	0	838	217	255	546	0	255	0	252	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0			
Lane Util. Factor		0.95		1.00	0.95			1.00	1.00			
Frt		0.97		1.00	1.00			1.00	0.85			
Flt Protected		1.00		0.95	1.00			0.95	1.00			
Satd. Flow (prot)		3430		1770	3539			1770	1583			
Flt Permitted		1.00		0.95	1.00			0.76	1.00			
Satd. Flow (perm)		3430		1770	3539			1410	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	911	236	277	593	0	277	0	274	0	0	0
RTOR Reduction (vph)	0	25	0	0	0	0	0	0	204	0	0	0
Lane Group Flow (vph)	0	1122	0	277	593	0	0	277	70	0	0	0
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm		
Protected Phases	7	4		3	8			2				6
Permitted Phases							2		2	6		
Actuated Green, G (s)		31.3		16.6	51.9			20.4	20.4			
Effective Green, g (s)		31.3		16.6	51.9			20.4	20.4			
Actuated g/C Ratio		0.39		0.21	0.65			0.25	0.25			
Clearance Time (s)		4.0		4.0	4.0			4.0	4.0			
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)		1336		365	2287			358	402			
v/s Ratio Prot		c0.33		c0.16	0.17							
v/s Ratio Perm								c0.20	0.04			
v/c Ratio		0.84		0.76	0.26			0.77	0.17			
Uniform Delay, d1		22.2		30.0	6.0			27.8	23.4			
Progression Factor		1.00		1.00	1.00			1.00	1.00			
Incremental Delay, d2		4.8		8.8	0.1			10.0	0.2			
Delay (s)		27.0		38.7	6.1			37.8	23.6			
Level of Service		C		D	A			D	C			
Approach Delay (s)		27.0			16.5			30.7			0.0	
Approach LOS		C			B			C			A	
Intersection Summary												
HCM 2000 Control Delay			24.3			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			80.3			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			68.3%			ICU Level of Service			C			
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Signalized Intersection Capacity Analysis
28: Higgins Road & Combie Road

Existing + Backgrnd + Proj - Mitigated
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 						 	
Volume (vph)	0	869	218	258	562	0	257	0	253	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0			
Lane Util. Factor		0.95		1.00	0.95			1.00	1.00			
Frt		0.97		1.00	1.00			1.00	0.85			
Flt Protected		1.00		0.95	1.00			0.95	1.00			
Satd. Flow (prot)		3433		1770	3539			1770	1583			
Flt Permitted		1.00		0.95	1.00			0.76	1.00			
Satd. Flow (perm)		3433		1770	3539			1410	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	945	237	280	611	0	279	0	275	0	0	0
RTOR Reduction (vph)	0	24	0	0	0	0	0	0	205	0	0	0
Lane Group Flow (vph)	0	1158	0	280	611	0	0	279	70	0	0	0
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm		
Protected Phases	7	4		3	8			2				6
Permitted Phases							2		2	6		
Actuated Green, G (s)		31.9		16.7	52.6			20.5	20.5			
Effective Green, g (s)		31.9		16.7	52.6			20.5	20.5			
Actuated g/C Ratio		0.39		0.21	0.65			0.25	0.25			
Clearance Time (s)		4.0		4.0	4.0			4.0	4.0			
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)		1350		364	2295			356	400			
v/s Ratio Prot		c0.34		c0.16	0.17							
v/s Ratio Perm								c0.20	0.04			
v/c Ratio		0.86		0.77	0.27			0.78	0.17			
Uniform Delay, d1		22.5		30.4	6.1			28.2	23.7			
Progression Factor		1.00		1.00	1.00			1.00	1.00			
Incremental Delay, d2		5.6		9.4	0.1			10.8	0.2			
Delay (s)		28.1		39.8	6.1			39.0	23.9			
Level of Service		C		D	A			D	C			
Approach Delay (s)		28.1			16.7			31.5			0.0	
Approach LOS		C			B			C			A	
Intersection Summary												
HCM 2000 Control Delay			25.0			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.81									
Actuated Cycle Length (s)			81.1			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			69.5%			ICU Level of Service			C			
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Signalized Intersection Capacity Analysis

28: Higgins Road & Combie Road

Cumulative - Mitigated

3/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗			↖	↗		↕	
Volume (vph)	0	876	268	284	576	0	310	0	254	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0			
Lane Util. Factor		0.95		1.00	0.95			1.00	1.00			
Frt		0.96		1.00	1.00			1.00	0.85			
Flt Protected		1.00		0.95	1.00			0.95	1.00			
Satd. Flow (prot)		3415		1770	3539			1770	1583			
Flt Permitted		1.00		0.95	1.00			0.76	1.00			
Satd. Flow (perm)		3415		1770	3539			1410	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	952	291	309	626	0	337	0	276	0	0	0
RTOR Reduction (vph)	0	36	0	0	0	0	0	0	202	0	0	0
Lane Group Flow (vph)	0	1207	0	309	626	0	0	337	74	0	0	0
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm		
Protected Phases	7	4		3	8			2				6
Permitted Phases							2		2	6		
Actuated Green, G (s)		29.6		15.5	49.1			20.9	20.9			
Effective Green, g (s)		29.6		15.5	49.1			20.9	20.9			
Actuated g/C Ratio		0.38		0.20	0.63			0.27	0.27			
Clearance Time (s)		4.0		4.0	4.0			4.0	4.0			
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)		1295		351	2227			377	424			
v/s Ratio Prot		c0.35		c0.17	0.18							
v/s Ratio Perm								c0.24	0.05			
v/c Ratio		0.93		0.88	0.28			0.89	0.17			
Uniform Delay, d1		23.2		30.3	6.5			27.5	21.9			
Progression Factor		1.00		1.00	1.00			1.00	1.00			
Incremental Delay, d2		12.1		21.7	0.1			22.5	0.2			
Delay (s)		35.4		52.1	6.6			50.0	22.1			
Level of Service		D		D	A			D	C			
Approach Delay (s)		35.4			21.6			37.5			0.0	
Approach LOS		D			C			D			A	

Intersection Summary

HCM 2000 Control Delay	31.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	78.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

28: Higgins Road & Combie Road

Cumulative + Proj - Mitigated

3/1/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 						 	
Volume (vph)	0	907	269	287	592	0	312	0	255	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0			
Lane Util. Factor		0.95		1.00	0.95			1.00	1.00			
Frt		0.97		1.00	1.00			1.00	0.85			
Flt Protected		1.00		0.95	1.00			0.95	1.00			
Satd. Flow (prot)		3418		1770	3539			1770	1583			
Flt Permitted		1.00		0.95	1.00			0.76	1.00			
Satd. Flow (perm)		3418		1770	3539			1410	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	986	292	312	643	0	339	0	277	0	0	0
RTOR Reduction (vph)	0	34	0	0	0	0	0	0	203	0	0	0
Lane Group Flow (vph)	0	1244	0	312	643	0	0	339	74	0	0	0
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm		
Protected Phases	7	4		3	8			2				6
Permitted Phases							2		2	6		
Actuated Green, G (s)		30.1		15.5	49.6			20.9	20.9			
Effective Green, g (s)		30.1		15.5	49.6			20.9	20.9			
Actuated g/C Ratio		0.38		0.20	0.63			0.27	0.27			
Clearance Time (s)		4.0		4.0	4.0			4.0	4.0			
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)		1310		349	2236			375	421			
v/s Ratio Prot		c0.36		c0.18	0.18							
v/s Ratio Perm								c0.24	0.05			
v/c Ratio		0.95		0.89	0.29			0.90	0.18			
Uniform Delay, d1		23.5		30.7	6.5			27.8	22.2			
Progression Factor		1.00		1.00	1.00			1.00	1.00			
Incremental Delay, d2		14.4		23.9	0.1			24.3	0.2			
Delay (s)		37.8		54.6	6.6			52.1	22.4			
Level of Service		D		D	A			D	C			
Approach Delay (s)		37.8			22.3			38.7			0.0	
Approach LOS		D			C			D			A	
Intersection Summary												
HCM 2000 Control Delay			32.8			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			78.5			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			76.8%			ICU Level of Service			D			
Analysis Period (min)			15									
c	Critical Lane Group											

APPENDIX J

Peak Hour Signal Warrants

**CUMULATIVE PLUS PROJECT - PEAK HOUR VOLUME WARRANT
(URBAN CONDITIONS)**

General Information

Description Intersection 19: Cumulative + Project

Major Approach Street Name SR-49

Minor Approach Street Name Woodridge

Geometry

Number of Approach Legs 3

Number of Major Approach Lanes 2

Number of Minor Approach Lanes 1

Volumes and Delay

Major Approach Volumes (Both Directions) 3090

Minor Approach Volume (One Direction Only) 230

Total Entering Volume 3320

Minor Approach Delay per Vehicle 36.9

SIGNAL WARRANT SATISFIED

**WARRANT 3 - Peak Hour
(Part A or Part B must be satisfied)**

PART A

SATISFIED YES NO

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced for traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; **AND**

Total Delay (Vehicle Hours) 2.36

2. The volume on the same minor street approach (one direction only equal or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; **AND**

Total Minor Approach Volume 230

3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.

Total Entering Volume 3320

PART B

SATISFIED YES NO

APPROACH LANES	Hour		
	One	2 or More	
Both Approaches - Major Street		✓	3090
Higher Approach - Minor Street	✓		230

The plotted point falls above the curve in Figure 4C-3. YES NO

OR. The plotted point falls above the curve in Figure 4C-4. YES NO

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

CUMULATIVE PLUS PROJECT - PEAK HOUR VOLUME WARRANT (URBAN CONDITIONS)

Peak Hour **PM**

Major Stre **SR-49**

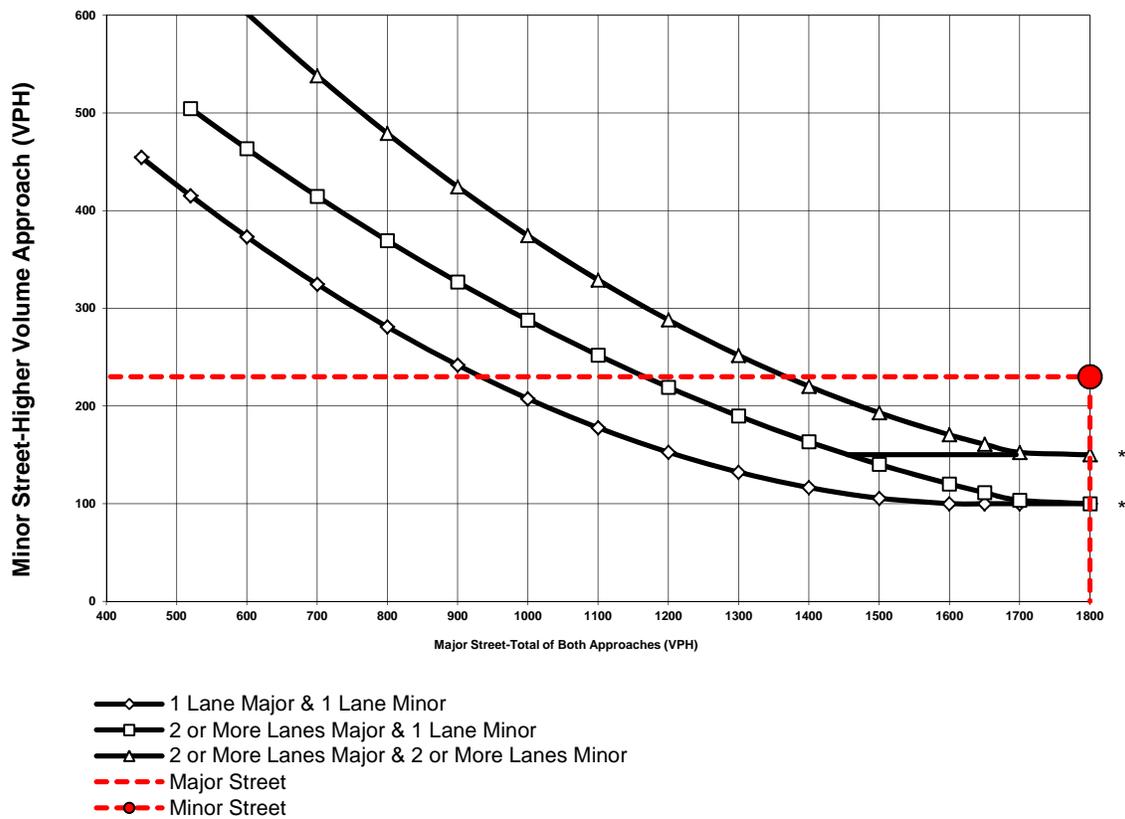
Minor **Woodridge**

Total of Both Approaches (VPH): **3090**
Number of Approach Lanes: **2**

Higher Volume Approach (VPH): **230**
Number of Approach Lanes: **1**

SIGNAL WARRANT SATISFIED

Figure 4C-3. Peak Hour Warrant (Urban)



* Note:
vph Applies as the
Lower Threshold Volume for a Minor Street Approach with One Lane.

Source: MUTCD 2003 Revision 1, as amended for use in California (September 26, 2006).

**EXISTING + BACKGROUND + PROJECT CONDITIONS - PEAK HOUR VOLUME WARRANT
(URBAN CONDITIONS)**

General Information

Description Intersection 21: Existing + Background + Project
 Major Approach Street Name Brunswick Rd
 Minor Approach Street Name Driveway Site 3-6,9

Geometry

Number of Approach Legs 3
 Number of Major Approach Lanes 1
 Number of Minor Approach Lanes 1

Volumes and Delay

Major Approach Volumes (Both Directions) 1860
 Minor Approach Volume (One Direction Only) 141
 Total Entering Volume 2001
 Minor Approach Delay per Vehicle 448.8

SIGNAL WARRANT SATISFIED

**WARRANT 3 - Peak Hour
(Part A or Part B must be satisfied)**

PART A SATISFIED YES NO
 (All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced for traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; **AND**
 YES NO
 Total Delay (Vehicle Hours) 17.58

2. The volume on the same minor street approach (one direction only equal or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; **AND**
 YES NO
 Total Minor Approach Volume 141

3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.
 YES NO
 Total Entering Volume 2001

PART B SATISFIED YES NO

APPROACH LANES	Hour		
	One	2 or More	
Both Approaches - Major Street	✓		1860
Higher Approach - Minor Street	✓		141

The plotted point falls above the curve in Figure 4C-3. YES NO

OR. The plotted point falls above the curve in Figure 4C-4. YES NO

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

**EXISTING + BACKGROUND + PROJECT CONDITIONS - PEAK HOUR VOLUME WARRANT
(URBAN CONDITIONS)**

Peak Hour **PM**

Major Stre **Brunswick Rd**

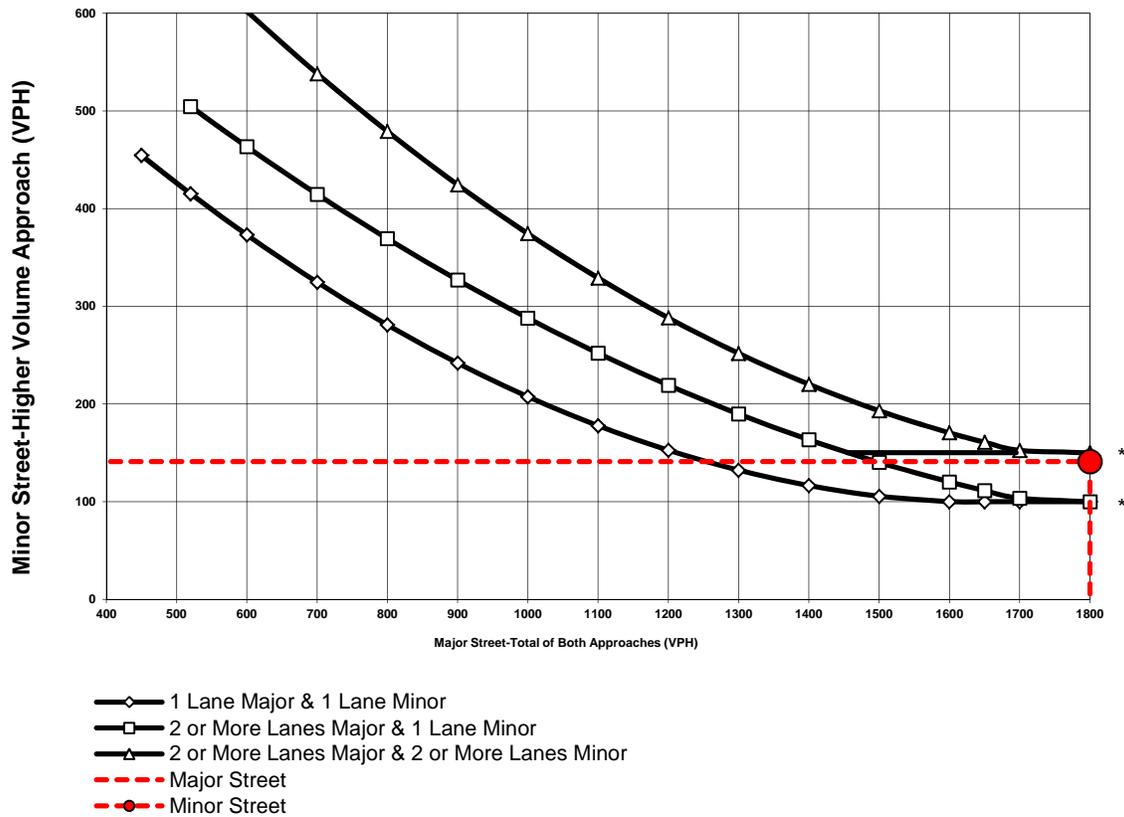
Minor **Driveway Site 3-6,9**

Total of Both Approaches (VPH): **1860**
Number of Approach Lanes: **1**

Higher Volume Approach (VPH): **141**
Number of Approach Lanes: **1**

SIGNAL WARRANT SATISFIED

Figure 4C-3. Peak Hour Warrant (Urban)



* Note:
vph Applies as the
Lower Threshold Volume for a Minor Street Approach with One Lane.

Source: MUTCD 2003 Revision 1, as amended for use in California (September 26, 2006).

**CUMULATIVE CONDITIONS - PEAK HOUR VOLUME WARRANT
(URBAN CONDITIONS)**

General Information

Description Intersection 21: Cumulative
 Major Approach Street Name Brunswick Rd
 Minor Approach Street Name Driveway Site 3-6,9

Geometry

Number of Approach Legs 3
 Number of Major Approach Lanes 1
 Number of Minor Approach Lanes 1

Volumes and Delay

Major Approach Volumes (Both Directions) 2092
 Minor Approach Volume (One Direction Only) 90
 Total Entering Volume 2182
 Minor Approach Delay per Vehicle 428.3

SIGNAL WARRANT NOT SATISFIED

**WARRANT 3 - Peak Hour
(Part A or Part B must be satisfied)**

PART A SATISFIED YES NO
 (All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced for traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; **AND**
 YES NO
 Total Delay (Vehicle Hours) 10.71

2. The volume on the same minor street approach (one direction only equal or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; **AND**
 YES NO
 Total Minor Approach Volume 90

3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.
 YES NO
 Total Entering Volume 2182

PART B SATISFIED YES NO

APPROACH LANES	Hour		
	One	2 or More	
Both Approaches - Major Street	✓		2092
Higher Approach - Minor Street	✓		90

The plotted point falls above the curve in Figure 4C-3. YES NO

OR. The plotted point falls above the curve in Figure 4C-4. YES NO

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

CUMULATIVE CONDITIONS - PEAK HOUR VOLUME WARRANT

**CUMULATIVE CONDITIONS - PEAK HOUR VOLUME WARRANT
(URBAN CONDITIONS)**

Peak Hour **PM**

Major Stre **Brunswick Rd**

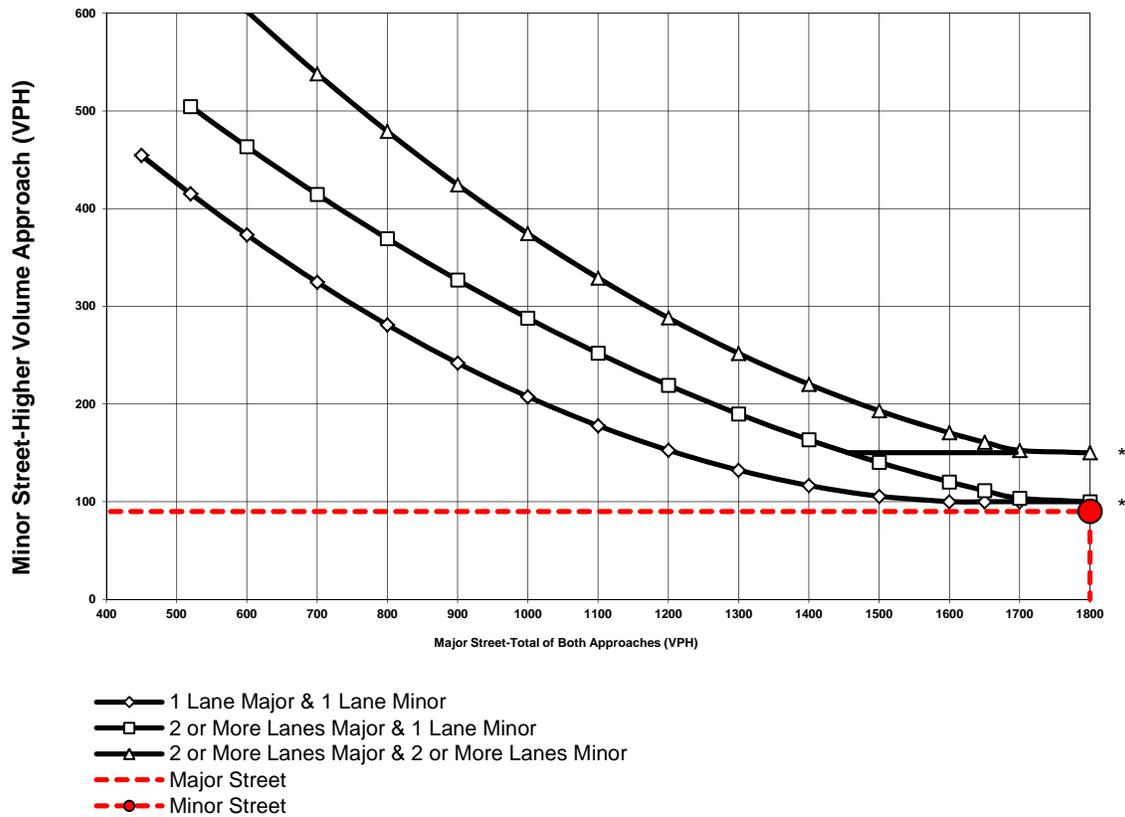
Minor **Driveway Site 3-6,9**

Total of Both Approaches (VPH): **2092**
Number of Approach Lanes: **1**

Higher Volume Approach (VPH): **90**
Number of Approach Lanes: **1**

SIGNAL WARRANT NOT SATISFIED

Figure 4C-3. Peak Hour Warrant (Urban)



* Note:
vph Applies as the
Lower Threshold Volume for a Minor Street Approach with One Lane.

Source: MUTCD 2003 Revision 1, as amended for use in California (September 26, 2006).

**CUMULATIVE + PROJECT CONDITIONS - PEAK HOUR VOLUME WARRANT
(URBAN CONDITIONS)**

General Information

Description Intersection 21: Cumulative + Project Conditions
 Major Approach Street Name Brunswick Rd
 Minor Approach Street Name Driveway Site 3-6,9

Geometry

Number of Approach Legs 3
 Number of Major Approach Lanes 1
 Number of Minor Approach Lanes 1

Volumes and Delay

Major Approach Volumes (Both Directions) 2261
 Minor Approach Volume (One Direction Only) 141
 Total Entering Volume 2402
 Minor Approach Delay per Vehicle 200

SIGNAL WARRANT SATISFIED

**WARRANT 3 - Peak Hour
(Part A or Part B must be satisfied)**

PART A

SATISFIED YES NO

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced for traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; **AND**

Total Delay (Vehicle Hours) 7.83

2. The volume on the same minor street approach (one direction only equal or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; **AND**

Total Minor Approach Volume 141

3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.

Total Entering Volume 2402

PART B

SATISFIED YES NO

APPROACH LANES	Hour		
	One	2 or More	
Both Approaches - Major Street	✓		2261
Higher Approach - Minor Street	✓		141

The plotted point falls above the curve in Figure 4C-3. YES NO

OR. The plotted point falls above the curve in Figure 4C-4. YES NO

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

CUMULATIVE + PROJECT CONDITIONS - PEAK HOUR VOLUME WARRANT (URBAN CONDITIONS)

Peak Hour **PM**

Major Stre **Brunswick Rd**

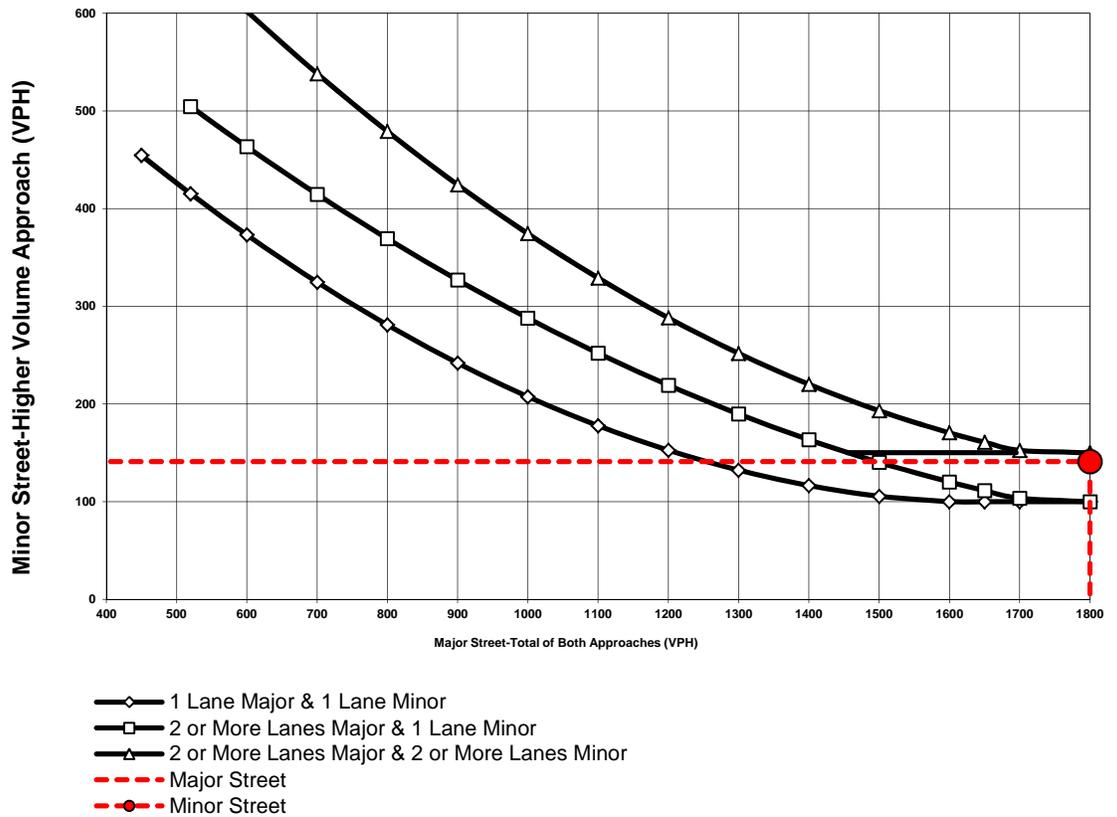
Minor **Driveway Site 3-6,9**

Total of Both Approaches (VPH): **2261**
Number of Approach Lanes: **1**

Higher Volume Approach (VPH): **141**
Number of Approach Lanes: **1**

SIGNAL WARRANT SATISFIED

Figure 4C-3. Peak Hour Warrant (Urban)



* Note:
vph Applies as the
Lower Threshold Volume for a Minor Street Approach with One Lane.

Source: MUTCD 2003 Revision 1, as amended for use in California (September 26, 2006).