Cyrus Way and Harbour Pointe Blvd SW
Analysis of Alternative Intersection Concepts
City of Mukilteo, WA

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Introduction

The Harbour Pointe Blvd SW widening project begins at the intersection of SR 525 and terminates 1,584 feet west on Harbour Pointe Blvd SW. Safety improvements to mitigate collisions along this section of Harbour Pointe Blvd SW are the main purpose for this project. Proposed changes will increase operational efficiency and improve the Level of Service (LOS). Another goal of this project is to create a continuous pedestrian and bike facility on the south side of Harbour Pointe Blvd SW connecting with the existing pedestrian, bike and transit facilities on SR 525.

Harbour Pointe Blvd SW will be widened to provide a consistent cross-section between SR 525 and Harbour Reach Dr. An 8-foot wide shared use path and 5-foot wide planter strip will be constructed on the south side of Harbour Point Blvd SW, thus filling a gap that currently exists in the pedestrian and bicycle facilities along the roadway. Concrete curb and gutter will also be used on the project to grade separate vehicular traffic and pedestrians and cyclists.

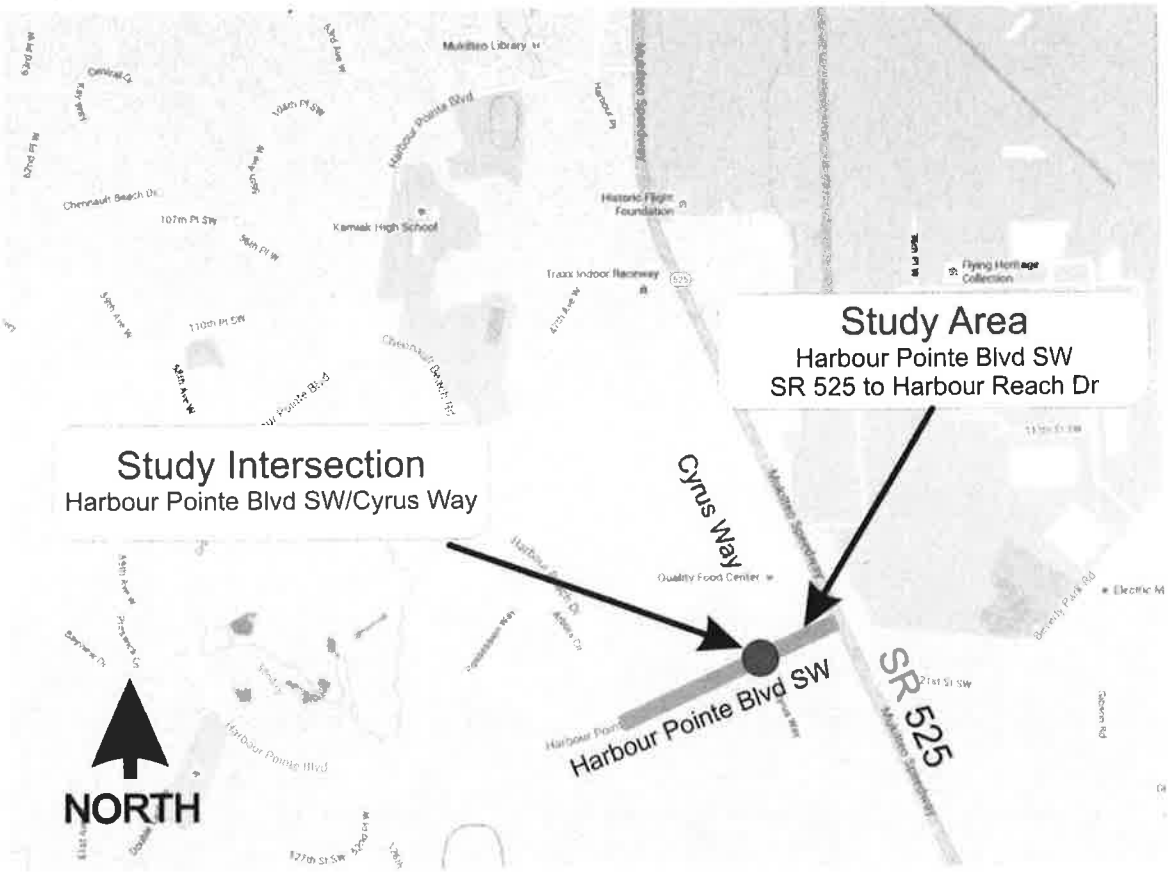
This traffic analysis looks at two options for intersection improvements at Harbour Point Blvd SW and Cyrus Way:

- Option A would be a roundabout with two lanes in the eastbound and westbound directions to match the current number of thru lanes on Harbour Pointe Blvd SW. Lighting levels would be improved and utilities would be undergrounded.
- Option B is upgrading the existing traffic signal, including adding left turn pockets on each approach, optimizing signal timings, and improving street lighting. Adding left turn lanes provides the ability to operate the traffic signal with protected and permissive left turn movements. Communications would be established with the traffic signal at SR 525 through either fiber optic cable or wireless access points. A communication link will allow the two signals to operate as a coordinated system, improving efficiency and reducing overall delay.

Figure 1 shows a vicinity map for the study area.

This traffic analysis developed information to determine the level of service, vehicle delays and queue length for a roundabout option and a traffic signal option. Traffic operations for both the current year (2015) and the design year (2040) are analyzed.

Figure 1 - Vicinity Map



Summary of Analysis Findings

The proposed two-lane roundabout for the intersection of Harbour Pointe Blvd SW and Cyrus Way will accommodate current and future traffic volumes (2040) at a LOS A with shorter queues and less delays than a traffic signal. Roundabouts are environmentally friendly and operate at lower speeds with fewer and less severe collisions. Roundabouts also have lower operational costs than a signalized intersection, however construction costs for a roundabout can be higher. Our planning level construction subtotal cost estimate for a roundabout at this location is $1.6M (see Attachment 1)

The traffic signal option will have longer overall delay and longer queues than a roundabout, but will still operate at a LOS of B. While initial costs are lower than a roundabout, maintenance and operational costs are higher. Traffic signal equipment needs to be inspected and maintained two to three times annually, and typically has a 20 year service life before needing replacement. Traffic signal timings should be reviewed and optimized every three to five years.

Existing Roadway Conditions

Harbour Pointe Blvd SW is a four-lane urban collector in the City of Mukilteo with five lanes at the intersection approach to SR 525 and a two-way left-turn lane part of the way between Cyrus Way and Harbour Reach Dr. This section of Harbour Pointe Blvd SW carries 16,900 vehicles east/westbound daily, and Cyrus Way carries 2,600 vehicles north/southbound daily. The south side of Harbour Pointe Blvd SW is unimproved, thus creating approximately a 960 ft gap in the shared use path. Freight traffic also uses this section of Harbour Pointe Blvd SW to access a light industrial manufacturing center along Cyrus Way and a technology center on Harbour Heights Parkway.

In the vicinity of the proposed project, the following is a brief description of Harbour Pointe Blvd SW and Cyrus Way:

- Harbour Pointe Blvd SW consists of two 11-foot wide travel lanes in each direction, with curbs on each side. The speed limit along the roadway is posted at 35 mph.
- Cyrus Way is a 36-foot wide road between curbs with one lane in each direction north of Harbour Pointe Blvd SW. South of Harbour Pointe Blvd SW, Cyrus Way narrows to about 20 feet wide without curbs. The posted speed along Cyrus Way is 30 mph.

Traffic Signal Operations and Maintenance

The City of Mukilteo has an interlocal agreement with Snohomish County to operate and maintain the traffic signal at Harbour Pointe Blvd SW and Cyrus Way. This signal is not coordinated with the traffic signal at SR 525, nor are there any communications links between the two signals.

The traffic signal at Harbour Pointe Blvd SW and SR 525 is owned and operated by the Washington State Department of Transportation (WSDOT). This traffic signal is part of a coordinated system along SR 525 from Lincoln Way to Paine Field Blvd. Any proposed changes to the operation of this signal would also require analysis of the SR 525 corridor for traffic progression operations. Any changes to the traffic signal operation would need WSDOT approval.

Data Collection

Traffic counts used for the traffic analysis were collected in 2014 and 2015. The AM, midday, and PM peak hour turning movements at the intersections of Harbour Pointe Blvd SW at Cyrus Way and at SR 525 are summarized in Table.1.

Table 1: 2015 PM Peak Hour Intersection Turning Movement Summary
Harbour Pointe Blvd SW and Cyrus Way and SR 525

Intersection	Peak Hour	PHF	% HV	Approach											
				Eastbound			Northbound			Westbound			Southbound		
				Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
SR 525 @ Harbour Pt Blvd SW (S)	AM	0.96	5.5	95	17	380	533	960	62	51	29	6	35	906	64
Cyrus Way @ Harbour Pointe Blvd	AM	0.91	3.7	7	539	83	49	14	27	28	505	51	12	20	16
SR 525 @ Harbour Pt Blvd SW (S)	MD	0.93	6.2	83	40	320	410	837	57	68	39	27	46	1053	53
Cyrus Way @ Harbour Pointe Blvd	MD	0.84	6.5	6	494	49	30	14	48	43	478	64	48	23	20
SR 525 @ Harbour Pt Blvd SW (S)	PM	0.96	5.4	180	65	479	607	1270	42	86	37	28	21	1306	25
Cyrus Way @ Harbour Pointe Blvd	PM	0.95	1.5	5	686	141	41	7	64	29	623	14	55	41	40

Harbour Pointe Blvd SW at Cyrus Way and SR 525 Intersections Traffic Forecast

A traffic model was developed for the City of Mukilteo in 2014 as an element of the comprehensive plan update. After incorporating new vehicle trips from planned growth, this model was used to estimate future PM peak hour traffic volumes in 2040. The model includes the intersection of Harbour Pointe Blvd SW and SR 525, but not Cyrus Way.

To forecast the turning movement volumes at Cyrus Way, we used the traffic model to find the future volumes along Harbour Pointe Blvd SW and its intersection with SR 525. An annual growth rate of about 0.36 percent was calculated. This growth rate was applied to the 2015 data and used to estimate the 2040 AM, Midday and PM turning movement volumes at the Harbour Pointe Blvd SW and Cyrus Way intersection, as shown in Table 2.

Applying the same growth rate to the current daily traffic, the forecasted annual daily two-way traffic volumes are 18,500 vehicles on Harbour Pointe Blvd SW and 3,175 on Cyrus Way in 2040.

Table 2: Adjusted 2040 PM Peak Hour Turning Movement Summary
Harbour Point Blvd SW and Cyrus Way

Intersection	Peak Hour	PHF	% HV	Approach											
				Eastbound			Northbound			Westbound			Southbound		
				Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
SR 525 @ Harbour Pt Blvd SW (S)	AM	0.96	5.5	104	19	415	581	1047	68	56	32	7	38	988	70
Cyrus Way @ Harbour Pointe Blvd	AM	0.91	3.7	8	593	91	54	15	30	31	556	56	13	22	18
SR 525 @ Harbour Pt Blvd SW (S)	MD	0.93	6.2	91	44	349	447	913	62	74	43	29	50	1149	58
Cyrus Way @ Harbour Pointe Blvd	MD	0.84	6.5	7	543	54	33	15	53	47	526	70	53	25	22
SR 525 @ Harbour Pt Blvd SW (S)	PM	0.96	5.4	198	65	479	663	1429	53	95	37	25	17	1440	22
Cyrus Way @ Harbour Pointe Blvd	PM	0.95	1.5	6	755	155	45	8	70	32	685	15	61	45	44

Design Vehicles

Cyrus Way provides freight access to a number of light industrial businesses. As a result, the roundabout and signal concepts were designed to accommodate WB-67 vehicles.

Harbour Pointe Blvd SW / Cyrus Way Intersection Analysis

A level of service (LOS) and queuing analysis was performed for the roundabout and traffic signal options at the proposed intersection of Cyrus Way and Harbour Pointe Blvd SW for the AM, Mid-Day, and PM peak hours. This analysis was performed using SIDRA, Version 3.2 for the roundabout option and Synchro 9.1 for the traffic signal option (see attachment 2). These software programs provide analysis based on the methodologies presented in the *Highway Capacity Manual* (HMC) (Transportation Research Board, 2000 Edition).The following parameters were used:

- Future peak hour factor: Used same as 2015
- Future Heavy Vehicle Percentage: Used same percentages as 2015
- Environment Factor: 1.1

2015 and 2040 Intersection Analysis for Roundabout and Traffic Signal Options

A summary of the 2015 and 2040 Harbour Pointe Blvd SW / Cyrus Way intersection analysis for the roundabout and traffic signal options is provided in Tables 3 and 4.

Table 3 shows a comparison of the LOS and average delay for the two intersection options. Table 4 shows a comparison of the 95% percentile approach queue lengths at the Harbour Pointe Blvd SW / Cyrus Way intersection for the two intersection options.

Table 3: PM Peak Hour LOS Summary –Harbour Pointe Blvd SW / Cyrus Way

	2015 LOS[1] and Delay[2]			2040 LOS[1] and Delay[2]		
Traffic Control	Roundabout	Traffic Signal	Degree of Saturation	Roundabout	Traffic Signal	Degree of Saturation
Southbound Approach	A-8.6	A-9.0	0.28	A-9.6	A-8.8	0.33
Northbound Approach	A-8.3	A-7.0	0.23	A-9.3	A-6.9	0.27
Westbound Approach	A-4.9	B-12.5	0.26	A-5.2	B-15.2	0.29
Eastbound Approach	A-6.4	B-13.3	0.37	A-7.1	B-17.0	0.42
Overall	**A-6.2**	**B-12.3**	**0.37**	**A-6.9**	**B-15.0**	**0.42**

1. Level of service, based on 2000 Highway Capacity Manual methodology.
2. Average delay in seconds per vehicle.
3. Degree of saturation is based on the highest approach for roundabout.

Table 4: PM Peak Hour Queue Summary* Harbour Pointe Blvd SW / Cyrus Way

	2015		2040	
Approach	Roundabout	Traffic Signal	Roundabout	Traffic Signal
Southbound Approach	30'	32	35'	35
Northbound Approach	25'	26	30'	28
Westbound Approach	45'	121	51'	132
Eastbound Approach	67'	157	79'	176

*95th percentile queue length is based on the SIDRA analysis for roundabout and the Synchro analysis for traffic signals. Queue shown is the maximum after 2 cycles.

2015 and 2040 Intersection Analysis for Roundabout Option

The following is a summary of the 2015 and 2040 intersection analysis for the roundabout option at Harbour Pointe Blvd SW / Cyrus Way intersection using Sidra software:

- 2015 Intersection Analysis for a Roundabout Option: A two lane roundabout in 2015 will operate at LOS A for PM peak hour. During the PM peak hour, the eastbound 95th percentile queue length will be approximately 67 feet. The westbound 95th percentile queue length will be 45 feet. The average intersection delay will be 6.2 seconds per vehicle in the PM peak hour.

- 2040 Intersection Analysis for a Roundabout Option: The 2040 intersection traffic analysis for a roundabout shows that the overall operation will be LOS A during the PM peak hour. The 95th percentile eastbound queue length will be 79 feet and the westbound 95th percentile queue length will be 51 feet. The average intersection delay will be 6.9 seconds per vehicle in the PM peak hour.

2015 and 2040 Intersection Analysis for Signal Option

The following is a summary of the 2015 and 2040 intersection analysis for the traffic signal option at Harbour Pointe Blvd SW / Cyrus Way intersection using Synchro software:

- 2015 Intersection Analysis for a Traffic Signal Option: For the signalized intersection option, two lanes and a left turn pocket were assumed for the eastbound and westbound approaches along Harbour Pointe Blvd SW, and single lane with a left turn pocket for southbound and northbound approaches along Cyrus Way. Based on the analysis, a traffic signal at the intersection will operate at LOS B during the PM peak period in 2015. The eastbound 95th percentile queue length will be about 157 feet. The westbound queue length will be about 121 feet. The average intersection delay will be 12.3 seconds per vehicle in the PM peak.
- 2040 intersection Analysis for a Traffic Signal Option: In 2040, a traffic signal at Harbour Pointe Blvd SW / Cyrus Way will also operate at LOS B. The 95th percentile eastbound queue length will be 176 feet and the westbound 95th percentile queue length will be 132 feet. The average intersection delay will be 15 seconds per vehicle in the PM peak.
- **Roundabout Option:** Based on the traffic analysis for 2040, the Harbour Pointe Blvd SW / Cyrus Way roundabout will operate at LOS of A with an average intersection delay of 6.9 seconds per vehicle. The 2040 estimated approach volumes on Harbour Pointe Blvd SW are 1,648 vehicles during the PM peak hour, and the approach volumes along Cyrus Way are forecast to be 273 vehicles. The proposed two lane roundabout will have more than enough capacity to handle traffic volumes in 2040.
- **Traffic Signal Option:** Based on the traffic analysis for 2040, the Harbour Pointe Blvd SW / Cyrus Way traffic signal will operate at LOS of B with an average intersection delay of 15.0 seconds per vehicle in the PM peak hour. The 2040 estimated intersection approach volumes during the PM peak hour are 1,648 vehicles on Harbour Pointe Blvd SW, and 273 on Cyrus Way. This intersection configuration also has the capacity to handle traffic volumes in 2040.

Harbour Pointe Blvd SW / SR 525 Intersection Analysis

Operation of the traffic signal at SR 525 can impact the operation of the Cyrus Way intersection during peak periods. Field observations during the PM peak hour show that the eastbound vehicles approaching SR 525 can queue up through the Cyrus Way intersection. Traffic count data show 13% of the eastbound vehicles approaching Cyrus Way turn right during the AM peak, 9% during midday, and 17% turn right in the PM peak. This data suggests that some drivers turn onto Cyrus Way to head southbound and bypass the intersection at SR 525.

One option to reduce the queuing on Harbour Pointe Blvd SW would be to change the eastbound signal phasing to allow right turns from the center lane, creating a double right turn operation. However, such an operation introduces conflicts with the northbound U-turns on SR 525, and potentially the westbound left turns on Harbour Pointe Blvd SW. Mitigation for these impacts could be turn restrictions, or protected signal phases. Additional analysis on SR 525 and coordination with WSDOT is needed to further explore the feasibility of modifying the operation of the Harbour Pointe Blvd SW / SR 525 traffic signal.

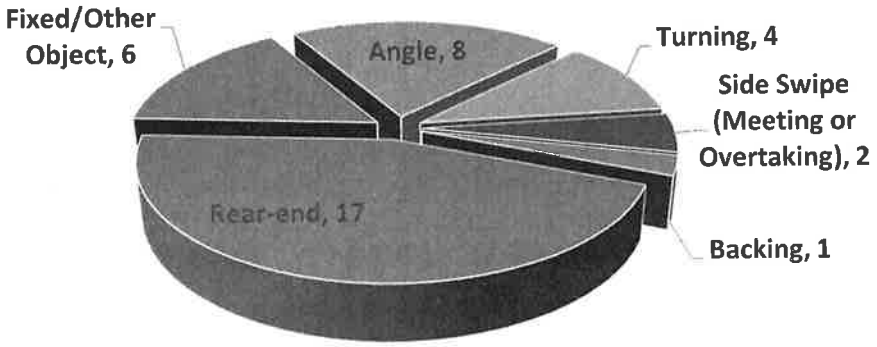
Another option to reduce queue lengths would be to increase the eastbound green time in the signal cycle. This would require reducing the time allowed for northbound and southbound vehicles, and can affect vehicle progression on SR 525, so WSDOT approval is needed for this option also.

Harbour Pointe Blvd SW Collision Analysis

Collisions occurring along Harbour Pointe Blvd SW from south of the SR 525 intersection to north of the Harbour Reach Drive intersection were examined in order to determine the safety needs for the new intersection. Historical collision data for this section of on Harbour Pointe Blvd SW between SR 525 and Harbour Reach Drive was provided by WSDOT for the 3 year period from 2012 to 2014. The purpose of the collision analysis is to identify potential safety "hot spots" and correctable collision types.

Along this section of Harbour Pointe Blvd SW, there were a total of 38 collisions reported during the three year analysis period at shown in Figure 2. Of these collisions, eight collisions were reported to have evident or possible injuries collisions. There were no collisions with fatalities, serious injuries, bicycles or pedestrians reported.

Figure 2: Collisions along Harbour Pointe Blvd SW South of SR 525 to North of Harbour Reach Drive 2020 to 2014



Fourteen collisions were at or related to the Harbour Pointe Blvd SW / Cyrus Way intersection. Typically, any intersection with a collision rate over one collision per million vehicles per year should be monitored, and safety devices may be considered. Given a 2015 AADT of about 16,900 vehicles on Harbour Pointe Blvd SW, the annual collision rate at the intersection is 0.646 per million vehicles (see table 5), which is below the one per one million entering vehicles threshold.

Table 5: Collision Rate Calculation

Number of intersection related crashes	14
Harbour Point Blvd SW volume (ADT)	16,900
Cyrus Way volume (ADT)	2,900
Time period (years)	3
Collision Rate (per million entering vehicles) = (14*10^6)/(365*3*(16,900+2,900)) =	0.646

Discussion of the Roundabout vs Traffic Signal Option

A roundabout at the Harbour Pointe Blvd SW / Cyrus Way intersection will help reduce traffic speeds along Harbour Pointe Blvd SW. This option will provide a safer travel speed, more in keeping with the emerging urban character of the area, and improve safety as vehicles approach SR 525. A traffic signal at the proposed intersection will not greatly reduce the speed of traffic approaching the SR 525 intersection when drivers have a green light at the traffic signal. This higher speed is more likely to result in a greater number of rear-end collisions and angle-related collisions than would be expected with a roundabout.

The two-lane roundabout option will provide better traffic operations than a traffic signal. A roundabout is projected to operate at LOS A throughout the design life of the project, whereas the traffic signal will operate at LOS B. The roundabout option also results in shorter queues than those anticipated with a traffic signal.

Operationally, roundabouts are expected to have a lower overall intersection delay than traffic signals or all-way stops by reducing the number and duration of stops. This provides environmental benefits in the form of noise and air quality impacts. Fuel consumption will be reduced by reducing the number of acceleration/deceleration cycles and the time spent idling. The center area of a roundabout has the potential to be converted to a pervious surface and used for low impact development treatment.

The use of a roundabout to control traffic at the proposed intersection should result in fewer and less severe collisions than what would be experienced if a traffic signal were installed due to reduced operating speeds, fewer conflict points, and yield control on all approach legs.

A comparison of vehicle-to-vehicle conflict points for a signalized intersection to a roundabout shows that there is a reduction in the number of conflict points with a roundabout. The most severe conflict points in an intersection are those associated with left turns and right angles. Roundabouts reduce vehicle crossing conflicts by converting all movements to right turns. Roundabouts have been proven to reduce collision severity due to lower operating speeds and the elimination of vehicle crossing conflicts. The Insurance Institute for Highway Safety (IIHS) study shows approximately a 76 percent reduction factor for injury collisions at roundabouts compared to signalized intersections.

The preferred configuration for a roundabout at this intersection provides for two lanes in the eastbound and the westbound direction. This design will maintain lane continuity in both directions to match the existing configuration to the east and west. A one lane roundabout could work from a capacity point of view. However, westbound vehicles would need to merge prior to the intersection. There is a double left turn operation at SR 525 that sends a platoon of vehicles towards this intersection every traffic signal cycle. In addition, a single lane roundabout is not much smaller than a double lane roundabout, when designed to accommodate WB-67 design vehicles, so there is not much of a right of way or construction cost savings between the two designs. A single lane roundabout design can also lead to higher speeds through the roundabout because of the wider lanes. Another option that can be considered would be having two lanes in the westbound directions, and only one lane in the east bound direction. This may reduce the right of way needs and impacts while still providing adequate capacity and access

Access:

A roundabout at Harbour Pointe Blvd and Cyrus Way would be operationally compatible with the adjacent intersections at SR525 and Harbour Reach Dr. Access to the parcels in

the SW and SE corners would be improved with a roundabout over a traffic signal. Placing the access point on the approach to a roundabout, and restricting the operation to right-in/right-out, allows exiting vehicles to travel any direction by circling the roundabout. Vehicles desiring to enter the parcel would still be challenged with a roundabout or a traffic signal as corner parcel access points typically function better with right-in/right-out. If the City of Mukilteo allowed a second access for these parcels on the departure side from the roundabout, then the access for vehicles entering the parcels would be improved over a traffic signal. With an upgraded traffic signal, it is recommended that driveway access point be restricted to right-in right-out operation where the vehicle queues extend beyond and block the driveway. This is to improve safety and traffic flow.

Right of Way:

The right of way needs for a roundabout are greater than that needed for the roadway widening for the traffic signal improvements. The existing right of way width of Harbour Pointe Blvd SW varies between Harbour Reach Dr and SR 525. In the vicinity of Cyrus Way, the right of way width is 60 ft west of Cyrus Way, and 70 ft to the east. Planning level estimates for the amount of right of way needed in the SW and SE quadrants of Harbour Pointe Blvd SW are as much as 19,800 sf for a roundabout. Assuming that a 13 ft wide right of way acquisition on the south side is desired for the traffic signal option to provide room for a 5-foot wide planter strip and 8-foot wide shared-use path, the need would be approximately 8,900 sf.

A preliminary layout for the proposed roundabout option at the Harbour Pointe Blvd. SW intersection is illustrated in Figure 3.

Estimated costs:

A high end planning level construction subtotal cost estimate for a two-lane roundabout can be as much as $1.6M. This estimate is for construction only, and does not include right of way costs, environmental costs (such as wetland mitigation), design, and construction management. There are a number of assumptions used in this estimate, such as the full replacement or removal of roadway elements that are included in the final scope. This estimate could be reduced through the design process as the design details are decided upon and a closer look at quantities and construction needs are completed.

The signal upgrade option can vary depending on the scope of final improvements. A construction project in 2001 placed the curb and most of the signal poles in a workable locations, so they could be retained for the project. However, the signal pole in the SW corner is placed too close to the curb, and has some damage from turning vehicles. It is recommended to replace the signal pole, and relocate it further back from the curb. The 2001 project also installed conduit for an interconnect cable to SR 525. It is unknown if the conduit is still available, and if there is a complete route to the traffic signal controller cabinet at SR 525. If not, there will be additional cost and coordination with WSDOT, or a

different connection method (such as wireless) would need to be used to establish communications between the intersections of SR 525 and Cyrus Way.

In addition, sidewalks and curb ramps will need to be reconstructed at Cyrus Way to comply with ADA requirements, and street lighting may need to be improved. The planning level construction subtotal cost estimate for the traffic signal option is about $900K. Similar to the roundabout, this estimate is for construction only, and does not include right of way costs, environmental costs (such as wetland mitigation), design, and construction management.

The planning level construction cost estimate for both the roundabout option and traffic signal option include all elements to complete the widening project as described in the introduction of this document.

Pedestrian and Bicycle Access:

This project scope will construct curb, gutter, and sidewalk along the south side of Harbour Pointe Blvd SW, and south on Cyrus Way, connecting to existing facilities to the west, south, and east.

Roundabouts can reduce delay, improve safety, and provide for good connections for pedestrians and bicyclists. Drivers approaching a roundabout are slowing and prepared to stop if necessary. This reduces the number and severity of accidents. By eliminating left turns, there are fewer conflicting maneuvers for pedestrians and bicyclists to keep track of when crossing a roadway. In addition, depending on the design of the splitter island and location of the crosswalk, pedestrians may be able to cross one lane at a time, and use the splitter island as a refuge to wait until there is a safe opportunity to cross.

With traffic signals, drivers approaching the intersection with a green signal indication tend to travel at the posted or operating speed. One study that reviewed 1,297 signalized intersections found that 22% of pedestrian accidents involved left-turning vehicles[1]. Protected left turn phases can help reduce conflicts with pedestrians.

[1] Khasnabis, S., C.V. Zegeer, and M.J. Cynecki. Effects of Pedestrian Signals on Safety, Operations, and Pedestrian Behavior - Literature Review. In Transportation Research Record 847, TRB, National Research Council, Washington, D.C., 1982

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SCALE IN FEET

CITY OF MUKILTEO, WA
HARBOUR POINTE BLVD SW AND CYRUS WAY

ATTACHMENT 1

Harbour Pointe Blvd and Cyrus Way Roundabout

Planning level Cost Estimate

City of Mukilteo

Harbour Point Blvd SW & Cyrus Way Roundabout

December 10, 2015

CONSTRUCTION COST ESTIMATE

Harbour Pointe Blvd SW & Cyrus Way

No.	Sect. No.	Item	Quantity	Unit	Unit Cost	Total Cost
1	1-05	Construction Surveying (10%)	1	LS	$117,000.00	$117,000.00
2	1-07	SPCC Plan	1	LS	$2,500.00	$2,500.00
3	1-07	Potholing	1	FA	$5,000.00	$5,000.00
4	1-09	Force Account	1	FA	$20,000.00	$20,000.00
5	1-10	Traffic Control Labor Supervisor	1	LS	$25,000.00	$25,000.00
6	1-10	Traffic Control Labor	2,400	HR	$42.00	$100,800.00
7	1-10	Temporary Traffic Control Devices	1	LS	$20,000.00	$20,000.00
8	1-10	Portable Changeable Message Sign	4	EA	$6,000.00	$24,000.00
9	1-10	Operation of Portable Changeable Message Sign	4,400	HR	$3.50	$15,400.00
10	2-01	Clearing and Grubbing	1	LS	$10,000.00	$10,000.00
11	2-02	Removal of Structures and Obstructions	1	LS	$15,000.00	$15,000.00
12	2-02	Removing Asphalt Concrete Pavement	4,600	SY	$8.00	$36,800.00
13	2-02	Sawcutting	2,000	LF	$5.00	$10,000.00
14	2-03	Roadway Excavation, Including Haul	1,500	CY	$23.00	$34,500.00
15	2-03	Unsuitable Foundation Excavation, Including Haul	500	CY	$25.00	$12,500.00
16	2-03	Gravel Borrow, Including Haul	500	TON	$17.00	$8,500.00
17	2-09	Shoring or Extra Excavation Class B	2000	LF	$1.00	$2,000.00
18	4-04	Crushed Surfacing Top Course	210	TON	$25.00	$5,250.00
19	4-04	Crushed Surfacing Base Course	2,400	TON	$25.00	$60,000.00
20	5-04	HMA CL 1/2 In. PG 64-22	1,600	TON	$100.00	$160,000.00
21	5-04	Incidental HMA for driveways, Class B	10	TON	$120.00	$1,200.00
22	7-04	Solid Wall PVC Storm Sewer Pipe 12" Diam	2,000	LF	$35.00	$70,000.00
23	7-05	Catch Basin Type I	16	EA	$1,000.00	$16,000.00
24	7-05	Catch Basin Type II, 48 In. Dia.	2	EA	$3,000.00	$6,000.00
25	7-05	Catch Basin Type II, 54 In. Dia.	1	EA	$4,500.00	$4,500.00
26	7-05??	Detain/Treat Stormwater Tank	1	EA	$150,000.00	$150,000.00
27	7-12	Adjust Valve Box	6	EA	$350.00	$2,100.00
28	7-14	Hydrant Assembly	4	EA	$4,000.00	$16,000.00
29	8-01	Temporary Water Pollution/Erosion Control	1	LS	$10,000.00	$10,000.00
30	8-01	Temporary Water Pollution/Erosion Control Plan	1	LS	$2,500.00	$2,500.00
31	8-01	Temporary Reinforced Silt Fencing	2,500	LF	$7.00	$17,500.00
32	8-03	Landscape (including irrigation, etc)	1	LS	$100,000.00	$100,000.00
33	8-04	Cement Concrete Curb & Gutter	2,200	LF	$25.00	$55,000.00
34	8-04	Cement Concrete Traffic Curb	800	LF	$20.00	$16,000.00
35	8-04	Roundabout Truck Apron Cement Concrete Curb	300	LF	$25.00	$7,500.00
36	8-04	Roundabout Central Island Cement Concrete Curb	200	LF	$30.00	$6,000.00

CONSTRUCTION COST ESTIMATE

Harbour Pointe Blvd SW & Cyrus Way

No.	Sect. No.	Item	Quantity	Unit	Unit Cost	Total Cost
37	8-06	Cement Conc. Driveway Entrance	100	SY	$50.00	$5,000.00
38	8-13	Adjust Monument Case and Cover	1	EA	$700.00	$700.00
39	8-14	Sidewalk Curb Ramp Type 1	8	EA	$1,700.00	$13,600.00
40	8-14	Cement Concrete Bicycle Ramp	8	EA	$1,500.00	$12,000.00
41	8-14	Cement Concrete Sidewalk	1,350	SY	$35.00	$47,250.00
42	8-18	Mailbox Support	4	EA	$400.00	$1,600.00
43	8-20	Illumination System (underground)	1	LS	$255,000.00	$255,000.00
44	8-21	Permanent Signing	1	LS	$20,000.00	$20,000.00
45	8-22	Plastic Crosswalk Stripe	2200	SF	$10.00	$22,000.00
46	8-22	Plastic Traffic Letter	20	EA	$100.00	$2,000.00
47	8-22	Plastic Line	2800	LF	$2.00	$5,600.00
48	8-22	Plastic Wide Line	3900	LF	$2.00	$7,800.00
49	8-22	Plastic Bicycle Lane Symbol	12	EA	$250.00	$3,000.00
50	8-23	Temporary Pavement Marking	3,000	LF	$0.60	$1,800.00
51	8-23	Removing Temporary Pavement Marking	3,000	LF	$0.60	$1,800.00
52		Utility relocation	1	LS	$12,000.00	$12,000.00
					SUBTOTAL CONSTRUCTION COST	**$1,575,700.00**
Other Items						
	1-09	Mobilization & Demobilization			10%	$158,000.00
		Miscellaneous & Contingency			20%	$315,140.00
					Total Construction Cost	**$2,048,840.00**
Special Studies & Engineering						
	PS&E				15%	$236,355.00
	Construction Management				10%	$157,570.00
	Environmental - (Documentation & Permits)				8%	$126,056.00
	Right of Way (estimated lump sum)					$144,606.74
					PROJECT TOTAL	**$2,713,427.74**

ATTACHMENT 2

SIDRA and Synchro Reports

Cyrus Way and Harbour Pointe Blvd SW
Summary of Modeling results

No Build Analysis

2015	EB Delay	LOS	WB Delay	LOS	NB Delay	LOS	SB Delay	LOS	Total Delay	LOS	95% Queue EB (Lt)	EB (thru-rt)	WB (Lt)	WB (thru-rt)	NB (Lt)	NB (thru-rt)	SB (Lt)	SB (thru-rt)
AM	9.6	A	9.8	A	11.2	B	10.3	B	9.8	A	--	101	--	96	--	44	--	27
MD	9.7	A	10.1	B	8.4	A	11.8	B	9.9	A	--	90	--	98	--	38	--	46
PM	10.8	B	10.7	B	8.1	A	11.8	B	10.7	B	--	141	--	115	--	42	--	62

2040	EB Delay	LOS	WB Delay	LOS	NB Delay	LOS	SB Delay	LOS	Total Delay	LOS	95% Queue EB (Lt)	EB (thru-rt)	WB (Lt)	WB (thru-rt)	NB (Lt)	NB (thru-rt)	SB (Lt)	SB (thru-rt)
AM	10	B	10.2	B	11.2	B	10.2	B	10.2	B	--	113	--	108	--	47	--	29
MD	9.7	A	10.2	B	8.6	A	12.2	B	10	B	--	98	--	108	--	41	--	50
PM	11.5	B	11.2	B	8.1	A	12.3	B	11.3	B	--	161	--	130	--	45	--	68

Build with Traffic Signal Analysis

2015	EB Delay	LOS	WB Delay	LOS	NB Delay	LOS	SB Delay	LOS	Total Delay	LOS	95% Queue EB (Lt)	EB (thru-rt)	WB (Lt)	WB (thru-rt)	NB (Lt)	NB (thru-rt)	SB (Lt)	SB (thru-rt)
AM	11.5	B	11.2	B	9.5	A	8.8	A	11.2	B	7	111	19	100	30	19	12	19
MD	11.7	B	11.6	B	7.3	A	9.8	A	11.2	B	7	100	27	99	21	22	29	21
PM	13.3	B	12.5	B	7	A	9	A	12.3	B	6	157	22	121	26	22	32	31

2040	EB Delay	LOS	WB Delay	LOS	NB Delay	LOS	SB Delay	LOS	Total Delay	LOS	95% Queue EB (Lt)	EB (thru-rt)	WB (Lt)	WB (thru-rt)	NB (Lt)	NB (thru-rt)	SB (Lt)	SB (thru-rt)
AM	18.8	B	18	B	7.3	B	6.9	B	17.3	B	9	132	24	117	30	19	11	20
MD	19.7	B	19.6	B	5.2	A	6.8	A	17.7	B	9	124	35	122	19	20	27	19
PM	17	B	15.2	B	6.9	A	8.8	A	15	B	7	176	26	132	28	23	35	34

Build with Roundabout Anaylsis

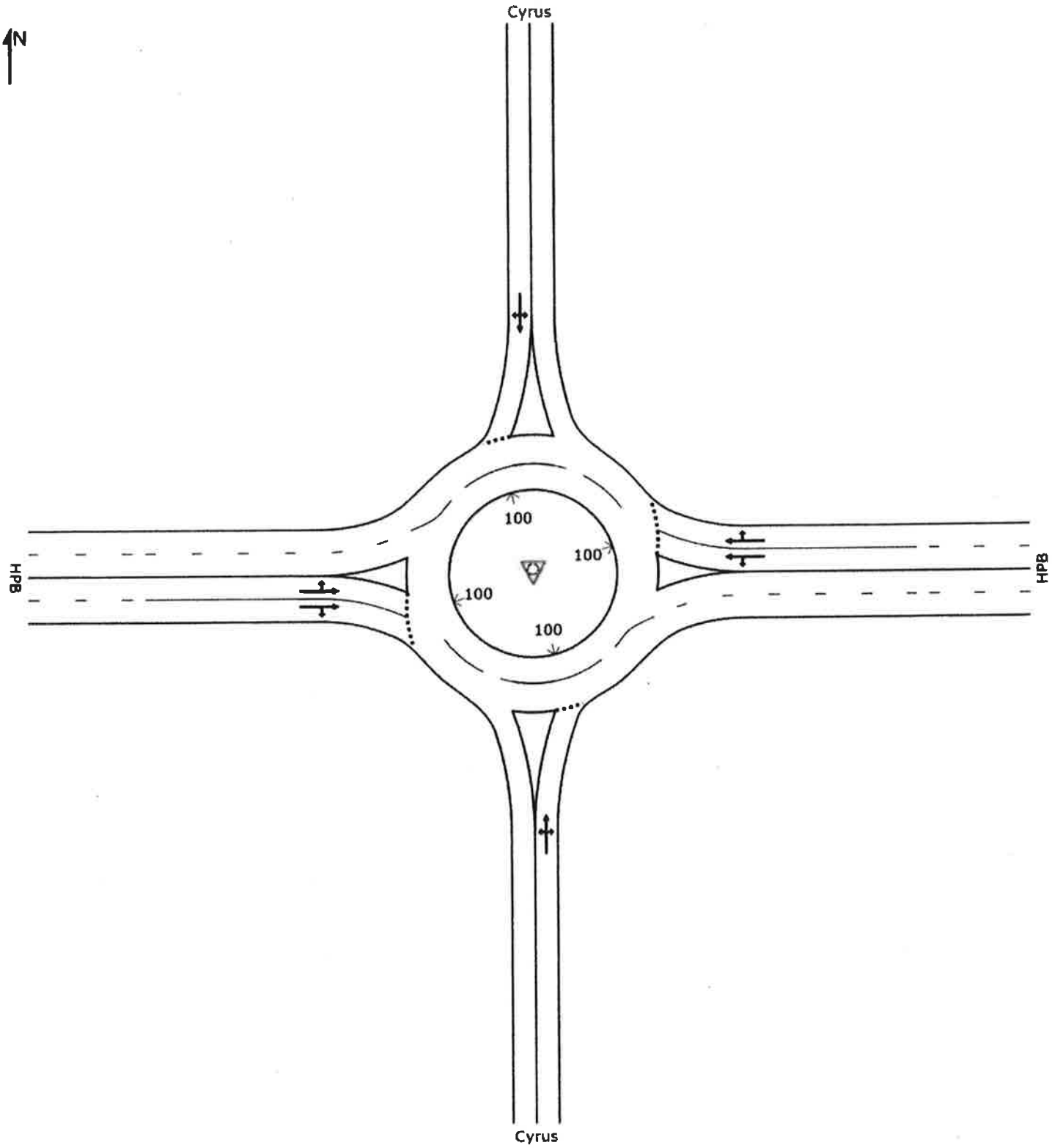
2015	EB Delay	LOS	WB Delay	LOS	NB Delay	LOS	SB Delay	LOS	Total Delay	LOS	95% Queue EB (Lt)	EB (thru-rt)	WB (Lt)	WB (thru-rt)	NB (Lt)	NB (thru-rt)	SB (Lt)	SB (thru-rt)
AM	5.1	A	4.9	A	6.7	A	7.1	A	5.2	A	--	44	--	42	--	15	--	13
MD	5.3	A	5.2	A	6.9	A	7.2	A	5.5	A		43		47		16		17
PM	6.4	A	4.9	A	8.3	A	8.6	A	6.2	A	--	67	--	45	--	25	--	30

2040	EB Delay	LOS	WB Delay	LOS	NB Delay	LOS	SB Delay	LOS	Total Delay	LOS	95% Queue EB (Lt)	EB (thru-rt)	WB (Lt)	WB (thru-rt)	NB (Lt)	NB (thru-rt)	SB (Lt)	SB (thru-rt)
AM	5.4	A	5.2	A	7.2	A	7.6	A	5.6	A	--	50	--	48	--	18	--	15
MD	5.9	A	5.2	A	7.9	A	7.4	A	5.9	A	--	54	--	48	--	21	--	18
PM	7.1	A	5.2	A	9.3	A	9.6	A	6.9	A	--	79	--	51	--	30	--	35

SITE LAYOUT

Site: Cyrus/HPB

New Site
Roundabout



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INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: Cyrus/HPB

New Site
Roundabout

Volume Display Method: Total and %

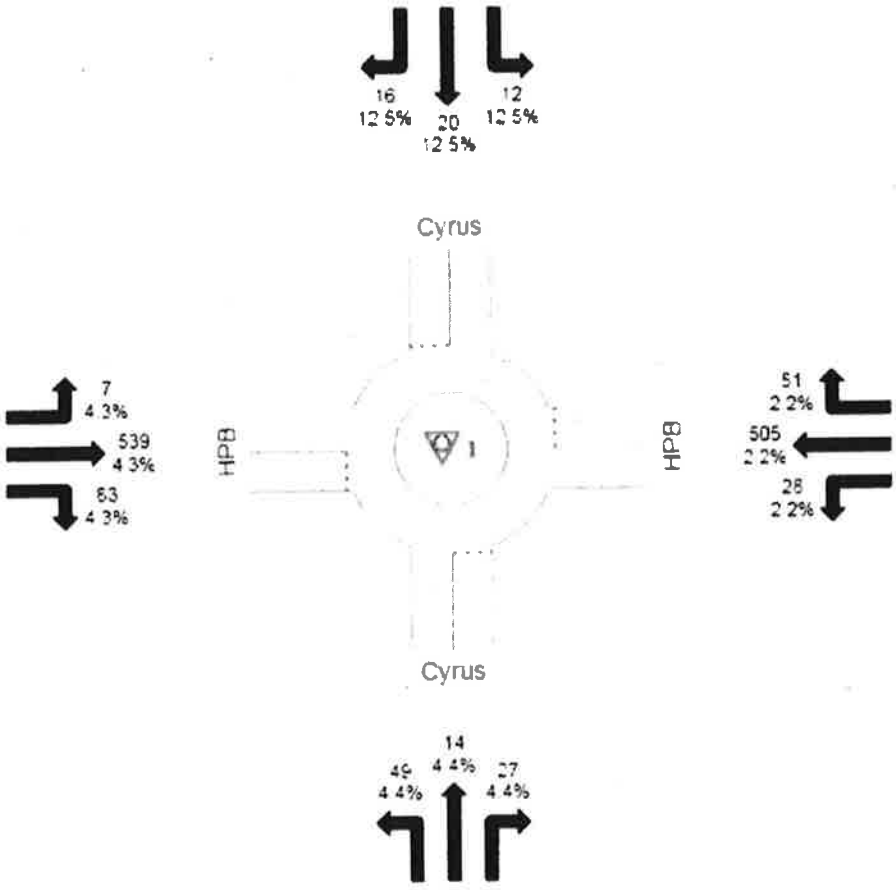
Volumes are shown for Movement Class(es): All Classes and Heavy Vehicles

Total Intersection Volumes (veh)

All Movement Classes: 1351

Light Vehicles (LV): 1301

Heavy Vehicles (HV): 50



MOVEMENT SUMMARY

Site: Cyrus/HPB

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total 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: Cyrus											
3	L2	59	4.4	0.151	6.7	LOS A	0.6	15.2	0.54	0.51	27.4
8	T1	17	4.4	0.151	6.7	LOS A	0.6	15.2	0.54	0.51	27.0
18	R2	33	4.4	0.151	6.7	LOS A	0.6	15.2	0.54	0.51	26.4
Approach		108	4.4	0.151	6.7	LOS A	0.6	15.2	0.54	0.51	27.0
East: HPB											
1	L2	33	2.2	0.254	5.0	LOS A	1.6	41.5	0.30	0.14	32.1
6	T1	587	2.2	0.254	4.9	LOS A	1.6	42.0	0.29	0.14	32.1
16	R2	59	2.2	0.254	4.7	LOS A	1.6	42.0	0.29	0.13	31.2
Approach		679	2.2	0.254	4.9	LOS A	1.6	42.0	0.29	0.14	32.0
North: Cyrus											
7	L2	19	12.5	0.121	7.1	LOS A	0.5	12.5	0.55	0.53	27.7
4	T1	32	12.5	0.121	7.1	LOS A	0.5	12.5	0.55	0.53	27.4
14	R2	25	12.5	0.121	7.1	LOS A	0.5	12.5	0.55	0.53	26.7
Approach		76	12.5	0.121	7.1	LOS A	0.5	12.5	0.55	0.53	27.2
West: HPB											
5	L2	8	4.3	0.267	5.3	LOS A	1.7	43.2	0.30	0.15	32.2
2	T1	599	4.3	0.267	5.1	LOS A	1.7	43.6	0.29	0.14	32.1
12	R2	92	4.3	0.267	4.9	LOS A	1.7	43.6	0.29	0.14	31.1
Approach		699	4.3	0.267	5.1	LOS A	1.7	43.6	0.29	0.14	31.9
All Vehicles		1563	3.8	0.267	5.2	LOS A	1.7	43.6	0.32	0.18	31.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: Cyrus/HPB

New Site
Roundabout

Volume Display Method: Total and %

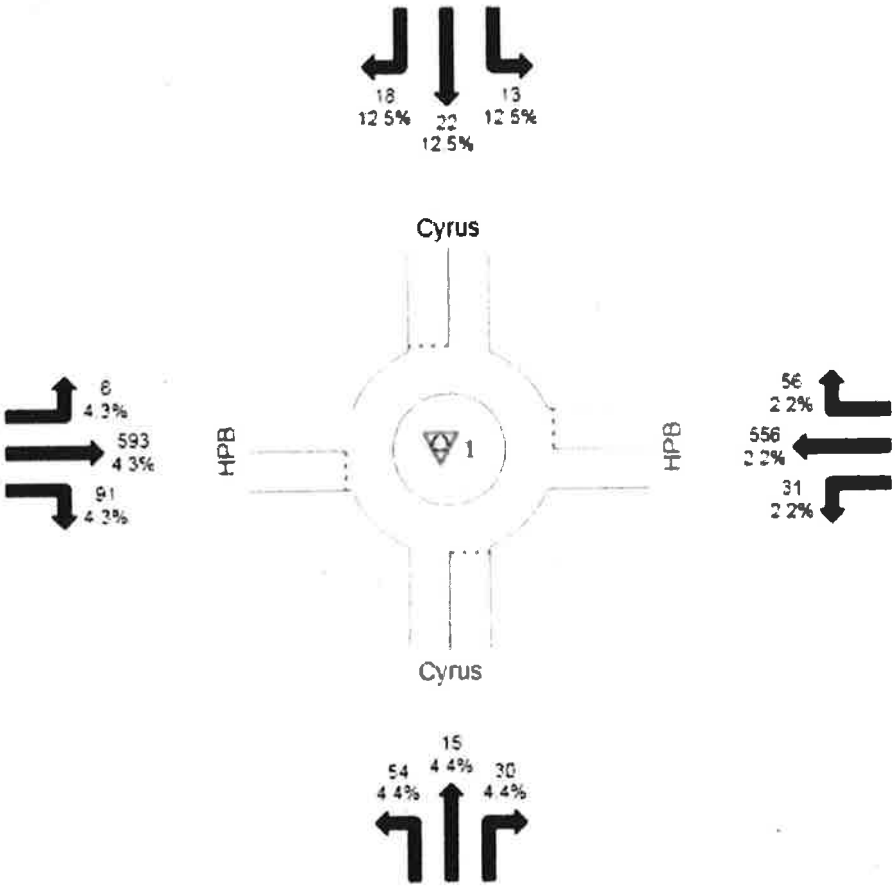
Volumes are shown for Movement Class(es): All Classes and Heavy Vehicles

Total Intersection Volumes (veh)

All Movement Classes: 1487

Light Vehicles (LV): 1432

Heavy Vehicles (HV): 55



MOVEMENT SUMMARY

Site: Cyrus/HPB

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total 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: Cyrus											
3	L2	65	4.4	0.173	7.2	LOS A	0.7	17.6	0.57	0.55	27.2
8	T1	18	4.4	0.173	7.2	LOS A	0.7	17.6	0.57	0.55	26.9
18	R2	36	4.4	0.173	7.2	LOS A	0.7	17.6	0.57	0.55	26.2
Approach		119	4.4	0.173	7.2	LOS A	0.7	17.6	0.57	0.55	26.9
East: HPB											
1	L2	36	2.2	0.283	5.4	LOS A	1.9	47.5	0.32	0.16	32.0
6	T1	647	2.2	0.283	5.2	LOS A	1.9	48.1	0.32	0.16	31.9
16	R2	65	2.2	0.283	5.1	LOS A	1.9	48.1	0.31	0.15	31.1
Approach		748	2.2	0.283	5.2	LOS A	1.9	48.1	0.32	0.16	31.9
North: Cyrus											
7	L2	21	12.5	0.140	7.6	LOS A	0.5	14.5	0.58	0.57	27.6
4	T1	35	12.5	0.140	7.6	LOS A	0.5	14.5	0.58	0.57	27.2
14	R2	29	12.5	0.140	7.6	LOS A	0.5	14.5	0.58	0.57	26.5
Approach		84	12.5	0.140	7.6	LOS A	0.5	14.5	0.58	0.57	27.1
West: HPB											
5	L2	9	4.3	0.297	5.6	LOS A	1.9	49.4	0.32	0.16	32.0
2	T1	659	4.3	0.297	5.5	LOS A	1.9	49.9	0.32	0.16	31.9
12	R2	101	4.3	0.297	5.3	LOS A	1.9	49.9	0.31	0.15	31.0
Approach		769	4.3	0.297	5.4	LOS A	1.9	49.9	0.32	0.16	31.8
All Vehicles		1720	3.8	0.297	5.6	LOS A	1.9	49.9	0.35	0.20	31.2

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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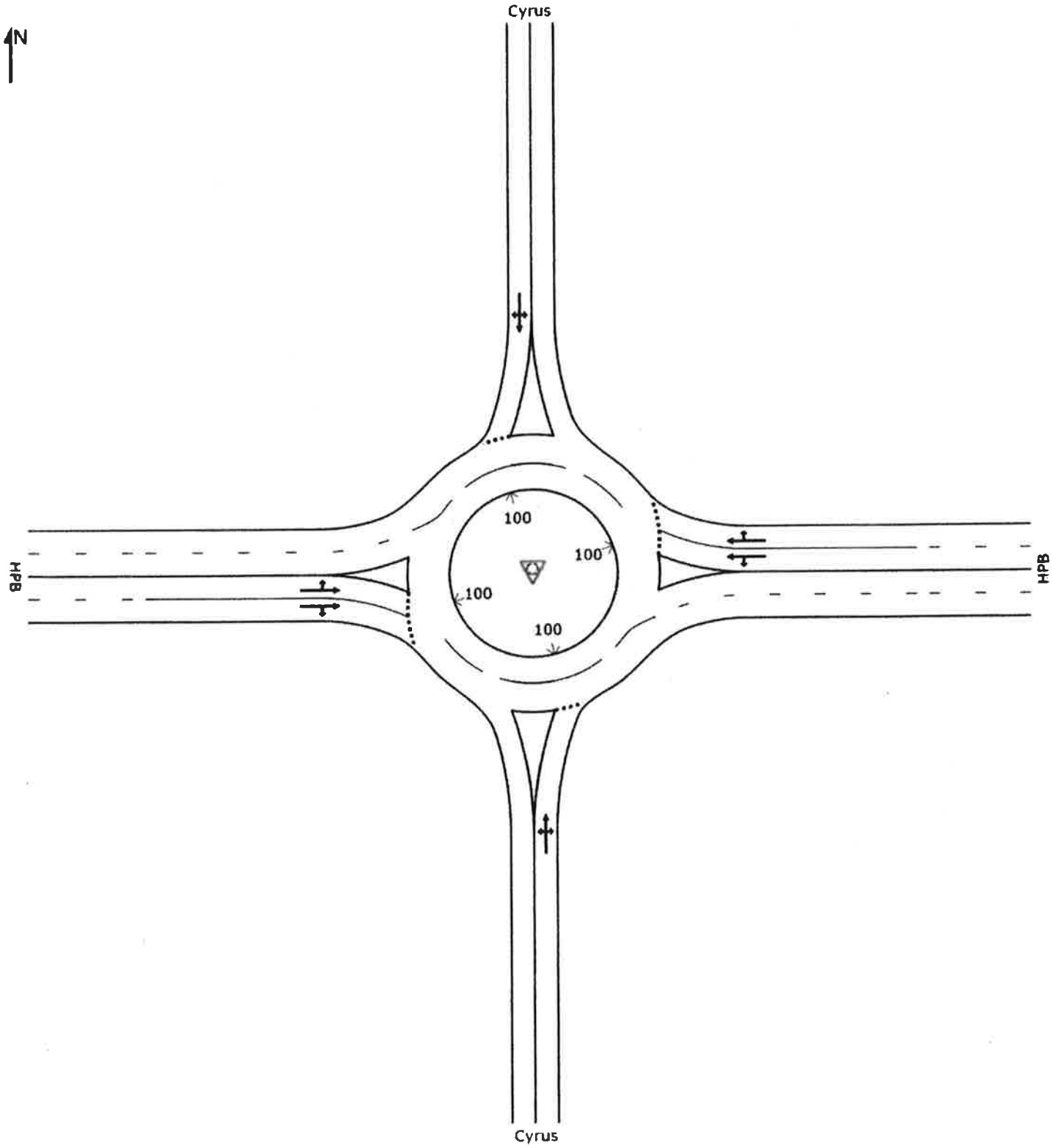
SITE LAYOUT

Site: Cyrus/HPB

New Site
Roundabout



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INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: Cyrus/HPB

New Site
Roundabout

Volume Display Method: Total and %

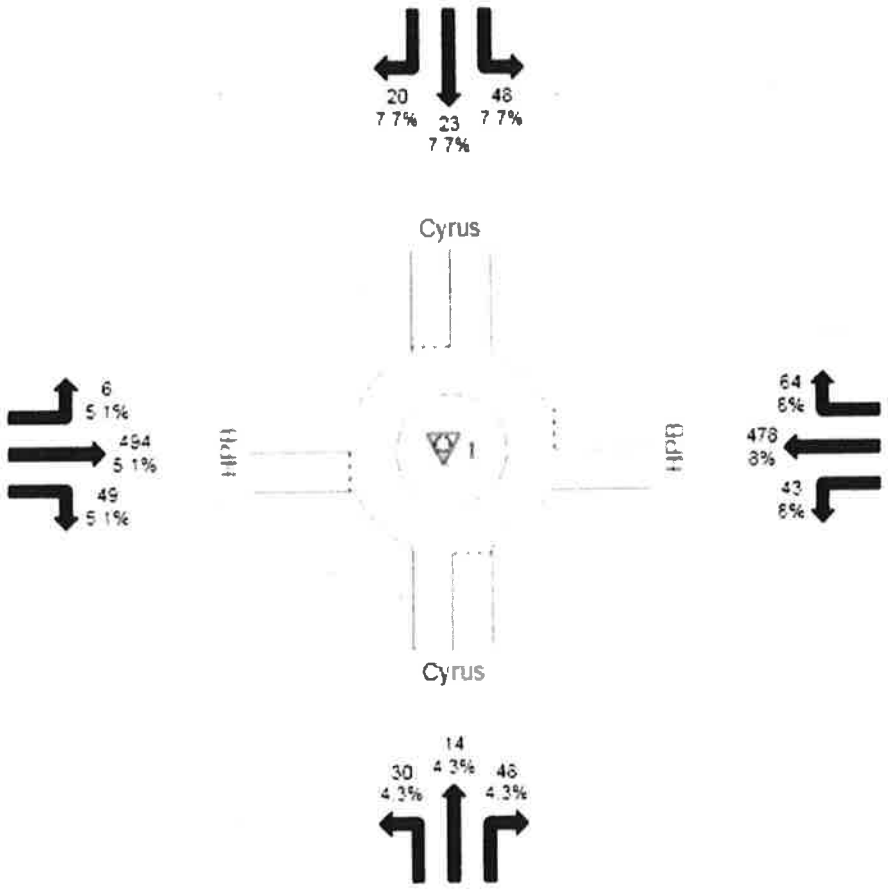
Volumes are shown for Movement Class(es): All Classes and Heavy Vehicles

Total Intersection Volumes (veh)

All Movement Classes: 1317

Light Vehicles (LV): 1231

Heavy Vehicles (HV): 86



MOVEMENT SUMMARY

Site: Cyrus/HPB

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total 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: Cyrus											
3	L2	36	4.3	0.157	6.9	LOS A	0.6	16.0	0.56	0.53	27.7
8	T1	17	4.3	0.157	6.9	LOS A	0.6	16.0	0.56	0.53	27.3
18	R2	57	4.3	0.157	6.9	LOS A	0.6	16.0	0.56	0.53	26.6
Approach		110	4.3	0.157	6.9	LOS A	0.6	16.0	0.56	0.53	27.0
East: HPB											
1	L2	51	8.0	0.270	5.3	LOS A	1.8	46.9	0.26	0.11	31.8
6	T1	569	8.0	0.270	5.2	LOS A	1.8	47.4	0.25	0.11	31.9
16	R2	76	8.0	0.270	5.0	LOS A	1.8	47.4	0.25	0.10	31.0
Approach		696	8.0	0.270	5.2	LOS A	1.8	47.4	0.25	0.11	31.8
North: Cyrus											
7	L2	57	7.7	0.162	7.2	LOS A	0.6	16.5	0.56	0.54	27.3
4	T1	27	7.7	0.162	7.2	LOS A	0.6	16.5	0.56	0.54	26.9
14	R2	24	7.7	0.162	7.2	LOS A	0.6	16.5	0.56	0.54	26.2
Approach		108	7.7	0.162	7.2	LOS A	0.6	16.5	0.56	0.54	26.9
West: HPB											
5	L2	7	5.1	0.265	5.5	LOS A	1.6	42.2	0.38	0.22	32.1
2	T1	588	5.1	0.265	5.3	LOS A	1.6	42.8	0.37	0.21	32.0
12	R2	58	5.1	0.265	5.1	LOS A	1.6	42.8	0.37	0.21	31.0
Approach		654	5.1	0.265	5.3	LOS A	1.6	42.8	0.37	0.21	31.9
All Vehicles		1568	6.5	0.270	5.5	LOS A	1.8	47.4	0.35	0.21	31.0

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: Cyrus/HPB

New Site
Roundabout

Volume Display Method: Total and %

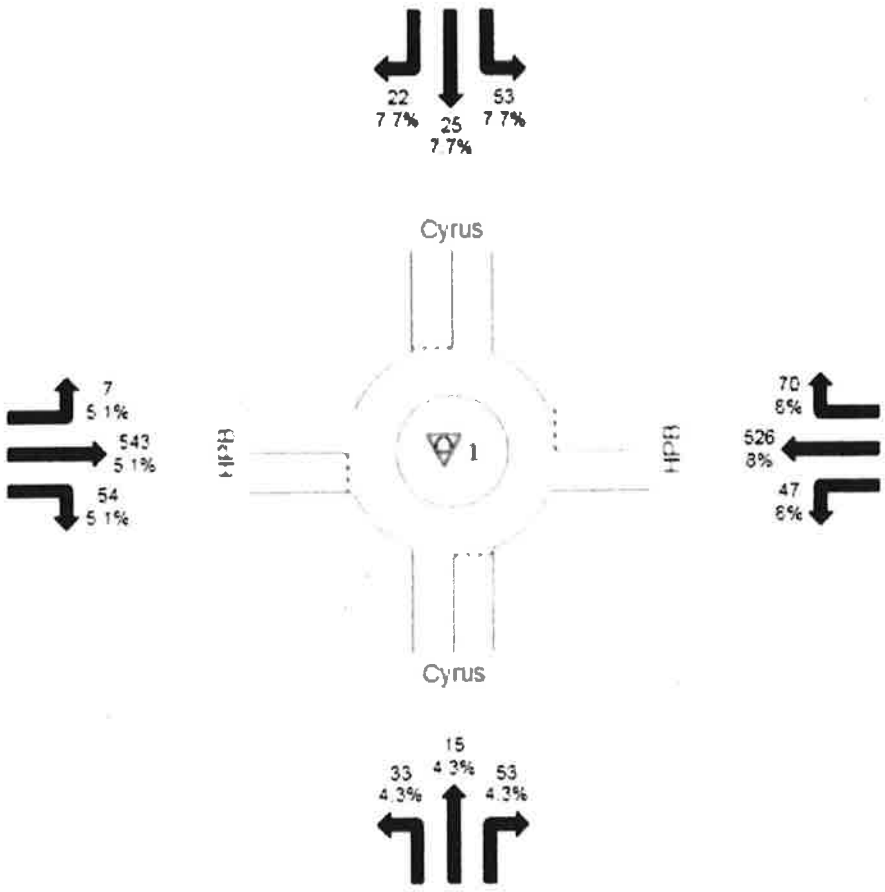
Volumes are shown for Movement Class(es): All Classes and Heavy Vehicles

Total Intersection Volumes (veh)

All Movement Classes: 1448

Light Vehicles (LV): 1354

Heavy Vehicles (HV): 94



MOVEMENT SUMMARY

Site: Cyrus/HPB

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total 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: Cyrus											
3	L2	43	4.3	0.201	7.9	LOS A	0.8	21.0	0.60	0.60	27.3
8	T1	19	4.3	0.201	7.9	LOS A	0.8	21.0	0.60	0.60	27.0
18	R2	69	4.3	0.201	7.9	LOS A	0.8	21.0	0.60	0.60	26.3
Approach		131	4.3	0.201	7.9	LOS A	0.8	21.0	0.60	0.60	26.7
East: HPB											
1	L2	51	8.0	0.272	5.4	LOS A	1.8	47.4	0.29	0.13	31.8
6	T1	566	8.0	0.272	5.2	LOS A	1.8	48.0	0.28	0.13	31.8
16	R2	75	8.0	0.272	5.1	LOS A	1.8	48.0	0.28	0.12	31.0
Approach		691	8.0	0.272	5.2	LOS A	1.8	48.0	0.28	0.13	31.7
North: Cyrus											
7	L2	60	7.7	0.171	7.4	LOS A	0.7	17.6	0.56	0.55	27.2
4	T1	28	7.7	0.171	7.4	LOS A	0.7	17.6	0.56	0.55	26.9
14	R2	25	7.7	0.171	7.4	LOS A	0.7	17.6	0.56	0.55	26.2
Approach		114	7.7	0.171	7.4	LOS A	0.7	17.6	0.56	0.55	26.9
West: HPB											
5	L2	9	5.1	0.316	6.1	LOS A	2.0	52.9	0.40	0.24	31.8
2	T1	696	5.1	0.316	5.9	LOS A	2.1	53.6	0.40	0.23	31.7
12	R2	69	5.1	0.316	5.7	LOS A	2.1	53.6	0.39	0.23	30.8
Approach		774	5.1	0.316	5.9	LOS A	2.1	53.6	0.40	0.23	31.6
All Vehicles		1711	6.4	0.316	5.9	LOS A	2.1	53.6	0.38	0.24	30.9

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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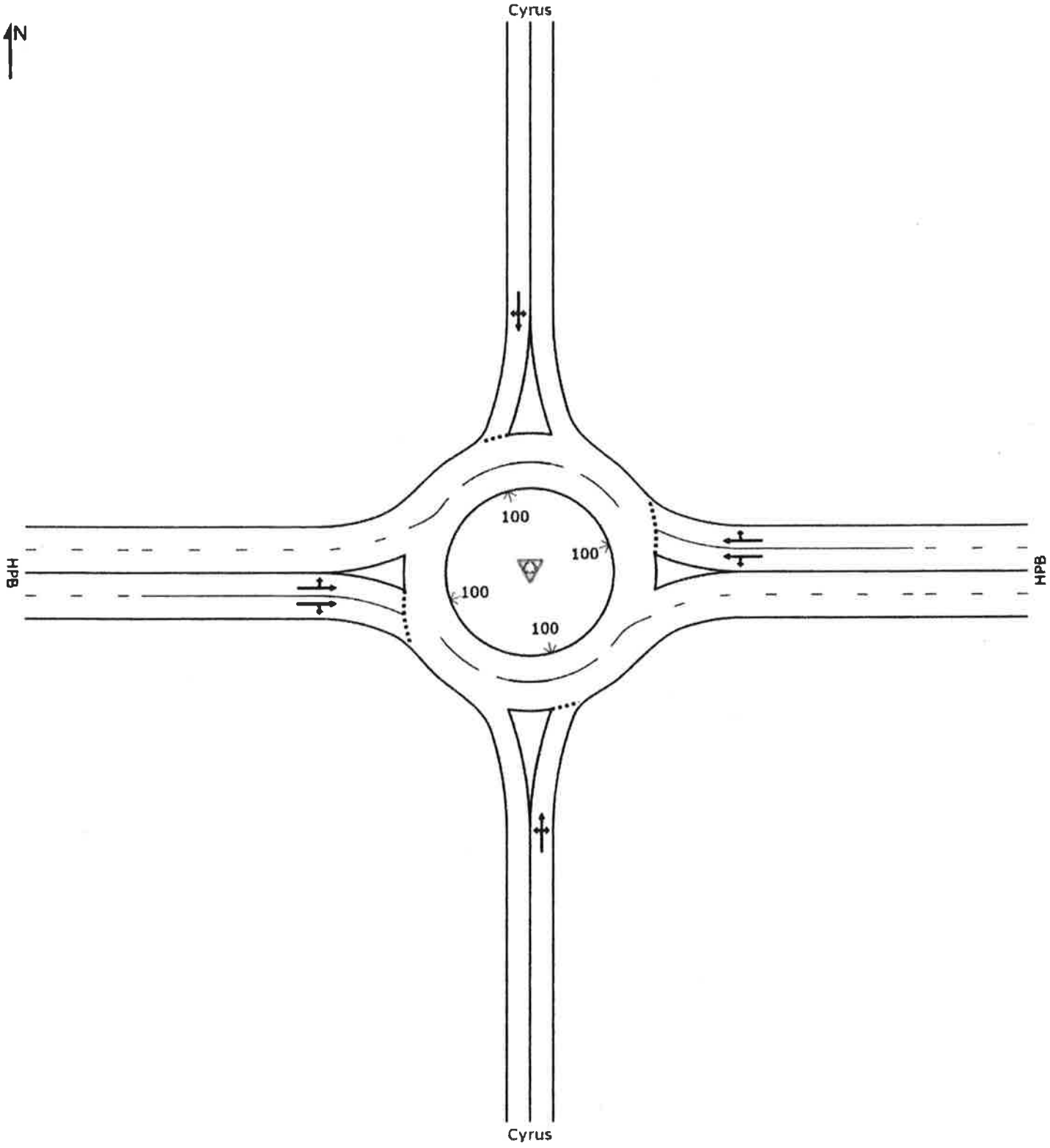
SITE LAYOUT

Site: Cyrus/HPB

New Site
Roundabout



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INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: Cyrus/HPB

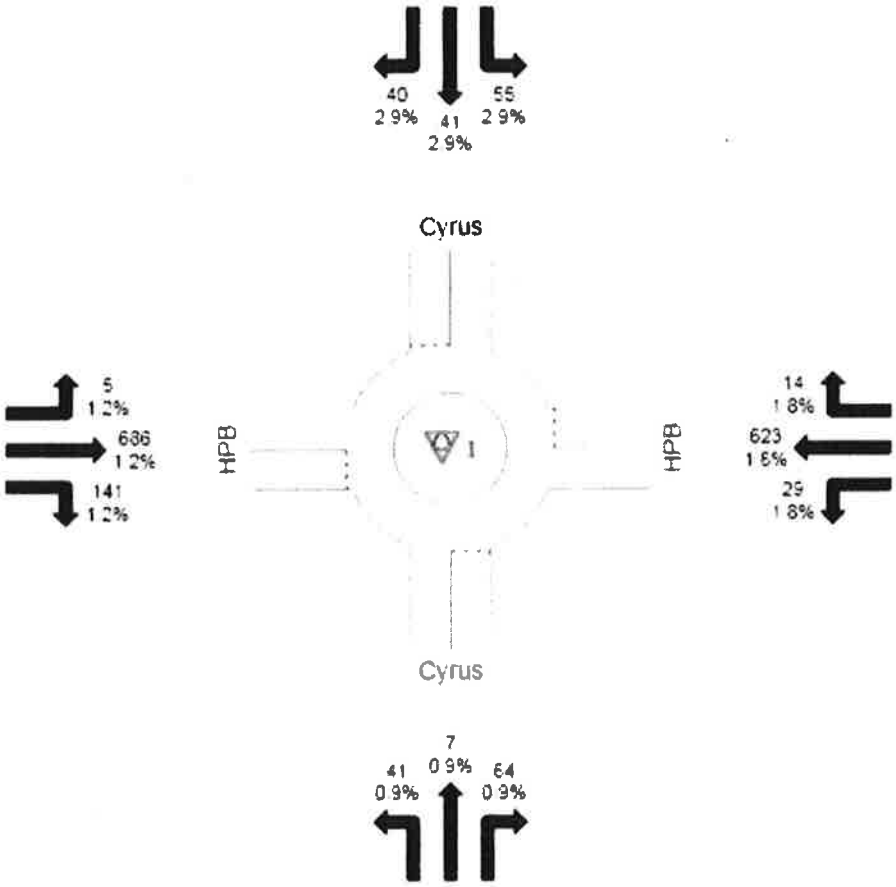
New Site
Roundabout

Volume Display Method: Total and %

Volumes are shown for Movement Class(es): All Classes and Heavy Vehicles

Total Intersection Volumes (veh)

- **All Movement Classes: 1746**
- **Light Vehicles (LV): 1719**
- **Heavy Vehicles (HV): 27**



MOVEMENT SUMMARY

Site: Cyrus/HPB

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total 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: Cyrus											
3	L2	55	0.9	0.231	8.3	LOS A	1.0	24.8	0.63	0.63	27.1
8	T1	9	0.9	0.231	8.3	LOS A	1.0	24.8	0.63	0.63	26.8
18	R2	86	0.9	0.231	8.3	LOS A	1.0	24.8	0.63	0.63	26.1
Approach		151	0.9	0.231	8.3	LOS A	1.0	24.8	0.63	0.63	26.5
East: HPB											
1	L2	31	1.8	0.261	5.0	LOS A	1.7	44.0	0.27	0.12	32.2
6	T1	663	1.8	0.261	4.9	LOS A	1.8	44.6	0.27	0.12	32.1
16	R2	15	1.8	0.261	4.8	LOS A	1.8	44.6	0.27	0.11	31.3
Approach		709	1.8	0.261	4.9	LOS A	1.8	44.6	0.27	0.12	32.1
North: Cyrus											
7	L2	80	2.9	0.282	8.6	LOS A	1.2	29.6	0.60	0.60	27.0
4	T1	59	2.9	0.282	8.6	LOS A	1.2	29.6	0.60	0.60	26.7
14	R2	58	2.9	0.282	8.6	LOS A	1.2	29.6	0.60	0.60	26.0
Approach		197	2.9	0.282	8.6	LOS A	1.2	29.6	0.60	0.60	26.6
West: HPB											
5	L2	6	1.2	0.371	6.7	LOS A	2.6	65.6	0.46	0.29	31.6
2	T1	762	1.2	0.371	6.5	LOS A	2.6	66.8	0.46	0.28	31.5
12	R2	157	1.2	0.371	6.2	LOS A	2.6	66.8	0.45	0.27	30.6
Approach		924	1.2	0.371	6.4	LOS A	2.6	66.8	0.46	0.28	31.3
All Vehicles		1981	1.6	0.371	6.2	LOS A	2.6	66.8	0.42	0.28	30.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: Cyrus/HPB

New Site
Roundabout

Volume Display Method: Total and %

Volumes are shown for Movement Class(es): All Classes and Heavy Vehicles

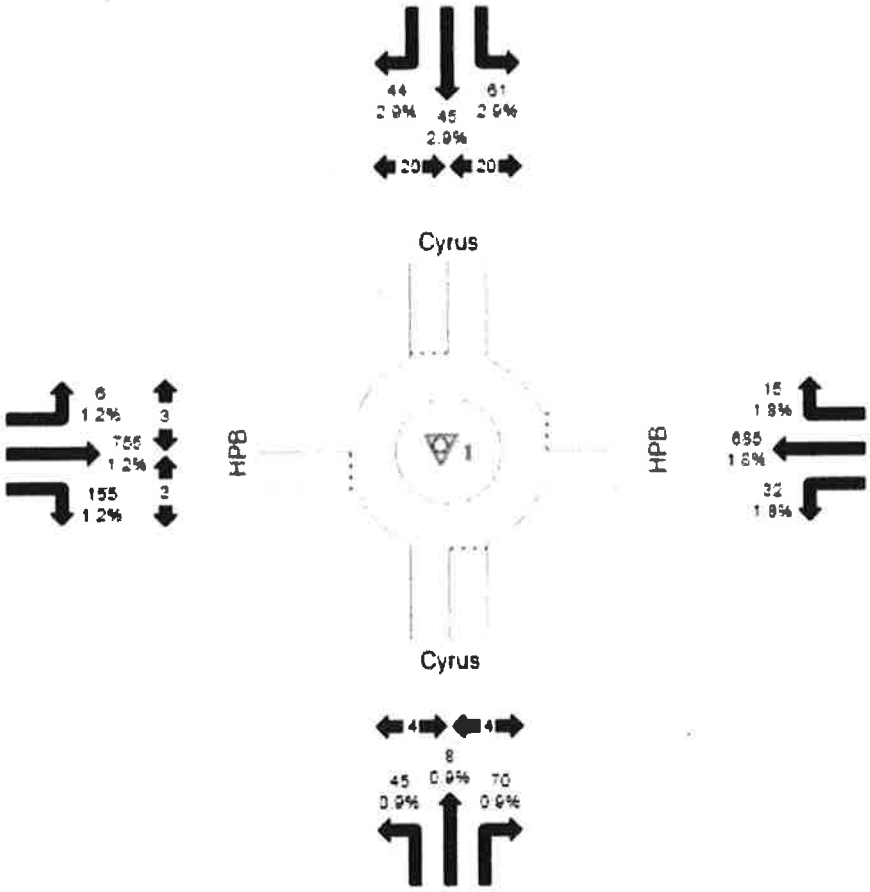
Total Intersection Volumes (veh)

All Movement Classes: 1921

Light Vehicles (LV): 1891

Heavy Vehicles (HV): 30

Pedestrians: 54



MOVEMENT SUMMARY

Site: Cyrus/HPB

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total 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: Cyrus											
3	L2	61	0.9	0.270	9.3	LOS A	1.2	29.8	0.67	0.67	32.2
8	T1	11	0.9	0.270	9.3	LOS A	1.2	29.8	0.67	0.67	32.1
18	R2	95	0.9	0.270	9.3	LOS A	1.2	29.8	0.67	0.67	31.3
Approach		166	0.9	0.270	9.3	LOS A	1.2	29.8	0.67	0.67	31.6
East: HPB											
1	L2	34	1.8	0.289	5.4	LOS A	2.0	50.4	0.30	0.14	34.9
6	T1	729	1.8	0.289	5.2	LOS A	2.0	51.1	0.30	0.14	35.0
16	R2	16	1.8	0.289	5.1	LOS A	2.0	51.1	0.29	0.13	34.1
Approach		779	1.8	0.289	5.2	LOS A	2.0	51.1	0.30	0.14	35.0
North: Cyrus											
7	L2	88	2.9	0.326	9.6	LOS A	1.4	35.3	0.63	0.64	32.0
4	T1	65	2.9	0.326	9.6	LOS A	1.4	35.3	0.63	0.64	31.8
14	R2	64	2.9	0.326	9.6	LOS A	1.4	35.3	0.63	0.64	31.0
Approach		217	2.9	0.326	9.6	LOS A	1.4	35.3	0.63	0.64	31.7
West: HPB											
5	L2	7	1.2	0.417	7.4	LOS A	3.0	76.9	0.51	0.33	34.1
2	T1	839	1.2	0.417	7.2	LOS A	3.1	78.5	0.50	0.33	34.1
12	R2	172	1.2	0.417	6.9	LOS A	3.1	78.5	0.49	0.31	33.1
Approach		1018	1.2	0.417	7.1	LOS A	3.1	78.5	0.50	0.32	33.9
All Vehicles		2180	1.6	0.417	6.9	LOS A	3.1	78.5	0.45	0.31	33.9

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Queues
3: Cyrus Wy & Harbour Pt Blvd SW

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	661	615	95	51
v/c Ratio	0.40	0.38	0.17	0.09
Control Delay	9.6	9.8	11.2	10.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	9.6	9.8	11.2	10.3
Queue Length 50th (ft)	66	63	16	8
Queue Length 95th (ft)	101	96	44	27
Internal Link Dist (ft)	677	808	428	438
Turn Bay Length (ft)				
Base Capacity (vph)	1666	1601	549	597
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.40	0.38	0.17	0.09

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	539	83	28	505	51	49	14	27	12	20	16
Future Volume (vph)	7	539	83	28	505	51	49	14	27	12	20	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frt		0.98			0.99			0.96			0.95	
Flt Protected		1.00			1.00			0.97			0.99	
Satd. Flow (prot)		3468			3484			1741			1757	
Flt Permitted		0.95			0.91			0.85			0.94	
Satd. Flow (perm)		3294			3179			1519			1676	
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)	7	567	87	29	532	54	52	15	28	13	21	17
RTOR Reduction (vph)	0	20	0	0	12	0	0	18	0	0	11	0
Lane Group Flow (vph)	0	641	0	0	603	0	0	77	0	0	40	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		30.0			30.0			21.0			21.0	
Effective Green, g (s)		30.0			30.0			21.0			21.0	
Actuated g/C Ratio		0.50			0.50			0.35			0.35	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1647			1589			531			586	
v/s Ratio Prot												
v/s Ratio Perm		c0.19			0.19			c0.05			0.02	
v/c Ratio		0.39			0.38			0.14			0.07	
Uniform Delay, d1		9.3			9.3			13.4			13.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.7			0.7			0.6			0.2	
Delay (s)		10.0			9.9			13.9			13.2	
Level of Service		B			A			B			B	
Approach Delay (s)		10.0			9.9			13.9			13.2	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	54.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Queues
3: Cyrus Wy & Harbour Pt Blvd SW

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	7	654	29	586	52	43	13	38
v/c Ratio	0.02	0.42	0.10	0.37	0.10	0.06	0.03	0.06
Control Delay	9.6	11.6	10.6	11.3	11.9	6.7	11.2	8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.6	11.6	10.6	11.3	11.9	6.7	11.2	8.0
Queue Length 50th (ft)	1	74	6	66	11	3	3	4
Queue Length 95th (ft)	7	111	19	100	30	19	12	19
Internal Link Dist (ft)		677		808		428		438
Turn Bay Length (ft)	300		300		100		100	
Base Capacity (vph)	323	1546	296	1579	534	676	494	643
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.42	0.10	0.37	0.10	0.06	0.03	0.06

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	539	83	28	505	51	49	14	27	12	20	16
Future Volume (vph)	7	539	83	28	505	51	49	14	27	12	20	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		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		1.00	1.00	
Frt	1.00	0.98		1.00	0.99		1.00	0.90		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	3392		1768	3483		1736	1648		1612	1583	
Flt Permitted	0.39	1.00		0.35	1.00		0.73	1.00		0.73	1.00	
Satd. Flow (perm)	719	3392		659	3483		1338	1648		1237	1583	
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)	7	567	87	29	532	54	52	15	28	13	21	17
RTOR Reduction (vph)	0	20	0	0	13	0	0	17	0	0	10	0
Lane Group Flow (vph)	7	634	0	29	573	0	52	26	0	13	28	0
Confl. Peds. (#/hr)	2		1	1		2						
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	4%	4%	4%	12%	12%	12%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	27.0	27.0		27.0	27.0		24.0	24.0		24.0	24.0	
Effective Green, g (s)	27.0	27.0		27.0	27.0		24.0	24.0		24.0	24.0	
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.40	0.40		0.40	0.40	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	323	1526		296	1567		535	659		494	633	
v/s Ratio Prot		c0.19			0.16			0.02			0.02	
v/s Ratio Perm	0.01			0.04			c0.04			0.01		
v/c Ratio	0.02	0.42		0.10	0.37		0.10	0.04		0.03	0.04	
Uniform Delay, d1	9.2	11.2		9.5	10.9		11.2	11.0		10.9	11.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.2		0.7	0.7		0.4	0.1		0.1	0.1	
Delay (s)	9.2	11.3		10.2	11.5		11.6	11.1		11.0	11.1	
Level of Service	A	B		B	B		B	B		B	B	
Approach Delay (s)		11.3			11.5			11.4			11.1	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	11.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	40.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	728	677	105	56
v/c Ratio	0.44	0.43	0.19	0.09
Control Delay	10.0	10.2	11.2	10.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	10.0	10.2	11.2	10.2
Queue Length 50th (ft)	76	72	18	9
Queue Length 95th (ft)	113	108	47	29
Internal Link Dist (ft)	677	808	428	438
Turn Bay Length (ft)				
Base Capacity (vph)	1664	1585	548	596
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.44	0.43	0.19	0.09

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	593	91	31	556	56	54	15	30	13	22	18
Future Volume (vph)	8	593	91	31	556	56	54	15	30	13	22	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frt		0.98			0.99			0.96			0.95	
Flt Protected		1.00			1.00			0.97			0.99	
Satd. Flow (prot)		3467			3484			1739			1755	
Flt Permitted		0.95			0.90			0.84			0.94	
Satd. Flow (perm)		3290			3147			1508			1671	
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)	8	624	96	33	585	59	57	16	32	14	23	19
RTOR Reduction (vph)	0	20	0	0	12	0	0	21	0	0	12	0
Lane Group Flow (vph)	0	708	0	0	665	0	0	84	0	0	44	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		30.0			30.0			21.0			21.0	
Effective Green, g (s)		30.0			30.0			21.0			21.0	
Actuated g/C Ratio		0.50			0.50			0.35			0.35	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1645			1573			527			584	
v/s Ratio Prot												
v/s Ratio Perm		c0.22			0.21			c0.06			0.03	
v/c Ratio		0.43			0.42			0.16			0.07	
Uniform Delay, d1		9.6			9.5			13.4			13.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.8			0.8			0.6			0.2	
Delay (s)		10.4			10.3			14.1			13.3	
Level of Service		B			B			B			B	
Approach Delay (s)		10.4			10.3			14.1			13.3	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	10.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Queues
3: Cyrus Wy & Harbour Pt Blvd SW

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	8	720	33	644	57	48	14	42
v/c Ratio	0.05	0.64	0.23	0.58	0.08	0.05	0.02	0.04
Control Delay	12.4	18.9	17.2	18.0	9.1	5.2	8.9	6.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.4	18.9	17.2	18.0	9.1	5.2	8.9	6.3
Queue Length 50th (ft)	2	109	9	97	9	2	2	4
Queue Length 95th (ft)	9	132	24	117	30	19	11	20
Internal Link Dist (ft)		677		808		428		438
Turn Bay Length (ft)	300		300		100		100	
Base Capacity (vph)	250	1580	208	1583	727	910	722	937
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.46	0.16	0.41	0.08	0.05	0.02	0.04

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	593	91	31	556	56	54	15	30	13	22	18
Future Volume (vph)	8	593	91	31	556	56	54	15	30	13	22	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.99		1.00	0.90		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3468		1770	3491		1770	1676		1770	1736	
Flt Permitted	0.30	1.00		0.25	1.00		0.73	1.00		0.73	1.00	
Satd. Flow (perm)	556	3468		463	3491		1359	1676		1352	1736	
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)	8	624	96	33	585	59	57	16	32	14	23	19
RTOR Reduction (vph)	0	25	0	0	16	0	0	15	0	0	9	0
Lane Group Flow (vph)	8	695	0	33	628	0	57	33	0	14	33	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	18.9	18.9		18.9	18.9		32.1	32.1		32.1	32.1	
Effective Green, g (s)	18.9	18.9		18.9	18.9		32.1	32.1		32.1	32.1	
Actuated g/C Ratio	0.31	0.31		0.31	0.31		0.54	0.54		0.54	0.54	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	175	1092		145	1099		727	896		723	928	
v/s Ratio Prot		c0.20			0.18			0.02			0.02	
v/s Ratio Perm	0.01			0.07			c0.04			0.01		
v/c Ratio	0.05	0.64		0.23	0.57		0.08	0.04		0.02	0.04	
Uniform Delay, d1	14.3	17.6		15.2	17.2		6.8	6.6		6.6	6.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	1.2		0.8	0.7		0.2	0.1		0.0	0.1	
Delay (s)	14.4	18.8		16.0	17.9		7.0	6.7		6.6	6.7	
Level of Service	B	B		B	B		A	A		A	A	
Approach Delay (s)		18.8			17.8			6.9			6.7	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	17.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Queues
3: Cyrus Wy & Harbour Pt Blvd SW

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	578	615	98	96
v/c Ratio	0.35	0.40	0.16	0.17
Control Delay	9.7	10.1	8.4	11.8
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	9.7	10.1	8.4	11.8
Queue Length 50th (ft)	59	64	11	18
Queue Length 95th (ft)	90	98	38	46
Internal Link Dist (ft)	677	808	428	438
Turn Bay Length (ft)				
Base Capacity (vph)	1644	1531	594	554
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.35	0.40	0.16	0.17

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	494	49	43	478	64	30	14	48	48	23	20
Future Volume (vph)	6	494	49	43	478	64	30	14	48	48	23	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frt		0.99			0.98			0.93			0.97	
Flt Protected		1.00			1.00			0.98			0.97	
Satd. Flow (prot)		3490			3469			1704			1761	
Flt Permitted		0.95			0.88			0.91			0.84	
Satd. Flow (perm)		3316			3080			1568			1512	
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)	6	520	52	45	503	67	32	15	51	51	24	21
RTOR Reduction (vph)	0	12	0	0	16	0	0	33	0	0	13	0
Lane Group Flow (vph)	0	566	0	0	599	0	0	65	0	0	83	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		29.5			29.5			21.5			21.5	
Effective Green, g (s)		29.5			29.5			21.5			21.5	
Actuated g/C Ratio		0.49			0.49			0.36			0.36	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1630			1514			561			541	
v/s Ratio Prot												
v/s Ratio Perm		0.17			c0.19			0.04			c0.05	
v/c Ratio		0.35			0.40			0.12			0.15	
Uniform Delay, d1		9.3			9.6			12.9			13.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.6			0.8			0.4			0.6	
Delay (s)		9.9			10.4			13.3			13.7	
Level of Service		A			B			B			B	
Approach Delay (s)		9.9			10.4			13.3			13.7	
Approach LOS		A			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	51.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Queues
3: Cyrus Wy & Harbour Pt Blvd SW

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	6	572	45	570	32	66	51	45
v/c Ratio	0.02	0.38	0.15	0.39	0.06	0.10	0.10	0.07
Control Delay	9.7	11.7	11.6	11.6	11.2	5.4	11.7	7.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.7	11.7	11.6	11.6	11.2	5.4	11.7	7.6
Queue Length 50th (ft)	1	66	9	64	7	3	11	5
Queue Length 95th (ft)	7	100	27	99	21	22	29	21
Internal Link Dist (ft)		677		808		428		438
Turn Bay Length (ft)	300		300		100		100	
Base Capacity (vph)	317	1506	310	1460	541	683	512	675
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.38	0.15	0.39	0.06	0.10	0.10	0.07

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	494	49	43	478	64	30	14	48	48	23	20
Future Volume (vph)	6	494	49	43	478	64	30	14	48	48	23	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.88		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1704	3385		1670	3268		1731	1599		1670	1625	
Flt Permitted	0.40	1.00		0.40	1.00		0.73	1.00		0.71	1.00	
Satd. Flow (perm)	720	3385		703	3268		1326	1599		1255	1625	
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)	6	520	52	45	503	67	32	15	51	51	24	21
RTOR Reduction (vph)	0	12	0	0	17	0	0	30	0	0	12	0
Lane Group Flow (vph)	6	560	0	45	553	0	32	36	0	51	33	0
Confl. Peds. (#/hr)	12		1	1		12	4		1	1		4
Heavy Vehicles (%)	5%	5%	5%	8%	8%	8%	4%	4%	4%	8%	8%	8%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	26.5	26.5		26.5	26.5		24.5	24.5		24.5	24.5	
Effective Green, g (s)	26.5	26.5		26.5	26.5		24.5	24.5		24.5	24.5	
Actuated g/C Ratio	0.44	0.44		0.44	0.44		0.41	0.41		0.41	0.41	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	318	1495		310	1443		541	652		512	663	
v/s Ratio Prot		0.17			c0.17			0.02			0.02	
v/s Ratio Perm	0.01			0.06			0.02			c0.04		
v/c Ratio	0.02	0.37		0.15	0.38		0.06	0.05		0.10	0.05	
Uniform Delay, d1	9.4	11.2		10.0	11.3		10.8	10.7		10.9	10.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.2		1.0	0.8		0.2	0.2		0.4	0.1	
Delay (s)	9.5	11.4		11.0	12.0		11.0	10.9		11.3	10.9	
Level of Service	A	B		B	B		B	B		B	B	
Approach Delay (s)		11.3			12.0			10.9			11.1	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	11.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Queues
3: Cyrus Wy & Harbour Pt Blvd SW

12/18/2015

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	636	677	107	105
v/c Ratio	0.47	0.55	0.16	0.17
Control Delay	11.0	18.6	5.8	8.0
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	11.0	18.6	5.8	8.0
Queue Length 50th (ft)	57	156	8	13
Queue Length 95th (ft)	92	m222	29	35
Internal Link Dist (ft)	677	808	428	438
Turn Bay Length (ft)				
Base Capacity (vph)	1339	1242	658	615
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.47	0.55	0.16	0.17

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	7	543	54	5	42	526	70	33	15	53	53	25
Future Volume (vph)	7	543	54	5	42	526	70	33	15	53	53	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5				4.5			4.5			4.5
Lane Util. Factor		0.95				0.95			1.00			1.00
Frt		0.99				0.98			0.93			0.97
Flt Protected		1.00				1.00			0.98			0.97
Satd. Flow (prot)		3490				3468			1703			1761
Flt Permitted		0.95				0.88			0.90			0.83
Satd. Flow (perm)		3308				3051			1563			1505
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)	7	572	57	5	44	554	74	35	16	56	56	26
RTOR Reduction (vph)	0	16	0	0	0	21	0	0	34	0	0	14
Lane Group Flow (vph)	0	620	0	0	0	656	0	0	73	0	0	91
Heavy Vehicles (%)	2%	2%	2%	5%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	NA			Perm	NA		Perm	NA		Perm	NA
Protected Phases		4				8			2			6
Permitted Phases	4				8			2			6	
Actuated Green, G (s)		18.0				18.0			18.0			18.0
Effective Green, g (s)		18.0				18.0			18.0			18.0
Actuated g/C Ratio		0.40				0.40			0.40			0.40
Clearance Time (s)		4.5				4.5			4.5			4.5
Vehicle Extension (s)		3.0				3.0			3.0			3.0
Lane Grp Cap (vph)		1323				1220			625			602
v/s Ratio Prot												
v/s Ratio Perm		0.19				c0.22			0.05			c0.06
v/c Ratio		0.47				0.54			0.12			0.15
Uniform Delay, d1		10.0				10.3			8.5			8.6
Progression Factor		1.00				1.75			1.00			1.00
Incremental Delay, d2		1.2				1.3			0.4			0.5
Delay (s)		11.2				19.3			8.9			9.2
Level of Service		B				B			A			A
Approach Delay (s)		11.2				19.3			8.9			9.2
Approach LOS		B				B			A			A

Intersection Summary			
HCM 2000 Control Delay	14.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	55.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	22
Future Volume (vph)	22
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.95
Adj. Flow (vph)	23
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Heavy Vehicles (%)	2%
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Queues
3: Cyrus Wy & Harbour Pt Blvd SW

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	7	629	49	638	35	72	56	49
v/c Ratio	0.04	0.56	0.24	0.57	0.05	0.09	0.09	0.06
Control Delay	9.3	13.7	20.7	20.7	8.1	4.1	8.2	5.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.3	13.7	20.7	20.7	8.1	4.1	8.2	5.7
Queue Length 50th (ft)	1	64	23	158	4	2	7	3
Queue Length 95th (ft)	6	88	m35	m205	18	19	25	18
Internal Link Dist (ft)		677		808		428		438
Turn Bay Length (ft)	300		300		100		100	
Base Capacity (vph)	250	1412	254	1414	655	826	641	851
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.45	0.19	0.45	0.05	0.09	0.09	0.06

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	7	543	54	5	42	536	70	33	15	53	53	25
Future Volume (vph)	7	543	54	5	42	536	70	33	15	53	53	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5		4.5	4.5		4.5	4.5
Lane Util. Factor	1.00	0.95			1.00	0.95		1.00	1.00		1.00	1.00
Frt	1.00	0.99			1.00	0.98		1.00	0.88		1.00	0.93
Flt Protected	0.95	1.00			0.95	1.00		0.95	1.00		0.95	1.00
Satd. Flow (prot)	1770	3491			1764	3478		1770	1645		1770	1732
Flt Permitted	0.34	1.00			0.34	1.00		0.73	1.00		0.71	1.00
Satd. Flow (perm)	625	3491			636	3478		1351	1645		1323	1732
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)	7	572	57	5	44	564	74	35	16	56	56	26
RTOR Reduction (vph)	0	19	0	0	0	26	0	0	29	0	0	12
Lane Group Flow (vph)	7	610	0	0	49	612	0	35	43	0	56	37
Heavy Vehicles (%)	2%	2%	2%	5%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	Perm	NA		Perm	NA		Perm	NA
Protected Phases		4				8			2			6
Permitted Phases	4			8	8			2			6	
Actuated Green, G (s)	14.2	14.2			14.2	14.2		21.8	21.8		21.8	21.8
Effective Green, g (s)	14.2	14.2			14.2	14.2		21.8	21.8		21.8	21.8
Actuated g/C Ratio	0.32	0.32			0.32	0.32		0.48	0.48		0.48	0.48
Clearance Time (s)	4.5	4.5			4.5	4.5		4.5	4.5		4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	197	1101			200	1097		654	796		640	839
v/s Ratio Prot		0.17				c0.18			0.03			0.02
v/s Ratio Perm	0.01				0.08			0.03			c0.04	
v/c Ratio	0.04	0.55			0.24	0.56		0.05	0.05		0.09	0.04
Uniform Delay, d1	10.7	12.8			11.4	12.8		6.1	6.1		6.2	6.1
Progression Factor	1.00	1.00			1.77	1.64		1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	0.6			0.5	0.5		0.2	0.1		0.3	0.1
Delay (s)	10.7	13.4			20.7	21.5		6.3	6.3		6.5	6.2
Level of Service	B	B			C	C		A	A		A	A
Approach Delay (s)		13.4				21.4			6.3			6.4
Approach LOS		B				C			A			A

Intersection Summary			
HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	22
Future Volume (vph)	22
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.95
Adj. Flow (vph)	23
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Heavy Vehicles (%)	2%
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Queues
3: Cyrus Wy & Harbour Pt Blvd SW

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	875	702	117	143
v/c Ratio	0.52	0.44	0.21	0.26
Control Delay	10.8	10.7	8.1	11.8
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	10.8	10.7	8.1	11.8
Queue Length 50th (ft)	96	78	12	26
Queue Length 95th (ft)	141	115	42	62
Internal Link Dist (ft)	677	808	428	438
Turn Bay Length (ft)				
Base Capacity (vph)	1671	1585	567	560
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.52	0.44	0.21	0.26

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	686	141	29	623	14	41	7	64	55	41	40
Future Volume (vph)	5	686	141	29	623	14	41	7	64	55	41	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frt		0.97			1.00			0.92			0.96	
Flt Protected		1.00			1.00			0.98			0.98	
Satd. Flow (prot)		3448			3520			1688			1753	
Flt Permitted		0.95			0.90			0.87			0.86	
Satd. Flow (perm)		3283			3163			1496			1530	
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)	5	722	148	31	656	15	43	7	67	58	43	42
RTOR Reduction (vph)	0	29	0	0	3	0	0	44	0	0	25	0
Lane Group Flow (vph)	0	847	0	0	700	0	0	73	0	0	118	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		30.0			30.0			21.0			21.0	
Effective Green, g (s)		30.0			30.0			21.0			21.0	
Actuated g/C Ratio		0.50			0.50			0.35			0.35	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1641			1581			523			535	
v/s Ratio Prot												
v/s Ratio Perm		c0.26			0.22			0.05			c0.08	
v/c Ratio		0.52			0.44			0.14			0.22	
Uniform Delay, d1		10.1			9.6			13.3			13.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.2			0.9			0.6			1.0	
Delay (s)		11.3			10.5			13.9			14.7	
Level of Service		B			B			B			B	
Approach Delay (s)		11.3			10.5			13.9			14.7	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	11.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Queues
3: Cyrus Wy & Harbour Pt Blvd SW

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	5	870	31	671	43	74	58	85
v/c Ratio	0.02	0.56	0.16	0.43	0.08	0.11	0.11	0.12
Control Delay	9.8	13.3	12.6	12.5	11.4	4.4	11.7	7.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.8	13.3	12.6	12.5	11.4	4.4	11.7	7.2
Queue Length 50th (ft)	1	108	6	82	9	1	12	9
Queue Length 95th (ft)	6	157	22	121	26	22	32	31
Internal Link Dist (ft)		677		808		428		438
Turn Bay Length (ft)	300		300		100		100	
Base Capacity (vph)	280	1558	197	1559	538	703	534	717
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.56	0.16	0.43	0.08	0.11	0.11	0.12

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	686	141	29	623	14	41	7	64	55	41	40
Future Volume (vph)	5	686	141	29	623	14	41	7	64	55	41	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.86		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1766	3467		1767	3523		1784	1626		1752	1696	
Flt Permitted	0.34	1.00		0.24	1.00		0.70	1.00		0.71	1.00	
Satd. Flow (perm)	635	3467		448	3523		1318	1626		1308	1696	
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)	5	722	148	31	656	15	43	7	67	58	43	42
RTOR Reduction (vph)	0	28	0	0	3	0	0	40	0	0	25	0
Lane Group Flow (vph)	5	842	0	31	668	0	43	34	0	58	60	0
Confl. Peds. (#/hr)	19		4	4		19	3					3
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	3%	3%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	26.5	26.5		26.5	26.5		24.5	24.5		24.5	24.5	
Effective Green, g (s)	26.5	26.5		26.5	26.5		24.5	24.5		24.5	24.5	
Actuated g/C Ratio	0.44	0.44		0.44	0.44		0.41	0.41		0.41	0.41	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	280	1531		197	1555		538	663		534	692	
v/s Ratio Prot		c0.24			0.19			0.02			0.04	
v/s Ratio Perm	0.01			0.07			0.03			c0.04		
v/c Ratio	0.02	0.55		0.16	0.43		0.08	0.05		0.11	0.09	
Uniform Delay, d1	9.4	12.4		10.1	11.5		10.9	10.7		11.0	10.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.4		1.7	0.9		0.3	0.1		0.4	0.2	
Delay (s)	9.5	12.8		11.7	12.4		11.1	10.9		11.4	11.1	
Level of Service	A	B		B	B		B	B		B	B	
Approach Delay (s)		12.7			12.4			11.0			11.2	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	12.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Queues
3: Cyrus Wy & Harbour Pt Blvd SW

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	963	771	129	157
v/c Ratio	0.51	0.44	0.26	0.33
Control Delay	9.9	21.2	10.4	17.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	9.9	21.2	10.4	17.1
Queue Length 50th (ft)	113	254	17	41
Queue Length 95th (ft)	158	m271	54	87
Internal Link Dist (ft)	677	808	428	438
Turn Bay Length (ft)				
Base Capacity (vph)	1878	1764	504	483
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.51	0.44	0.26	0.33

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	1	4	755	155	2	30	685	15	45	8	70	61
Future Volume (vph)	1	4	755	155	2	30	685	15	45	8	70	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.5				4.5			4.5		
Lane Util. Factor			0.95				0.95			1.00		
Frt			0.97				1.00			0.92		
Flt Protected			1.00				1.00			0.98		
Satd. Flow (prot)			3448				3520			1688		
Flt Permitted			0.95				0.89			0.86		
Satd. Flow (perm)			3284				3124			1475		
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)	1	4	795	163	2	32	721	16	47	8	74	64
RTOR Reduction (vph)	0	0	24	0	0	0	2	0	0	51	0	0
Lane Group Flow (vph)	0	0	939	0	0	0	769	0	0	78	0	0
Heavy Vehicles (%)	5%	2%	2%	2%	5%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	Perm	NA		Perm	Perm	NA		Perm	NA		Perm
Protected Phases			4				8			2		
Permitted Phases	4	4			8	8			2			6
Actuated Green, G (s)			39.5				39.5			21.5		
Effective Green, g (s)			39.5				39.5			21.5		
Actuated g/C Ratio			0.56				0.56			0.31		
Clearance Time (s)			4.5				4.5			4.5		
Vehicle Extension (s)			3.0				3.0			3.0		
Lane Grp Cap (vph)			1853				1762			453		
v/s Ratio Prot												
v/s Ratio Perm			c0.29				0.25			0.05		
v/c Ratio			0.51				0.44			0.17		
Uniform Delay, d1			9.3				8.8			17.7		
Progression Factor			1.00				2.37			1.00		
Incremental Delay, d2			1.0				0.3			0.8		
Delay (s)			10.3				21.2			18.6		
Level of Service			B				C			B		
Approach Delay (s)			10.3				21.2			18.6		
Approach LOS			B				C			B		

Intersection Summary			
HCM 2000 Control Delay	15.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations	⇕	
Traffic Volume (vph)	45	44
Future Volume (vph)	45	44
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.5	
Lane Util. Factor	1.00	
Frt	0.96	
Flt Protected	0.98	
Satd. Flow (prot)	1753	
Flt Permitted	0.84	
Satd. Flow (perm)	1504	
Peak-hour factor, PHF	0.95	0.95
Adj. Flow (vph)	47	46
RTOR Reduction (vph)	21	0
Lane Group Flow (vph)	136	0
Heavy Vehicles (%)	2%	2%
Turn Type	NA	
Protected Phases	6	
Permitted Phases		
Actuated Green, G (s)	21.5	
Effective Green, g (s)	21.5	
Actuated g/C Ratio	0.31	
Clearance Time (s)	4.5	
Vehicle Extension (s)	3.0	
Lane Grp Cap (vph)	461	
v/s Ratio Prot		
v/s Ratio Perm	c0.09	
v/c Ratio	0.29	
Uniform Delay, d1	18.5	
Progression Factor	1.00	
Incremental Delay, d2	1.6	
Delay (s)	20.1	
Level of Service	C	
Approach Delay (s)	20.1	
Approach LOS	C	

Intersection Summary

Queues
3: Cyrus Wy & Harbour Pt Blvd SW

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	6	958	34	737	47	82	64	93
v/c Ratio	0.03	0.72	0.21	0.56	0.09	0.11	0.11	0.12
Control Delay	8.8	14.5	12.6	12.6	9.0	3.7	9.2	5.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.8	14.5	12.6	12.6	9.0	3.7	9.2	5.7
Queue Length 50th (ft)	1	93	5	71	7	1	10	7
Queue Length 95th (ft)	6	144	21	110	22	19	27	27
Internal Link Dist (ft)		677		808		428		438
Turn Bay Length (ft)	300		300		100		100	
Base Capacity (vph)	223	1417	176	1415	551	726	557	759
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.68	0.19	0.52	0.09	0.11	0.11	0.12

Intersection Summary

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	1	5	755	155	2	30	685	15	45	8	70	61
Future Volume (vph)	1	5	755	155	2	30	685	15	45	8	70	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5			4.5	4.5		4.5	4.5		4.5
Lane Util. Factor		1.00	0.95			1.00	0.95		1.00	1.00		1.00
Frt		1.00	0.97			1.00	1.00		1.00	0.86		1.00
Flt Protected		0.95	1.00			0.95	1.00		0.95	1.00		0.95
Satd. Flow (prot)		1761	3449			1767	3528		1770	1611		1770
Flt Permitted		0.30	1.00			0.24	1.00		0.70	1.00		0.70
Satd. Flow (perm)		558	3449			440	3528		1298	1611		1311
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)	1	5	795	163	2	32	721	16	47	8	74	64
RTOR Reduction (vph)	0	0	40	0	0	0	4	0	0	43	0	0
Lane Group Flow (vph)	0	6	918	0	0	34	733	0	47	39	0	64
Heavy Vehicles (%)	5%	2%	2%	2%	5%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	Perm	NA		Perm	Perm	NA		Perm	NA		Perm
Protected Phases			4				8			2		
Permitted Phases	4	4			8	8			2			6
Actuated Green, G (s)		16.9	16.9			16.9	16.9		19.1	19.1		19.1
Effective Green, g (s)		16.9	16.9			16.9	16.9		19.1	19.1		19.1
Actuated g/C Ratio		0.38	0.38			0.38	0.38		0.42	0.42		0.42
Clearance Time (s)		4.5	4.5			4.5	4.5		4.5	4.5		4.5
Vehicle Extension (s)		3.0	3.0			3.0	3.0		3.0	3.0		3.0
Lane Grp Cap (vph)		209	1295			165	1324		550	683		556
v/s Ratio Prot			c0.27				0.21			0.02		
v/s Ratio Perm		0.01				0.08			0.04			c0.05
v/c Ratio		0.03	0.71			0.21	0.55		0.09	0.06		0.12
Uniform Delay, d1		8.9	12.0			9.5	11.1		7.7	7.6		7.8
Progression Factor		1.00	1.00			1.00	1.00		1.00	1.00		1.00
Incremental Delay, d2		0.1	1.8			0.6	0.5		0.3	0.2		0.4
Delay (s)		8.9	13.8			10.1	11.6		8.0	7.8		8.3
Level of Service		A	B			B	B		A	A		A
Approach Delay (s)			13.7				11.5			7.9		
Approach LOS			B				B			A		

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	45	44
Future Volume (vph)	45	44
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.5	
Lane Util. Factor	1.00	
Frt	0.93	
Flt Protected	1.00	
Satd. Flow (prot)	1725	
Flt Permitted	1.00	
Satd. Flow (perm)	1725	
Peak-hour factor, PHF	0.95	0.95
Adj. Flow (vph)	47	46
RTOR Reduction (vph)	26	0
Lane Group Flow (vph)	67	0
Heavy Vehicles (%)	2%	2%
Turn Type	NA	
Protected Phases	6	
Permitted Phases		
Actuated Green, G (s)	19.1	
Effective Green, g (s)	19.1	
Actuated g/C Ratio	0.42	
Clearance Time (s)	4.5	
Vehicle Extension (s)	3.0	
Lane Grp Cap (vph)	732	
v/s Ratio Prot	0.04	
v/s Ratio Perm		
v/c Ratio	0.09	
Uniform Delay, d1	7.8	
Progression Factor	1.00	
Incremental Delay, d2	0.2	
Delay (s)	8.0	
Level of Service	A	
Approach Delay (s)	8.1	
Approach LOS	A	

Intersection Summary