

TRAFFIC IMPACT STUDY

June 2021

Proposed Residential Development
Densmore Road,
Cobourg, Ontario

Prepared for
Marshall Homes



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June 23, 2021
Ms. Samantha Bateman
Project Manager
Marshall Homes
9-1295 Wharf Street
Pickering, ON L1W 1A2

Re: Proposed Townhomes Development, Densmore Road, Cobourg, ON – Traffic Impact Study

Dear Ms. Bateman,

TRANS-PLAN is pleased to submit this Traffic Impact Study in support of the proposed residential development on the northeast quadrant of the intersection of Densmore Road and Birchwood Trail in the Town of Cobourg, Northumberland County. The proposed residential development consists of 39 townhouse dwelling units and 84 stacked townhouse dwelling units. Two full-movement site accesses are provided along Densmore Road.

Our traffic impact study findings indicate that signal timing adjustments are recommended at the Densmore Road and Baltimore Road / Division Street intersection due to background developments. The study findings indicate that the surrounding road network can accommodate the traffic generated by the proposed development. The residential parcel is expected to have minimal impacts on the surrounding road network. No roadway improvements were found necessary. Details are provided herein.

Sincerely,



Anil Seegobin, P.Eng.
Partner, Engineer



Navneet Grewal
Transportation E.I.T.

Trans-Plan Transportation Inc.
Transportation Consultants

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Transmittal Letter

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1. INTRODUCTION

Trans-Plan has been retained by Marshall Homes to complete a Traffic Impact Study for a proposed residential development on the northeast quadrant of the intersection of Densmore Road and Birchwood Trail in the Town of Cobourg, Northumberland County. This Traffic Impact Study includes the following study components:

- A review and assessment of the existing road network
- An assessment of boundary roadway operations under future background conditions, including a review of traffic growth, area developments and planned roadway improvements in the study area
- An assessment of site-generated traffic impacts on the study area intersections under future background and total traffic conditions
- Recommendations to mitigate any identified traffic impacts on the boundary roadways, resulting from the proposed development.
- The determination of roadway and intersection improvements, as required, to accommodate the proposed development.

Prior to commencing this study, transportation and planning staff at the Town of Cobourg, Northumberland County and MTO were contacted and provided with our study terms of reference for their review.

2. STUDY AREA CONTEXT

The subject site, shown in Figure 1, is a vacant parcel of land located along the north side of Densmore Rd. It is located approximately 500m east of the Division Road / Baltimore Road and Densmore Road major intersection. The site is bounded by Highway 401 to the north and Densmore Road to the south.

The surrounding land use primarily consists of low-density residential dwellings, located west and southwest of the site. Adjacent west of the site is an Extendicare facility and located south of the site is St. Mary's Catholic Secondary School.

3. PROPOSED DEVELOPMENT

The site plan, prepared by 4 Architecture Inc, is shown in Figure 2. The proposed residential dwelling is located on the northeast quadrant of Densmore Road and Birchwood Trail and consists of two and three storey townhouse dwellings.

The development statistics are as follows:

- 39 townhouse dwelling units
- 84 stacked townhouse dwelling units
- Proposed parking supply of 194 spaces
- Two full-movement site accesses along Densmore Road

4. EXISTING CONDITIONS

4.1 Road Network

The study area roadways in the immediate vicinity of the site are described as follows:

Densmore Road is a collector road under the jurisdiction of the Town of Cobourg. It runs in an east-west direction and has two travel lanes: one in each direction. The posted speed limit is 50km/hr except between O'Conner Court and Birchwood Trail where the posted speed limit is 40 km/h.

Baltimore Road and Division Street are arterial roadways under the jurisdiction of the Town of Cobourg that run North and South. Both roadways have four travel lanes: two in each direction. The speed limit is not posted and is assumed to be 50km/h.

Otto Drive is a local roadway under the jurisdiction of the Town of Cobourg. This roadway run in a north-south direction and have two travel lanes: one in each direction. The speed limits are not posted and are assumed to be 50km/h.

Birchwood Trail is a local roadway under the jurisdiction of the Town of Cobourg. This roadway run in a north-south direction and have two travel lanes: one in each direction. The speed limits are not posted and are assumed to be 50km/h.

Parkview Hills Drive is a local roadway under the jurisdiction of the Town of Cobourg. This roadway run in a north-south direction and have two travel lanes: one in each direction. The speed limits are not posted and are assumed to be 50km/h.

O'Conner Court is a local roadway under the jurisdiction of the Town of Cobourg. This roadway run in a north-south direction and have two travel lanes: one in each direction. The speed limits are not posted and are assumed to be 50km/h.

4.2 Traffic Counts

Trans-Plan collected Turning Movement Counts (TMC) on May 18th, 2021. The TMC collected for this project were adjusted because of irregular traffic patters resulting from the COVID-19 pandemic. To adjust the data, Trans-Plan acquired TMC for the Densmore Rd and Division St intersection from Acc-Traffic. These counts were conducted on April 12,2016 and were used to rebalance 2021 TMC.

The traffic count sources, dates, times and peak hours are shown in Table 1. The detailed TMC data is provided in Appendix A.

Table 1 – Intersection Turning Movement Count Details

Intersection	Source	Count Date	Count Hours	Peak Hours
Densmore Road and Baltimore Road	Accu-Traffic	April 12, 2016	7:00am – 9:30am 3:30pm – 6:00pm	7:45am – 8:45am 3:45pm – 4:45pm
	Trans-Plan	May 18, 2021	7:00am – 9:00am 3:00pm – 6:30pm	7:45am – 8:45 am 4:00pm – 5:00 pm
Densmore Road and St. Mary C.S.S Access	Trans-Plan	May 18, 2021	7:00am – 9:00am 3:00pm – 6:30pm	7:30am – 8:30am 4:15pm – 5:15 pm
Densmore Road and Parkview Hills Drive	Trans-Plan	May 18, 2021	7:00am – 9:00am 3:00pm – 6:30pm	7:30am – 8:30am 4:15pm – 5:15 pm
Densmore Road and O’Conner Court	Trans-Plan	May 18, 2021	7:00am – 9:00am 3:00pm – 6:30pm	7:30am – 8:30am 4:15pm – 5:15 pm
HWY 401 Ramps and Baltimore Road	Trans-Plan	May 18, 2021	7:00am – 9:00am 3:00pm – 6:30pm	7:30am – 8:30am 4:15pm – 5:15 pm

4.3 Traffic Growth Adjustment Factor

As previously mentioned, 2016 TMC were obtained from Accu-Traffic for the intersection of Densmore Rd at Division/Baltimore Rd. The historical 2016 counts at this intersection were compared to the 2021 counts gathered by Trans-Plan to adjust for variations in traffic patterns due to the provincial lock down in response to the COVID-19 pandemic.

The 2016 and 2021 counts at the Densmore Rd and Division St/ Baltimore Rd intersection were compared to scale up the study area. The results of the comparison are presented in Table 2.

Table 2 – Traffic Growth Adjustment Factor, 2016 to 2021, Densmore Rd and Division St/ Baltimore Rd

Time Period	Total Volumes, All Approaches (vehicles)		Traffic Growth Adjustment Factor
	Year 2016	Year 2021	
Weekday AM Peak Hour	1,772	1,203	2016 counts are 32% higher
Weekday PM Peak Hour	1,782	1,641	2016 counts are 8% higher

To obtain the existing (2020) traffic volumes, adjustment factors of +32% and +8% were applied to the 2021 AM and PM counts, respectively. Effectively, this scaled up 2021 counts to the 2016 count. Then an annual growth rate of 2% for 5 years was applied to the adjusted data to grow the counts to present day. The 2% annual growth rate was applied for all horizon years (2026 and 2031) throughout the study area.

The existing roadway characteristics of the study area are shown in Figure 3. Existing (2021) traffic volumes, for the weekday AM and PM peak hours are shown in Figure 4, these volumes were adjusted and balanced as needed for corridor volume consistency.

4.4 Signal Timing Plans

The signal timing plan for the Densmore Road and Baltimore Road / Division Street intersection was obtained from the Town of Cobourg. The signal timing plans for the Highway 401 WB OFF ramp and Baltimore Road were obtained from the Ministry of Transportation Ontario.

4.5 Peak Hour Factors

Peak hour factors were calculated using the 2021 traffic counts collected by Trans-Plan. Peak Hour Factors used for the analysis are presented in Table 3.

Table 3 – Peak Hour Factors

Intersection	Peak Hour Factor	
	AM	PM
Densmore Road and Baltimore Road	0.83	0.98
Densmore Road and St. Mary C.S.S Access	0.82	0.88
Densmore Road and Parkview Hills Drive	0.81	0.90
O.Densmore Road and O'Conner Court	0.77	0.82
HWY 401 WB Off Ramp and Baltimore Road	0.92	0.95
HWY 401 WB On Ramp and Baltimore Road	0.91	0.93
HWY 401 EB Off & On Ramp and Baltimore Road	0.89	0.98

4.6 Cyclist and Pedestrian Network

From Baltimore Road to Birchwood Trail, sidewalks exist along the north side of Densmore Road. East of Birchwood Trail to the east project limit, the sidewalk is on the south side of Densmore Road. Sidewalks exist along the east side of Division Street/ Baltimore Road south of the Densmore Road and Baltimore Road intersection. All pedestrian facilities are terminated north of this intersection. Delineated crosswalks for pedestrians exist along all approaches of the Densmore Road and Baltimore Road/Division Street intersection. There are no bike lanes within the project study area.

5. FUTURE BACKGROUND CONDITIONS

Future background traffic volumes were determined based on a review of planned developments and future traffic volume growth in the study area. Planned roadway improvements are also reviewed in this section.

5.1 Horizon Years

As per the MTO Guidelines for Traffic Impact Study, the horizon years used for our analysis are described as follows:

- Existing (2021) traffic conditions
- Future five-year (2026) traffic conditions
- Future ten-year (2031) traffic conditions

5.2 Background Growth Rate

A conservative annual growth rate of 2% was applied throughout the study area. The growth rate was compounded annually for future condition analysis.

5.3 Background Developments

The Town of Cobourg was consulted for nearby development applications. While developments were mentioned, no development statistics regarding density and the number of dwelling units were provided or available online. Development data for the Villages of Central Park, located east of the site at Danforth Road and Greer Road was incorporated into this study. Table 4 provides details regarding this development. The background development details, and trip generation / distribution are provided in Appendix B.

Table 4 – Background Developments, Nearby the Study Area

No.	Location / Description	Land Use	Development Size	Build-out Status*
1	Danforth Rd and Greer Rd	Residential	1500 – 1700 units	Unknown – multiple phases

The Villages of Central Park is a purposed development that will be completed in multiple phases. Based on Staff Report prepared on February 16, 2021, by the Corporation of the Town of Cobourg, titled “Villages of Central Park – Rondeau (Cobourg East Community) Authorization of a Tree Removal Agreement”, the phased development will consist of 1500-1700 dwelling units that will consist of single family detached homes and medium/high density residential buildings.

Exact development statistics are currently unknown; therefore, a conservative assumption was made, and trips were generated assuming the development will have 1600 single family detached homes. This assumption would also generate enough trips to provide a tolerance for the other unknown developments in the study area.

5.4 Roadway Improvements

Based on correspondence with the Town of Cobourg, no roadway improvements are proposed within the study area.

Future background traffic volumes for the 2026 and 2031 horizon years for the weekday AM and PM peak hours are respectively shown in Figure 5 and Figure 6, respectively.

6. SITE TRAFFIC

6.1 Trip Generation

The site trips for the proposed development were generated using the Institute of Transportation Engineers (“ITE”) Trip Generation manuals, 10th Edition. The site trip generation using the applicable ITE Land Use Codes (“LUC”) are shown in Table 5.

Table 5 – Site Trip Generation

Land Use	Size	Weekday AM Peak Hour			Weekday PM Peak Hour		
		In	Out	Total	In	Out	Total
Multifamily Housing (Low-Rise) LUC 220	20 units						
	Distribution Equation	23%	77%	100%	63%	37%	100%
	Rate	0.12	0.37	0.50	0.44	0.26	0.70
	Trips	2	8	10	9	5	14
Multifamily Housing (Mid-Rise) LUC 221)	103 units						
	Distribution Equation	26%	74%	100%	61%	39%	100%
	Rate	0.09	0.25	0.34	0.27	0.10	0.45
	Trips	9	26	35	28	18	46
	Total Trips	11	34	45	37	23	60

The proposed development is expected to generate approximately 45 and 60 two-way trips in the weekday AM and PM peak hours.

6.2 Trip Distribution and Assignment

Residential trips were distributed along Densmore Road using existing travel patterns. The directional split on Densmore road is 40 percent eastbound and 60 percent westbound during both the AM and PM peak periods. The site trip assignments for the weekday AM and PM peak hours, are shown in Figure 7

7. FUTURE TOTAL CONDITIONS

Site traffic volumes were added to the future background traffic volumes to obtain future total traffic volumes for the peak hours. The future total traffic volumes for the 2026 and 2031 horizon year, for the weekday AM and PM peak hours, is shown in Figure 8 and Figure 9, respectively.

7.1 Capacity Analysis and Queuing Analysis

A capacity analysis was performed for the study area intersections using Synchro analysis software. The results of the weekday AM and PM peak hour capacity results for the 2026 and 2031 horizon years are respectively shown in Table 6 and Table 7. Queuing results for the future site accesses during the future total conditions are provided in Table 8. The Synchro 10 output sheets and level of service (“LOS”) definitions are provided in Appendix C and Appendix D.

Capacity Analysis Thresholds:

Signalized intersections that operate at an overall volume-to-capacity (v/c) ratio of 0.90 and individual movements operating at a v/c ratio of 1.0 is typically considered critical and have been identified. For unsignalized intersections, individual movements operating at a LOS of E or above have been identified. The results of the capacity analysis are summarized in this section for each intersection:

Baltimore Rd & HWY 401 EB Off Ramps

Existing Conditions

The eastbound and westbound movements currently operate with a LOS of D during both the AM and PM peak periods. Eastbound vehicles experience delays of up to 40 seconds and 36 seconds during the AM and PM peak period, respectively. Westbound vehicles experience delays of up to 44 seconds during the AM peak period and 36 seconds during the PM peak period. All other movements operate with a LOS of B with delays less than 20 seconds.

Future Conditions – Horizon Year 2026

The eastbound and westbound movements are expected to operate with a LOS of D during both the AM and PM peak periods. Northbound and southbound movements are expected to operate with a LOS of B and C, respectively during the AM peak period. During the PM peak period, both the northbound and southbound movements are expected to operate at a LOS of B.

Future Conditions – Horizon Year 2031

The eastbound and westbound movements are expected to operate with a LOS of D during both the AM and PM peak periods. During the AM peak period, northbound movements are expected to operate with a LOS of B and southbound movements are expected to operate with a LOS of B. During the PM peak period, the northbound left movement is expected to operate at a LOS of C.

Division Street / Baltimore Road & Densmore Road

Existing Conditions

The southbound through and right movements currently operate at of LOS of E and D during the AM and PM peak periods, respectively. The delay for this movement is approximately 75 seconds during the AM peak period and 35 seconds during the PM peak period. The northbound through and right movements operate at a LOS of D during both peak periods.

Signal Timing Plan Improvements

To support future growth, the signal timing plan is optimized. During the weekday AM peak hour, the northbound left and southbound left phases were decreased from 14 seconds to 10 seconds. The northbound and southbound through phase was increased from 42 seconds to 49 seconds. Eastbound and westbound left turning phases were decreased from 14 seconds to 11 seconds. Splits were changed accordingly while maintaining cycle length.

During the weekday PM peak hour, the north and southbound left turn phases were increased from 14 seconds to 18 seconds. The east and westbound left phases were decreased from 14 seconds to 10 seconds. Splits were changed accordingly while maintaining cycle length.

Future Conditions – Horizon Year 2026

Southbound movements are expected to operate at a LOS of D during the AM peak period while all other movements are expected to operate at an LOS of C. During the PM peak period, the northbound right / through and southbound left movement are expected to operate at a LOS of F. Delays for the northbound

right and through movements is expected to be approximately 145 seconds whereas the delay for the southbound left movement is expected to be approximately 92 seconds.

Future Conditions – Horizon Year 2031

Southbound movements are anticipated to have a LOS of D in the AM peak period with delays up to 53 seconds. During the PM peak period, both the northbound through / right and southbound left movements are expected to have LOS of F. Delays for the northbound through / right movement are expected to be 247 seconds and delays for the southbound left movement are expected 123 seconds.

Densmore Road & St. Mary's Catholic Secondary School / West site access

Existing Conditions

All approaches currently operate at a LOS of A during both peak periods.

Future Conditions – Horizon Year 2026

Southbound movements are expected to operate at a LOS of C and D during the AM and PM peak periods, respectively.

Future Conditions – Horizon Year 2031

The northbound left movement and southbound through movement are expected to operate at an LOS of D.

Queuing Analysis

Under total 2026 AM peak hour conditions, the southbound 95th percentile queue are expected to be 7m. These queues are well contained within the storage length of the west site access. Under total 2026 PM peak hour conditions, the southbound queues are expected to reach 6m.

Under total 2031 AM peak hour conditions, the 95th percentile westbound queue is expected to reach 6m. The southbound queue is expected to reach 8m. During the PM peak period under 2031 conditions, the southbound 95th percentile queue is expected to reach 10 m.

Densmore Road & Park Hills Drive

Existing Conditions

Northbound movements currently operate at an LOS of B during the AM and PM peak periods while eastbound and westbound approaches operate at a LOS of A.

Future Conditions – Horizon Year 2026

The northbound movements are expected to operate at an LOS of C with delays up to 22 seconds.

Future Conditions – Horizon Year 2031

The northbound movements are expected to operate at an LOS of C and D during the AM and PM peak periods, respectively. Delays are expected to extend up to 22 seconds during the AM peak period and 27 seconds during the PM peak period.

Densmore Road & O'Conner Court/East Site Access

Existing Conditions

Northbound movements currently operate at an LOS of B during the AM and PM peak periods while all other approaches operate at a LOS of A.

Future Conditions – Horizon Year 2026

The northbound and south movements are expected to operate at an LOS of C during the AM and PM peak period.

Future Conditions – Horizon Year 2031

The northbound and south movements are expected to operate at an LOS of C during the AM peak period. Southbound movements are expected to continue operating at a LOS of C during the PM peak period whereas the northbound movements are expected to operate at a LOS of D with delays extending upwards to 29 seconds.

Queuing Analysis

Under total 2026 AM peak hour conditions, the southbound 95th percentile queue is expected to be 11m which is well contained within the storage length of the east site access. Under total 2026 PM peak hour conditions the southbound 95th percentile queue is expected to reach 7m.

Under total 2031 AM and PM peak hour conditions, the 95th percentile southbound queue is expected to reach 11m and 8m, respectively. Overall, the intersections in the study area are mostly operating acceptably. Signal timing adjustments are recommended the intersection of Division Street / Baltimore Road and Densmore Road in the future. It is expected to experience some delay during the weekday PM peak hour. The delays are mainly attributed to the estimates background traffic growth along the roadway. The proposed site accesses on Stanley Avenue and Livingstone Street are all operating acceptably in the future.

Table 6 – 2026 Capacity Analysis Results

Intersection Movement	Existing 2021 Traffic			Total 2021 Traffic			BKGD 2026 Traffic Conditions			Total 2026 Traffic Conditions		
	AM Peak		LOS	PM Peak		LOS	AM Peak		LOS	AM Peak		LOS
	V/C	Delay		V/C	Delay		V/C	Delay		V/C	Delay	
Baltimore Rd & Division St /HWY 401 WB Off Ramp	0.54	23	C	0.46	15	B	0.59	24	C	0.71	29	C
Eastbound Through / Left / Right	0.02	40	D	0.03	36	D	0.02	41	D	0.03	44	D
Westbound Through / Left / Right	0.79	44	D	0.56	36	D	0.80	44	D	0.83	45	D
Northbound Left	0.05	13	B	0.11	9	A	0.07	14	B	0.13	19	B
Northbound Through	0.22	14	B	0.46	13	B	0.28	16	B	0.36	20	B
Southbound Through / Right	0.49	19	B	0.31	14	B	0.55	21	C	0.73	29	C
Division Street/Baltimore Rd & Veronica St/Densmore Rd	0.54	53	D	0.50	42	D	0.60	31	C	0.73	41	D
Eastbound Left	0.03	20	B	0.08	20	C	0.03	22	C	0.04	22	C
Eastbound Through / Right	0.01	26	C	0.03	26	C	0.04	26	C	0.04	26	C
Westbound Left	0.18	21	C	0.16	21	C	0.42	27	C	0.48	28	C
Westbound Through / Right	0.09	27	C	0.07	27	C	0.19	28	C	0.23	29	C
Northbound Left	0.16	26	C	0.06	21	C	0.19	23	C	0.26	28	C
Northbound Through / Right	0.63	35	D	0.94	53	D	0.51	28	C	0.62	30	C
Southbound Left	0.39	25	C	0.51	33	C	0.55	28	C	0.79	48	D
Southbound Through / Right	1.03	75	E	0.63	35	D	0.80	36	D	0.97	53	D
St Mary's S.S./West Site Access & Densmore Rd												
Eastbound Through / Left / Right	0	0	A	0	0	A	0	0	A	0	0	A
Westbound Through / Left / Right	0	0	A	0	0	A	0	0	A	0	0	A
Northbound Left	0	0	A	0	0	A	0	0	A	0	0	A
Northbound Right	9	9	A	0	0	A	10	10	B	11	11	B
Southbound Through	0	0	A	0	0	A	0	0	A	23	23	C
Parkview Hills Drive & Densmore Rd												
Eastbound Through / Right	0	0	A	0	0	A	0	0	A	0	0	A
Westbound Through / Left	0	0	A	0	0	A	1	1	A	1	1	A
Northbound Left / Right	11	11	B	11	11	B	18	18	C	22	22	C
O'Conner Crt/East Site Access & Densmore Rd												
Eastbound Through / Left / Right	0	0	A	0	0	A	0	0	A	0	0	A
Westbound Through / Left / Right	0	0	A	0	0	A	0	0	A	0	0	A
Northbound Through / Left / Right	11	11	B	11	11	B	16	16	C	19	19	C
Southbound Through / Left / Right	0	0	A	0	0	A	0	0	A	16	16	C

Table 7 – 2031 Capacity Analysis Results

Intersection Movement		Existing 2021 Traffic			Total 2021 Traffic			BKGD 2031 Traffic Conditions						Total 2031 Traffic Conditions						
		AM Peak			PM Peak			AM Peak			PM Peak			AM Peak			PM Peak			
		V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	
Baltimore Rd & Division St /HWY 401 WB Off Ramp		0.54	23	C	0.46	15	B	0.71	29	C	0.66	23	C	0.71	29	C	0.67	24	C	
		0.02	40	D	0.03	36	D	0.03	44	D	0.04	37	D	0.03	44	D	0.04	37	D	
		0.79	44	D	0.56	36	D	0.83	44	D	0.74	43	D	0.83	45	D	0.74	43	D	
		0.05	13	B	0.11	9	A	0.13	19	B	0.20	13	B	0.13	19	B	0.20	13	B	
		0.22	14	B	0.46	13	B	0.36	20	B	0.71	21	C	0.36	20	B	0.73	21	C	
		0.49	19	B	0.31	14	B	0.73	28	C	0.53	21	C	0.73	29	C	0.54	21	C	
Division Street/Baltimore Rd & Veronica St/Densmore Rd		0.54	53	D	0.50	42	D	0.72	41	D	0.93	139	F	0.73	41	D	0.95	141	F	
		0.03	20	B	0.08	20	C	0.04	22	C	0.15	24	C	0.04	22	C	0.16	24	C	
		0.01	26	C	0.03	26	C	0.04	26	C	0.04	26	C	0.04	26	C	0.04	26	C	
		0.18	21	C	0.16	21	C	0.46	28	C	0.44	28	C	0.48	28	C	0.46	29	C	
		0.09	27	C	0.07	27	C	0.22	29	C	0.16	28	C	0.23	29	C	0.19	28	C	
		0.16	26	C	0.06	21	C	0.26	28	C	0.09	21	C	0.26	28	C	0.09	21	C	
		0.63	35	D	0.94	53	D	0.62	30	C	1.44	243	F	0.62	30	C	1.45	247	F	
		0.39	25	C	0.51	33	C	0.77	46	D	1.08	110	F	0.79	48	D	1.12	123	F	
St Mary's S.S/West Site Access & Densmore Rd		1.03	75	E	0.63	35	D	0.97	53	D	0.86	44	D	0.97	53	D	0.86	44	D	
			0	A		0	A		0	A		0	A		0	A		0	A	
			0	A		0	A		0	A		0	A		0	A		0	A	
			0	A		0	A		0	A		27	D		0	A		32	D	
Parkview Hills Drive & Densmore Rd			9	A		0	A		11	B		13	B		11	B		13	B	
			0	A		0	A		0	A		0	A		23	C		32	D	
Eastbound Through / Right Westbound Through / Left Northbound Left / Right			0	A		0	A		0	A		0	A		0	A		0	A	
			0	A		0	A		1	A		0	A		1	A		0	A	
			11	B		11	B		21	C		25	C		22	C		27	D	
O'Conner Crt/East Site Access & Densmore Rd																				
			0	A		0	A		0	A		0	A		0	A		0	A	
			0	A		0	A		0	A		0	A		0	A		0	A	
			11	B		11	B		18	C		25	C		19	C		29	D	
			0	A		0	A		0	A		0	A		16	C		18	C	

Table 8 – Queuing Analysis Results

Intersection Movement	Available Storage (m)	95th Percentile Vehicle Queues (m)			
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
St Mary's S.S/West Site Access & Densmore Rd					
Westbound Left	75	0	0	6	0
Southbound Left/ Right*	33	7	6	8	10
O'Conner Crt/East Site Access & Densmore Rd					
Westbound Left	100	0	0	0	0
Southbound Left/ Right*	30	11	7	11	8

Note: (*) Approximate distance to nearest internal point of conflict within the development.

8. SUMMARY AND CONCLUSIONS

8.1 Summary

This Traffic Impact Study (Update), prepared in support of the proposed residential development at Densmore Road, Cobourg, is summarized as follows:

Proposed Development & Site Statistics

The proposed residential development is located on the northeast quadrant of Densmore Road and Birchwood Trail and will consist of two and three storey townhouse dwellings. The residential development will include 39 townhouse dwelling units, 84 stacked townhouse dwellings, a proposed parking supply of 194 spaces and two full-movement site accesses along Densmore Road.

Traffic Impact Study

- Historical Turning Movement Count (TMC) data was purchased from Accu-Traffic for AM and PM peak hour volumes at the intersection of Densmore Road and Baltimore Road / Division Street.
- Current (2021) Turning Movement Counts were collected by Trans-Plan on May 18th, 2021.
- Historic data at the Densmore Road and Baltimore Road / Division Street intersection was used to factor and scale current (2021) traffic and adjust for irregular traffic patterns as a result of COVID-19 restrictions. A +32 percent adjustment was applied to current (2021) weekday AM peak period counts and a +8 percent adjustment was applied to current (2021) PM peak period counts.
- A growth rate of 2% per annum was applied to all intersections within the study area.
- One (1) notable background development was found nearby the study area, based on review of the Town of Cobourg website. The estimated trips generated by the developments were included into our analysis of future conditions.
- The site trips were generated utilizing the formulas in the ITE Trip Generation manuals, 10th Edition. The trips were distributed to the surrounding road network based on existing travel patterns, with consideration of nearby traffic signals, etc.

- The site trips were generated utilizing the formulas in the ITE Trip Generation manuals, 10th Edition. The trips were distributed to the surrounding road network based on existing travel patterns, with consideration of nearby traffic signals, etc.
- The intersections in the study area are mostly operating acceptably. Signal timing adjustments are recommended at the intersection of Division Street / Baltimore Road and Densmore Road in the future. It is expected to experience some delay during the weekday PM peak hour.
- The proposed residential dwellings are expected to have minimal traffic impacts on the surrounding road network. Impacts on the site area intersections are primarily a result of the background development that generates a substantial number of trips. The proposed site accesses on Densmore Road are all operating acceptably in the future.

8.2 Conclusions

Overall, the surrounding road network can operate acceptably under future traffic conditions, except for the Densmore Road and Baltimore Road / Division Street intersection which experiences delays under future traffic conditions due to background growth.

The proposed residential development is expected to have minimal impacts on the surrounding road network. Signal timing adjustments are recommended at the Densmore Road and Baltimore Road / Division Street intersection to accommodate future traffic growth. No roadway improvements were found necessary to accommodate the future site traffic.

Respectfully submitted,



Anil Seegobin, P.Eng.
Partner, Engineer



Navneet Grewal
Transportation E.I.T.

Trans-Plan Transportation Inc.
Transportation Consultants

Figure 1 – Site Location



Source: Google Earth

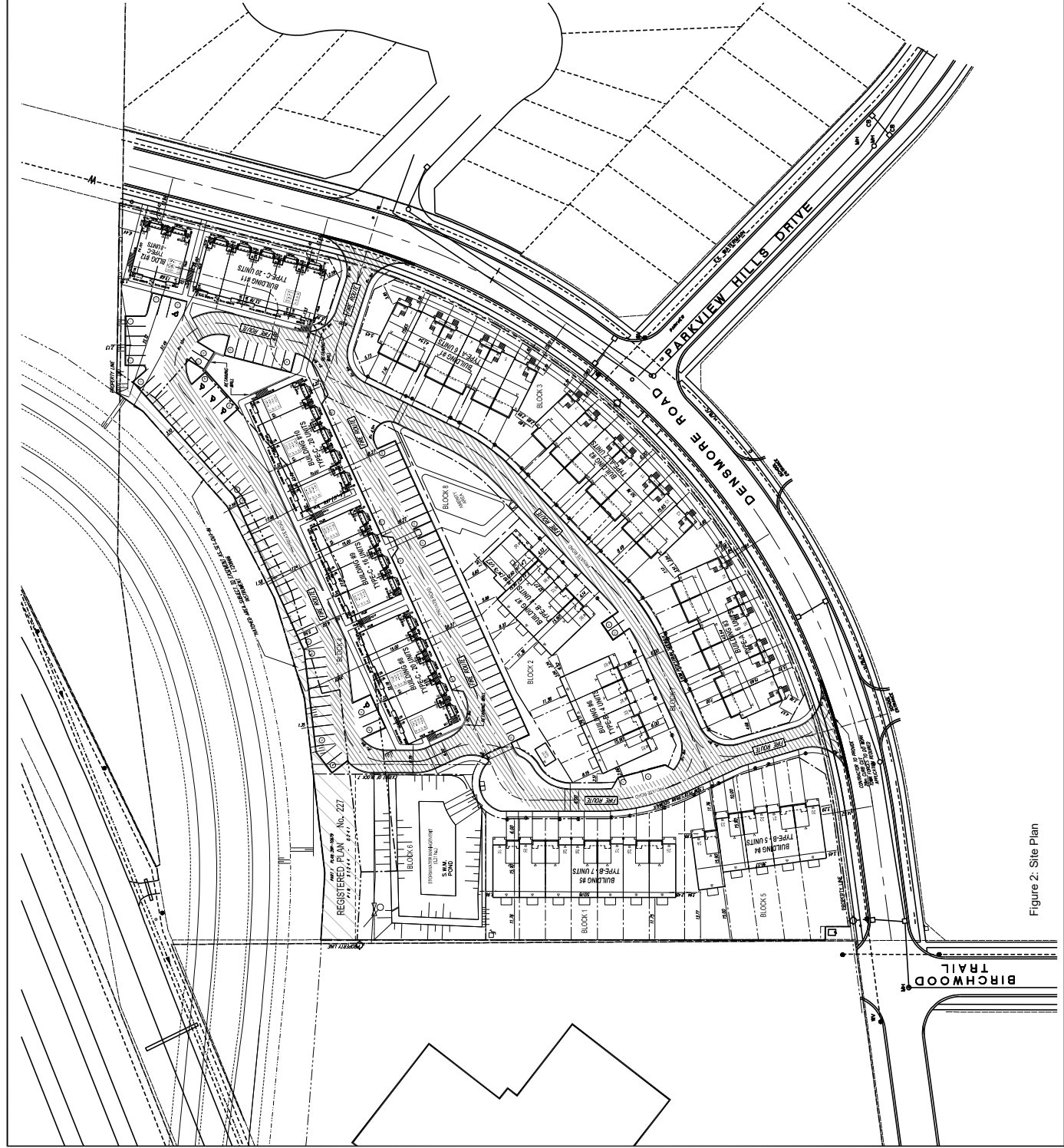
[illegible]

Figure 3: Existing Study Area Roadway Characteristics

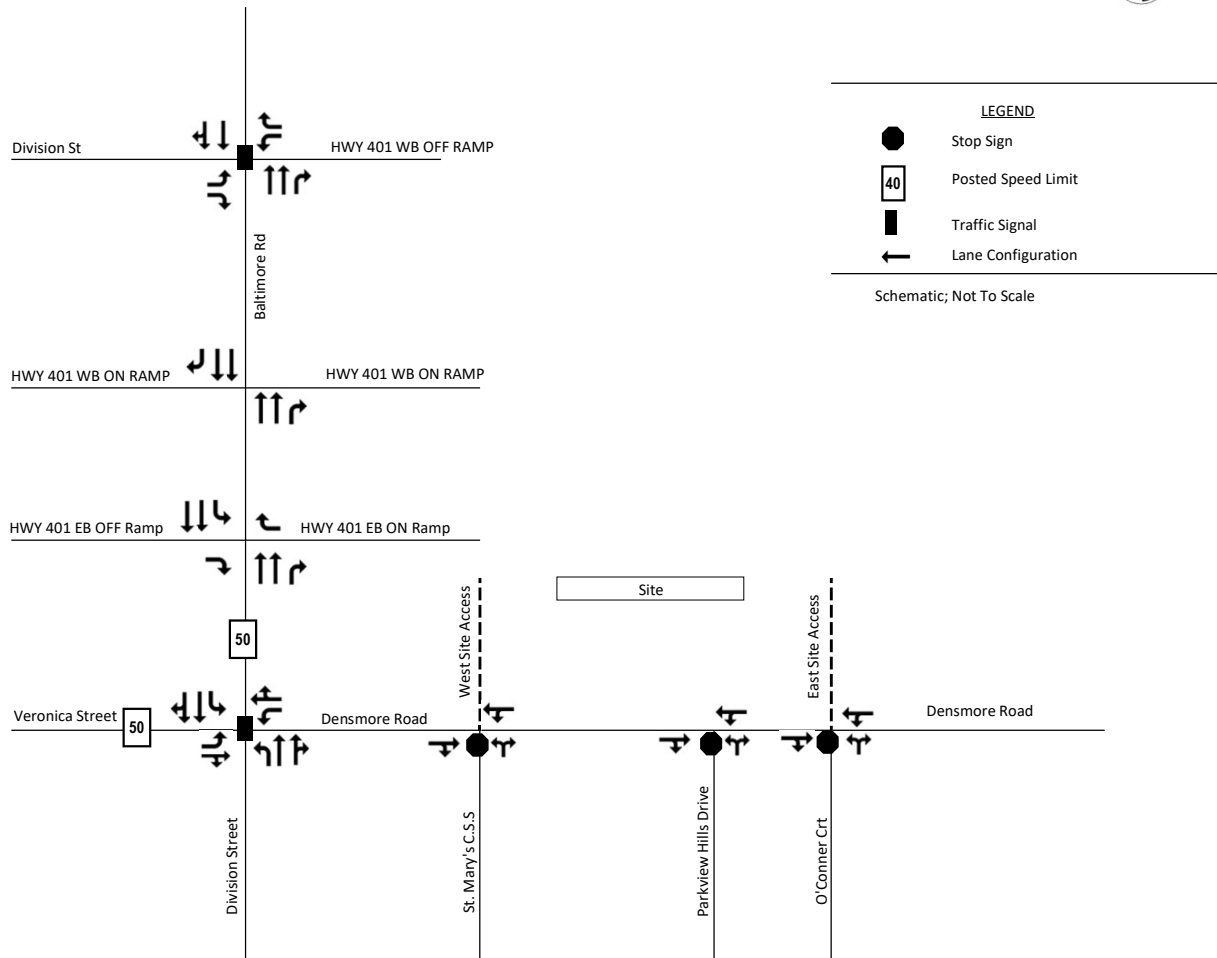


Figure 4: 2021 Existing Traffic Volumes, Weekday AM and PM Peak Hours

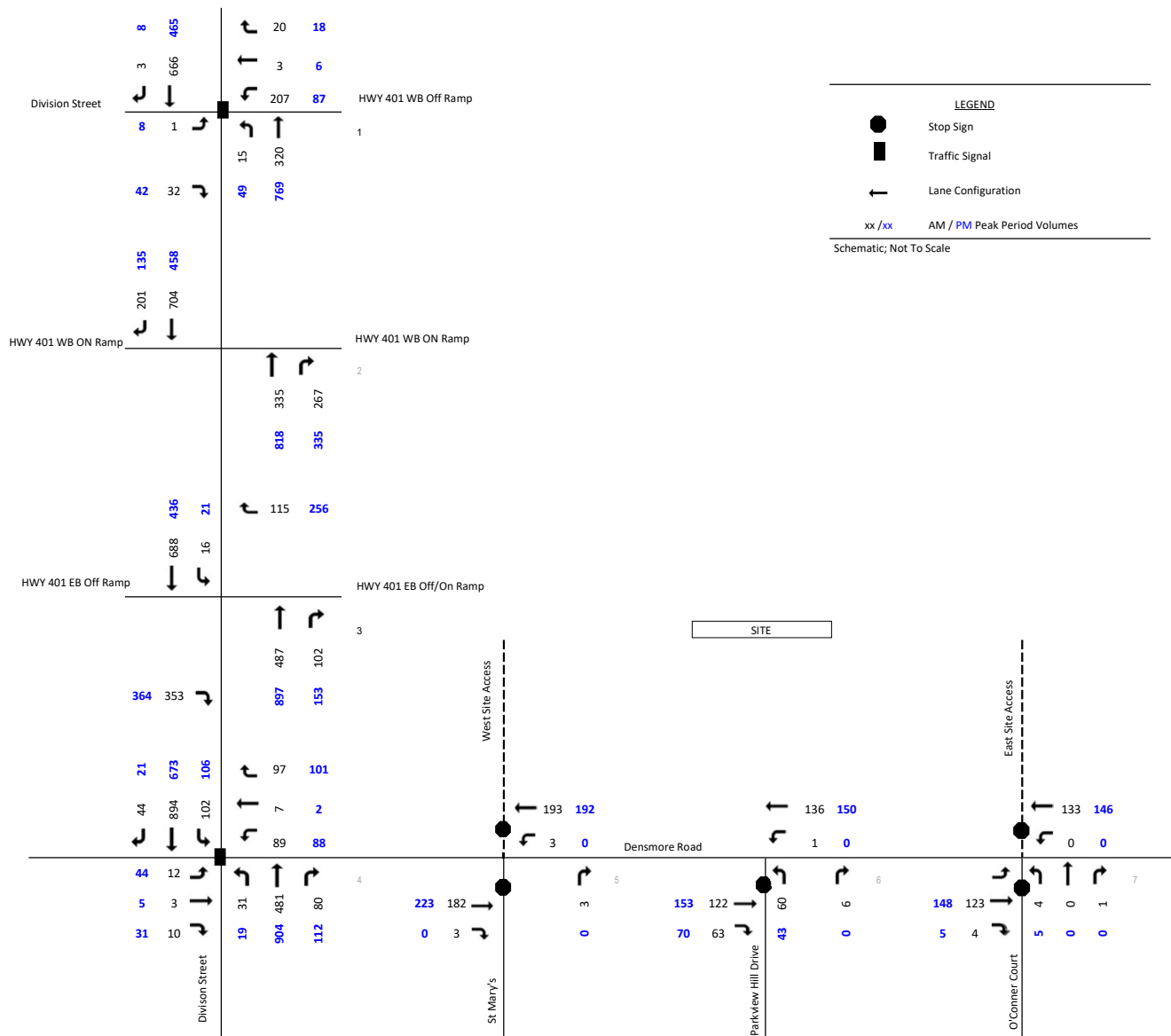


Figure 5: 2026 Background Volumes, Weekday AM and PM Peak Hours

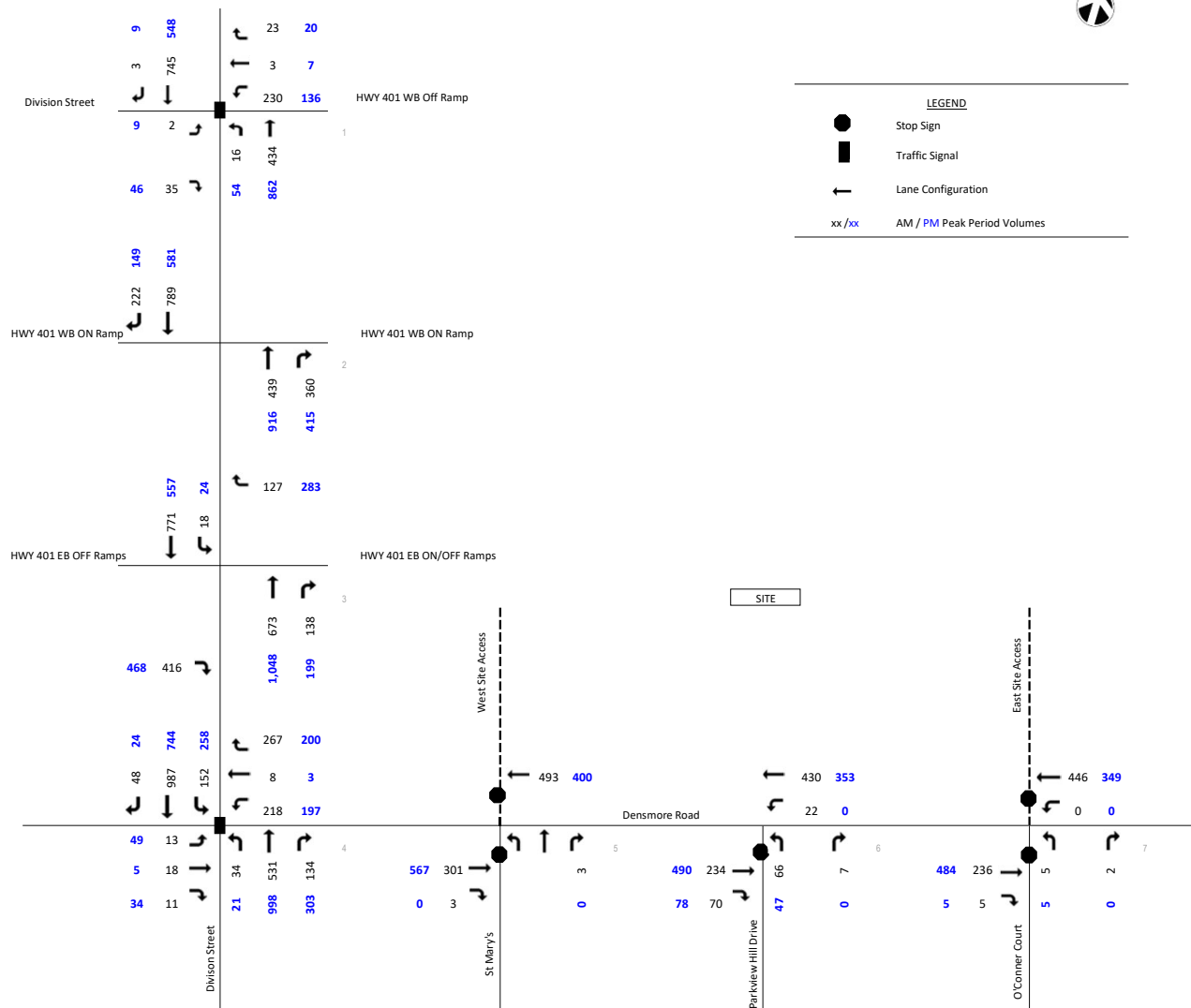


Figure 6: 2031 Background Traffic Volumes, Weekday AM and PM Peak Hours

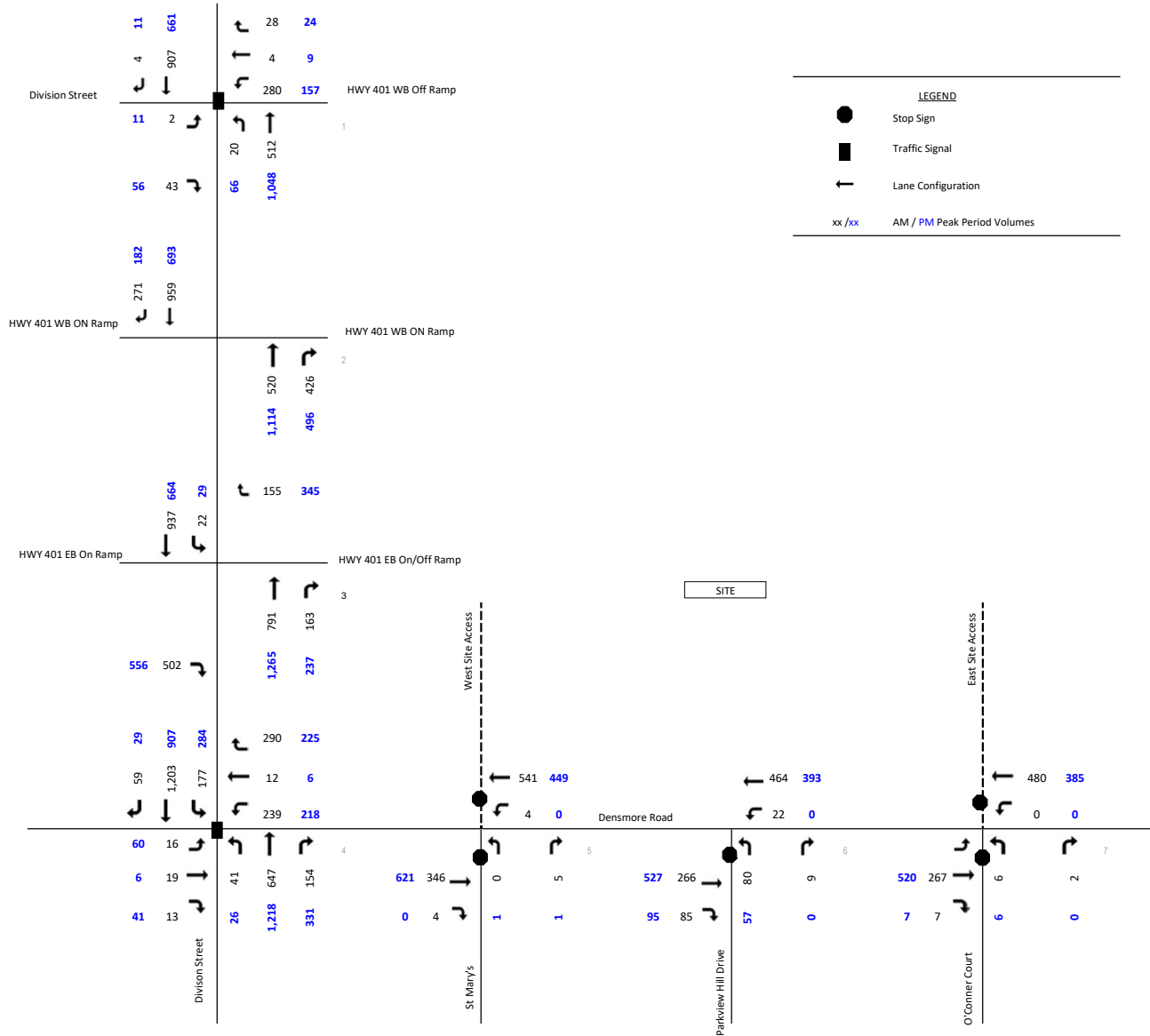




Figure 7: SiteTraffic Volumes, Weekday AM and PM Peak Hours

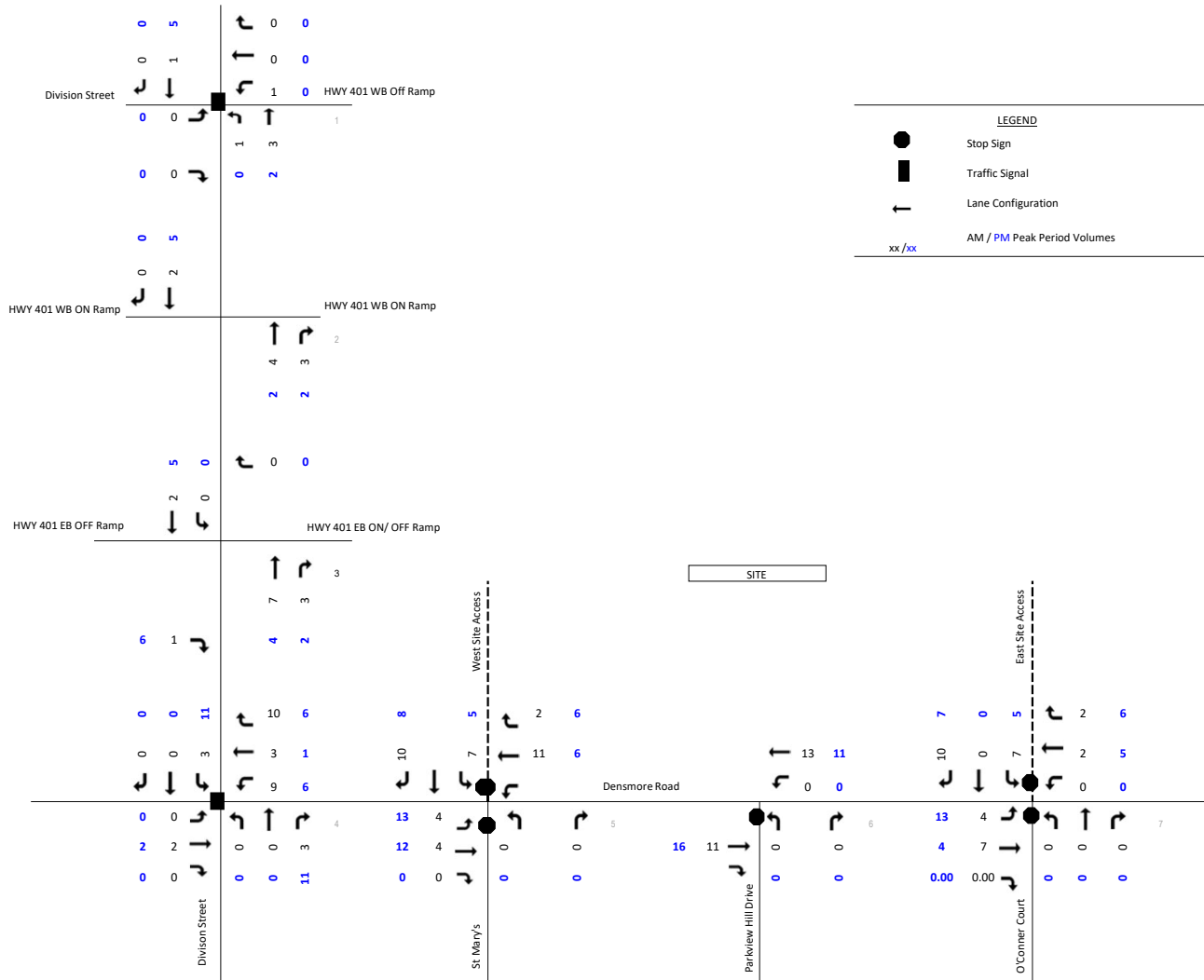


Figure 8: 2026 Total Traffic Volumes, Weekday AM and PM Peak Hours

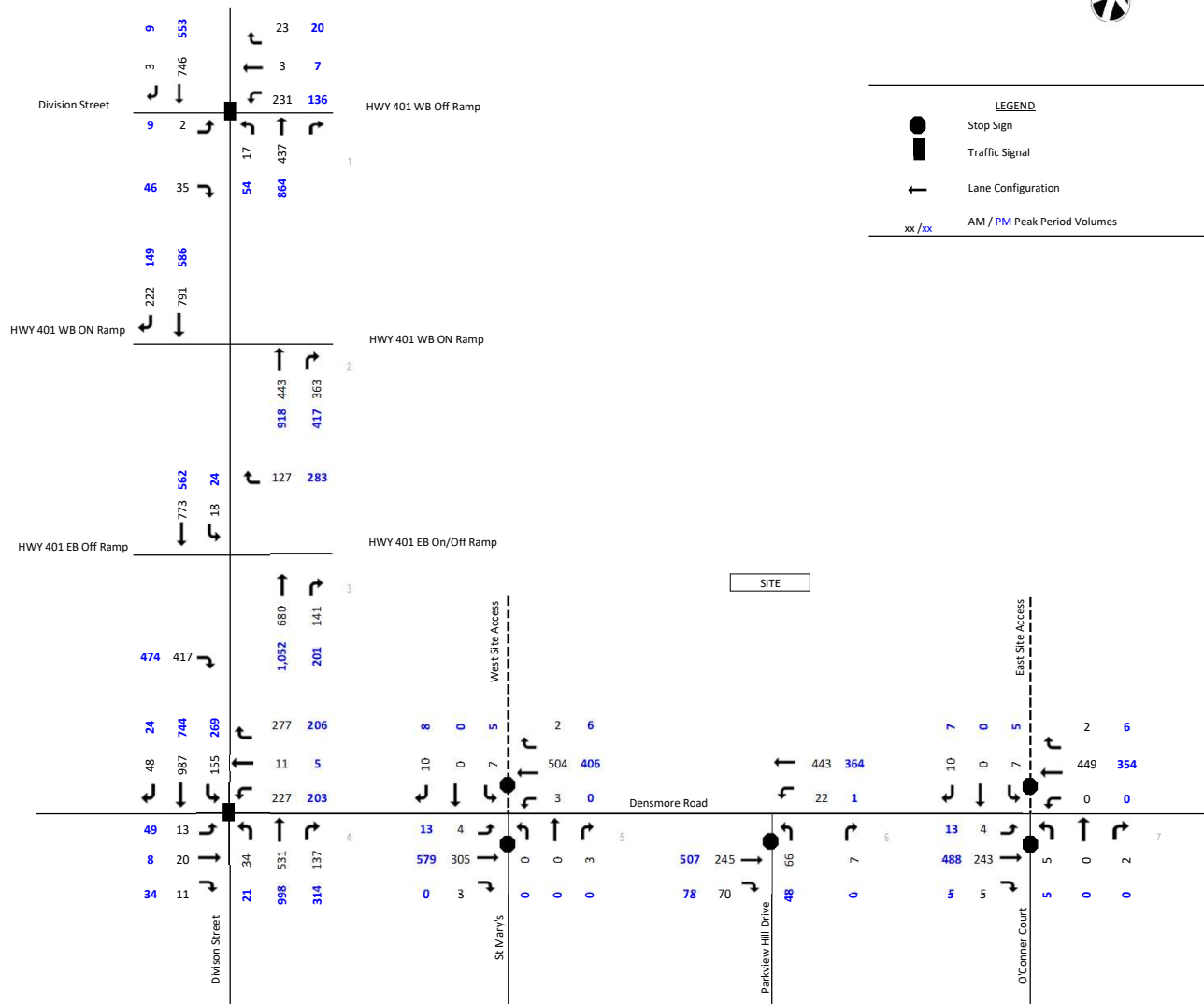
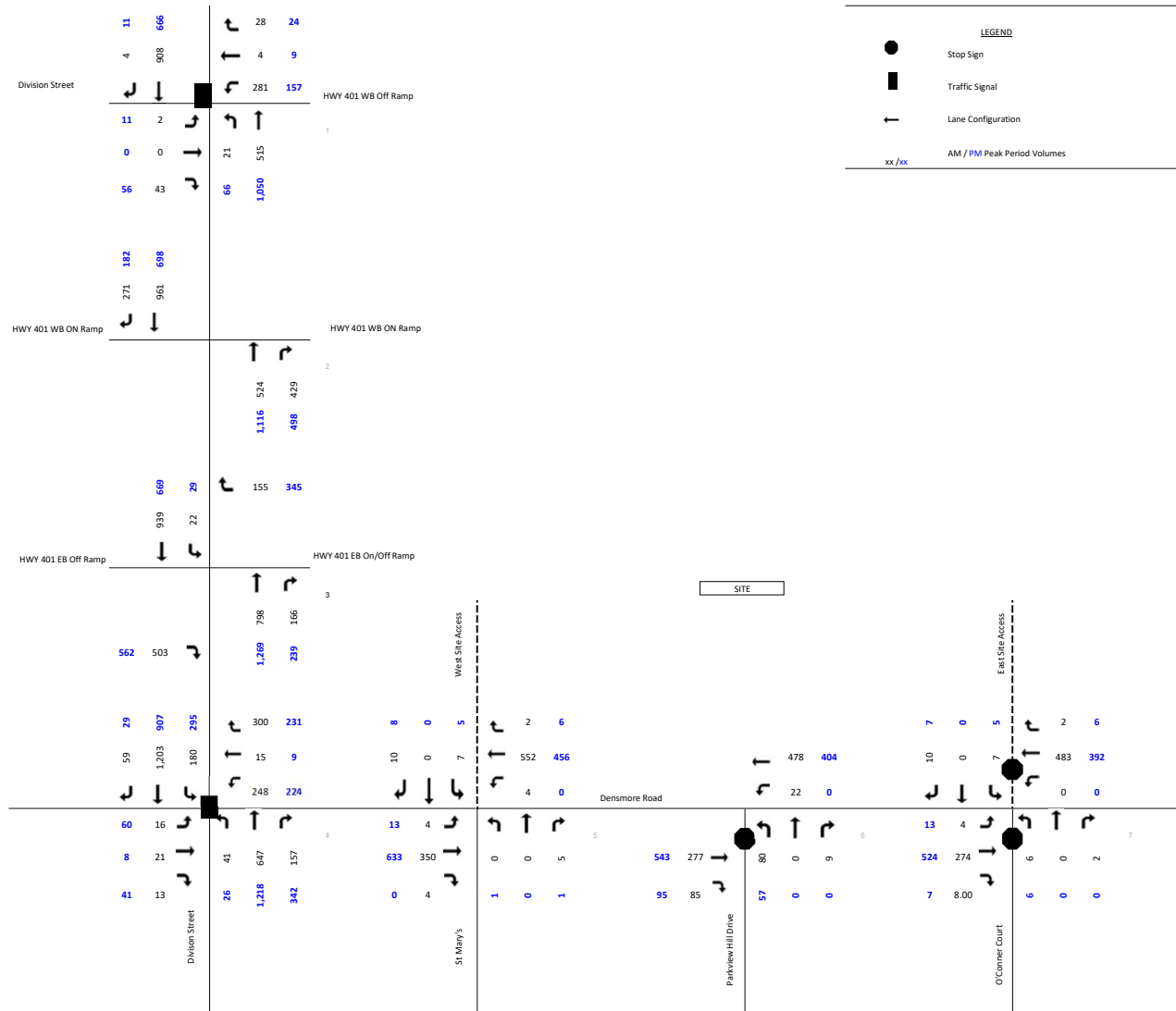




Figure 9: 2031 Total Traffic Volumes, Weekday AM and PM Peak Hours



APPENDICES

Appendix A – Turning Movement Counts and Signal Timing Plans

Appendix B – Background Development Information

Appendix C – Capacity and Queueing Analysis

Appendix D – Level of Service Definitions



APPENDIX A

Turning Movement Counts & Signal Timing Plans

Accu-Traffic Inc.

Morning Peak Diagram	Specified Period From: 7:00:00 To: 9:30:00	One Hour Peak From: 7:45:00 To: 8:45:00
Municipality: Cobourg Site #: 1605500004 Intersection: Division St & Densmore Rd TFR File #: 1 Count date: 12-Apr-16	Weather conditions: Person counted: Person prepared: Person checked:	
** Signalized Intersection **		Major Road: Division St runs N/S

North Leg Total: 1430 North Entering: 903 North Peds: 0 Peds Cross:	<table style="margin: auto;"> <tr><td>Cyclists</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>Trucks</td><td>2</td><td>36</td><td>14</td><td>52</td></tr> <tr><td>Cars</td><td>42</td><td>669</td><td>140</td><td>851</td></tr> <tr><td>Totals</td><td>44</td><td>705</td><td>154</td><td></td></tr> </table>	Cyclists	0	0	0	0	Trucks	2	36	14	52	Cars	42	669	140	851	Totals	44	705	154		<table style="margin: auto;"> <tr><td>Cyclists</td><td>0</td></tr> <tr><td>Trucks</td><td>53</td></tr> <tr><td>Cars</td><td>474</td></tr> <tr><td>Totals</td><td>527</td></tr> </table>	Cyclists	0	Trucks	53	Cars	474	Totals	527	East Leg Total: 539 East Entering: 243 East Peds: 3 Peds Cross:
Cyclists	0	0	0	0																											
Trucks	2	36	14	52																											
Cars	42	669	140	851																											
Totals	44	705	154																												
Cyclists	0																														
Trucks	53																														
Cars	474																														
Totals	527																														

Cyclists	Trucks	Cars	Totals
0	4	78	82

←

Veronica St

Cyclists	Trucks	Cars	Totals
0	6	7	13
0	0	6	6
0	0	19	19
0	6	32	

↑
→
↓

Baltimore Rd

Division St

Cars	Trucks	Cyclists	Totals
81	11	0	92
7	1	0	8
135	8	0	143
223	20	0	

↑
←
↓

Densmore Rd

Cars	Trucks	Cyclists	Totals
273	23	0	296

→

Peds Cross: West Peds: 1 West Entering: 38 West Leg Total: 120	<table style="margin: auto;"> <tr><td>Cars</td><td>823</td></tr> <tr><td>Trucks</td><td>44</td></tr> <tr><td>Cyclists</td><td>0</td></tr> <tr><td>Totals</td><td>867</td></tr> </table>	Cars	823	Trucks	44	Cyclists	0	Totals	867	<table style="margin: auto;"> <tr><td>Cars</td><td>29</td><td>386</td><td>127</td><td>542</td></tr> <tr><td>Trucks</td><td>1</td><td>36</td><td>9</td><td>46</td></tr> <tr><td>Cyclists</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>Totals</td><td>30</td><td>422</td><td>136</td><td></td></tr> </table>	Cars	29	386	127	542	Trucks	1	36	9	46	Cyclists	0	0	0	0	Totals	30	422	136		Peds Cross: South Peds: 0 South Entering: 588 South Leg Total: 1455
Cars	823																														
Trucks	44																														
Cyclists	0																														
Totals	867																														
Cars	29	386	127	542																											
Trucks	1	36	9	46																											
Cyclists	0	0	0	0																											
Totals	30	422	136																												

Comments

Accu-Traffic Inc.

Afternoon Peak Diagram	Specified Period From: 15:30:00 To: 18:00:00	One Hour Peak From: 15:45:00 To: 16:45:00
Municipality: Cobourg Site #: 1605500004 Intersection: Division St & Densmore Rd TFR File #: 1 Count date: 12-Apr-16	Weather conditions: Person counted: Person prepared: Person checked:	
** Signalized Intersection **		Major Road: Division St runs N/S

North Leg Total: 1524 North Entering: 657 North Peds: 0 Peds Cross:		East Leg Total: 376 East Entering: 178 East Peds: 1 Peds Cross:
--	--	--

Cyclists 0 0 0 0 Trucks 0 15 5 20 Cars 15 528 94 637 Totals 15 543 99 637		Cyclists 0 Trucks 20 Cars 847 Totals 867
--	--	---

Cyclists	Trucks	Cars	Totals
0	0	38	38

Veronica St

Cyclists	Trucks	Cars	Totals
0	0	31	31
0	0	7	7
0	2	52	54
0	2	90	



Baltimore Rd

Division St

Densmore Rd

Cars	Trucks	Cyclists	Totals
93	3	0	96
0	0	0	0
80	2	0	82
173	5	0	

Cars	Trucks	Cyclists	Totals
193	5	0	198

Peds Cross: West Peds: 1 West Entering: 92 West Leg Total: 130		Cars 660 Trucks 19 Cyclists 0 Totals 679		Cars 23 723 92 838 Trucks 0 17 0 17 Cyclists 0 0 0 0 Totals 23 740 92 838	Peds Cross: South Peds: 1 South Entering: 855 South Leg Total: 1534
---	--	---	--	--	--

Comments

Accu-Traffic Inc.

Total Count Diagram

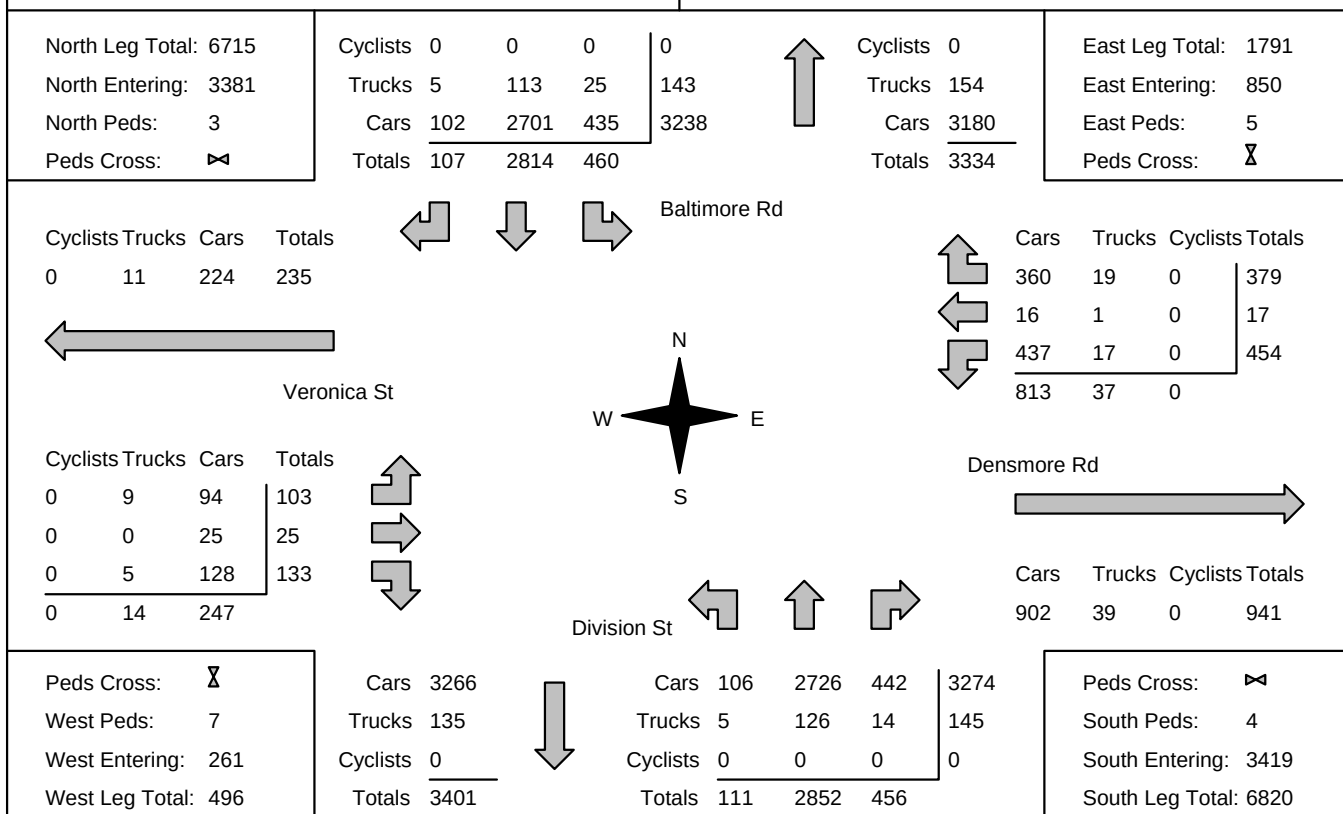
Municipality: Cobourg
Site #: 1605500004
Intersection: Division St & Densmore Rd
TFR File #: 1
Count date: 12-Apr-16

Weather conditions:

Person counted:
Person prepared:
Person checked:

**** Signalized Intersection ****

Major Road: Division St runs N/S



Comments



Turning Movement Count Diagram

Intersection: Baltimore Rd at 401 West Bound Off-Ramp and Division Street
Municipality: Cobourg, Ontario

Intersection ID:

Date: Tuesday, May 18th, 2021

AM Peak Hour: 7:30 to 8:30

Baltimore Rd									
North Total 688					East Total 342				
North Entering 456	Cyclists	0	0	0	East Entering 158				
North Receiving 232	Truck	0	16	0	East Receiving 184				
North Peds 0	Cars	2	438	0	East Peds 0				
401 WB OffRamp	0	0	1	↗	↖	13	1	0	
	0	0	0	→	←	2	0	0	
	0	1	21	↘	↙	133	9	0	
West Total 37		10	196	171	South Total 1029				
West Entering 23		0	21	13	South Entering 411				
West Receiving 14		0	0	0	South Receiving 618				
West Peds 0					South Peds 0				

MD Peak Hour: - to -

Baltimore Rd									
North Total 0					East Total 0				
North Entering 0	Cyclists	0	0	0		East Entering 0			
North Receiving 0	Truck	0	0	0		East Receiving 0			
North Peds 0	Cars	0	0	0		East Peds 0			
					←	↓	→		
401 WB OffRamp	0	0	0	↑			0	0	0
	0	0	0	→			←	0	0
	0	0	0	↓			↙	0	0
					←	↑	→		
West Total 0					0	0	0	South Total 0	
West Entering 0		0	0	0			South Entering 0		
West Receiving 0		0	0	0			South Receiving 0		
West Peds 0							South Peds 0		

PM Peak Hour: 16:15 to 17:15

Baltimore Rd									
North Total ###					East Total 375				
North Entering 379	Cyclists	0	0	0	East Entering 93				
North Receiving 650	Truck	0	14	0	East Receiving 282				
North Peds 0	Cars	7	358	0	East Peds 0				
401 WB OffRamp	0	0	7	↗	↖	15	0	0	
	0	0	0	→	←	5	0	0	
	0	0	35	↘	↙	66	7	0	
West Total 97		41	612	270	South Total 1433				
West Entering 42		0	16	12	South Entering 953				
West Receiving 55		2	0	0	South Receiving 480				
West Peds 0					South Peds 0				

Total 5-Hour Count

Baltimore Rd										
North Total 4442					East Total 1832					
North Entering 2027		Cyclists	0	0	0	East Entering 595				
North Receiving 2415		Truck	0	66	0	East Receiving 1237				
North Peds 0		Cars	33	1928	0	East Peds 0				
			←	↓	↘					
401 WB OffRamp	0	0	22	↗			↗	76	6	0
	0	0	0	→			←	21	2	0
	0	2	185	↘			↘	451	39	0
			←	↑	↗					
West Total 424			157	2237	1168	South Total 6378				
West Entering 209			0	74	69	South Entering 3707				
West Receiving 215			2	0	0	South Receiving 2671				
West Peds 1						South Peds 0				



Turning Movement Count Diagram

Intersection: Baltimore Road at 401 West Bount On-Ramps

Municipality: Cobourg, Ontario

Intersection ID:

Date: Tuesday, May 18th, 2021

AM Peak Hour: 7:30 to 8:30

Baltimore Rd									
North Total	842							East Total	183
North Entering	621	Cyclists	0	0	0			East Entering	0
North Receiving	221	Truck	3	27	0			East Receiving	183
North Peds	0	Cars	135	456	0			East Peds	0
			←	↓	→				
	0	0	0	↑				0	0
	0	0	0	→				0	0
	0	0	0	↓				0	0
West Total	138							South Total	887
West Entering	0							South Entering	404
West Receiving	138							South Receiving	483
West Peds	0							South Peds	0
			←	↑	→				
	0			199	169				
	0			22	14				
	0			0	0				

MD Peak Hour: - to -

Baltimore Rd									
North Total	0							East Total	0
North Entering	0	Cyclists	0	0	0			East Entering	0
North Receiving	0	Truck	0	0	0			East Receiving	0
North Peds	0	Cars	0	0	0			East Peds	0
			←	↓	→				
	0	0	0	↑				0	0
	0	0	0	→				0	0
	0	0	0	↓				0	0
West Total	0							South Total	0
West Entering	0							South Entering	0
West Receiving	0							South Receiving	0
West Peds	0							South Peds	0
			←	↑	→				
	0			0	0				
	0			0	0				
	0			0	0				

PM Peak Hour: 16:00 to 17:00

Baltimore Rd									
North Total	###							East Total	276
North Entering	493	Cyclists	0	0	0			East Entering	0
North Receiving	660	Truck	3	18	0			East Receiving	276
North Peds	0	Cars	110	362	0			East Peds	0
			←	↓	→				
	0	0	0	↑				0	0
	0	0	0	→				0	0
	0	0	0	↓				0	0
West Total	113							South Total	1316
West Entering	0							South Entering	936
West Receiving	113							South Receiving	380
West Peds	0							South Peds	0
			←	↑	→				
	0			641	261				
	0			17	15				
	0			2	0				

Total 5-Hour Count

Baltimore Rd									
North Total	5120							East Total	1242
North Entering	2677	Cyclists	0	0	0			East Entering	0
North Receiving	2443	Truck	23	94	0			East Receiving	1242
North Peds	0	Cars	611	1949	0			East Peds	0
			←	↓	→				
	0	0	0	↑				0	0
	0	0	0	→				0	0
	0	0	0	↓				0	0
West Total	634							South Total	5728
West Entering	0							South Entering	3685
West Receiving	634							South Receiving	2043
West Peds	0							South Peds	0
			←	↑	→				
	0			2364	1167				
	0			77	75				
	0			2	0				



Turning Movement Count Diagram

Intersection: Baltimore Rd at 401 East Bount Ramps, North Side of intersection
Municipality: Cobourg, Ontario

Intersection ID:

Date: Tuesday, May 18th, 2021

AM Peak Hour: 7:30 to 8:30

Baltimore Rd									
North Total	886							East Total	90
North Entering	474	Cyclists	0	0	0			East Entering	79
North Receiving	412	Truck	0	22	1			East Receiving	11
North Peds	0	Cars	0	441	10			East Peds	0
			←	↓	→				
			0	0	0	↑			68 11 0
			0	0	0	→			0 0 0
			0	0	0	↓			0 0 0
West Total	0		←	↑	→			South Total	796
West Entering	0		0	308	0			South Entering	333
West Receiving	0		0	25	0			South Receiving	463
West Peds	0		0	0	0			South Peds	0

MD Peak Hour: - to -

Baltimore Rd									
North Total	0							East Total	0
North Entering	0	Cyclists	0	0	0			East Entering	0
North Receiving	0	Truck	0	0	0			East Receiving	0
North Peds	0	Cars	0	0	0			East Peds	0
			←	↓	→				
			0	0	0	↑			0 0 0
			0	0	0	→			0 0 0
			0	0	0	↓			0 0 0
West Total	0		←	↑	→			South Total	0
West Entering	0		0	0	0			South Entering	0
West Receiving	0		0	0	0			South Receiving	0
West Peds	0		0	0	0			South Peds	0

PM Peak Hour: 16:15 to 17:15

Baltimore Rd									
North Total	###							East Total	233
North Entering	384	Cyclists	0	0	0			East Entering	215
North Receiving	969	Truck	0	18	1			East Receiving	18
North Peds	0	Cars	0	348	17			East Peds	0
			←	↓	→				
			0	0	0	↑			213 2 0
			0	0	0	→			0 0 0
			0	0	0	↓			0 0 0
West Total	0		←	↑	→			South Total	1120
West Entering	0		0	727	0			South Entering	754
West Receiving	0		0	25	0			South Receiving	366
West Peds	0		0	2	0			South Peds	0

Total 5-Hour Count

Baltimore Rd									
North Total	5756							East Total	849
North Entering	2039	Cyclists	0	0	0			East Entering	768
North Receiving	3717	Truck	0	79	5			East Receiving	81
North Peds	0	Cars	0	1879	76			East Peds	0
			←	↓	→				
			0	0	0	↑			743 25 0
			0	0	0	→			0 0 0
			0	0	0	↓			0 0 0
West Total	0		←	↑	→			South Total	4907
West Entering	0		0	2831	0			South Entering	2949
West Receiving	0		0	116	0			South Receiving	1958
West Peds	0		0	2	0			South Peds	0



Turning Movement Count Diagram

Intersection: Baltimore Rd at 401 East Bound Ramps, South Side of intersection
Municipality: Cobourg, Ontario

Intersection ID:

Date: Tuesday, May 18th, 2021

AM Peak Hour: 7:30 to 8:30

Baltimore Rd									
North Total 803					East Total 70				
North Entering 473	Cyclists	0	0	0	East Entering 0				
North Receiving 330	Truck	0	20	0	East Receiving 70				
North Peds 0	Cars	0	453	0	East Peds 0				
401 EB Off Ramp		0	0	0	←		0	0	0
		0	0	0	→		←	0	0
		0	22	220	↘		↘	0	0
					←	↑	↗		
West Total 242					0	305	59	South Total 1115	
West Entering 242		0	25	11	South Entering 400				
West Receiving 0		0	0	0	South Receiving 715				
West Peds 0					South Peds 0				

MD Peak Hour: - to -

Baltimore Rd												
North Total 0					East Total 0							
North Entering 0	Cyclists	0	0	0	East Entering 0							
North Receiving 0	Truck	0	0	0	East Receiving 0							
North Peds 0	Cars	0	0	0	East Peds 0							
					←	↓	→					
401 EB Off Ramp	0	0	0	↑	↑					0	0	0
	0	0	0	→	←					0	0	0
	0	0	0	↓	↓					0	0	0
					←	↑	→					
West Total 0					0	0	0	South Total 0				
West Entering 0		0	0	0	South Entering 0							
West Receiving 0		0	0	0	South Receiving 0							
West Peds 0					South Peds 0							

PM Peak Hour: 16:15 to 17:15

Baltimore Rd									
North Total ###					East Total 128				
North Entering 352	Cyclists	0	0	0	East Entering 0				
North Receiving 754	Truck	0	18	0	East Receiving 128				
North Peds 0	Cars	0	334	0	East Peds 0				
401 EB Off Ramp		0	0	0	←		0	0	0
		0	0	0	↓		0	0	0
		0	8	242	↘		0	0	0
					↘				
					←	↑	↘		
West Total 250					0	726	123	South Total 1484	
West Entering 250		0	26	5	South Entering 882				
West Receiving 0		0	2	0	South Receiving 602				
West Peds 1					South Peds 0				

Total 5-Hour Count

Baltimore Rd									
North Total 4881					East Total 543				
North Entering 1952	Cyclists	0	0	0	East Entering 0				
North Receiving 2929	Truck	0	77	0	East Receiving 543				
North Peds 0	Cars	0	1875	0	East Peds 0				
401 EB Off Ramp		0	0	0		0	0	0	
		0	0	0		0	0	0	
		0	75	1205		0	0	0	
West Total 1280					South Total 6704				
West Entering 1280		0	2809	497	South Entering 3472				
West Receiving 0		0	118	46	South Receiving 3232				
West Peds 4		0	2	0	South Peds 0				



Turning Movement Count Diagram

Intersection: Division Street at Densmore Road

Municipality: Cobourg, Ontario

Intersection ID:

Date: Tuesday, May 18th, 2021

AM Peak Hour: 7:45 to 8:45

Baltimore Rd									
North Total ###						East Total 252			
North Entering	655	Cyclists	0	0	0	East Entering	125		
North Receiving	399	Truck	3	39	2	East Receiving	127		
North Peds	2	Cars	27	516	68	East Peds	2		
			←	↓	→				
Veronica St	0	2	6	↑		←	58	3	0
	0	0	2	→		←	3	0	0
	0	0	7	↓		←	59	2	0
			←	↑	→				
West Total 71			21	299	52	South Total 1029			
West Entering	17		0	31	3	South Entering 406			
West Receiving	54		0	0	0	South Receiving 623			
West Peds	2					South Peds 2			

MD Peak Hour: - to -

Baltimore Rd										
North Total			0				East Total			0
North Entering	0	Cyclists	0	0	0		East Entering			0
North Receiving	0	Truck	0	0	0		East Receiving			0
North Peds	0	Cars	0	0	0		East Peds			0
			←	↓	→					
Veronica St	0	0	0	↑		←	0	0	0	
	0	0	0	→		←	0	0	0	
	0	0	0	↓		↓	0	0	0	
			←	↑	→					
West Total			0	0	0	South Total			0	
West Entering	0		0	0	0	South Entering			0	
West Receiving	0		0	0	0	South Receiving			0	
West Peds	0					South Peds			0	

PM Peak Hour: 16:00 to 17:00

Baltimore Rd									
North Total ###						East Total 341			
North Entering	598	Cyclists	0	0	0	East Entering	161		
North Receiving	836	Truck	4	16	8	East Receiving	180		
North Peds	1	Cars	14	475	81	East Peds	5		
			←	↓	→				
Veronica St	0	0	37	↗		↖	80	5	0
	0	0	4	→		←	2	0	0
	0	0	26	↘		↙	69	5	0
			↖	↑	↗				
West Total 103			16	679	87	South Total 1408			
West Entering	67		0	33	0	South Entering 817			
West Receiving	36		0	2	0	South Receiving 591			
West Peds	0					South Peds 0			

Total 5-Hour Count

Baltimore Rd									
North Total 6537						East Total 1476			
North Entering 3136	Cyclists	0	0	0		East Entering 709			
North Receiving 3401	Truck	18	123	16		East Receiving 767			
North Peds 5	Cars	92	2514	373		East Peds 11			
		↙	↓	↘					
Veronica St	0	13	106	↗		↗	348	14	0
	0	2	14	→		←	9	2	0
	0	6	100	↘		↘	321	15	0
		↙	↑	↘					
West Total 442			71	2774	352	South Total 6441			
West Entering 241		8	144	10		South Entering 3362			
West Receiving 201		1	2	0		South Receiving 3079			
West Peds 3						South Peds 3			



Turning Movement Count Diagram

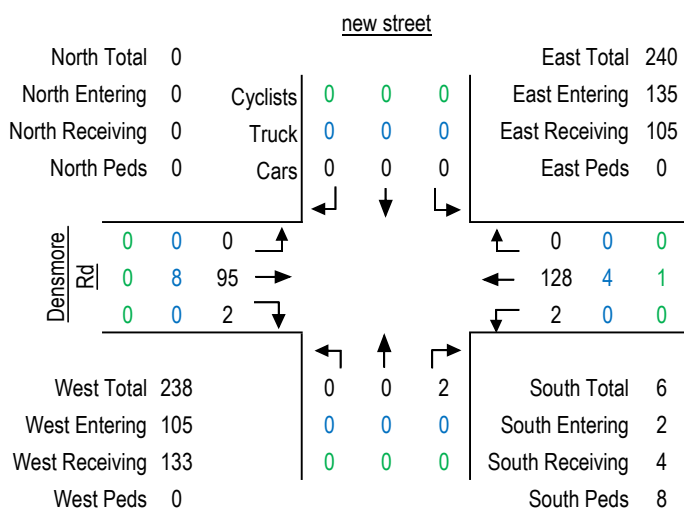
Intersection: Densmore Road and St Mary's School accesses

Municipality: Cobourg, Ontario

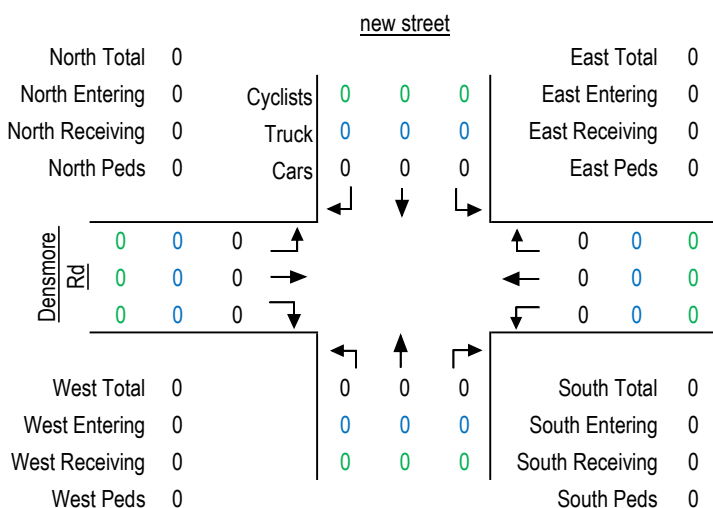
Intersection ID:

Date: Tuesday, May 18th, 2021

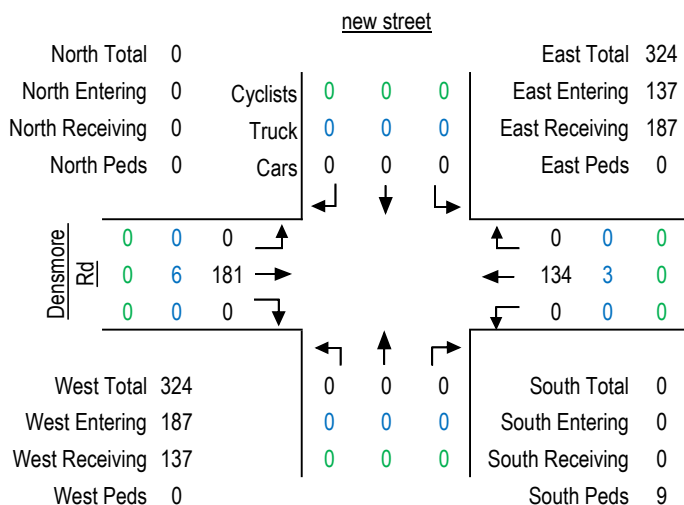
AM Peak Hour: 7:30 to 8:30



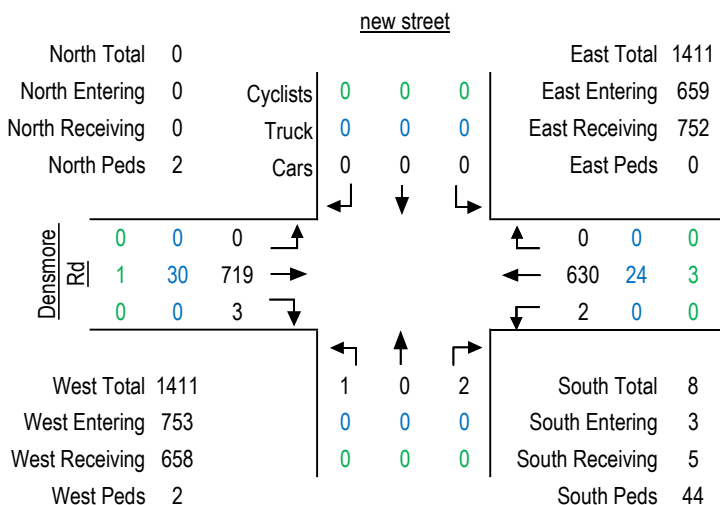
MD Peak Hour: - to -



PM Peak Hour: 16:15 to 17:15



Total 5-Hour Count





Turning Movement Count Diagram

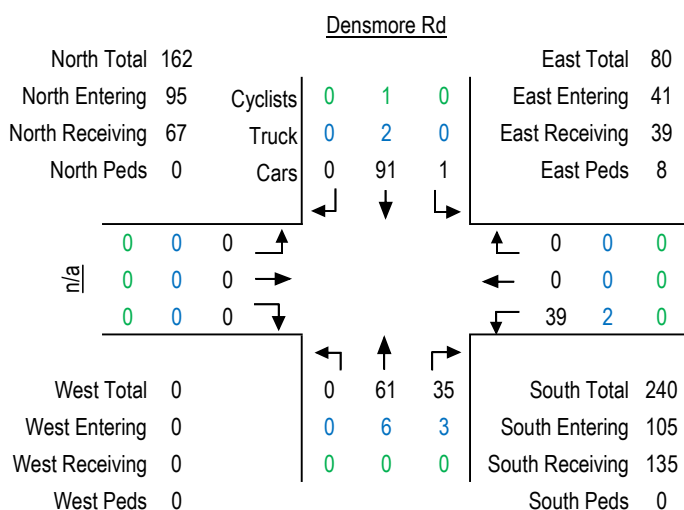
Intersection: Densmore Road and Parkview Drive

Municipality: Cobourg, Ontario

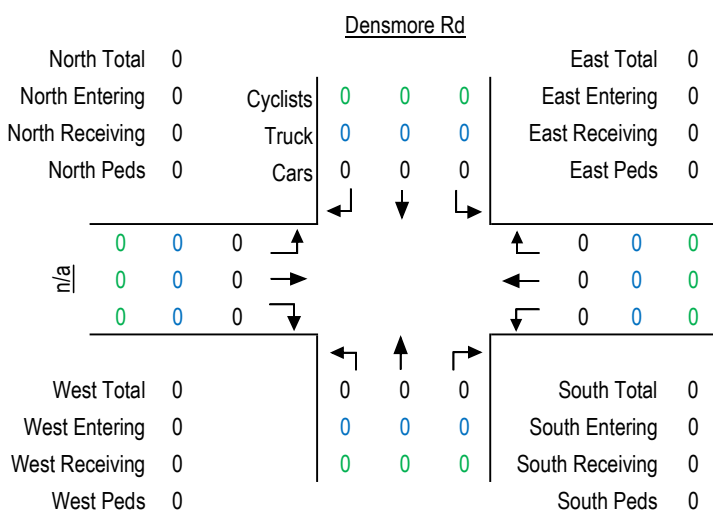
Intersection ID:

Date: Tuesday, May 18th, 2021

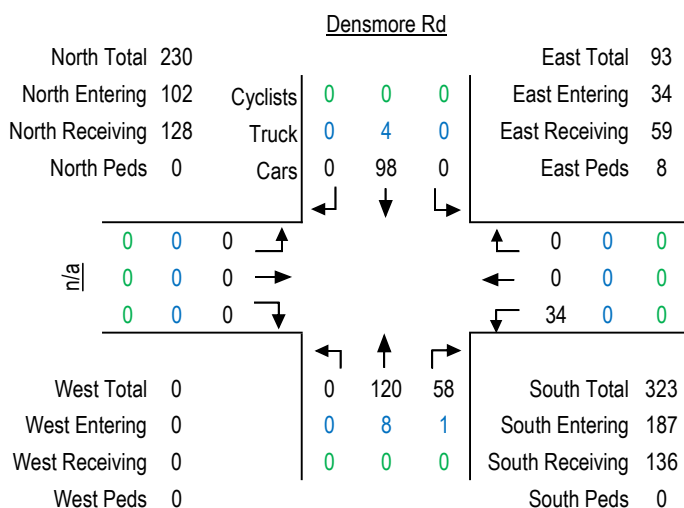
AM Peak Hour: 7:30 to 8:30



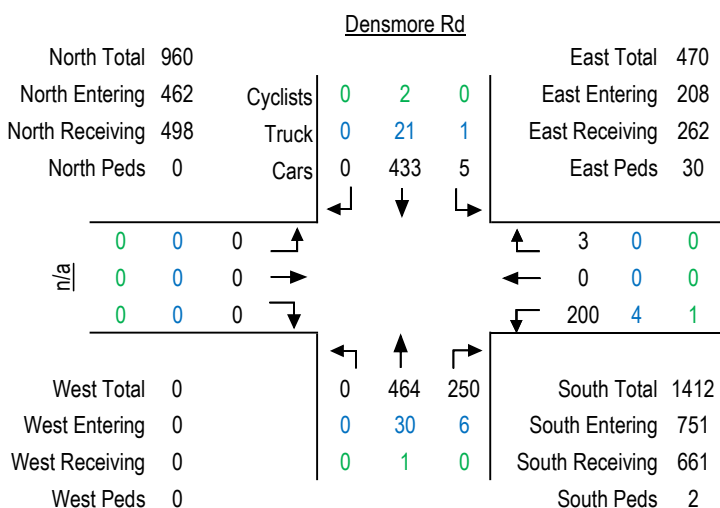
MD Peak Hour: - to -



PM Peak Hour: 16:15 to 17:15



Total 5-Hour Count





Turning Movement Count Diagram

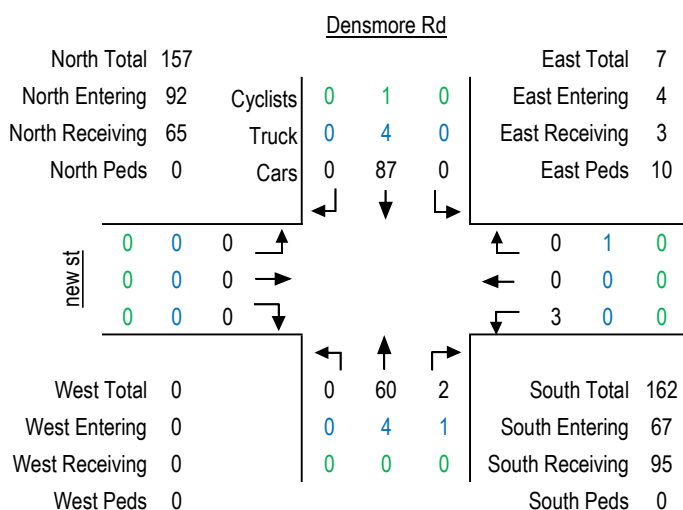
Intersection: Densmore Road at O'Connor Court

Municipality: Cobourg, Ontario

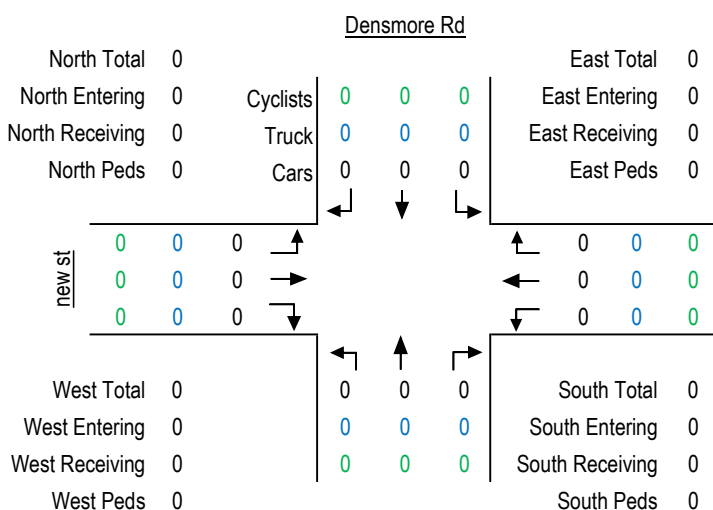
Intersection ID:

Date: Tuesday, May 18th, 2021

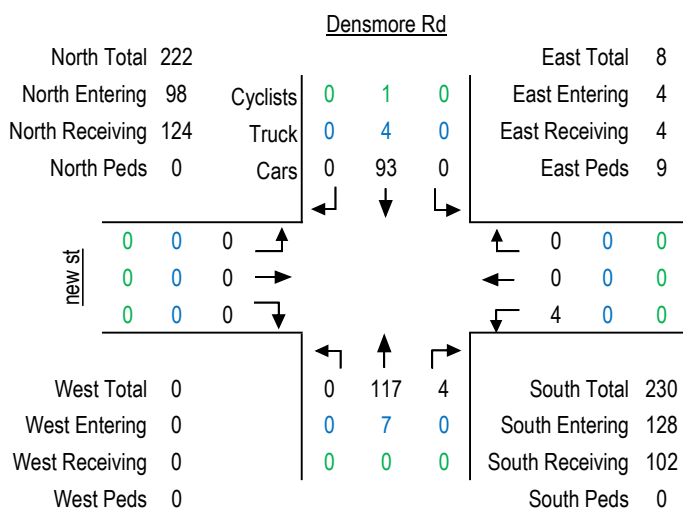
AM Peak Hour: 7:30 to 8:30



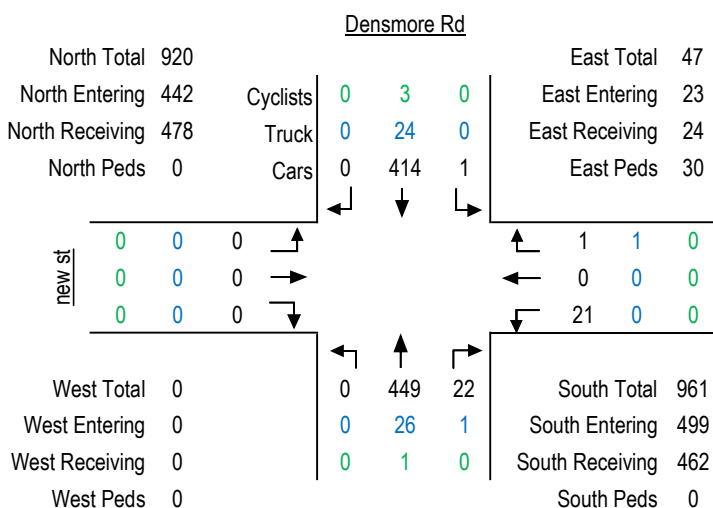
MD Peak Hour: - to -



PM Peak Hour: 16:15 to 17:15



Total 5-Hour Count



Cover Sheet

Location: Hwy 401 at County Rd 45 Division St WB

Area/District: Bancroft

Timing Based On T.M. Dated: _____

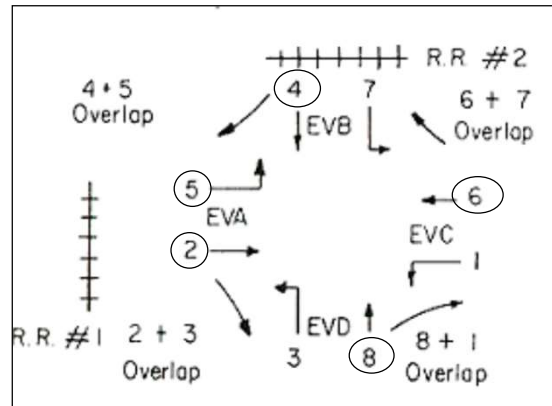
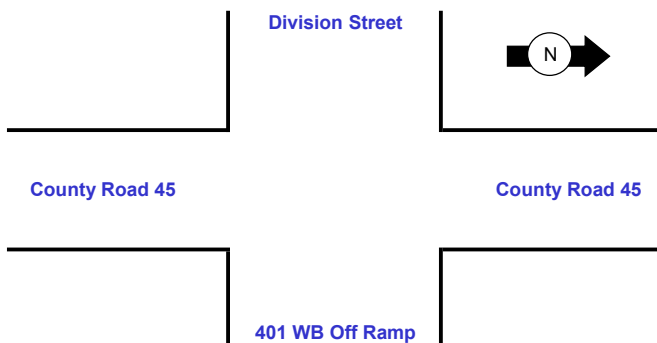
Traffic Signal # 8

Timing Developed By: Derek Thielman

Approved By: Paul Webster

Installed By: _____

Installation Date: _____



Circle Movements and Operations

COMMUNICATIONS ADDRESSING

COMM ADDRESS
(C/0 + 0 + 0) = 1

CELL # : 647-237-2936

ZONE ADDRESS
(C/0 + 0 + 1) = 1

UDP PORT: 8054

AREA NUMBER
(C/0 + 0 + 2) = 4

IP ADDRESS: 10.151.192.216

AREA ADDRESS 8
(C/0 + 0 + 3) =

AMPLIFIER: ☒ YES

PROGRAM: 233ON1.D

DISABLE ALARM REPORTING

		Column F							
		1	2	3	4	5	6	7	8
0	OMIT ALARMS					X			

< C + 0 + C = 5 >

- 1 = STOP TIME
- 2 = FLASH SENSE
- 3 = KEYBOARD ENTRY
- 4 = MANUAL PLAN SELECT
- 5 = ENABLE POLICE CNTRL (Not Used)
- 6 = EXTERNAL ALARM (Door Alarm)
- 7 = DETECTOR FAILURE

ACTUATED INTERVAL TIMING AND FAZE FUNCTIONS

PHASE								
1	2	3	4	5	6	7	8	
0	WALK	7	7	7	7	7	7	E
1	DONT WALK	17	24	17	24	17	24	RR1 CLR
2	MIN INITIAL	20	10	7	20	10		EVA DLY
3	TYPE 3 LIMIT							EVA CLR
4	ADD PER VEH							EVB DLY
5	VEH EXT	4.2	3.0	3.0	4.2	3.0		EVB CLR
6	MAX GAP	4.2	3.0	3.0	4.2	3.0		EVC DLY
7	MIN GAP	4.2	3.0	3.0	4.2	3.0		EVC CLR
8	MAX LIMIT	40	15	15	40	25		EVD DLY
9	MAXIMUM 2							EVD CLR
A	ADV /DLY WALK							RR2 DLY
B	SEQUENCE TO				8			RR2 CLR
C	COND SRV MIN							EV CLR
D	REDUCE EVERY							EV DLY
E	YELLOW	5.0	4.1	2.4	5.0	4.1	2.4	RR CLR
F	RED CLEAR	1.5	2.4	1.5	2.4	1.5	2.4	RR DLY

PHASE BANK #1 < C + O + F = 1 >

9	A	B	C	D	E
0					
1	PHASE 1	-			RR1 DLY
2	PHASE 2	-			RR1 CLR
3	PHASE 3	-			EVA DLY
4	PHASE 4	-			EVA CLR
5	PHASE 5	-			EVB DLY
6	PHASE 6	-			EVB CLR
7	PHASE 7	-			EVC DLY
8	PHASE 8	-			EVC CLR
					EVD DLY
					EVD CLR
					RR2 DLY
					RR2 CLR
					EV CLR
					EV DLY
					RR CLR
					RR DLY

ALL RED START

(F/1 + C + O) = 5.0

RED REVERT

(F/1 + O + F) = 5.0

DW

COLUMN F PHASES								
1	2	3	4	5	6	7	8	
0	PERMIT							
1	RED LOCK							
2	YELLOW LOCK							
3	VEH MIN CALL							
4	PED RECALL							
5	PEDESTRIANS							
6	YIELD AT FLSH DW							
7	RED REST							
8	DOUBLE ENTRY							
9	VEH MAX CALL							
A	SOFT RECALL							
B	MAXIMUM 2							
C	COND SERVICE							
D	MAN CONT CALL							
E	YELLOW START							
F	FIRST PHASES							

< C + O + F = 1 >

Column E Phases / Bits

1	2	3	4	5	6	7	8
0	EXCLUSIVE						
1	RR1 CLEAR						
2	RR2 CLEAR						
3	RR2 LTD SRV						
4	PROT/PERM						
5	FLH TO PREMT						
6	FLASH ENTRY						
7	DISABL MIN YEL						
8	DISABL OVP YEL						
9	OVP FLH YEL						
A	EM VEH A						
B	EM VEH B						
C	EM VEH C						
D	EM VEH D						
E	EXTRA 1						
F	IC SELECT						

< C + O + E = 125 >

FLASH TO PREEMPT

- 1 = EVA
2 = EVB
3 = EVC
4 = EVD
5 = RR1
6 = RR2
7 = SE1
8 = SE2
1 = TBC TYPE 1
2 = NEMA EXT. COORD.
3 = DAYLIGHT SAVINGS
4 =

EXTRA 1

- 5 = EXPANDED STATUS REPORTING
6 = INTERNATIONAL PED
7 = CLEAR OUTPUTS DURING FLASH
8 = SPLIT RING

EXTRA 2

- 1 = AWR ON DURING PHASE INITIAL
2 = LMU INSTALLED

IC SELECT

- 2 = 2 WAY MODEM
3 = 7 WIRE SLAVE
4 = FLASH / FREE
5 = SIMPLEX MASTER
7 = 7 WIRE MASTER
8 = OFFSET INTURP

Column F Phases / Bits

1	2	3	4	5	6	7	8
0	ADV GRN FLH						
1	PHASE FLASH						
2	FLASH WALK						
3	GUAR PASS						
4	SIMUL GAP						
5	SEQ TIMING						
6	ADV WALK						
7	DELAY WALK						
8	EXT RECALL						
9							
A	MAX EXTEN						
B	INH PED RSRV						
C	SEMI ACTUATED						
D							
E	STRT VEH CALL						
F	STRT PED CALL						

SPECIALS < C + O + F = 2 >

MANUAL PLAN	14
< C/0 + A + 1 >	
MANUAL OFFSET	0
< C/0 + B + 1 >	

MANUAL SELECTION

MANUAL PLAN

- 0 = Automatic (Master)
9 = Control Plan 1 - 9
14 (E) = Free (Isolated)
15 (F) = Software Flash

MANUAL OFFSET

- 0 = Automatic (Master)
1 = Offset A
2 = Offset B
3 = Offset C

Pretimed

Column F

PHASE										PHASES							
	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8
WALK		7		7		7		7			X		X	X	X		X
DON'T WALK		17		24		17		24									
MIN INTIAL		20		10	7	20		10			X				X		
TYPE 3 LIMIT																	
ADD PER VEH																	
VEH EXT		4.2		3.0	3.0	4.2		3.0			X		X		X		X
MAX GAP		4.2		3.0	3.0	4.2		3.0									
MIN GAP		4.2		3.0	3.0	4.2		3.0									
MAX LIMIT		30		15	10	30		20			X		X	X	X		X
MAXIMUM 2											X		X	X	X		X
ADV / DLY WALK																	
SEQUENCE TO					8												
COND SRV MIN																	
REDUCE EVERY																	
YELLOW		5.0		4.1				4.1			X				X		
RED CLEAR		1.5		2.4		1.5		2.4									X
PHASE BANK #	< C + O + F = 1 >									< C + O + F = 1 >							

LOCATION: Hwy 401 at County Rd 45 Division St WB

Issued Date: 18-Oct-16

Installed Date: 31-Oct-16

Programmed EPAC Data

10/21/20

2:27:30PM

Intersection Name: 2020 13 Division & Densmore/Ve

Intersection Alias: 202013

Access Code: 9999 Channel: 5 Address: 1 Revision: 3.33e

Access Data

Port 2 Comm :1200 Baud

Port 3 Comm :1200 Baud

Phase Data

Vehical Basic Timings							Vehical Density Timings			Time B4	Cars	Time To	
Phase	Min_Grn	Passage	Max1	Max2	Yellow	All Red	Added Initial	Max_Initial	Reduction	Before	Reduce	Min_Gap	
1	6	3.0	10	10	3.0	1.0	0.0	0	0	0	0	0.0	
2	15	3.0	35	35	4.0	2.0	0.0	0	0	0	0	0.0	
3	6	3.0	10	10	3.0	1.0	0.0	0	0	0	0	0.0	
4	7	3.0	20	20	4.0	2.0	0.0	0	0	0	0	0.0	
5	6	3.0	15	15	3.0	1.0	0.0	0	0	0	0	0.0	
6	15	3.0	35	35	4.0	2.0	0.0	0	0	0	0	0.0	
7	6	3.0	10	10	3.0	1.0	0.0	0	0	0	0	0.0	
8	7	3.0	20	20	4.0	2.0	0.0	0	0	0	0	0.0	

Pedestrian Timing			Extended Actuated		General Control					Miscellaneous				
Phase	Ped Walk	Flashing Clear	Ped Clear	Rest in Walk	Initialize	Non-Act Response	Veh Recall	Ped Recall	Recall Delay	Non Lock	Dual Entry	Last Car Passage	Conditional Service	No Simultaneous Gap Out
1	0	0	No	0	No	Inactive	None	None	None	0	Yes	No	No	No
2	10	26	No	2	No	Yellow	NonActI	Max	None	0	Yes	Yes	No	No
3	0	0	No	0	No	Inactive	None	None	None	0	Yes	No	No	No
4	10	26	No	2	No	Inactive	NonActII	None	None	0	Yes	Yes	No	No
5	0	0	No	0	No	Inactive	None	None	None	0	Yes	No	No	No
6	10	26	No	2	No	Yellow	NonActI	Max	None	0	Yes	Yes	No	No
7	0	0	No	0	No	Inactive	None	None	None	0	Yes	No	No	No
8	10	26	No	2	No	Inactive	NonActII	None	None	0	Yes	Yes	No	No

Special Sequence				Vehical Detector Phase Assignment					
Phase	Phase Omit	Minus Yellow Phase	Omit Call		Assigned Phase	Mode	Switched Phase	Extend	Delay
1	2	0	0	Vehical Detector Channel :1					
2	0	0	0	Vehical Detector Channel :2					
3	4	0	0	Vehical Detector Channel :3					
4	0	0	0	Vehical Detector Channel :4					
5	6	0	0	Vehical Detector Channel :5					
6	0	0	0	Vehical Detector Channel :6					
7	8	0	0	Vehical Detector Channel :7					
8	0	0	0	Vehical Detector Channel :8					

Pedestrian Detector Default Data				Special Detector Phase Assignment				
				Assign Phase	Switched Phase	Mode	Extend	Delay
:								
Default Data								

Unit Data

General Control				Remote Flash			Flash	Flash	
Startup Time: 5sec		Startup State: Flash	Red Revert: 4sec		Test A = Flash		Channel	Color	Flash Alternat
Auto Ped Clear: No		Stop Time Reset: No	Alternate Sequence: 0				Default Data - No Flash		
ABC connector Input Modes: 0			Input	Output			Flash Entry Exit		
ABC connector Output Modes: 0			Ring	Respons	Selection	Phase	Phase	Phase	
D connector Input Modes: 0			1	Ring 1	Ring 1				
			2	Ring 2	Ring 2				
D connector Output Modes: 0			3	None	None				
			4	None	None				
						Default Data - No Flash			



APPENDIX B

Background Development Information

STAFF REPORT

THE CORPORATION OF THE TOWN OF COBOURG



Report to:	Mayor and Council Members	Priority:	☒ High ☐ Low
Submitted by:	Glenn McGlashon, MCIP, RPP Director, Planning & Development gmcglashon@cobourg.ca	Meeting Type: Open Session ☒ Closed Session ☐	
Meeting Date:	February 16, 2021		
Report No.:	Planning and Development-005-21		
Submit comments to Council			

Subject/Title: Villages of Central Park - Rondeau (Cobourg East Community),
Authorization of a Tree Removal Agreement

RECOMMENDATION:

THAT Council receive this Report for information purposes; and,

FURTHER THAT Council endorse the By-law affixed to the Report as Appendix II which authorizes the Mayor and Municipal Clerk to enter into a Tree Removal Agreement with Rondeau (Cobourg) Ltd. to address all relevant municipal and agency requirements associated with the removal of trees on the Villages of Central Park development site in accordance with the detailed Tree Inventory & Preservation Plan (TIPP), Arborist Report and Related Landscape Analysis prepared by Henry Kortekaas & Associates Inc. and The Planning Partnership, subject to the finalization of details by municipal staff and partner review agencies.

1. STRATEGIC PLAN

N/A

2. PUBLIC ENGAGEMENT

In July of 2018, Cobourg Municipal Council granted approval of an Official Plan Amendment and Zoning By-law Amendment for the development of a 1,500 -1,700 unit mixed-use, neighbourhood-oriented community on a 107.3 hectare area of land generally located in the area of Brook Road North and Elgin Street East, known as Villages of Central Park (Rondeau). Council also granted approval of a draft plan of subdivision with conditions for Phase 1 comprised of up to 216 units

located in the south-western quadrant of the subject lands. The aforementioned approvals followed a Planning Public Meeting which was held in June of 2018 in accordance with the provisions of the Planning Act, R.S.O 1990, c.P. 13, as amended. A formal presentation was also made to the current Council on April 8, 2019 by The Planning Partnership to provide an overview of the project and answer questions.

In September of 2019, Council received an application for Clearance of Draft Plan of Subdivision Conditions from Rondeau (Cobourg) Ltd. (RCL) for final approval of the Phase 1 draft plan. The *Planning Act* does not prescribe any statutory public notice or engagement requirements for applications to clear conditions of Draft Plan of Subdivision Approval, as these particular applications are recognized as being a detailed, technical review of matters relating to a draft approved subdivision development, including servicing, grading, stormwater management, tree protection and landscaping, utility coordination, and agency conditions to name a few. The application particulars are posted on the Planning Applications page of the Planning & Development website, and approval of all Agreements associated with developments, including pre-servicing and subdivision agreements, are considered by Council in open session prior to final approval.

3. PURPOSE

The purpose of this Report is to provide Council with an overview of the requested approvals by RCL for the development lands, specifically the tree removals in Stage 1 of the proposed Work Plan.

4. ORIGIN AND LEGISLATION

Section 51(26) of the *Planning Act* authorizes the municipality to enter into agreements imposed as a condition to the approval of a plan of subdivision and the agreements may be registered against the land to which it applies.

5. BACKGROUND

The overall Villages of Central Park development lands have an area of 107.3 hectares, and are generally located in the area of Brook Road North and Elgin Street East. The draft approved Phase 1 lands are located in the south-west quadrant of the development, east of Denton Drive and north of Elgin Street East. See *Figure 1 -- Key Map* below.

The Villages of Central Park - Phase 1 Lands are designated as “Living Area, “Village Square”, “Elementary School” and “Environmental Protection” in the Cobourg East Community Secondary Plan (OPA 76), and zoned “Cobourg East Low Density Residential (CER1) Zone,” “Institutional (I-8) Zone”, “Open Space (OS) Zone”, and “Environmental Constraint (EC) Zone” in the Comprehensive Zoning By-law No. 85-2003.

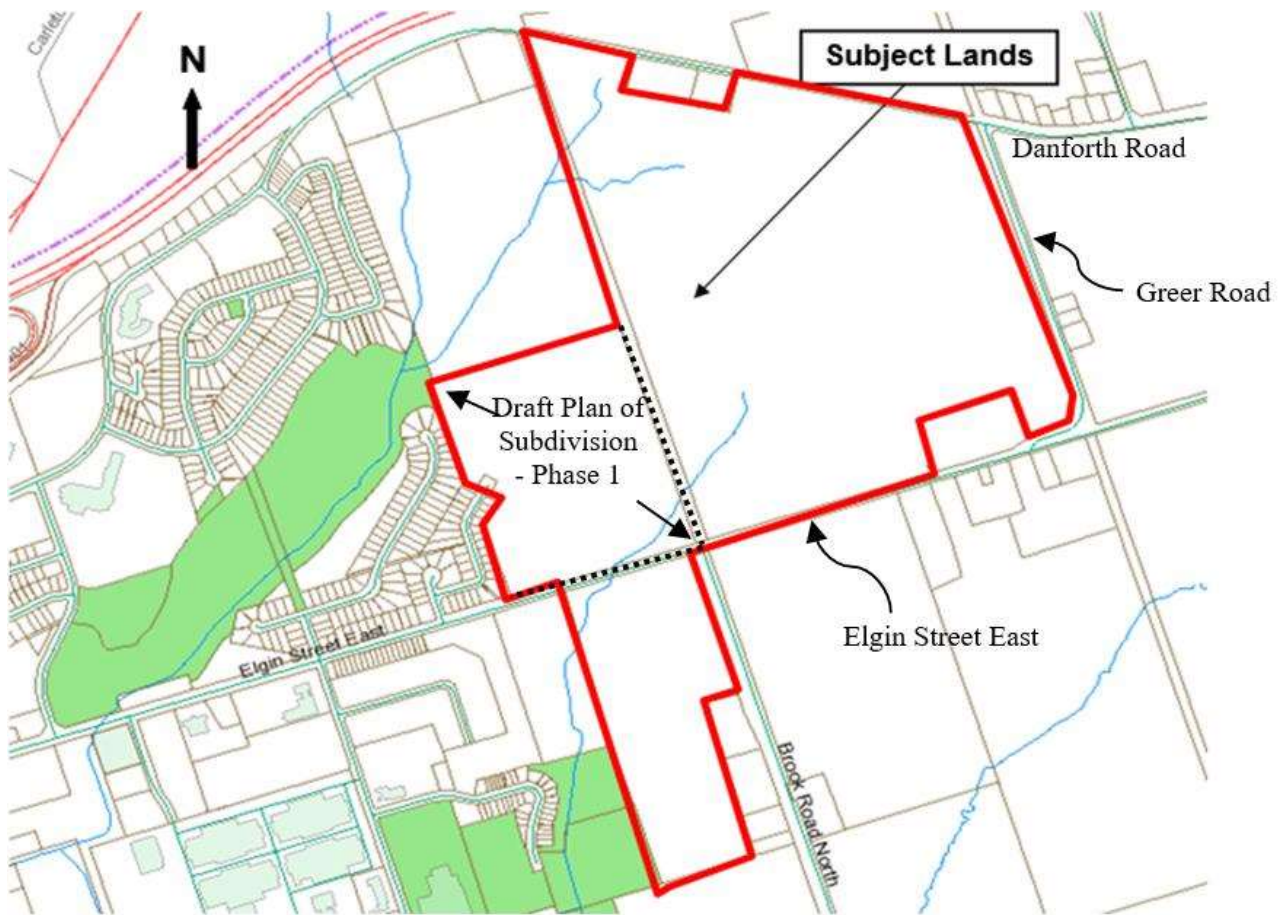
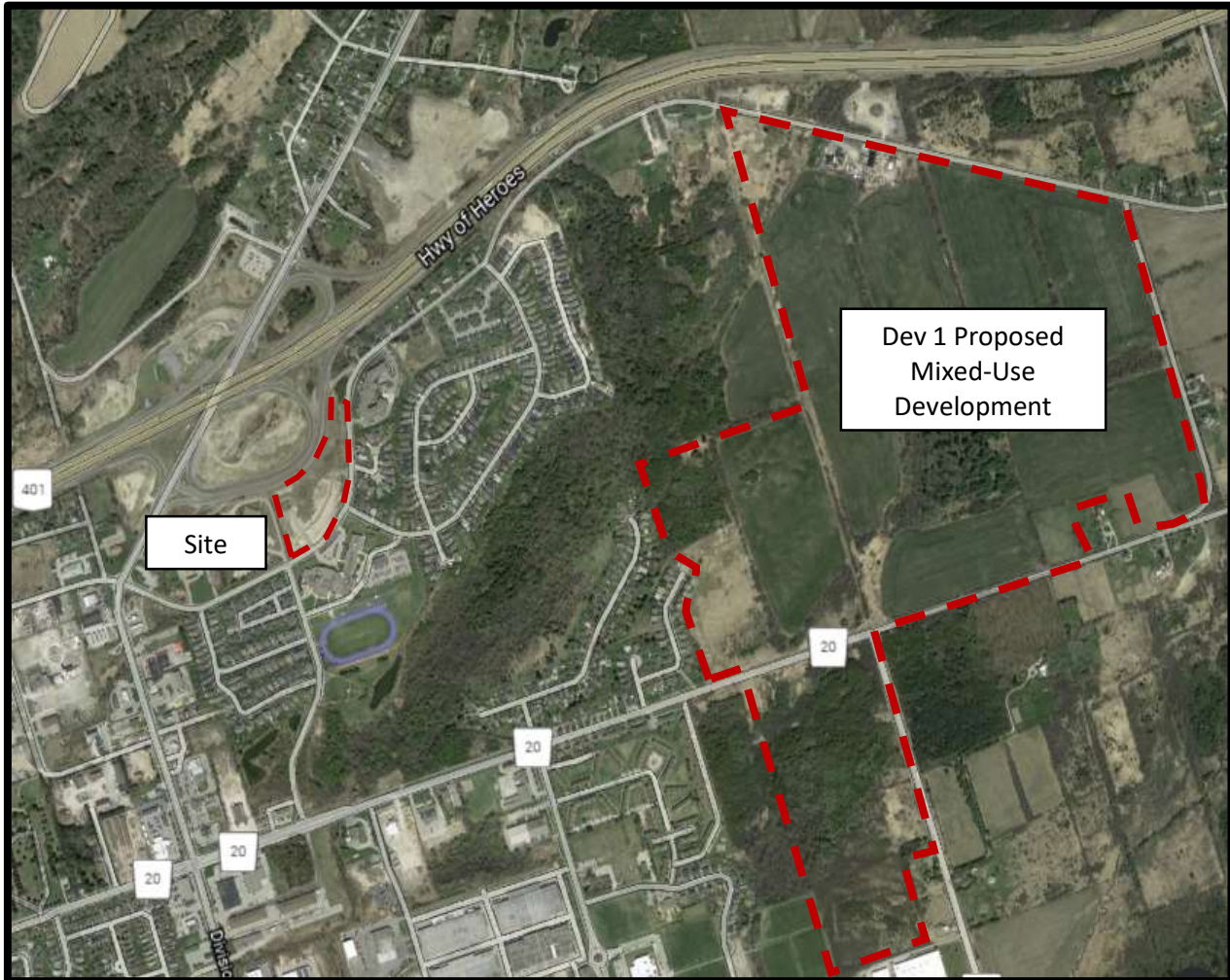


Figure 1 – Key Map

As indicated above, RCL propose the phased development of a 1,500 -1,700 unit mixed-use, neighbourhood-oriented community on the 107 ha site. The site is currently comprised of a mix of open farm field/meadow, fence/hedgerows, successional and scrub vegetation, woodlots, marsh and creek tributary. The central woodlot, creek/marsh valley, and Nickerson Woods and Elgin Street/Brook Road North woodlots collectively comprise approx. 27 ha (67 ac) or approx. 25% of the total development area, which will be conveyed to the Municipality to form part of its greenlands/open space system. An additional 15 ha (37 ac) of public parkland and open spaces (stormwater management ponds, trail-heads) within the development will contribute to the Municipality's open space system, for a total of approx. 40% of the overall site being dedicated and maintained as public open space (see Figure 2 – Overall Community Master Plan).

Background Development Map



Background Development Trip Generation

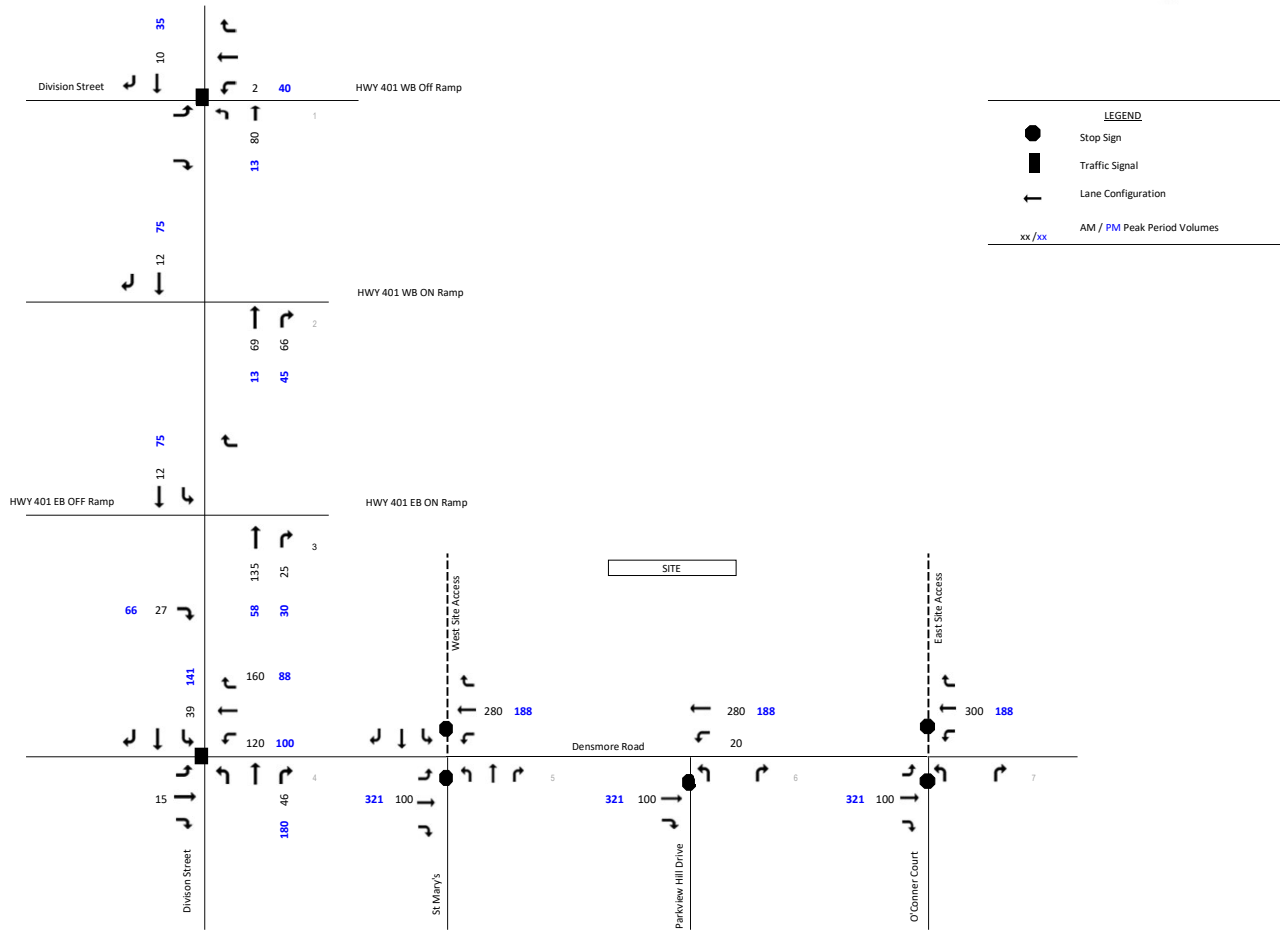
Villages of Central Park

Land Use	Dwelling Units		AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Danforth and Greer Road - Villages of Central Park Residential Single Family Detached Housing (Low-Rise) ITE Code 210	1600	Distribution	25%	75%	100%	63%	37%	100%
		Fitted Curve Equation	$T = 0.71(X) + 4.80$			$\ln(T) = 0.96 \ln(X) + 0.20$		
		Rate	0.18	0.53	0.71	0.57	0.34	0.91
		Trips	285	856	1141	917	538	1455

Assume 35% of background development trips move along Densmore/Danforth Road during both the AM and PM peaks

Land Use	Dwelling Units		AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Danforth and Greer Road - Villages of Central Park Residential Single Family Detached Housing (Low-Rise) ITE Code 210	1600	Distribution	25%	75%	100%	63%	37%	100%
		Fitted Curve Equation	T = 0.71(X) +4.80			Ln(T) = 0.96 Ln(X) + 0.20		
		Rate	0.18	0.53	0.71	0.57	0.34	0.91
		Trips	285	856	1141	917	538	1455
Trips Along Densmore Rd			100	300	400	321	188	509

Background Development - Villages of Central Park





APPENDIX C

Capacity and Queueing Analysis

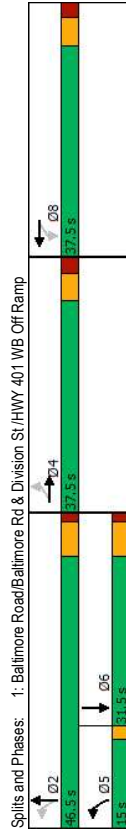
Timings

1: Baltimore Road/Baltimore Rd & Division St /HWY 401 WB Off Ramp

<Existing 2021> AM Peak

06-18-2021

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Configurations	1	0	207	3	15	320	666
Traffic Volume (vph)	1	0	207	3	15	320	666
Future Volume (vph)	1	0	207	3	15	320	666
Turn Type	Perm	NA	Perm	NA	pm-pt	NA	NA
Protected Phases	4	4	8	2	2	2	6
Permitted Phases	4	4	8	8	5	2	6
Detector Phase	4	4	8	8	5	2	6
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	20.0	20.0
Minimum Split (s)	37.5	37.5	37.5	37.5	9.0	30.5	30.5
Total Split (s)	37.5	37.5	37.5	37.5	15.0	46.5	31.5
Total Split (%)	30.9%	30.9%	30.9%	30.9%	12.3%	38.3%	25.9%
Yellow Time (s)	4.1	4.1	4.1	4.1	2.0	5.0	5.0
All-Red Time (s)	2.4	2.4	2.4	2.4	0.0	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	2.0	6.5	6.5
Lead/Lag					Lead	Lag	
Lead-Lag Optimize?					Yes	Yes	
Recall Mode	None	None	None	None	Max	None	
Act Eff Green (s)	10.3	21.9	45.9	41.3	38.2		
Actuated g/C Ratio	0.12	0.26	0.54	0.48	0.45		
v/c Ratio	0.13	0.76	0.04	0.22	0.47		
Control Delay	0.9	45.0	15.1	16.3	22.4		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	0.9	45.0	15.1	16.3	22.4		
LOS	A	D	B	B	C		
Approach Delay	0.9	45.0	16.2	22.4			
Approach LOS	A	D	B	C			
Intersection Summary							
Cycle Length: 121.5							
Actuated Cycle Length: 85.3							
Natural Cycle: 115							
Control Type: Actuated-Uncoordinated							
Maximum v/c Ratio: 0.76							
Intersection Signal Delay: 24.3							
Intersection Capacity Utilization 48.8%							
Analysis Period (min) 15							



HCM Signalized Intersection Capacity Analysis

1: Baltimore Road/Baltimore Rd & Division St /HWY 401 WB Off Ramp

<Existing 2021> AM Peak

06-18-2021

Movement	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	1	0	32	207	3	20	15	320
Traffic Volume (vph)	1	0	32	207	3	20	15	320
Future Volume (vph)	1	0	32	207	3	20	15	320
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		6.5		2.0	6.5		6.5
Lane Util. Factor	1.00		1.00		1.00	0.95		0.95
Frt	0.87		0.99		1.00	1.00		1.00
Flt Protected	1.00		0.96		0.95	1.00		1.00
Satd. Flow (prot)	1572		1695		1805	3282		3470
Flt Permitted	1.00		0.72		0.29	1.00		1.00
Satd. Flow (perm)	1569		1277		548	3282		3470
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	0	35	225	3	22	16	348
RTOR Reduction (vph)	0	34	0	0	3	0	0	0
Lane Group Flow (vph)	0	2	0	0	247	0	16	348
Heavy Vehicles (%)	0%	0%	5%	6%	0%	7%	0%	10%
Turn Type	Perm	NA	Perm	Perm	pm+pt	NA	Perm	Perm
Protected Phases	4				8	5	2	6
Permitted Phases	4				8	2		
Actuated Green, G (s)	5.3				21.9	42.6	42.6	38.2
Effective Green, g (s)	5.3				21.9	42.6	42.6	38.2
Actuated g/C Ratio	0.06				0.25	0.48	0.48	0.43
Clearance Time (s)	6.5				6.5	2.0	6.5	6.5
Vehicle Extension (s)	3.0				3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	93				313	295	1565	1484
v/s Ratio Prot	0.00				0.00	c0.11		c0.21
v/s Ratio Perm	0.02				0.79	0.05	0.22	0.49
Uniform Delay, d1	39.6				31.5	12.8	13.7	18.5
Progression Factor	1.00				1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1				12.4	0.1	0.3	0.3
Delay (s)	39.7				43.9	12.9	14.0	18.8
Level of Service	D				D	B	B	B
Approach Delay (s)	39.7				43.9	13.9	18.8	18.8
Approach LOS	D				D	B	B	B
Intersection Summary								
HCM 2000 Control Delay					22.6			C
HCM 2000 Volume to Capacity ratio					0.54			
Actuated Cycle Length (s)					85.3			21.5
Intersection Capacity Utilization					48.8%			A
Analysis Period (min)					15			
c. Critical Lane Group								

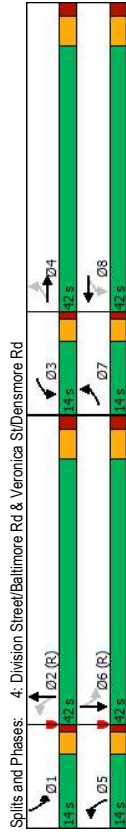
Timings

4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<Existing 2021> AM Peak

06-18-2021

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group								
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Traffic Volume (vph)	12	3	89	7	31	481	102	894
Future Volume (vph)	12	3	89	7	31	481	102	894
Turn Type	pm-pt	NA	pm-pt	NA	pm-pt	NA	pm-pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4	8	8	2	2	6	6	6
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	6.0	7.0	6.0	7.0	6.0	15.0	6.0	15.0
Minimum Split (s)	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0
Total Split (s)	14.0	42.0	14.0	42.0	14.0	42.0	14.0	42.0
Total Split (%)	12.5%	37.5%	12.5%	37.5%	12.5%	37.5%	12.5%	37.5%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effect Green (s)	48.0	36.0	48.0	36.0	48.0	36.0	48.0	36.0
Actuated g/C Ratio	0.43	0.32	0.43	0.32	0.43	0.32	0.43	0.32
v/c Ratio	0.03	0.03	0.17	0.21	0.16	0.63	0.38	1.04
Control Delay	16.6	15.0	18.1	6.9	18.2	34.6	21.0	74.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.6	15.0	18.1	6.9	18.2	34.6	21.0	74.5
LOS	B	B	B	A	B	C	C	E
Approach Delay								
Approach LOS	B	B	B	B	B	C	C	E
Intersection Summary								
Cycle Length: 112								
Actuated Cycle Length: 112								
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green								
Natural Cycle: 105								
Control Type: Prelimed								
Maximum v/c Ratio: 1.04								
Intersection Signal Delay: 51.2								
Intersection Capacity Utilization 56.0%								
Analysis Period (min) 15								



HCM Signalized Intersection Capacity Analysis

4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<Existing 2021> AM Peak

06-18-2021

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Movement								
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Traffic Volume (vph)	12	3	10	89	7	31	481	80
Future Volume (vph)	12	3	10	89	7	31	481	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95
Frt	1.00	0.89	1.00	0.86	1.00	0.98	1.00	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1444	1686	1719	1589	1805	3258	1752	3346
Flt Permitted	0.68	1.00	0.75	1.00	0.11	1.00	0.26	1.00
Satd. Flow (perm)	1031	1686	1352	1589	211	3258	480	3346
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	14	4	12	106	8	37	573	95
RTOR Reduction (vph)	0	8	0	0	78	0	12	0
Lane Group Flow (vph)	14	8	0	106	45	0	37	656
Heavy Vehicles (%)	25%	0%	0%	5%	0%	3%	0%	9%
Turn Type	pm-pt	NA	pm-pt	NA	pm-pt	NA	pm-pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4	8	8	2	2	6	6	6
Actuated Green, G (s)	48.0	36.0	46.0	36.0	46.0	36.0	46.0	36.0
Effective Green, g (s)	46.0	36.0	46.0	36.0	46.0	36.0	46.0	36.0
Actuated g/C Ratio	0.41	0.32	0.41	0.32	0.41	0.32	0.41	0.32
Clearance Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Grp Cap (vph)	460	541	588	510	228	1047	310	1075
v/s Ratio Prot	0.00	0.00	c0.02	0.03	0.01	0.20	c0.03	c0.33
v/s Ratio Perm	0.01		c0.06		0.05		0.13	
v/c Ratio	0.03	0.01	0.18	0.09	0.16	0.63	0.39	1.03
Uniform Delay, d1	19.6	25.9	20.7	26.5	24.2	32.3	21.7	38.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.0	0.7	0.3	1.5	2.8	3.7	36.9
Delay (s)	19.8	26.0	21.4	26.9	25.7	35.1	25.4	74.9
Level of Service	B	C	C	C	C	D	C	E
Approach Delay (s)	23.1		24.3		34.6		70.0	
Approach LOS	C		C		C		E	
Intersection Summary								
HCM 2000 Control Delay	53.3							
HCM 2000 Volume to Capacity ratio	0.54							
Actuated Cycle Length (s)	112.0							
Intersection Capacity Utilization	56.0%							
Analysis Period (min)	15							
c Critical Lane Group								

HCM Unsignalized Intersection Capacity Analysis 5: St Mary's S.S/West Site Access & Densmore Rd <Existing 2021> AM Peak 06-18-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔	↔	↔		↔		↔	↔	↔	↔
Traffic Volume (veh/h)	0	182	3	3	193	0	0	0	0	3	0	0
Future Volume (Veh/h)	0	182	3	3	193	0	0	0	0	3	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	0	222	4	4	235	0	0	0	4	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None											
Median storage (veh)												
Upstream signal (m)												
pX platoon unblocked												
VC, conflicting volume	235			226			467	467	224	471	469	235
VC1, stage 1 conf vol												
VC2, stage 2 conf vol	235			226			467	467	224	471	469	235
VCu, unblocked vol	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
IC, single (s)												
IC, 2 stage (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
IF (s)	100			100			100	100	100	100	100	100
p0 queue free %	1344			1354			508	495	815	503	494	809
CM capacity (veh/h)												
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	226	239	0	4	0	0						
Volume Left	0	4	0	0	0	0						
Volume Right	4	0	0	4	0	0						
cSH	1344	1354	1700	815	1700	1700						
Volume to Capacity	0.00	0.00	0.00	0.00	0.00	0.00						
Queue Length 95th (m)	0.0	0.1	0.0	0.1	0.0	0.0						
Control Delay (s)	0.0	0.2	0.0	9.4	0.0	0.0						
Lane LOS	A	A	A	A	A	A						
Approach Delay (s)	0.0	0.2	9.4									
Approach LOS	A											
Intersection Summary												
Average Delay				0.2								
Intersection Capacity Utilization				19.8%								
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis 6: Parkview Hills Drive & Densmore Rd <Existing 2021> AM Peak 06-18-2021

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	122	63	1	136	60	6
Future Volume (Veh/h)	122	63	1	136	60	6
Sign Control	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	151	78	1	168	74	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)						
pX platoon unblocked						
VC, conflicting volume			229		360	190
VC1, stage 1 conf vol						
VC2, stage 2 conf vol			229		360	190
VCu, unblocked vol			4.1		6.4	6.2
IC, single (s)						
IC, 2 stage (s)			2.2		3.5	3.3
IF (s)			100		88	99
p0 queue free %			1351		632	857
CM capacity (veh/h)						
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	229	169	81			
Volume Left	0	1	74			
Volume Right	78	0	7			
cSH	1700	1351	647			
Volume to Capacity	0.13	0.00	0.13			
Queue Length 95th (m)	0.0	0.0	3.4			
Control Delay (s)	0.0	0.1	11.4			
Lane LOS	A	A	B			
Approach Delay (s)	0.0	0.1	11.4			
Approach LOS		B				
Intersection Summary						
Average Delay			1.9			
Intersection Capacity Utilization			20.6%			
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 7: O'Conner Crt/East Site Access & Densmore Rd <Existing 2021> AM Peak 06-18-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	123	4	0	133	0	4	0	1	0	0	0
Future Volume (Veh/h)	0	123	4	0	133	0	4	0	1	0	0	0
Sign Control		Free			Free		Stop		Stop		Stop	
Grade		0%			0%		0%		0%		0%	
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Hourly flow rate (vph)	0	160	5	0	173	0	5	0	1	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX platoon unblocked												
VC, conflicting volume	173			165			336	336	162	336	338	173
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	173			165			336	336	162	336	338	173
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
IC, 2 stage (s)												
IF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	100	100	100	100	100
CM capacity (veh/h)	1416			1426			618	585	882	616	583	871
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	165	173	6	0								
Volume Left	0	0	5	0								
Volume Right	5	0	1	0								
cSH	1416	1426	651	1700								
Volume to Capacity	0.00	0.00	0.01	0.00								
Queue Length 95th (m)	0.0	0.0	0.2	0.0								
Control Delay (s)	0.0	0.0	10.6	0.0								
Lane LOS			B	A								
Approach Delay (s)	0.0	0.0	10.6	0.0								
Approach LOS			B	A								
Intersection Summary												
Average Delay			0.2									
Intersection Capacity Utilization			17.0%									
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 19: Baltimore Rd & HWY 401 EB Off Ramp <Existing 2021> AM Peak 06-18-2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	115	487	0	0	704
Future Volume (Veh/h)	0	115	487	0	0	704
Sign Control		Yield	Free			Free
Grade		0%	0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	128	541	0	0	782
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			333			
pX platoon unblocked	0.98	0.98			0.98	
VC, conflicting volume	932	270			541	
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCu, unblocked vol	883	219			495	
IC, single (s)	6.8	7.2			4.1	
IC, 2 stage (s)						
IF (s)	3.5	3.4			2.2	
p0 queue free %	100	83			100	
CM capacity (veh/h)	276	735			1059	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	128	270	270	391	391	
Volume Left	0	0	0	0	0	
Volume Right	128	0	0	0	0	
cSH	735	1700	1700	1700	1700	
Volume to Capacity	0.17	0.16	0.16	0.23	0.23	
Queue Length 95th (m)	5.0	0.0	0.0	0.0	0.0	
Control Delay (s)	10.9	0.0	0.0	0.0	0.0	
Lane LOS		B				
Approach Delay (s)	10.9	0.0		0.0		
Approach LOS		B				
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			27.2%			
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 21: Baltimore Rd & HWY 401 EB Off Ramp & HWY 401 EB ON Ramp

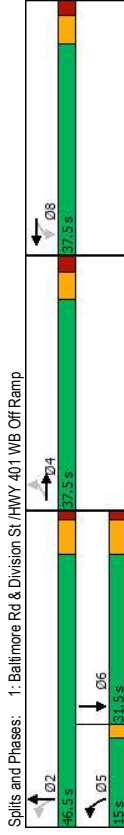
<Existing 2021> AM Peak
 06-18-2021

Movement	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations										
Traffic Volume (veh/h)	0	353	0	487	103	0	688	0	0	0
Future Volume (Veh/h)	0	353	0	487	103	0	688	0	0	0
Sign Control	Yield		Free	0%		Free	0%	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
Hourly flow rate (vph)	0	392	0	541	114	0	764	0	0	0
Pedestrians										
Lane Width (m)										
Walking Speed (m/s)										
Percent Blockage										
Right turn flare (veh)										
Median type										
Median storage (veh)										
Upstream signal (m)										
pK platform unblocked	0.90					0.90			0.90	0.90
VC1, stage 1 conf vol	1305	382	764			541			1315	1305
VC2, stage 2 conf vol										
VCU, unblocked vol	1121	382	764			273			1132	1121
IC, single (s)	6.5	7.1	4.1			4.1			7.5	6.5
IC, 2 stage (s)										
p0 queue free %	4.0	3.4	2.2			2.2			3.5	4.0
dm capacity (veh/h)	188	596	858			1160			100	100
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2				
Volume Total	392	270	270	114	382	382				
Volume Left	0	0	0	0	0	0				
Volume Right	392	0	0	114	0	0				
cSH	596	1700	1700	1700	1700	1700				
Volume to Capacity	0.66	0.16	0.16	0.07	0.22	0.22				
Queue Length 95th (m)	38.7	0.0	0.0	0.0	0.0	0.0				
Control Delay (s)	21.8	0.0	0.0	0.0	0.0	0.0				
Lane LOS	C									
Approach Delay (s)	21.8	0.0			0.0					
Approach LOS	C									
Intersection Summary										
Average Delay					4.7					
Intersection Capacity Utilization					47.5%					A
Analysis Period (min)					15					

Timings
 1: Baltimore Rd & Division St / HWY 401 WB Off Ramp

<Existing 2021> PM Peak
 06-18-2021

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Configurations							
Traffic Volume (vph)	8	0	87	6	49	769	465
Future Volume (vph)	8	0	87	6	49	769	465
Turn Type	Perm	NA	Perm	NA	ph+pt	NA	NA
Protected Phases	4		4		5	2	6
Permitted Phases	4		8		8	5	2
Detector Phase	4		8		8	5	2
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	20.0	20.0
Minimum Split (s)	37.5	37.5	37.5	37.5	9.0	30.5	30.5
Total Split (s)	37.5	37.5	37.5	37.5	15.0	46.5	31.5
Total Split (%)	30.9%	30.9%	30.9%	30.9%	12.3%	38.3%	25.9%
Yellow Time (s)	4.1	4.1	4.1	4.1	2.0	5.0	5.0
All-Red Time (s)	2.4	2.4	2.4	2.4	0.0	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	2.0	6.5	6.5
Lead/Lag					Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes
Recall Mode	None	None	None	None	None	Max	None
Act Effct Green (s)	10.1	12.9	48.1	43.6	38.2		
Actuated g/C Ratio	0.13	0.16	0.61	0.55	0.48		
v/c Ratio	0.17	0.55	0.09	0.45	0.30		
Control Delay	1.6	39.2	9.8	13.6	16.6		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	1.6	39.2	9.8	13.6	16.6		
LOS	A	D	A	B	B		
Approach Delay	1.6		39.2		13.4	16.6	
Approach LOS	A		D		B	B	
Intersection Summary							
Cycle Length: 121.5							
Actuated Cycle Length: 78.9							
Natural Cycle: 115							
Control Type: Actuated-Uncoordinated							
Maximum v/c Ratio: 0.55							
Intersection Signal Delay: 16.0							
Intersection Capacity Utilization 49.6%							
Analysis Period (min) 15							



HCM Signalized Intersection Capacity Analysis
 1: Baltimore Rd & Division St/Hwy 401 WB Off Ramp

<Existing 2021> PM Peak
 06-18-2021

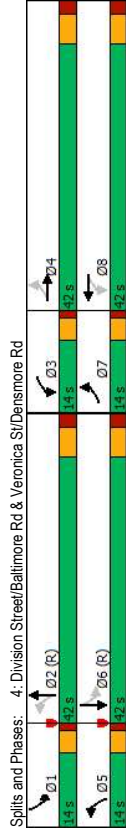
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	8	0	42	87	6	18	49	769	0	0	465	8
Traffic Volume (vph)	8	0	42	87	6	18	49	769	0	0	465	8
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	6.5	0.0	6.5	6.5	2.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Total Lost time (s)	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Lane Util. Factor	0.89	0.98	0.96	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	1670	1640	1805	3282	0.43	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Permitted	1619	1256	826	3282	0.43	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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	0	44	92	6	19	52	809	0	0	489	8
RTOR Reduction (vph)	0	48	0	0	7	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	4	0	0	110	0	52	809	0	0	496	0
Heavy Vehicles (%)	0%	0%	0%	10%	0%	7%	0%	10%	7%	0%	4%	0%
Turn Type	Perm	NA	Perm	Perm	NA	pm+pt	NA	NA	NA	NA	NA	NA
Protected Phases	4	4	8	8	5	2	2	2	2	2	2	2
Permitted Phases	4	8	8	8	5	2	2	2	2	2	2	2
Actuated Green, G (s)	5.6	5.6	12.9	12.9	44.4	44.4	44.4	44.4	44.4	44.4	38.2	38.2
Effective Green, g (s)	5.6	5.6	12.9	12.9	44.4	44.4	44.4	44.4	44.4	44.4	38.2	38.2
Actuated g/C Ratio	0.07	0.16	0.16	0.16	0.54	0.54	0.54	0.54	0.54	0.54	0.46	0.46
Clearance Time (s)	6.5	6.5	6.5	6.5	2.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5
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)	110	196	494	1768	0.01	c0.25	0.14	0.14	0.14	0.14	1606	1606
v/s Ratio Prot	c0.00	c0.09	0.01	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.14	0.14
v/s Ratio Perm	0.03	0.56	0.11	0.46	0.11	0.46	0.11	0.46	0.11	0.46	0.31	0.31
Uniform Delay, d1	35.9	32.1	9.1	11.6	9.1	11.6	9.1	11.6	9.1	11.6	13.8	13.8
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	0.1	3.7	0.1	0.9	0.1	0.9	0.1	0.9	0.1	0.9	0.1	0.1
Delay (s)	36.0	35.8	9.2	12.5	9.2	12.5	9.2	12.5	9.2	12.5	13.9	13.9
Level of Service	D	D	A	B	A	B	A	B	A	B	B	B
Approach Delay (s)	36.0	35.8	12.3	13.9	12.3	13.9	12.3	13.9	12.3	13.9	13.9	13.9
Approach LOS	D	D	B	B	B	B	B	B	B	B	B	B
Intersection Summary	HCM 2000 Level of Service											
HCM 2000 Control Delay	15.4											
HCM 2000 Volume to Capacity ratio	0.46											
Actuated Cycle Length (s)	82.4											
Intersection Capacity Utilization	49.6%											
Analysis Period (min)	15											
c. Critical Lane Group	15											

Densmore Rd
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 Synchro 10 Report

Timings
 4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<Existing 2021> PM Peak
 06-18-2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4	4	4	4	4	4	4	4	4	4	4	4
Traffic Volume (vph)	44	5	88	2	19	904	106	673	106	673	106	673
Future Volume (vph)	44	5	88	2	19	904	106	673	106	673	106	673
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6	6	6	6	6
Permitted Phases	7	4	3	8	5	2	1	6	6	6	6	6
Detector Phase	7	4	3	8	5	2	1	6	6	6	6	6
Switch Phase	6.0	7.0	6.0	7.0	6.0	15.0	6.0	15.0	6.0	15.0	6.0	15.0
Minimum Initial (s)	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0
Minimum Split (s)	14.0	42.0	14.0	42.0	14.0	42.0	14.0	42.0	14.0	42.0	14.0	42.0
Total Split (%)	12.5%	37.5%	12.5%	37.5%	12.5%	37.5%	12.5%	37.5%	12.5%	37.5%	12.5%	37.5%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max
Recall Mode	48.0	36.0	48.0	36.0	48.0	36.0	48.0	36.0	48.0	36.0	48.0	36.0
Act Effct Green (s)	0.43	0.32	0.43	0.32	0.43	0.32	0.43	0.32	0.43	0.32	0.43	0.32
Actuated g/C Ratio	0.07	0.07	0.15	0.19	0.06	0.94	0.51	0.63	0.51	0.63	0.51	0.63
v/c Ratio	17.0	10.8	17.9	6.4	16.8	53.4	26.8	35.3	26.8	35.3	26.8	35.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.0	10.8	17.9	6.4	16.8	53.4	26.8	35.3	26.8	35.3	26.8	35.3
LOS	B	B	B	A	B	D	C	D	C	D	C	D
Approach Delay	14.2	11.7	52.7	34.2	11.7	52.7	34.2	11.7	52.7	34.2	11.7	52.7
Approach LOS	B	B	D	D	B	D	D	D	D	D	D	D
Intersection Summary	Cycle Length: 112											
Cycle Length: 112	Actuated Cycle Length: 112											
Offset: 0 (0%), Referenced to phase 2NBT and 6SBTL, Start of Green	Natural Cycle: 105											
Control Type: Prelimed	Maximum v/c Ratio: 0.94											
Intersection Signal Delay: 40.5	Intersection LOS: D											
Intersection Capacity Utilization 59.3%	ICU Level of Service B											
Analysis Period (min) 15												



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HCM Signalized Intersection Capacity Analysis
 4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<Existing 2021> PM Peak
 06-18-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	44	5	31	88	2	101	19	904	112	106	673	21
Future Volume (vph)	44	5	31	88	2	101	19	904	112	106	673	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1805	1654	1687	1530	1805	3399	1656	3470	1656	3470	1656	3470
Flt Permitted	0.69	1.00	0.73	1.00	0.24	1.00	0.11	1.00	0.11	1.00	0.11	1.00
Satd. Flow (perm)	1309	1654	1302	1530	447	3399	194	3470	194	3470	194	3470
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)	45	5	32	90	2	103	19	922	114	108	687	21
RTOR Reduction (vph)	0	22	0	0	70	0	0	9	0	0	2	0
Lane Group Flow (vph)	45	15	0	90	35	0	19	1027	0	108	706	0
Heavy Vehicles (%)	0%	0%	0%	7%	0%	6%	0%	5%	0%	9%	3%	22%
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6	1	6	1	6
Permitted Phases	4	8	8	8	2	2	6	6	6	6	6	6
Actuated Green, G (s)	46.0	36.0	46.0	36.0	46.0	36.0	46.0	36.0	46.0	36.0	46.0	36.0
Effective Green, g (s)	46.0	36.0	46.0	36.0	46.0	36.0	46.0	36.0	46.0	36.0	46.0	36.0
Actuated g/C Ratio	0.41	0.32	0.41	0.32	0.41	0.32	0.41	0.32	0.41	0.32	0.41	0.32
Clearance Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Grp Cap (vph)	581	531	569	491	304	1092	210	1115	210	1115	210	1115
v/s Ratio Prot	0.01	0.01	c0.01	0.02	0.01	c0.30	c0.05	0.20	c0.05	0.20	c0.05	0.20
v/s Ratio Perm	0.02	c0.05	0.16	0.07	0.02	0.06	0.94	0.17	0.06	0.94	0.17	0.63
Uniform Delay, d1	19.9	26.0	20.5	26.4	20.5	37.0	24.6	32.4	24.6	32.4	24.6	32.4
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	0.3	0.1	0.6	0.3	0.4	16.2	8.7	2.7	8.7	2.7	8.7	2.7
Delay (s)	20.2	26.1	21.1	26.7	20.9	53.2	33.3	35.1	33.3	35.1	33.3	35.1
Level of Service	C	C	C	C	C	D	C	D	C	D	C	D
Approach Delay (s)	22.9	24.1	24.1	24.1	24.1	52.6	34.9	34.9	34.9	34.9	34.9	34.9
Approach LOS	C	C	C	C	C	D	C	D	C	D	C	D
Intersection Summary												
HCM 2000 Control Delay	42.2 HCM 2000 Level of Service											
HCM 2000 Volume to Capacity ratio	0.50											
Actuated Cycle Length (s)	112.0 Sum of lost time (s)											
Intersection Capacity Utilization	59.3% ICU Level of Service											
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
 5: St Mary's S.S/West Site Access & Densmore Rd

<Existing 2021> PM Peak
 06-18-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	223	0	0	192	0	0	0	0	0	0	0
Future Volume (Veh/h)	0	223	0	0	192	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	0	251	0	0	216	0	0	0	0	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	216			251			467	467	251	467	467	216
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vC3, unblocked vol	216			251			467	467	251	467	467	216
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
IC, 2 stage (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	100	100	100
cM capacity (veh/h)	1366			1326			509	496	793	509	496	829
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	251	216	0	0	0	0						
Volume Left	0	0	0	0	0	0						
Volume Right	0	0	0	0	0	0						
cSH	1366	1326	1700	1700	1700	1700						
Volume to Capacity	0.00	0.00	0.00	0.00	0.00	0.00						
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0						
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0						
Lane LOS	A	A	A	A	A	A						
Approach Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0						
Approach LOS	A	A	A	A	A	A						
Intersection Summary												
Average Delay	0.0											
Intersection Capacity Utilization	15.1%											
ICU Level of Service	A											
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis 6: Parkview Hills Drive & Densmore Rd

HCM Unsignalized Intersection Capacity Analysis 7: O'Conner Crt/East Site Access & Densmore Rd

Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	EB	EB	WB	WB	NB	NB	
Traffic Volume (veh/h)	153	70	0	150	43	0	
Future Volume (Veh/h)	153	70	0	150	43	0	
Sign Control	Free	Free	Free	Free	Stop	Stop	
Grade	0%	0%	0%	0%	0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	
Hourly flow rate (vph)	170	78	0	167	48	0	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None						
Median storage (veh)							
Upstream signal (m)							
pX platoon unblocked							
VC, conflicting volume		248			376	209	
VC1, stage 1 conf vol							
VC2, stage 2 conf vol		248			376	209	
VCu, unblocked vol		4.1			6.4	6.2	
IC, single (s)							
IC, 2 stage (s)		2.2			3.5	3.3	
p0 queue free %		100			92	100	
CM capacity (veh/h)		1330			629	836	
Direction, Lane #	EB 1	WB 1	NB 1				
Volume Total	248	167	48				
Volume Left	0	0	48				
Volume Right	78	0	0				
cSH	1700	1330	629				
Volume to Capacity	0.15	0.00	0.08				
Queue Length 95th (m)	0.0	0.0	2.0				
Control Delay (s)	0.0	0.0	11.2				
Lane LOS			B				
Approach Delay (s)	0.0	0.0	11.2				
Approach LOS			B				
Intersection Summary							
Average Delay			1.2				
Intersection Capacity Utilization			22.3%				
Analysis Period (min)			15				

Densmore Rd
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Synchro 10 Report

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Traffic Volume (veh/h)	0	148	5	0	146	0	5	0	0	0	0	0
Future Volume (Veh/h)	0	148	5	0	146	0	5	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	0	180	6	0	178	0	6	0	0	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None											
Median storage (veh)												
Upstream signal (m)												
pX platoon unblocked												
VC, conflicting volume	178			186			361	361	183	361	364	178
VC1, stage 1 conf vol												
VC2, stage 2 conf vol	178			186			361	361	183	361	364	178
VCu, unblocked vol	4.1			4.1			7.1	6.6	6.2	7.1	6.5	6.2
IC, single (s)												
IC, 2 stage (s)	2.2			2.2			3.5	4.1	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	100	100	100	100	100
CM capacity (veh/h)	1410			1377			538	560	865	598	567	870
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	186	178	6	0								
Volume Left	0	0	6	0								
Volume Right	6	0	0	0								
cSH	1410	1377	598	1700								
Volume to Capacity	0.00	0.00	0.01	0.00								
Queue Length 95th (m)	0.0	0.0	0.2	0.0								
Control Delay (s)	0.0	0.0	11.1	0.0								
Lane LOS			B	A								
Approach Delay (s)	0.0	0.0	11.1	0.0								
Approach LOS			B	A								
Intersection Summary												
Average Delay			0.2									
Intersection Capacity Utilization			18.1%									
Analysis Period (min)			15									

Densmore Rd
Trans-Plan

Synchro 10 Report

HCM Unsignalized Intersection Capacity Analysis
19: Baltimore Rd & HWY 401 EB Off Ramp

<Existing 2021> PM Peak
06-18-2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↖↗	↖↗		↖↗
Traffic Volume (veh/h)	0	256	897	0	0	458
Future Volume (Veh/h)	0	256	897	0	0	458
Sign Control	Yield		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	261	915	0	0	467
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			333			
pX platoon unblocked	0.80	0.80			0.80	
VC, conflicting volume	1148	458			915	
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCu, unblocked vol	682	0			390	
IC, single (s)	6.8	6.9			4.2	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.3	
p0 queue free %	100	70			100	
CM capacity (veh/h)	310	869			908	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	261	458	458	234	234	
Volume Left	0	0	0	0	0	
Volume Right	261	0	0	0	0	
cSH	869	1700	1700	1700	1700	
Volume to Capacity	0.30	0.27	0.27	0.14	0.14	
Queue Length 95th (m)	10.1	0.0	0.0	0.0	0.0	
Control Delay (s)	10.9	0.0	0.0	0.0	0.0	
Lane LOS	B					
Approach Delay (s)	10.9	0.0		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			1.7			
Intersection Capacity Utilization			47.3%		ICU Level of Service	A
Analysis Period (min)			15			

Densmore Rd
Trans-Plan

Synchro 10 Report

HCM Unsignalized Intersection Capacity Analysis
21: Baltimore Rd & HWY 401 EB Off Ramp & HWY 401 EB ON Ramp

<Existing 2021> PM Peak
06-18-2021

Movement	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations				↖↗	↖↗		↖↗		
Traffic Volume (veh/h)	0	364	0	897	153	0	436	0	0
Future Volume (Veh/h)	0	364	0	897	153	0	436	0	0
Sign Control	Yield		Free		Free		Free	Stop	
Grade	0%		0%		0%		0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	371	0	915	156	0	445	0	0
Pedestrians									
Lane Width (m)									
Walking Speed (m/s)									
Percent Blockage									
Right turn flare (veh)									
Median type				None			None		
Median storage (veh)									
Upstream signal (m)				155					
pX platoon unblocked	0.74					0.74		0.74	0.74
VC, conflicting volume	1360	222	445			915		1508	1360
VC1, stage 1 conf vol									
VC2, stage 2 conf vol									
VCu, unblocked vol	770	222	445			164		972	770
IC, single (s)	6.5	6.9	4.1			4.1		7.5	6.5
IC, 2 stage (s)									
IF (s)	4.0	3.3	2.2			2.2		3.5	4.0
p0 queue free %	100	53	100			100		100	100
CM capacity (veh/h)	245	787	1126			1049		82	245
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2			
Volume Total	371	458	458	156	222	222			
Volume Left	0	0	0	0	0	0			
Volume Right	371	0	0	156	0	0			
cSH	787	1700	1700	1700	1700	1700			
Volume to Capacity	0.47	0.27	0.27	0.09	0.13	0.13			
Queue Length 95th (m)	20.4	0.0	0.0	0.0	0.0	0.0			
Control Delay (s)	13.6	0.0	0.0	0.0	0.0	0.0			
Lane LOS	B								
Approach Delay (s)	13.6	0.0			0.0				
Approach LOS	B								
Intersection Summary									
Average Delay				2.7					
Intersection Capacity Utilization				41.3%		ICU Level of Service		A	
Analysis Period (min)				15					

Densmore Rd
Trans-Plan

Synchro 10 Report

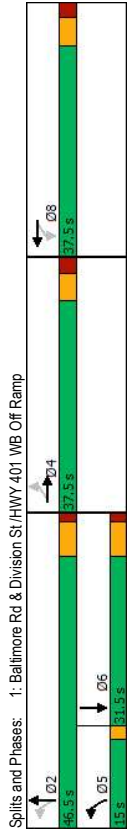
Timings

1: Baltimore Rd & Division St /HWY 401 WB Off Ramp

<BKGD 2026> AM Peak

06-21-2021

	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group							
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Traffic Volume (vph)	2	0	230	3	16	434	745
Future Volume (vph)	2	0	230	3	16	434	745
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	NA
Protected Phases	4	8	2	2	5	2	6
Permitted Phases	4	8	2	2	5	2	6
Detector Phase	4	8	8	8	5	2	6
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	20.0	20.0
Minimum Split (s)	37.5	37.5	37.5	37.5	9.0	30.5	30.5
Total Split (s)	37.5	37.5	37.5	37.5	15.0	46.5	31.5
Total Split (%)	30.9%	30.9%	30.9%	30.9%	12.3%	38.3%	25.9%
Yellow Time (s)	4.1	4.1	4.1	4.1	2.0	5.0	5.0
All-Red Time (s)	2.4	2.4	2.4	2.4	0.0	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	2.0	6.5	6.5
Lead/Lag					Lead		Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	Max	None	None
Act Eff Green (s)	10.3	24.6	45.8	41.1	38.0		
Actuated g/C Ratio	0.12	0.28	0.52	0.47	0.43		
v/c Ratio	0.14	0.77	0.05	0.28	0.53		
Control Delay	1.0	45.4	15.8	17.7	24.3		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	1.0	45.4	15.8	17.7	24.3		
LOS	A	D	B	B	C		
Approach Delay	1.0	45.4	17.6	24.3			
Approach LOS	A	D	B	C			
Intersection Summary							
Cycle Length: 121.5							
Actuated Cycle Length: 87.9							
Natural Cycle: 115							
Control Type: Actuated-Uncoordinated							
Maximum v/c Ratio: 0.77							
Intersection Signal Delay: 25.3							
Intersection Capacity Utilization 52.5%							
Analysis Period (min) 15							



Splits and Phases: 1: Baltimore Rd & Division St /HWY 401 WB Off Ramp

HCM Signalized Intersection Capacity Analysis

1: Baltimore Rd & Division St /HWY 401 WB Off Ramp

<BKGD 2026> AM Peak

06-21-2021

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	2	0	35	230	3	23	16	434	0	0	745	3
Future Volume (vph)	2	0	35	230	3	23	16	434	0	0	745	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5			6.5			2.0	6.5				
Lane Util. Factor	1.00			1.00			1.00	0.95				
Frt	0.87			0.99			1.00	1.00				
Flt Protected	1.00			0.96			0.95	1.00				
Satd. Flow (prot)	1652			1648			1805	3505				
Flt Permitted	0.99			0.72			0.25	1.00				
Satd. Flow (perm)	1647			1239			477	3505				
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)	2	0	37	242	3	24	17	457	0	0	784	3
RTOR Reduction (vph)	0	37	0	0	3	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2	0	0	266	0	17	457	0	0	787	0
Heavy Vehicles (%)	0%	0%	0%	10%	0%	0%	0%	3%	4%	0%	4%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA				
Protected Phases	4			8			5	2				6
Permitted Phases	4			8			2					
Actuated Green, G (s)	5.3			24.7			42.5	42.5				38.0
Effective Green, g (s)	5.3			24.7			42.5	42.5				38.0
Actuated g/C Ratio	0.06			0.27			0.46	0.46				0.41
Clearance Time (s)	6.5			6.5			2.0	6.5				6.5
Vehicle Extension (s)	3.0			3.0			3.0	3.0				3.0
Lane Grp Cap (vph)	94			332			256	1619				1433
v/s Ratio Prot	0.00			c0.21			0.00	c0.13				c0.23
v/s Ratio Perm	0.02			0.80			0.07	0.28				0.55
Uniform Delay, d1	40.9			31.4			14.2	15.3				20.5
Progression Factor	1.00			1.00			1.00	1.00				1.00
Incremental Delay, d2	0.1			13.0			0.1	0.4				0.4
Delay (s)	41.0			44.4			14.3	15.8				20.9
Level of Service	D			D			B	B				C
Approach Delay (s)	41.0			44.4			15.7	20.9				20.9
Approach LOS	D			D			B	C				C
Intersection Summary												
HCM 2000 Control Delay	23.9			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	0.59											
Actuated Cycle Length (s)	92.0			Sum of lost time (s)			21.5					
Intersection Capacity Utilization	52.5%			ICU Level of Service			A					
Analysis Period (min)	15											
c. Critical Lane Group												

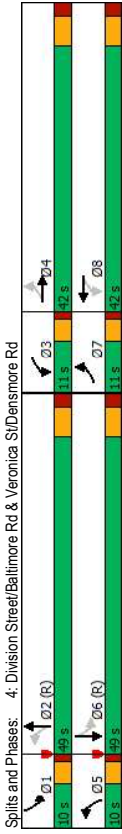
Timings

4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<BKGD 2026> AM Peak

06-21-2021

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Traffic Volume (vph)	13	18	218	8	34	531	152	987
Future Volume (vph)	13	18	218	8	34	531	152	987
Turn Type	pm-pt	NA	pm-pt	NA	pm-pt	NA	pm-pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4	8	2	2	6	6	6	6
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase	6.0	7.0	6.0	7.0	6.0	15.0	6.0	15.0
Minimum Initial (s)	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0
Minimum Split (s)	11.0	42.0	11.0	42.0	10.0	49.0	10.0	49.0
Total Split (%)	9.8%	37.5%	9.8%	37.5%	8.9%	43.8%	8.9%	43.8%
Total Split (%)	9.8%	37.5%	9.8%	37.5%	8.9%	43.8%	8.9%	43.8%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lost Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Max	Max	Max	Max	Max	Max	Max	Max
Recall Mode	45.0	36.0	45.0	36.0	51.0	43.0	51.0	43.0
Act Effct Green (s)	0.40	0.32	0.40	0.32	0.46	0.38	0.46	0.38
Actuated g/C Ratio	0.03	0.05	0.40	0.41	0.19	0.52	0.53	0.80
v/c Ratio	18.2	19.1	24.2	5.8	17.4	26.9	24.3	35.9
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	18.2	19.1	24.2	5.8	17.4	26.9	24.3	35.9
Total Delay	B	B	C	A	B	C	C	D
LOS	B	B	C	A	B	C	C	D
Approach Delay	18.8	13.9	26.4	26.4	34.4	34.4	34.4	34.4
Approach LOS	B	B	C	C	C	C	C	C
Intersection Summary								
Cycle Length: 112								
Actuated Cycle Length: 112								
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green								
Natural Cycle: 105								
Control Type: Prelimed								
Maximum v/c Ratio: 0.80								
Intersection Signal Delay: 27.7								
Intersection Capacity Utilization 65.9%								
Analysis Period (min) 15								



HCM Signalized Intersection Capacity Analysis

4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<BKGD 2026> AM Peak

06-21-2021

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Movement	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Traffic Volume (vph)	13	18	11	218	8	34	531	152
Future Volume (vph)	13	18	11	218	8	34	531	152
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95
Frt	1.00	0.94	1.00	0.85	1.00	0.97	1.00	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1805	1792	1687	1534	1805	3366	1656	3451
Flt Permitted	0.46	1.00	0.74	1.00	0.11	1.00	0.29	1.00
Satd. Flow (perm)	868	1792	1311	1534	218	3366	509	3451
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	13	18	11	222	8	35	542	137
RTOR Reduction (vph)	0	7	0	0	185	0	20	0
Lane Group Flow (vph)	13	22	0	222	95	0	35	659
Heavy Vehicles (%)	0%	0%	0%	7%	0%	6%	0%	3%
Turn Type	pm-pt	NA	pm-pt	NA	pm-pt	NA	pm-pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4	8	2	2	6	6	6	6
Actuated Green, G (s)	43.0	36.0	43.0	36.0	49.0	43.0	49.0	43.0
Effective Green, g (s)	43.0	36.0	43.0	36.0	49.0	43.0	49.0	43.0
Actuated g/C Ratio	0.38	0.32	0.38	0.32	0.44	0.38	0.44	0.38
Clearance Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Grp Cap (vph)	391	576	526	493	180	1292	284	1324
v/s Ratio Prot	0.00	0.01	0.03	0.06	0.01	0.20	0.03	0.31
v/s Ratio Perm	0.01	0.01	0.14	0.07	0.07	0.21	0.01	0.21
v/c Ratio	0.03	0.04	0.42	0.19	0.19	0.51	0.05	0.80
Uniform Delay, d1	21.7	26.1	24.6	27.5	21.0	26.4	20.9	30.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1	2.5	0.9	2.4	1.4	7.4	5.0
Delay (s)	21.9	26.2	27.1	28.4	23.4	27.9	28.3	35.6
Level of Service	C	C	C	C	C	C	C	D
Approach Delay (s)	24.9	C	27.8	C	C	C	34.7	C
Approach LOS	C	C	C	C	C	C	C	C
Intersection Summary								
HCM 2000 Control Delay								
HCM 2000 Volume to Capacity ratio								
Actuated Cycle Length (s)								
Intersection Capacity Utilization								
Analysis Period (min)								
c Critical Lane Group								

HCM Unsignalized Intersection Capacity Analysis
5: St Mary's S.S/West Site Access & Densmore Rd

<BKGD 2026> AM Peak
06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔	↔	↔		↔		↔	↔	↔	↔
Traffic Volume (veh/h)	0	301	3	3	493	0	0	0	3	0	0	0
Future Volume (Veh/h)	0	301	3	3	493	0	0	0	3	0	0	0
Sign Control		Free		Free		Stop		Stop		Stop		Stop
Grade		0%		0%		0%		0%		0%		0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	0	338	3	3	554	0	0	0	3	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None				None						
Median storage (veh)												
Upstream signal (m)												
pX platoon unblocked	554			341			900	900	340	902	901	554
VC, conflicting volume												
VC1, stage 1 conf vol												
VC2, stage 2 conf vol	554			341			900	900	340	902	901	554
VCU, unblocked vol	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
IC, single (s)												
IC, 2 stage (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	100	100	100
ICF (s)												
ICF (s)	1026			1229			261	280	707	259	279	536
ICM capacity (veh/h)												
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1							
Volume Total	341	557	0	3	0							
Volume Left	0	3	0	0	0							
Volume Right	3	0	0	3	0							
cSH	1026	1229	1700	707	1700							
Volume to Capacity	0.00	0.00	0.00	0.00	0.00							
Queue Length 95th (m)	0.0	0.1	0.0	0.1	0.0							
Control Delay (s)	0.0	0.1	0.0	10.1	0.0							
Lane LOS	A	A	A	B	A							
Approach Delay (s)	0.0	0.1	10.1		0.0							
Approach LOS		B			A							
Intersection Summary												
Average Delay					0.1							
Intersection Capacity Utilization					31.7%					ICU Level of Service	A	
Analysis Period (min)					15							

HCM Unsignalized Intersection Capacity Analysis
6: Parkview Hills Drive & Densmore Rd

<BKGD 2026> AM Peak
06-21-2021

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	234	70	22	430	66	7
Future Volume (Veh/h)	234	70	22	430	66	7
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)	260	78	24	478	73	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None			None	
Median storage (veh)						
Upstream signal (m)						
pX platoon unblocked					825	299
VC, conflicting volume						
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol					825	299
IC, single (s)					6.4	6.2
IC, 2 stage (s)						
ICF (s)					2.2	3.5
ICF (s)					98	78
p0 queue free %					1232	338
ICM capacity (veh/h)						745
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	338	502	81			
Volume Left	0	24	73			
Volume Right	78	0	8			
cSH	1700	1232	358			
Volume to Capacity	0.20	0.02	0.23			
Queue Length 95th (m)	0.0	0.5	6.9			
Control Delay (s)	0.0	0.6	18.0			
Lane LOS	A	A	C			
Approach Delay (s)	0.0	0.6	18.0			
Approach LOS		C				
Intersection Summary						
Average Delay			1.9			
Intersection Capacity Utilization			51.3%			ICU Level of Service
Analysis Period (min)			15			A

HCM Unsignalized Intersection Capacity Analysis
7: O'Conner Crt/East Site Access & Densmore Rd

<BKGD 2026> AM Peak

06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔	↔		↔			↔	↔
Traffic Volume (veh/h)	0	236	5	0	446	0	5	0	2	0	0	0
Future Volume (Veh/h)	0	236	5	0	446	0	5	0	2	0	0	0
Sign Control		Free			Free		Stop		Stop		Stop	
Grade		0%			0%		0%		0%		0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	0	288	6	0	544	0	6	0	2	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX platoon unblocked												
VC, conflicting volume	544			294			835		835	291	837	838
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCU, unblocked vol	544			294			835		835	291	837	838
IC, single (s)	4.1			4.1			7.1		6.6	6.2	7.1	6.5
IC, 2 stage (s)												
IF (s)	2.2			2.2			3.5		4.1	3.3	3.5	4.0
p0 queue free %	100			100			98		100	100	100	100
CM capacity (veh/h)	1035			1256			289		299	753	288	305
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	294	544	8	0								
Volume Left	0	0	6	0								
Volume Right	6	0	2	0								
cSH	1035	1256	342	1700								
Volume to Capacity	0.00	0.00	0.02	0.00								
Queue Length 95th (m)	0.0	0.0	0.6	0.0								
Control Delay (s)	0.0	0.0	15.8	0.0								
Lane LOS			C	A								
Approach Delay (s)	0.0	0.0	15.8	0.0								
Approach LOS			C	A								
Intersection Summary												
Average Delay			0.1									
Intersection Capacity Utilization			33.5%									A
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
19: Baltimore Rd & HWY 401 EB Off Ramp

<BKGD 2026> AM Peak

06-21-2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↔	↔		↔
Traffic Volume (veh/h)	0	127	673	0	0	789
Future Volume (Veh/h)	0	127	673	0	0	789
Sign Control		Yield	Free			Free
Grade		0%	0%			0%
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	130	687	0	0	805
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			333			
pX platoon unblocked						
VC, conflicting volume	1090	344				687
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	1090	344				687
IC, single (s)	6.8	6.9				4.2
IC, 2 stage (s)						
IF (s)	3.5	3.3				2.3
p0 queue free %	100	80				100
CM capacity (veh/h)	213	655				876
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	130	344	344	402	402	
Volume Left	0	0	0	0	0	
Volume Right	130	0	0	0	0	
cSH	655	1700	1700	1700	1700	
Volume to Capacity	0.20	0.20	0.20	0.24	0.24	
Queue Length 95th (m)	5.9	0.0	0.0	0.0	0.0	
Control Delay (s)	11.8	0.0	0.0	0.0	0.0	
Lane LOS		B				
Approach Delay (s)	11.8	0.0		0.0		
Approach LOS		B				
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			33.1%			A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 21: Baltimore Rd & HWY 401 EB Off Ramp & HWY 401 EB ON Ramp

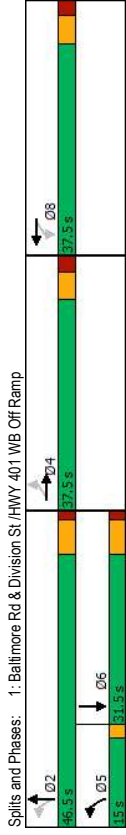
<BKGD 2026> AM Peak
 06-21-2021

Movement	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations										
Traffic Volume (veh/h)	0	503	0	673	138	0	953	0	0	0
Future Volume (Veh/h)	0	503	0	673	138	0	953	0	0	0
Sign Control	Yield		Free	0%		Free	0%	Stop		
Grade	0%		0%			0%		0%		
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	513	0	687	141	0	972	0	0	0
Pedestrians										
Lane Width (m)										
Walking Speed (m/s)										
Percent Blockage										
Right turn flare (veh)										
Median type										
Median storage (veh)										
Upstream signal (m)										
pK platform unblocked	0.91					0.91		0.91	0.91	0.91
VC, conflicting volume	1659	486	972			687		1686	1659	
VC1, stage 1 conf vol										
VC2, stage 2 conf vol										
VCu, unblocked vol	1525	486	972			455		1554	1525	
IC, single (s)	6.5	6.9	4.1			4.1		7.5	6.5	
IC, 2 stage (s)										
p0 queue free %	4.0	3.3	2.2			2.2		3.5	4.0	
p0 capacity (veh/h)	100	4	100			100		100	100	
cM capacity (veh/h)	108	533	717			1014		3	108	
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2				
Volume Total	513	344	344	141	486	486				
Volume Left	0	0	0	0	0	0				
Volume Right	513	0	0	141	0	0				
cSH	533	1700	1700	1700	1700	1700				
Volume to Capacity	0.96	0.20	0.20	0.08	0.29	0.29				
Queue Length 95th (m)	101.6	0.0	0.0	0.0	0.0	0.0				
Control Delay (s)	58.2	0.0	0.0	0.0	0.0	0.0				
Lane LOS	F									
Approach Delay (s)	58.2	0.0			0.0					
Approach LOS	F									
Intersection Summary										
Average Delay					12.9					C
Intersection Capacity Utilization					64.2%					
Analysis Period (min)					15					

Timings
 1: Baltimore Rd & Division St / HWY 401 WB Off Ramp

<BKGD 2026> PM Peak
 06-21-2021

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Configurations							
Traffic Volume (vph)	9	0	136	7	54	862	548
Future Volume (vph)	9	0	136	7	54	862	548
Turn Type	Perm	NA	Perm	NA	ph+pt	NA	NA
Protected Phases	4		4		8	5	2
Permitted Phases	4		8		8	5	2
Detector Phase	4		8		8	5	2
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	20.0	20.0
Minimum Split (s)	37.5	37.5	37.5	37.5	9.0	30.5	30.5
Total Split (s)	37.5	37.5	37.5	37.5	15.0	46.5	31.5
Total Split (%)	30.9%	30.9%	30.9%	30.9%	12.3%	38.3%	25.9%
Yellow Time (s)	4.1	4.1	4.1	4.1	2.0	5.0	5.0
All-Red Time (s)	2.4	2.4	2.4	2.4	0.0	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	2.0	6.5	6.5
Lead/Lag					Lead		Lag
Lead-Lag Optimize?					Yes		Yes
Recall Mode	None	None	None	None	Max	None	None
Act Effct Green (s)	10.2	16.6	45.5	40.9	33.6		
Actuated g/C Ratio	0.12	0.20	0.55	0.49	0.40		
v/c Ratio	0.19	0.68	0.12	0.56	0.42		
Control Delay	2.6	45.3	12.6	18.7	22.4		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	2.6	45.3	12.6	18.7	22.4		
LOS	A	D	B	B	C		
Approach Delay	2.6	45.3		18.3	22.4		
Approach LOS	A	D		B	C		
Intersection Summary							
Cycle Length: 121.5							
Actuated Cycle Length: 83.2							
Natural Cycle: 115							
Control Type: Actuated-Uncoordinated							
Maximum v/c Ratio: 0.68							
Intersection Signal Delay: 21.8							
Intersection Capacity Utilization 52.5%							
Analysis Period (min) 15							



HCM Signalized Intersection Capacity Analysis 1: Baltimore Rd & Division St/Hwy 401 WB Off Ramp

<BKGD 2026> PM Peak

06-21-2021

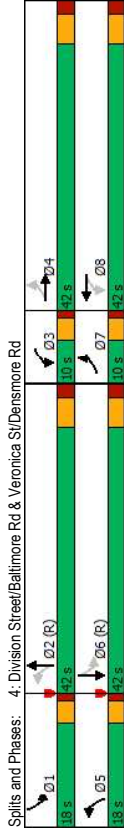
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	9	0	46	136	7	20	54	862	0	0	548	9
Traffic Volume (vph)	9	0	46	136	7	20	54	862	0	0	548	9
Future Volume (vph)	9	0	46	136	7	20	54	862	0	0	548	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	0	0	6.5	0	0	6.5	0	0	0	6.5	0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Frt	0.89	0.98	0.96	0.96	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.99	0.99	0.96	0.96	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1671	1671	1642	1642	1805	3282	3282	3282	3282	3282	3282	3282
Flt Permitted	0.97	0.72	0.72	0.72	0.36	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1634	1234	1234	1234	677	3282	3282	3282	3282	3282	3282	3282
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)	9	0	48	143	7	21	57	907	0	0	577	9
RTOR Reduction (vph)	0	52	0	0	5	0	0	0	0	0	0	1
Lane Group Flow (vph)	0	5	0	0	166	0	57	907	0	0	585	0
Heavy Vehicles (%)	0%	0%	0%	10%	0%	7%	0%	10%	7%	0%	4%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA	7%	0%	4%	0%
Protected Phases	4	4	4	8	8	8	5	2	2	2	6	6
Permitted Phases	4	4	4	8	8	8	5	2	2	2	6	6
Actuated Green, G (s)	7.6	7.6	16.6	16.6	41.4	41.4	41.4	41.4	41.4	41.4	33.6	33.6
Effective Green, g (s)	7.6	7.6	16.6	16.6	41.4	41.4	41.4	41.4	41.4	41.4	33.6	33.6
Actuated g/C Ratio	0.09	0.20	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.39	0.39
Clearance Time (s)	6.5	6.5	6.5	6.5	2.0	6.5	2.0	6.5	2.0	6.5	6.5	6.5
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)	145	145	240	240	406	1596	406	1596	406	1596	1368	1368
v/s Ratio Prot	c0.00	c0.13	0.01	0.01	c0.28	0.17	0.01	c0.28	0.17	0.01	0.17	0.17
v/s Ratio Perm	0.04	0.04	0.69	0.69	0.14	0.57	0.14	0.57	0.14	0.57	0.43	0.43
Uniform Delay, d1	35.4	31.9	11.8	11.8	15.5	15.5	15.5	15.5	15.5	15.5	18.8	18.8
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	0.1	8.3	0.2	0.2	1.5	1.5	1.5	1.5	1.5	1.5	0.2	0.2
Delay (s)	35.5	40.2	12.0	12.0	17.0	17.0	17.0	17.0	17.0	17.0	19.0	19.0
Level of Service	D	D	B	B	B	B	B	B	B	B	B	B
Approach Delay (s)	35.5	35.5	40.2	40.2	16.7	16.7	16.7	16.7	16.7	16.7	19.0	19.0
Approach LOS	D	D	B	B	B	B	B	B	B	B	B	B
Intersection Summary	HCM 2000 Level of Service											
HCM 2000 Control Delay	20.3											
HCM 2000 Volume to Capacity ratio	0.55											
Actuated Cycle Length (s)	85.1											
Intersection Capacity Utilization	52.5%											
Analysis Period (min)	15											
c. Critical Lane Group												

Timings 4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<BKGD 2026> PM Peak

06-21-2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4	4	4	4	4	4	4	4	4	4	4	4
Traffic Volume (vph)	49	5	197	3	21	998	258	744	4	4	4	4
Future Volume (vph)	49	5	197	3	21	998	258	744	4	4	4	4
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6	6	6	6	6
Permitted Phases	7	4	3	8	5	2	1	6	6	6	6	6
Detector Phase	7	4	3	8	5	2	1	6	6	6	6	6
Switch Phase	6.0	7.0	6.0	7.0	6.0	15.0	6.0	15.0	6.0	15.0	6.0	15.0
Minimum Initial (s)	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0
Minimum Split (s)	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0
Total Split (%)	8.9%	37.5%	8.9%	37.5%	8.9%	37.5%	16.1%	37.5%	16.1%	37.5%	16.1%	37.5%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max
Recall Mode	44.0	36.0	44.0	36.0	44.0	36.0	52.0	36.0	52.0	36.0	52.0	36.0
Act Effct Green (s)	0.39	0.32	0.39	0.32	0.39	0.32	0.46	0.32	0.46	0.32	0.46	0.32
Actuated g/C Ratio	0.11	0.07	0.38	0.33	0.06	1.20	0.97	0.70	1.20	0.97	0.70	0.70
v/c Ratio	19.6	10.5	24.5	5.6	14.7	133.5	76.7	37.2	14.7	133.5	76.7	37.2
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	13.6	10.5	24.5	5.6	14.7	133.5	76.7	37.2	14.7	133.5	76.7	37.2
Total Delay	B	B	C	A	B	F	E	D	F	F	E	D
LOS	B	B	C	A	B	F	E	D	F	F	E	D
Approach Delay	15.6	14.9	131.7	131.7	131.7	131.7	131.7	131.7	131.7	131.7	131.7	131.7
Approach LOS	B	B	F	F	F	F	F	F	F	F	F	F
Intersection Summary												
Cycle Length: 112												
Actuated Cycle Length: 112												
Offset: 0 (0%), Referenced to phase 2(NBTL and 6(SBTL), Start of Green												
Natural Cycle: 115												
Control Type: Prelimed												
Maximum v/c Ratio: 1.20												
Intersection Signal Delay: 81.0												
Intersection Capacity Utilization 85.8%												
Analysis Period (min) 15												



HCM Signalized Intersection Capacity Analysis
 4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<BKGD 2026> PM Peak
 06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	49	5	34	197	3	200	21	998	303	258	744	24
Future Volume (vph)	49	5	34	197	3	200	21	998	303	258	744	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1805	1651	1687	1529	1805	1529	1805	3355	1656	3469	1656	3469
Flt Permitted	0.56	1.00	0.73	1.00	0.73	1.00	0.19	1.00	0.11	1.00	0.11	1.00
Satd. Flow (perm)	1065	1651	1298	1529	1298	1529	364	3355	194	3469	194	3469
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)	50	5	35	201	3	204	21	1018	309	263	759	24
RTOR Reduction (vph)	0	24	0	0	138	0	0	26	0	0	2	0
Lane Group Flow (vph)	50	16	0	201	69	0	21	1301	0	263	781	0
Heavy Vehicles (%)	0%	0%	0%	7%	0%	6%	0%	5%	0%	9%	3%	22%
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	2	1	6	1	6
Permitted Phases	4	8	8	2	2	2	6	6	6	6	6	6
Actuated Green, G (s)	42.0	36.0	42.0	36.0	42.0	36.0	50.0	36.0	50.0	36.0	50.0	36.0
Effective Green, g (s)	42.0	36.0	42.0	36.0	42.0	36.0	50.0	36.0	50.0	36.0	50.0	36.0
Actuated g/C Ratio	0.38	0.32	0.38	0.32	0.38	0.32	0.45	0.32	0.45	0.32	0.45	0.32
Clearance Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Grp Cap (vph)	439	530	507	491	342	1078	269	1115	269	1115	269	1115
v/s Ratio Prot	0.01	0.01	c0.02	0.04	0.01	c0.39	c0.12	0.23	c0.12	0.23	c0.12	0.23
v/s Ratio Perm	0.11	0.03	0.40	0.14	0.02	0.06	1.21	0.98	0.98	0.70	0.98	0.70
Uniform Delay, d1	22.6	26.0	25.0	27.0	18.6	38.0	32.0	33.3	32.0	33.3	32.0	33.3
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	0.5	0.1	2.3	0.6	0.3	102.1	49.5	3.7	49.5	3.7	49.5	3.7
Delay (s)	23.1	26.1	27.3	27.6	19.0	140.1	81.5	37.0	81.5	37.0	81.5	37.0
Level of Service	C	C	C	C	B	F	F	D	F	D	F	D
Approach Delay (s)	24.5	27.4	27.4	27.4	138.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2
Approach LOS	C	C	C	C	F	D	D	D	D	D	D	D
Intersection Summary	HCM 2000 Level of Service											
HCM 2000 Control Delay	86.5											
HCM 2000 Volume to Capacity ratio	0.80											
Actuated Cycle Length (s)	112.0											
Intersection Capacity Utilization	85.8%											
Analysis Period (min)	15											
c Critical Lane Group	E											

HCM Unsignalized Intersection Capacity Analysis
 5: St Mary's S.S/West Site Access & Densmore Rd

<BKGD 2026> PM Peak
 06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (veh/h)	0	567	0	0	400	0	0	0	0	0	0	0
Future Volume (Veh/h)	0	567	0	0	400	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	0	637	0	0	449	0	0	0	0	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None	None	None	None	None	None	None	None	None	None	None	None
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	449	637	637	1086	1086	637	1086	1086	637	1086	1086	449
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vC3, unblocked vol	449	637	637	1086	1086	637	1086	1086	637	1086	1086	449
IC, single (s)	4.1	4.1	4.1	7.1	7.1	4.1	7.1	7.1	4.1	7.1	7.1	4.1
IC, 2 stage (s)	2.2	2.2	2.2	3.5	3.5	2.2	3.5	3.5	2.2	3.5	3.5	2.2
p0 queue free %	100	100	100	100	100	100	100	100	100	100	100	100
CM capacity (veh/h)	1122	956	956	196	196	1122	196	196	1122	956	956	1122
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 1	EB 1	WB 1	NB 1	NB 2	SB 1	SB 1
Volume Total	637	449	0	0	0	0	637	449	0	0	0	0
Volume Left	0	0	0	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0	0	0	0	0	0
cSH	1122	956	1700	1700	1700	1700	1122	956	1700	1700	1700	1122
Volume to Capacity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	A	A	A	A	A	A	A	A	A	A	A
Approach Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Approach LOS	A	A	A	A	A	A	A	A	A	A	A	A
Intersection Summary	Intersection Capacity Utilization											
Average Delay	0.0											
Intersection Capacity Utilization	33.2%											
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
6: Parkview Hills Drive & Densmore Rd

<BKGD 2026> PM Peak
06-21-2021

Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	EB	EB	WB	WB	NB	NB	
Traffic Volume (veh/h)	490	78	0	353	47	0	
Future Volume (Veh/h)	490	78	0	353	47	0	
Sign Control	Free	Free	Free	Free	Stop	Stop	
Grade	0%	0%	0%	0%	0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	
Hourly flow rate (vph)	544	87	0	392	52	0	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None						
Median storage (veh)							
Upstream signal (m)							
pX platoon unblocked							
VC, conflicting volume		631			980	588	
VC1, stage 1 conf vol							
VC2, stage 2 conf vol		631			980	588	
VCu, unblocked vol		4.1			6.4	6.2	
IC, single (s)							
IC, 2 stage (s)		2.2			3.5	3.3	
IF (s)							
p0 queue free %		100			81	100	
CM capacity (veh/h)		961			280	513	
Direction, Lane #	EB 1	WB 1	NB 1				
Volume Total	631	392	52				
Volume Left	0	0	52				
Volume Right	87	0	0				
cSH	1700	961	280				
Volume to Capacity	0.37	0.00	0.19				
Queue Length 95th (m)	0.0	0.0	5.4				
Control Delay (s)	0.0	0.0	20.8				
Lane LOS			C				
Approach Delay (s)	0.0	0.0	20.8				
Approach LOS			C				
Intersection Summary							
Average Delay			1.0				
Intersection Capacity Utilization			40.3%				
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis
7: O'Conner Crt/East Site Access & Densmore Rd

<BKGD 2026> PM Peak
06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Traffic Volume (veh/h)	0	484	5	0	349	0	5	0	0	0	0	0
Future Volume (Veh/h)	0	484	5	0	349	0	5	0	0	0	0	0
Sign Control		Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor		0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)		590	6	0	426	0	6	0	0	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None										
Median storage (veh)												
Upstream signal (m)												
pX platoon unblocked												
VC, conflicting volume		426			596		1019	1019	593	1019	1022	426
VC1, stage 1 conf vol												
VC2, stage 2 conf vol		426			596		1019	1019	593	1019	1022	426
VCu, unblocked vol		4.1			4.1		7.1	6.6	6.2	7.1	6.5	6.2
IC, single (s)												
IC, 2 stage (s)		2.2			2.2		3.5	4.1	3.3	3.5	4.0	3.3
IF (s)												
p0 queue free %		100			100		97	100	100	100	100	100
CM capacity (veh/h)		1144			971		217	233	509	217	238	633
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	596	426	6	0								
Volume Left	0	0	6	0								
Volume Right	6	0	0	0								
cSH	1144	971	217	1700								
Volume to Capacity	0.00	0.00	0.03	0.00								
Queue Length 95th (m)	0.0	0.0	0.7	0.0								
Control Delay (s)	0.0	0.0	22.0	0.0								
Lane LOS			C	A								
Approach Delay (s)	0.0	0.0	22.0	0.0								
Approach LOS			C	A								
Intersection Summary												
Average Delay				0.1								
Intersection Capacity Utilization				35.8%								
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis
19: Baltimore Rd & HWY 401 EB Off Ramp

<BKGD 2026> PM Peak
06-21-2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	283	1048	0	0	581
Future Volume (Veh/h)	0	283	1048	0	0	581
Sign Control	Yield	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	289	1069	0	0	593
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			333			
pX platoon unblocked	0.77	0.77			0.77	
VC, conflicting volume	1366	534			1069	
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCu, unblocked vol	874	0			489	
IC, single (s)	6.8	6.9			4.2	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.3	
p0 queue free %	100	65			100	
CM capacity (veh/h)	225	836			802	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	289	534	534	296	296	
Volume Left	0	0	0	0	0	
Volume Right	289	0	0	0	0	
cSH	836	1700	1700	1700	1700	
Volume to Capacity	0.35	0.31	0.31	0.17	0.17	
Queue Length 95th (m)	12.4	0.0	0.0	0.0	0.0	
Control Delay (s)	11.6	0.0	0.0	0.0	0.0	
Lane LOS	B					
Approach Delay (s)	11.6	0.0		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			1.7			
Intersection Capacity Utilization			53.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
21: Baltimore Rd & HWY 401 EB Off Ramp & HWY 401 EB ON Ramp

<BKGD 2026> PM Peak
06-21-2021

Movement	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations									
Traffic Volume (veh/h)	0	468	0	1048	199	0	557	0	0
Future Volume (Veh/h)	0	468	0	1048	199	0	557	0	0
Sign Control	Yield	Free	Free	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	478	0	1069	203	0	568	0	0
Pedestrians									
Lane Width (m)									
Walking Speed (m/s)									
Percent Blockage									
Right turn flare (veh)									
Median type				None			None		
Median storage (veh)									
Upstream signal (m)				155					
pX platoon unblocked	0.71					0.71		0.71	0.71
VC, conflicting volume	1637	284	568			1069		1831	1637
VC1, stage 1 conf vol									
VC2, stage 2 conf vol									
VCu, unblocked vol	1086	284	568			288		1358	1086
IC, single (s)	6.5	6.9	4.1			4.1		7.5	6.5
IC, 2 stage (s)									
IF (s)	4.0	3.3	2.2			2.2		3.5	4.0
p0 queue free %	100	34	100			100		100	100
CM capacity (veh/h)	155	719	1014			915		26	155
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2			
Volume Total	478	534	534	203	284	284			
Volume Left	0	0	0	0	0	0			
Volume Right	478	0	0	203	0	0			
cSH	719	1700	1700	1700	1700	1700			
Volume to Capacity	0.66	0.31	0.31	0.12	0.17	0.17			
Queue Length 95th (m)	40.7	0.0	0.0	0.0	0.0	0.0			
Control Delay (s)	19.4	0.0	0.0	0.0	0.0	0.0			
Lane LOS	C								
Approach Delay (s)	19.4	0.0			0.0				
Approach LOS	C								
Intersection Summary									
Average Delay					4.0				
Intersection Capacity Utilization					51.0%			ICU Level of Service	A
Analysis Period (min)					15				

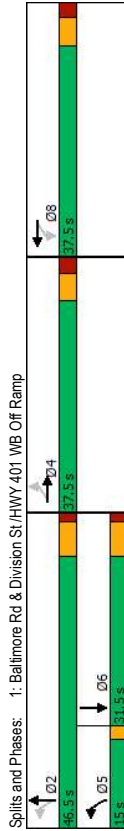
Timings

1: Baltimore Rd & Division St /HWY 401 WB Off Ramp

<BKGD 2031> AM Peak

06-21-2021

	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group							
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Traffic Volume (vph)	2	0	280	4	20	512	907
Future Volume (vph)	2	0	280	4	20	512	907
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	NA
Protected Phases	4	8	8	2	2	2	6
Permitted Phases	4	4	8	8	5	2	6
Detector Phase	4	4	8	8	5	2	6
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	20.0	20.0
Minimum Split (s)	37.5	37.5	37.5	37.5	9.0	30.5	30.5
Total Split (s)	37.5	37.5	37.5	37.5	15.0	46.5	31.5
Total Split (%)	30.9%	30.9%	30.9%	30.9%	12.3%	38.3%	25.9%
Yellow Time (s)	4.1	4.1	4.1	4.1	2.0	5.0	5.0
All-Red Time (s)	2.4	2.4	2.4	2.4	0.0	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	2.0	6.5	6.5
Lead/Lag					Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	Max	None	None
Act Eff Green (s)	10.1	31.2	44.8	40.3	36.9		
Actuated g/C Ratio	0.11	0.33	0.48	0.43	0.39		
v/c Ratio	0.17	0.80	0.08	0.36	0.70		
Control Delay	1.4	46.2	16.4	20.1	30.1		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	1.4	46.2	16.4	20.1	30.1		
LOS	A	D	B	C	C		
Approach Delay	1.4	46.2	20.0	30.1			
Approach LOS	A	D	B	C			
Intersection Summary							
Cycle Length: 121.5							
Actuated Cycle Length: 93.9							
Natural Cycle: 125							
Control Type: Actuated-Uncoordinated							
Maximum v/c Ratio: 0.80							
Intersection Signal Delay: 29.2							
Intersection Capacity Utilization 60.1%							
Analysis Period (min) 15							



Splits and Phases: 1: Baltimore Rd & Division St /HWY 401 WB Off Ramp

HCM Signalized Intersection Capacity Analysis

1: Baltimore Rd & Division St /HWY 401 WB Off Ramp

<BKGD 2031> AM Peak

06-21-2021

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Movement									
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Traffic Volume (vph)	2	0	43	280	4	28	20	512	907
Future Volume (vph)	2	0	43	280	4	28	20	512	907
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	2.0	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	0.95
Frt	0.87	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	1.00	0.96	0.96	0.95	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1651	1648	1648	1805	3505	3470	1651	1648	1651
Flt Permitted	1.00	0.71	0.71	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1647	1229	1229	287	3505	3470	1647	1229	1647
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2	0	45	295	4	29	21	539	955
RTOR Reduction (vph)	0	44	0	3	0	0	0	0	0
Lane Group Flow (vph)	0	3	0	325	0	21	539	0	959
Heavy Vehicles (%)	0%	0%	0%	10%	0%	0%	3%	4%	0%
Turn Type	Perm	NA	Perm	Perm	NA	pm+pt	NA	NA	NA
Protected Phases	4	4	8	8	5	2	6	6	6
Permitted Phases	4	4	8	8	5	2	6	6	6
Actuated Green, G (s)	5.6	5.6	31.2	31.2	41.5	41.5	36.9	36.9	36.9
Effective Green, g (s)	5.6	5.6	31.2	31.2	41.5	41.5	36.9	36.9	36.9
Actuated g/C Ratio	0.06	0.06	0.32	0.42	0.42	0.42	0.38	0.38	0.38
Clearance Time (s)	6.5	6.5	6.5	6.5	2.0	6.5	6.5	6.5	6.5
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)	94	392	162	1487	1309	1309	1309	1309	1309
v/s Ratio Prot	0.00	0.00	c0.15	c0.15	c0.28	c0.28	c0.28	c0.28	c0.28
v/s Ratio Perm	0.03	0.03	0.83	0.13	0.36	0.73	0.73	0.73	0.73
Uniform Delay, d1	43.5	30.8	18.4	19.2	26.2	26.2	26.2	26.2	26.2
Progression Delay, d2	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	13.5	0.4	0.7	2.2	2.2	2.2	2.2	2.2
Delay (s)	43.7	44.4	18.7	19.8	28.4	28.4	28.4	28.4	28.4
Level of Service	D	D	B	B	C	C	C	C	C
Approach Delay (s)	43.7	44.4	19.8	19.8	28.4	28.4	28.4	28.4	28.4
Approach LOS	D	D	B	B	C	C	C	C	C
Intersection Summary									
HCM 2000 Control Delay	29.0	29.0	19.8	19.8	28.4	28.4	28.4	28.4	28.4
HCM 2000 Volume to Capacity ratio	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Actuated Cycle Length (s)	97.8	97.8	97.8	97.8	97.8	97.8	97.8	97.8	97.8
Intersection Capacity Utilization	60.1%	60.1%	60.1%	60.1%	60.1%	60.1%	60.1%	60.1%	60.1%
Analysis Period (min)	15	15	15	15	15	15	15	15	15
c. Critical Lane Group									

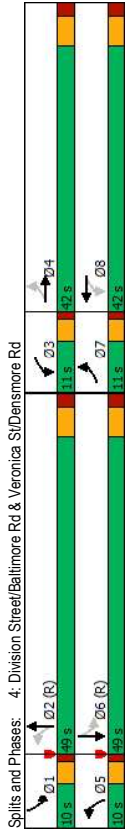
Timings

4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<BKGD 2031> AM Peak

06-21-2021

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group								
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Traffic Volume (vph)	16	19	239	12	41	647	177	1203
Future Volume (vph)	16	19	239	12	41	647	177	1203
Turn Type	pm-pt	NA	pm-pt	NA	pm-pt	NA	pm-pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4	8	2	2	6	6	6	6
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	6.0	7.0	6.0	7.0	6.0	15.0	6.0	15.0
Minimum Split (s)	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0
Total Split (s)	11.0	42.0	11.0	42.0	10.0	49.0	10.0	49.0
Total Split (%)	9.8%	37.5%	9.8%	37.5%	8.9%	43.8%	8.9%	43.8%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	45.0	36.0	45.0	36.0	51.0	43.0	51.0	43.0
Actuated g/C Ratio	0.40	0.32	0.40	0.32	0.46	0.38	0.46	0.38
v/c Ratio	0.04	0.05	0.45	0.44	0.25	0.62	0.75	0.97
Control Delay	18.3	18.5	25.2	6.0	18.7	29.4	40.0	52.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.3	18.5	25.2	6.0	18.7	29.4	40.0	52.7
LOS	B	B	C	A	B	C	D	D
Approach Delay								
Approach LOS	B	B	B	B	C	C	D	D
Intersection Summary								
Cycle Length: 112								
Actuated Cycle Length: 112								
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green								
Natural Cycle: 105								
Control Type: Prelimed								
Maximum v/c Ratio: 0.97								
Intersection Signal Delay: 37.2								
Intersection Capacity Utilization 73.4%								
Analysis Period (min) 15								



HCM Signalized Intersection Capacity Analysis

4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<BKGD 2031> AM Peak

06-21-2021

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Movement								
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Traffic Volume (vph)	16	19	13	239	12	290	41	647
Future Volume (vph)	16	19	13	239	12	290	41	647
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95
Frt	1.00	0.94	1.00	0.86	1.00	0.97	1.00	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1805	1784	1687	1537	1805	3370	1656	3451
Flt Permitted	0.42	1.00	0.74	1.00	0.09	1.00	0.22	1.00
Satd. Flow (perm)	795	1784	1307	1537	177	3370	381	3451
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	16	19	13	244	12	296	42	660
RTOR Reduction (vph)	0	9	0	0	0	18	0	0
Lane Group Flow (vph)	16	23	0	244	107	0	42	799
Heavy Vehicles (%)	0%	0%	0%	7%	0%	5%	0%	3%
Turn Type	pm-pt	NA	pm-pt	NA	pm-pt	NA	pm-pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4	8	2	2	6	6	6	6
Actuated Green, G (s)	43.0	36.0	43.0	36.0	49.0	43.0	49.0	43.0
Effective Green, g (s)	43.0	36.0	43.0	36.0	49.0	43.0	49.0	43.0
Actuated g/C Ratio	0.38	0.32	0.38	0.32	0.44	0.38	0.44	0.38
Clearance Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Grp Cap (vph)	368	573	525	494	164	1293	234	1324
v/s Ratio Prot	0.00	0.01	cd.03	0.07	0.01	0.24	cd.04	cd.037
v/c Ratio	0.04	0.04	0.46	0.22	0.26	0.62	0.77	0.97
Uniform Delay, d1	21.9	26.1	25.1	27.7	24.1	27.9	24.6	33.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1	2.9	1.0	3.7	2.2	2.1	18.6
Delay (s)	22.1	26.3	28.0	28.7	27.8	30.1	46.2	52.5
Level of Service	C	C	C	C	C	C	D	D
Approach Delay (s)	24.9		28.4		30.0		51.7	
Approach LOS	C	C	C	C	C	C	D	D
Intersection Summary								
HCM 2000 Control Delay	40.5							
HCM 2000 Volume to Capacity ratio	0.72							
Actuated Cycle Length (s)	112.0						20.0	
Intersection Capacity Utilization	73.4%							
Analysis Period (min)	15							
c Critical Lane Group								

DensmoreRd_Residential_Development

Trans-Plan

Synchro 10 Report

HCM Unsignalized Intersection Capacity Analysis
5: St Mary's S.S/West Site Access & Densmore Rd

<BKGD 2031> AM Peak
06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4	4	4	4						4	4
Traffic Volume (veh/h)	0	346	4	4	541	0	0	0	0	5	0	0
Future Volume (Veh/h)	0	346	4	4	541	0	0	0	0	5	0	0
Sign Control		Free		Free		Free	Stop	Stop		Stop		Stop
Grade		0%		0%		0%	0%	0%		0%		0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	0	389	4	4	608	0	0	0	6	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None										
Median storage (veh)												
Upstream signal (m)												
pX platoon unblocked	608			393			1007	1007	391	1013	1009	608
VC, conflicting volume												
VC1, stage 1 conf vol												
VC2, stage 2 conf vol	608			393			1007	1007	391	1013	1009	608
VCu, unblocked vol	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
IC, single (s)												
IC, 2 stage (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	99	100	100	100
IF (s)												
p0 queue free %	980			1177			221	242	662	217	241	499
CM capacity (veh/h)												
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1							
Volume Total	393	612	0	6	0							
Volume Left	0	4	0	0	0							
Volume Right	4	0	0	6	0							
cSH	980	1177	1700	662	1700							
Volume to Capacity	0.00	0.00	0.00	0.01	0.00							
Queue Length 95th (m)	0.0	0.1	0.0	0.2	0.0							
Control Delay (s)	0.0	0.1	0.0	10.5	0.0							
Lane LOS	A	A	A	B	A							
Approach Delay (s)	0.0	0.1	10.5		0.0							
Approach LOS		B			A							
Intersection Summary												
Average Delay				0.1								
Intersection Capacity Utilization				35.0%								
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis
6: Parkview Hills Drive & Densmore Rd

<BKGD 2031> AM Peak
06-21-2021

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	4				4	4
Traffic Volume (veh/h)	266	85	22	464	80	9
Future Volume (Veh/h)	266	85	22	464	80	9
Sign Control	Free		Free	Free	Stop	Stop
Grade	0%		0%	0%	0%	0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	236	94	24	516	89	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None			None	
Median storage (veh)						
Upstream signal (m)						
pX platoon unblocked						
VC, conflicting volume						
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCu, unblocked vol						
IC, single (s)						
IC, 2 stage (s)						
p0 queue free %						
IF (s)						
p0 queue free %						
CM capacity (veh/h)						
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	390	540	99			
Volume Left	0	24	89			
Volume Right	94	0	10			
cSH	1700	1180	321			
Volume to Capacity	0.23	0.02	0.31			
Queue Length 95th (m)	0.0	0.5	10.2			
Control Delay (s)	0.0	0.6	21.1			
Lane LOS	A	A	C			
Approach Delay (s)	0.0	0.6	21.1			
Approach LOS		C				
Intersection Summary						
Average Delay			2.3			
Intersection Capacity Utilization			54.0%			
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
7: O'Conner Crt/East Site Access & Densmore Rd

HCM Unsignalized Intersection Capacity Analysis
19: Baltimore Rd & HWY 401 EB Off Ramp

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔	↔		↔			↔	↔
Traffic Volume (veh/h)	0	267	7	0	480	0	6	0	2	0	0	0
Future Volume (Veh/h)	0	267	7	0	480	0	6	0	2	0	0	0
Sign Control		Free			Free		Stop		Stop		Stop	
Grade		0%			0%		0%		0%		0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	0	326	9	0	585	0	7	0	2	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX platoon unblocked												
VC, conflicting volume	585			335			916	916	330	918	920	585
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	585			335			916	916	330	918	920	585
IC, single (s)	4.1			4.1			7.1	6.6	6.2	7.1	6.5	6.2
IC, 2 stage (s)												
IF (s)	2.2			2.2			3.5	4.1	3.3	3.5	4.0	3.3
p0 queue free %	100			100			97	100	100	100	100	100
CM capacity (veh/h)	1000			1213			255	268	716	254	273	515
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	335	585	9	0								
Volume Left	0	0	7	0								
Volume Right	9	0	2	0								
cSH	1000	1213	298	1700								
Volume to Capacity	0.00	0.00	0.03	0.00								
Queue Length 95th (m)	0.0	0.0	0.7	0.0								
Control Delay (s)	0.0	0.0	17.5	0.0								
Lane LOS			C	A								
Approach Delay (s)	0.0	0.0	17.5	0.0								
Approach LOS			C	A								
Intersection Summary												
Average Delay			0.2									
Intersection Capacity Utilization			35.3%									A
Analysis Period (min)			15									

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↔	↔		↔
Traffic Volume (veh/h)	0	155	791	0	0	959
Future Volume (Veh/h)	0	155	791	0	0	959
Sign Control		Yield	Free			Free
Grade		0%	0%			0%
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	158	807	0	0	979
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			333			
pX platoon unblocked						
VC, conflicting volume	1296	404			807	
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCu, unblocked vol	1296	404			807	
IC, single (s)	6.8	6.9			4.2	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.3	
p0 queue free %	100	74			100	
CM capacity (veh/h)	156	599			788	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	158	404	404	490	490	
Volume Left	0	0	0	0	0	
Volume Right	158	0	0	0	0	
cSH	599	1700	1700	1700	1700	
Volume to Capacity	0.26	0.24	0.24	0.29	0.29	
Queue Length 95th (m)	8.4	0.0	0.0	0.0	0.0	
Control Delay (s)	13.1	0.0	0.0	0.0	0.0	
Lane LOS		B				
Approach Delay (s)	13.1	0.0		0.0		
Approach LOS		B				
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			38.1%			A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

21: Baltimore Rd & HWY 401 EB Off Ramp & HWY 401 EB ON Ramp

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Movement	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations				↕↕	↕		↕↕			
Traffic Volume (veh/h)	0	502	0	791	163	0	937	0	0	0
Future Volume (Veh/h)	0	502	0	791	163	0	937	0	0	0
Sign Control	Yield			Free			Free		Stop	
Grade	0%			0%			0%		0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	512	0	807	166	0	956	0	0	0
Pedestrians										
Lane Width (m)										
Walking Speed (m/s)										
Percent Blockage										
Right turn flare (veh)										
Median type				None			None			
Median storage (veh)										
Upstream signal (m)				155						
pX, platoon unblocked	0.86					0.86			0.86	0.86
vC, conflicting volume	1763	478	956			807			1797	1763
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	1567	478	956			460			1607	1567
tC, single (s)	6.5	6.9	4.1			4.1			7.5	6.5
tC, 2 stage (s)										
tF (s)	4.0	3.3	2.2			2.2			3.5	4.0
pQ queue free %	100	5	100			100			100	100
dM capacity (veh/h)	97	539	727			960			3	97
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2				
Volume Total	512	404	404	166	478	478				
Volume Left	0	0	0	0	0	0				
Volume Right	512	0	0	166	0	0				
cSH	539	1700	1700	1700	1700	1700				
Volume to Capacity	0.95	0.24	0.24	0.10	0.28	0.28				
Queue Length 95th (m)	98.2	0.0	0.0	0.0	0.0	0.0				
Control Delay (s)	55.0	0.0	0.0	0.0	0.0	0.0				
Lane LOS	F									
Approach Delay (s)	55.0	0.0			0.0					
Approach LOS	F									
Intersection Summary										
Average Delay				11.5						
Intersection Capacity Utilization				63.7%						B
Analysis Period (min)				15						

Timings

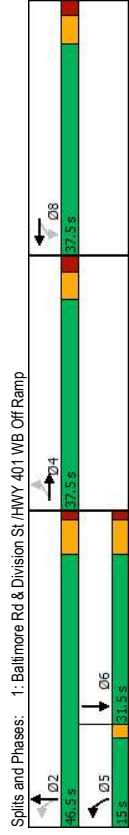
1: Baltimore Rd & Division St /HWY 401 WB Off Ramp

<BKGD 2031> PM Peak 06-21-2021

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Signal Timing Data											
Intersection: Main St & 1st Ave											
Signal Phases											
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT				
Lane Configurations		↔	↔	↔	↔	↔	↔				
Traffic Volume (vph)	11	0	157	9	66	1048	661				
Future Volume (vph)	11	0	157	9	66	1048	661				
Turn Type	Perm	NA	Perm	NA	pm-pt	NA	NA				
Protected Phases	4	4	8	8	5	2	6				
Permitted Phases	4	4	8	8	5	2	6				
Detector Phase	4	4	8	8	5	2	6				
Switch Phase											
Minimum Initial (s)	10.0	10.0	10.0	7.0	30.0	20.0	20.0				
Minimum Split (s)	37.5	37.5	37.5	37.5	9.0	30.5	30.5				
Total Split (s)	37.5	37.5	37.5	37.5	15.0	46.5	31.5				
Total Split (%)	30.9%	30.9%	30.9%	30.9%	12.3%	38.3%	25.9%				
Yellow Time (s)	4.1	4.1	4.1	4.1	2.0	5.0	5.0				
All-Red Time (s)	2.4	2.4	2.4	2.4	0.0	1.5	1.5				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	6.5	6.5	6.5	6.5	2.0	6.5	6.5				
Lead/Lag					Lead	Lag					
Lead-Lag Optimize?					Yes	Yes					
Recall Mode	None	None	None	None	Max	None	None				
Act Effrt Green (s)	10.2	18.7	45.5	40.9	33.4						
Actuated g/C Ratio	0.12	0.22	0.53	0.48	0.39						
v/c Ratio	0.24	0.73	0.17	0.70	0.52						
Control Delay	5.3	47.0	14.2	23.1	25.6						
Queue Delay	0.0	0.0	0.0	0.0	0.0						
Total Delay	5.3	47.0	14.2	23.1	25.6						
LOS	A	D	B	C	C						
Approach Delay	5.3	47.0		22.5	25.6						
Approach LOS	A	D		C	C						
Intersection Summary											
Cycle Length: 121.5											
Actuated Cycle Length: 85.3											
Natural Cycle: 115											
Control Type: Actuated-Uncoordinated											
Maximum v/c Ratio: 0.73											
Intersection Signal Delay: 25.3											
Intersection Capacity Utilization: 57.1%											
Analysis Period (min): 15											



HCM Signalized Intersection Capacity Analysis 1: Baltimore Rd & Division St/Hwy 401 WB Off Ramp

<BKGD 2031> PM Peak

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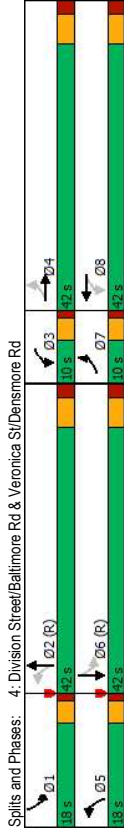
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	11	0	56	157	9	24	66	1048	0	0	661	11
Traffic Volume (vph)	11	0	56	157	9	24	66	1048	0	0	661	11
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Lane Util. Factor	0.89	0.89	0.89	0.89	0.89	0.89	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.99	0.99	0.99	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1673	1673	1673	1673	1673	1673	1805	3282	3465	3465	3465	3465
Flt Permitted	0.97	0.97	0.97	0.97	0.97	0.97	0.28	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1631	1631	1631	1631	1631	1631	531	3282	3465	3465	3465	3465
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)	12	0	59	165	9	25	69	1103	0	0	696	12
RTOR Reduction (vph)	0	65	0	0	5	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	6	0	0	194	0	69	1103	0	0	707	0
Heavy Vehicles (%)	0%	0%	0%	10%	0%	7%	0%	10%	7%	0%	4%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	NA	NA	NA	NA
Protected Phases	4	4	4	8	8	5	2	2	6	6	6	6
Permitted Phases	4	8	8	8	8	8	2	2	6	6	6	6
Actuated Green, G (s)	7.5	7.5	7.5	18.7	18.7	41.5	41.5	41.5	33.4	33.4	33.4	33.4
Effective Green, g (s)	7.5	7.5	7.5	18.7	18.7	41.5	41.5	41.5	33.4	33.4	33.4	33.4
Actuated g/C Ratio	0.09	0.21	0.21	0.48	0.48	0.48	0.48	0.48	0.38	0.38	0.38	0.38
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
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)	140	261	261	341	341	1361	0.01	c0.34	1327	1327	1327	1327
v/s Ratio Prot	c0.00	c0.16	c0.16	0.01	0.01	0.08	0.08	0.08	0.20	0.20	0.20	0.20
v/s Ratio Perm	0.04	0.74	0.74	0.20	0.20	0.71	0.71	0.71	0.53	0.53	0.53	0.53
Uniform Delay, d1	36.6	32.0	32.0	13.0	13.0	18.0	18.0	18.0	20.9	20.9	20.9	20.9
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	0.1	10.9	10.9	0.3	0.3	2.7	2.7	2.7	0.4	0.4	0.4	0.4
Delay (s)	36.7	42.9	42.9	13.3	13.3	20.8	20.8	20.8	21.3	21.3	21.3	21.3
Level of Service	D	D	D	B	B	C	C	C	C	C	C	C
Approach Delay (s)	36.7	42.9	42.9	20.3	20.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3
Approach LOS	D	D	D	C	C	C	C	C	C	C	C	C
Intersection Summary	HCM 2000 Level of Service C											
HCM 2000 Control Delay	23.3											
HCM 2000 Volume to Capacity ratio	0.66											
Actuated Cycle Length (s)	87.2											
Intersection Capacity Utilization	57.1%											
Analysis Period (min)	15											
c. Critical Lane Group												

Timings 4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<BKGD 2031> PM Peak

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Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	6	6	6	6	6	6	6	6
Traffic Volume (vph)	60	6	218	6	26	1218	284	907
Future Volume (vph)	60	6	218	6	26	1218	284	907
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	7	4	3	8	5	2	1	6
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase	6.0	7.0	6.0	7.0	6.0	15.0	6.0	15.0
Minimum Initial (s)	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0
Minimum Split (s)	10.0	42.0	10.0	42.0	18.0	42.0	18.0	42.0
Total Split (%)	8.9%	37.5%	8.9%	37.5%	16.1%	37.5%	16.1%	37.5%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Max	Max	Max	Max	Max	Max	Max	Max
Recall Mode	44.0	36.0	44.0	36.0	52.0	36.0	52.0	36.0
Act Effct Green (s)	0.39	0.32	0.39	0.32	0.46	0.32	0.46	0.32
Actuated g/C Ratio	0.14	0.09	0.42	0.36	0.09	1.43	1.07	0.86
v/c Ratio	19.9	10.0	25.5	5.7	15.0	231.4	103.2	44.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.9	10.0	25.5	5.7	15.0	231.4	103.2	44.5
LOS	B	B	C	A	B	F	F	D
Approach Delay	15.6	15.3	227.8	58.1	58.1	58.1	58.1	58.1
Approach LOS	B	B	F	F	F	F	F	E
Intersection Summary								
Cycle Length: 112								
Actuated Cycle Length: 112								
Offset: 0 (0%), Referenced to phase 2NBT and 6SBTL, Start of Green								
Natural Cycle: 145								
Control Type: Prelimed								
Maximum v/c Ratio: 1.43								
Intersection Signal Delay: 130.8								
Intersection Capacity Utilization 95.9%								
Analysis Period (min) 15								



4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<BKGD 2031> PM Peak

06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	60	6	41	218	6	225	26	1218	331	284	907	29
Future Volume (vph)	60	6	41	218	6	225	26	1218	331	284	907	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1805	1651	1687	1533	1805	1533	1805	3362	1656	3468	1656	3468
Flt Permitted	0.52	1.00	0.73	1.00	0.73	1.00	0.73	1.00	0.73	1.00	0.73	1.00
Satd. Flow (perm)	986	1651	1289	1533	986	1533	986	3362	1289	1533	986	3362
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)	61	6	42	222	6	230	27	1243	338	290	926	30
RTOR Reduction (vph)	0	29	0	0	156	0	0	22	0	0	2	0
Lane Group Flow (vph)	61	20	0	222	80	0	27	1559	0	290	954	0
Heavy Vehicles (%)	0%	0%	0%	7%	0%	6%	0%	5%	0%	9%	3%	22%
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	5	2	1	6	1	6
Permitted Phases	4	8	8	8	8	8	8	8	8	8	8	8
Actuated Green, G (s)	42.0	36.0	42.0	36.0	42.0	36.0	50.0	36.0	50.0	36.0	50.0	36.0
Effective Green, g (s)	42.0	36.0	42.0	36.0	42.0	36.0	50.0	36.0	50.0	36.0	50.0	36.0
Actuated g/C Ratio	0.38	0.32	0.38	0.32	0.38	0.32	0.45	0.32	0.45	0.32	0.45	0.32
Clearance Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Grp Cap (vph)	413	530	504	492	293	1080	293	1080	269	1114	269	1114
v/s Ratio Prot	0.01	0.01	c0.02	0.05	0.01	c0.46	0.01	c0.46	c0.13	0.28	c0.13	0.28
v/s Ratio Perm	0.05	0.05	0.44	0.16	0.03	0.03	0.03	0.03	0.35	0.35	0.35	0.35
Uniform Delay, d1	22.8	26.1	25.4	27.2	20.0	38.0	20.0	38.0	32.6	35.6	32.6	35.6
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	0.8	0.1	2.8	0.7	0.6	205.0	0.6	205.0	77.2	8.5	77.2	8.5
Delay (s)	23.5	26.2	28.2	27.9	20.6	243.0	20.6	243.0	109.7	44.1	109.7	44.1
Level of Service	C	C	C	C	C	F	C	F	F	F	F	D
Approach Delay (s)	24.7	28.1	28.1	28.1	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3
Approach LOS	C	C	C	C	C	F	C	F	F	F	F	E
Intersection Summary												
HCM 2000 Control Delay	138.6											
HCM 2000 Volume to Capacity ratio	0.93											
Actuated Cycle Length (s)	112.0											
Intersection Capacity Utilization	95.9%											
Analysis Period (min)	15											
c Critical Lane Group												

4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<BKGD 2031> PM Peak

06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	60	6	41	218	6	225	26	1218	331	284	907	29
Future Volume (vph)	60	6	41	218	6	225	26	1218	331	284	907	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1805	1651	1687	1533	1805	1533	1805	3362	1656	3468	1656	3468
Flt Permitted	0.52	1.00	0.73	1.00	0.73	1.00	0.73	1.00	0.73	1.00	0.73	1.00
Satd. Flow (perm)	986	1651	1289	1533	986	1533	986	3362	1289	1533	986	3362
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)	61	6	42	222	6	230	27	1243	338	290	926	30
RTOR Reduction (vph)	0	29	0	0	156	0	0	22	0	0	2	0
Lane Group Flow (vph)	61	20	0	222	80	0	27	1559	0	290	954	0
Heavy Vehicles (%)	0%	0%	0%	7%	0%	6%	0%	5%	0%	9%	3%	22%
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	5	2	1	6	1	6
Permitted Phases	4	8	8	8	8	8	8	8	8	8	8	8
Actuated Green, G (s)	42.0	36.0	42.0	36.0	42.0	36.0	50.0	36.0	50.0	36.0	50.0	36.0
Effective Green, g (s)	42.0	36.0	42.0	36.0	42.0	36.0	50.0	36.0	50.0	36.0	50.0	36.0
Actuated g/C Ratio	0.38	0.32	0.38	0.32	0.38	0.32	0.45	0.32	0.45	0.32	0.45	0.32
Clearance Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Grp Cap (vph)	413	530	504	492	293	1080	293	1080	269	1114	269	1114
v/s Ratio Prot	0.01	0.01	c0.02	0.05	0.01	c0.46	0.01	c0.46	c0.13	0.28	c0.13	0.28
v/s Ratio Perm	0.05	0.05	0.44	0.16	0.03	0.03	0.03	0.03	0.35	0.35	0.35	0.35
Uniform Delay, d1	22.8	26.1	25.4	27.2	20.0	38.0	20.0	38.0	32.6	35.6	32.6	35.6
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	0.8	0.1	2.8	0.7	0.6	205.0	0.6	205.0	77.2	8.5	77.2	8.5
Delay (s)	23.5	26.2	28.2	27.9	20.6	243.0	20.6	243.0	109.7	44.1	109.7	44.1
Level of Service	C	C	C	C	C	F	C	F	F	F	F	D
Approach Delay (s)	24.7	28.1	28.1	28.1	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3
Approach LOS	C	C	C	C	C	F	C	F	F	F	F	E
Intersection Summary												
HCM 2000 Control Delay	138.6											
HCM 2000 Volume to Capacity ratio	0.93											
Actuated Cycle Length (s)	112.0											
Intersection Capacity Utilization	95.9%											
Analysis Period (min)	15											
c Critical Lane Group												

4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<BKGD 2031> PM Peak

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HCM Signalized Intersection Capacity Analysis												
4: Division Street/Baltimore Rd & Veronica St/Densmore Rd												
<BKGD 203 1> PM Peak												
06-21-2021												

HCM Unsignalized Intersection Capacity Analysis 6: Parkview Hills Drive & Densmore Rd

<BKGD 2031> PM Peak
06-21-2021

Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	EB	EB	WB	WB	NB	NB	
Traffic Volume (veh/h)	527	95	0	393	57	0	
Future Volume (Veh/h)	527	95	0	393	57	0	
Sign Control	Free	Free	Free	Free	Stop	Stop	
Grade	0%	0%	0%	0%	0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	
Hourly flow rate (vph)	588	106	0	437	63	0	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None						
Median storage (veh)							
Upstream signal (m)							
pX platoon unblocked							
VC, conflicting volume		692			1076	639	
VC1, stage 1 conf vol							
VC2, stage 2 conf vol		692			1076	639	
VCu, unblocked vol		4.1			6.4	6.2	
IC, single (s)							
IC, 2 stage (s)		2.2			3.5	3.3	
p0 queue free %		100			74	100	
CM capacity (veh/h)		912			245	480	
Direction, Lane #	EB 1	WB 1	NB 1				
Volume Total	692	437	63				
Volume Left	0	0	63				
Volume Right	106	0	0				
cSH	1700	912	245				
Volume to Capacity	0.41	0.00	0.26				
Queue Length 95th (m)	0.0	0.0	8.0				
Control Delay (s)	0.0	0.0	24.7				
Lane LOS			C				
Approach Delay (s)	0.0	0.0	24.7				
Approach LOS			C				
Intersection Summary							
Average Delay			1.3				
Intersection Capacity Utilization			43.5%				
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis 7: O'Conner Crt/East Site Access & Densmore Rd

<BKGD 2031> PM Peak
06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Traffic Volume (veh/h)	0	520	7	0	385	0	6	0	0	0	0	0
Future Volume (Veh/h)	0	520	7	0	385	0	6	0	0	0	0	0
Sign Control		Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor		0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)		634	9	0	470	0	7	0	0	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None										
Median storage (veh)												
Upstream signal (m)												
pX platoon unblocked												
VC, conflicting volume		470			643		1108	1108	638	1108	1113	470
VC1, stage 1 conf vol												
VC2, stage 2 conf vol		470			643		1108	1108	638	1108	1113	470
VCu, unblocked vol		4.1			4.1		7.1	6.6	6.2	7.1	6.5	6.2
IC, single (s)												
IC, 2 stage (s)		2.2			2.2		3.5	4.1	3.3	3.5	4.0	3.3
p0 queue free %		100			100		96	100	100	100	100	100
CM capacity (veh/h)		1102			932		189	206	480	189	210	598
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	643	470	7	0								
Volume Left	0	0	7	0								
Volume Right	9	0	0	0								
cSH	1102	932	189	1700								
Volume to Capacity	0.00	0.00	0.04	0.00								
Queue Length 95th (m)	0.0	0.0	0.9	0.0								
Control Delay (s)	0.0	0.0	24.8	0.0								
Lane LOS			C	A								
Approach Delay (s)	0.0	0.0	24.8	0.0								
Approach LOS			C	A								
Intersection Summary												
Average Delay				0.2								
Intersection Capacity Utilization				37.8%								
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis
19: Baltimore Rd & HWY 401 EB Off Ramp

<BKGD 2031> PM Peak
06-21-2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (veh/h)	0	345	1265	0	0	693	↔ ↗ ↘
Future Volume (Veh/h)	0	345	1265	0	0	693	
Sign Control	Yield		Free		Free		
Grade	0%		0%		0%		
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	
Hourly flow rate (vph)	0	352	1291	0	0	707	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type			None			None	
Median storage (veh)							
Upstream signal (m)			333				
pX platoon unblocked	0.72	0.72			0.72		
VC, conflicting volume	1644	646			1291		
VC1, stage 1 conf vol							
VC2, stage 2 conf vol							
VCu, unblocked vol	1120	0			630		
IC, single (s)	6.8	6.9			4.2		
IC, 2 stage (s)							
IF (s)	3.5	3.3			2.3		
p0 queue free %	100	55			100		
cM capacity (veh/h)	147	784			665		
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2		
Volume Total	352	646	646	354	354		
Volume Left	0	0	0	0	0		
Volume Right	352	0	0	0	0		
cSH	784	1700	1700	1700	1700		
Volume to Capacity	0.45	0.38	0.38	0.21	0.21		
Queue Length 95th (m)	18.7	0.0	0.0	0.0	0.0		
Control Delay (s)	13.3	0.0	0.0	0.0	0.0		
Lane LOS	B						
Approach Delay (s)	13.3	0.0		0.0			
Approach LOS	B						
Intersection Summary							
Average Delay			2.0				
Intersection Capacity Utilization			63.0%		ICU Level of Service		B
Analysis Period (min)			15				

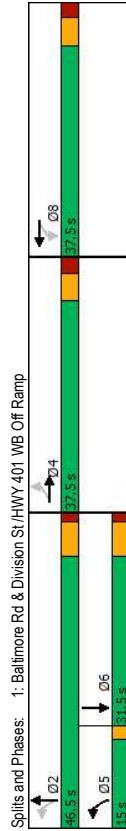
HCM Unsignalized Intersection Capacity Analysis
21: Baltimore Rd & HWY 401 EB Off Ramp & HWY 401 EB ON Ramp

<BKGD 2031> PM Peak
06-21-2021

Movement	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations										
Traffic Volume (veh/h)	0	556	0	1265	237	0	664	0	0	0
Future Volume (Veh/h)	0	556	0	1265	237	0	664	0	0	0
Sign Control	Yield		Free		Free		Free		Stop	
Grade	0%		0%		0%		0%		0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	567	0	1291	242	0	678	0	0	0
Pedestrians										
Lane Width (m)										
Walking Speed (m/s)										
Percent Blockage										
Right turn flare (veh)										
Median type				None			None			
Median storage (veh)										
Upstream signal (m)				155						
pX platoon unblocked	0.69					0.69		0.69	0.69	0.69
VC, conflicting volume	1969	339	678			1291		2197	1969	
VC1, stage 1 conf vol										
VC2, stage 2 conf vol										
VCu, unblocked vol	1511	339	678			533		1841	1511	
IC, single (s)	6.5	6.9	4.1			4.1		7.5	6.5	
IC, 2 stage (s)										
IF (s)	4.0	3.3	2.2			2.2		3.5	4.0	
p0 queue free %	100	14	100			100		100	100	
cM capacity (veh/h)	84	663	923			724		5	84	
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2				
Volume Total	567	646	646	242	339	339				
Volume Left	0	0	0	0	0	0				
Volume Right	567	0	0	242	0	0				
cSH	663	1700	1700	1700	1700	1700				
Volume to Capacity	0.86	0.38	0.38	0.14	0.20	0.20				
Queue Length 95th (m)	78.2	0.0	0.0	0.0	0.0	0.0				
Control Delay (s)	34.0	0.0	0.0	0.0	0.0	0.0				
Lane LOS	D									
Approach Delay (s)	34.0	0.0			0.0					
Approach LOS	D									
Intersection Summary										
Average Delay					6.9					
Intersection Capacity Utilization					59.4%			ICU Level of Service		B
Analysis Period (min)					15					

Timings 1: Baltimore Rd & Division St /HWY 401 WB Off Ramp <Total 2026> AM Peak 06-21-2021

	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group							
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Traffic Volume (vph)	2	0	281	4	21	515	908
Future Volume (vph)	2	0	281	4	21	515	908
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	NA
Protected Phases	4	8	8	2	2	2	6
Permitted Phases	4	4	8	8	5	2	6
Detector Phase	4	4	8	8	5	2	6
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	20.0	20.0
Minimum Split (s)	37.5	37.5	37.5	37.5	9.0	30.5	30.5
Total Split (s)	37.5	37.5	37.5	37.5	15.0	46.5	31.5
Total Split (%)	30.9%	30.9%	30.9%	30.9%	12.3%	38.3%	25.9%
Yellow Time (s)	4.1	4.1	4.1	4.1	2.0	5.0	5.0
All-Red Time (s)	2.4	2.4	2.4	2.4	0.0	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	2.0	6.5	6.5
Lead/Lag					Lead	Lag	
Lead-Lag Optimize?					Yes	Yes	
Recall Mode	None	None	None	None	Max	None	
Act Eff Green (s)	10.1	31.2	44.8	40.3	36.9		
Actuated g/C Ratio	0.11	0.33	0.48	0.43	0.39		
v/c Ratio	0.17	0.80	0.09	0.36	0.70		
Control Delay	1.4	46.4	16.3	20.1	30.1		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	1.4	46.4	16.3	20.1	30.1		
LOS	A	D	B	C	C		
Approach Delay	1.4	46.4	20.0	30.1			
Approach LOS	A	D	B	C			
Intersection Summary							
Cycle Length: 121.5							
Actuated Cycle Length: 93.9							
Natural Cycle: 125							
Control Type: Actuated-Uncoordinated							
Maximum v/c Ratio: 0.80							
Intersection Signal Delay: 29.2							
Intersection Capacity Utilization 60.2%							
Analysis Period (min) 15							



HCM Signalized Intersection Capacity Analysis 1: Baltimore Rd & Division St /HWY 401 WB Off Ramp <Total 2026> AM Peak 06-21-2021

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	2	0	43	281	4	28	21	515	0	0	908	4
Future Volume (vph)	2	0	43	281	4	28	21	515	0	0	908	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5			6.5			2.0	6.5				
Lane Util. Factor	1.00			1.00			1.00	0.95				
Frt	0.87			0.99			1.00	1.00				
Flt Protected	1.00			0.96			0.95	1.00				
Satd. Flow (prot)	1651			1648			1805	3505				
Flt Permitted	1.00			0.71			0.15	1.00				
Satd. Flow (perm)	1647			1229			285	3505				
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)	2	0	45	296	4	29	22	542	0	0	956	4
RTOR Reduction (vph)	0	44	0	0	3	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	3	0	0	326	0	22	542	0	0	960	0
Heavy Vehicles (%)	0%	0%	0%	10%	0%	0%	0%	3%	4%	0%	4%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	NA	NA	NA	NA
Protected Phases	4			8			5	2			6	
Permitted Phases	4			8			2				36.9	
Actuated Green, G (s)	5.6			31.2			41.6	41.6			36.9	
Effective Green, g (s)	5.6			31.2			41.6	41.6			36.9	
Actuated g/C Ratio	0.06			0.32			0.42	0.42			0.38	
Clearance Time (s)	6.5			6.5			2.0	6.5			6.5	
Vehicle Extension (s)	3.0			3.0			3.0	3.0			3.0	
Lane Grp Cap (vph)	94			391			163	1489			1307	
v/s Ratio Prot	0.00			c0.27			0.00	c0.15			c0.28	
v/s Ratio Perm	0.03			0.83			0.13	0.36			0.73	
Uniform Delay, d1	43.6			31.0			18.4	19.2			26.3	
Progression Factor	1.00			1.00			1.00	1.00			1.00	
Incremental Delay, d2	0.1			14.2			0.4	0.7			2.2	
Delay (s)	43.7			45.1			18.7	19.8			28.5	
Level of Service	D			D			B	B			C	
Approach Delay (s)	43.7			45.1			19.8	28.5			28.5	
Approach LOS	D			D			B	C			C	
Intersection Summary												
HCM 2000 Control Delay	29.2			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	0.71											
Actuated Cycle Length (s)	97.9			Sum of lost time (s)			21.5					
Intersection Capacity Utilization	60.2%			ICU Level of Service			B					
Analysis Period (min)	15											
c. Critical Lane Group												

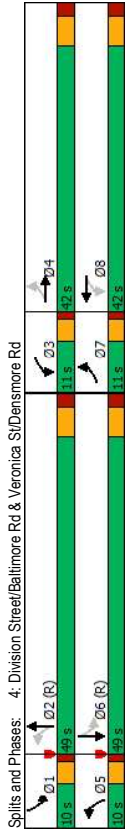
Timings

4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<Total 2026> AM Peak

06-21-2021

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group								
Lane Configurations	16	21	248	15	41	647	180	1203
Traffic Volume (vph)	16	21	248	15	41	647	180	1203
Future Volume (vph)	16	21	248	15	41	647	180	1203
Turn Type	pm-pt	NA	pm-pt	NA	pm-pt	NA	pm-pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4	8	2	2	6	6		
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	6.0	7.0	6.0	7.0	6.0	15.0	6.0	15.0
Minimum Split (s)	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0
Total Split (s)	11.0	42.0	11.0	42.0	10.0	49.0	10.0	49.0
Total Split (%)	9.8%	37.5%	9.8%	37.5%	8.9%	43.8%	8.9%	43.8%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	45.0	36.0	45.0	36.0	51.0	43.0	51.0	43.0
Actuated g/C Ratio	0.40	0.32	0.40	0.32	0.46	0.38	0.46	0.38
v/c Ratio	0.04	0.06	0.46	0.46	0.25	0.62	0.77	0.97
Control Delay	18.3	18.9	25.7	6.2	18.7	29.4	41.7	52.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.3	18.9	25.7	6.2	18.7	29.4	41.7	52.7
LOS	B	B	C	A	B	C	D	D
Approach Delay								
Approach LOS	B	B	B	B	C	C	D	D
Intersection Summary								
Cycle Length: 112								
Actuated Cycle Length: 112								
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green								
Natural Cycle: 105								
Control Type: Prelimed								
Maximum v/c Ratio: 0.97								
Intersection Signal Delay: 37.1								
Intersection Capacity Utilization 73.9%								
Analysis Period (min) 15								



<Total 2026> AM Peak

Trans-Plan

Synchro 10 Report

HCM Signalized Intersection Capacity Analysis

4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<Total 2026> AM Peak

06-21-2021

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Movement								
Lane Configurations	16	21	13	248	15	300	41	647
Traffic Volume (vph)	16	21	13	248	15	300	41	647
Future Volume (vph)	16	21	13	248	15	300	41	647
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95
Frt	1.00	0.94	1.00	0.86	1.00	0.97	1.00	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1805	1791	1687	1540	1805	3369	1656	3451
Flt Permitted	0.40	1.00	0.73	1.00	0.09	1.00	0.22	1.00
Satd. Flow (perm)	762	1791	1305	1540	177	3369	378	3451
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	16	21	13	253	15	306	42	660
RTOR Reduction (vph)	0	9	0	0	0	19	0	3
Lane Group Flow (vph)	16	25	0	253	113	0	42	801
Heavy Vehicles (%)	0%	0%	0%	7%	0%	6%	0%	9%
Turn Type	pm-pt	NA	pm-pt	NA	pm-pt	NA	pm-pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4	8	2	2	6	6		
Actuated Green, G (s)	43.0	36.0	43.0	36.0	49.0	43.0	49.0	43.0
Effective Green, g (s)	43.0	36.0	43.0	36.0	49.0	43.0	49.0	43.0
Actuated g/C Ratio	0.38	0.32	0.38	0.32	0.44	0.38	0.44	0.38
Clearance Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Grp Cap (vph)	357	575	524	495	164	1293	233	1324
v/s Ratio Prot	0.00	0.01	c0.03	0.07	0.01	0.24	c0.04	c0.37
v/c Ratio	0.04	0.04	0.48	0.23	0.26	0.62	0.79	0.97
Uniform Delay, d1	21.9	26.2	25.3	27.8	24.1	27.9	24.9	33.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1	3.2	1.1	3.7	2.2	23.3	18.6
Delay (s)	22.2	26.3	28.4	28.9	27.8	30.1	48.2	52.5
Level of Service	C	C	C	C	C	C	D	D
Approach Delay (s)	25.0		28.7		30.0		52.0	
Approach LOS	C		C		C		D	
Intersection Summary								
HCM 2000 Control Delay								
HCM 2000 Volume to Capacity ratio	40.6							
Actuated Cycle Length (s)	0.73							
Intersection Capacity Utilization	112.0							
Analysis Period (min)	73.9%							
c Critical Lane Group	15							

<Total 2026> AM Peak

Trans-Plan

Synchro 10 Report

HCM Unsignalized Intersection Capacity Analysis
5: St Mary's S.S/West Site Access & Densmore Rd

<Total 2026> AM Peak
06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4	4	4	4	4	4	4	4	4	4	4
Traffic Volume (veh/h)	4	350	4	4	552	2	0	0	0	5	7	0
Future Volume (Veh/h)	4	350	4	4	552	2	0	0	0	5	7	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	4	393	4	4	620	2	0	0	0	6	8	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None											
Median storage (veh)												
Upstream signal (m)												
pX platoon unblocked												
VC, conflicting volume	622			397			1043	1033	395	1038	1034	621
VC1, stage 1 conf vol												
VC2, stage 2 conf vol	622			397			1043	1033	395	1038	1034	621
VCu, unblocked vol	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
IC, single (s)												
IC, 2 stage (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	99	96	100	98
CM capacity (veh/h)	969			1173			203	233	659	208	232	491
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1							
Volume Total	401	626	0	6	19							
Volume Left	4	4	0	0	8							
Volume Right	4	2	0	6	11							
cSH	969	1173	1700	659	312							
Volume to Capacity	0.00	0.00	0.00	0.01	0.06							
Queue Length 95th (m)	0.1	0.1	0.0	0.2	1.5							
Control Delay (s)	0.1	0.1	0.0	10.5	17.3							
Lane LOS	A	A	A	B	C							
Approach Delay (s)	0.1	0.1	10.5	17.3								
Approach LOS	B	B	C	C								
Intersection Summary												
Average Delay				0.5								
Intersection Capacity Utilization				41.6%								
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis
6: Parkview Hills Drive & Densmore Rd

<Total 2026> AM Peak
06-21-2021

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	277	85	22	478	80	9
Future Volume (Veh/h)	277	85	22	478	80	9
Sign Control	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	308	94	24	531	89	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)						
pX platoon unblocked						
VC, conflicting volume			402		934	355
VC1, stage 1 conf vol						
VC2, stage 2 conf vol			402		934	355
VCu, unblocked vol			4.1		6.4	6.2
IC, single (s)						
IC, 2 stage (s)			2.2		3.5	3.3
IF (s)			98		69	99
p0 queue free %			1168		291	693
CM capacity (veh/h)						
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	402	555	99			
Volume Left	0	24	89			
Volume Right	94	0	10			
cSH	1700	1168	310			
Volume to Capacity	0.24	0.02	0.32			
Queue Length 95th (m)	0.0	0.5	10.7			
Control Delay (s)	0.0	0.6	22.0			
Lane LOS	A	A	C			
Approach Delay (s)	0.0	0.6	22.0			
Approach LOS	C	C	C			
Intersection Summary						
Average Delay			2.4			
Intersection Capacity Utilization			54.7%			
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
7: O'Conner Crt/East Site Access & Densmore Rd

<Total 2026> AM Peak
06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4	274	8	0	483	2	6	0	2	7	0	10
Traffic Volume (veh/h)	4	274	8	0	483	2	6	0	2	7	0	10
Future Volume (Veh/h)	Free	0%	0%	Free	0%	0%	Stop	0%	0%	Stop	0%	0%
Sign Control	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Grade	5	334	10	0	589	2	7	0	2	9	0	12
Peak Hour Factor												
Hourly flow rate (vph)												
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (m)												
pX platoon unblocked												
VC, conflicting volume	591			344			951	940	339	941	944	590
VC1, stage 1 conf vol												
VC2, stage 2 conf vol	591			344			951	940	339	941	944	590
VCU, unblocked vol	4.1			4.1			7.1	6.6	6.2	7.1	6.5	6.2
IC, single (s)												
IC, 2 stage (s)	2.2			2.2			3.5	4.1	3.3	3.5	4.0	3.3
IF (s)	99			100			97	100	100	96	100	98
p0 queue free %	995			1204			235	258	708	244	263	511
CM capacity (veh/h)												
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	349	591	9	21								
Volume Left	5	0	7	9								
Volume Right	10	2	2	12								
cSH	995	1204	276	348								
Volume to Capacity	0.01	0.00	0.03	0.06								
Queue Length 95th (m)	0.1	0.0	0.8	1.5								
Control Delay (s)	0.2	0.0	18.5	16.0								
Lane LOS	A	C	C	C								
Approach Delay (s)	0.2	0.0	18.5	16.0								
Approach LOS	C	C	C	C								
Intersection Summary												
Average Delay				0.6								
Intersection Capacity Utilization				35.5%								A
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis
19: Baltimore Rd & HWY 401 EB Off Ramp

<Total 2026> AM Peak
06-21-2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	127	680	0	0	791
Future Volume (Veh/h)	0	127	680	0	0	791
Sign Control	Yield	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	130	694	0	0	807
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			333			
pX platoon unblocked						
VC, conflicting volume	1098	347			694	
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	1098	347			694	
IC, single (s)	6.8	6.9			4.2	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.3	
p0 queue free %	100	80			100	
CM capacity (veh/h)	210	652			871	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	130	347	347	404	404	
Volume Left	0	0	0	0	0	
Volume Right	130	0	0	0	0	
cSH	652	1700	1700	1700	1700	
Volume to Capacity	0.20	0.20	0.20	0.24	0.24	
Queue Length 95th (m)	5.9	0.0	0.0	0.0	0.0	
Control Delay (s)	11.9	0.0	0.0	0.0	0.0	
Lane LOS	B					
Approach Delay (s)	11.9	0.0		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			33.3%			A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 21: Baltimore Rd & HWY 401 EB Off Ramp & HWY 401 EB ON Ramp

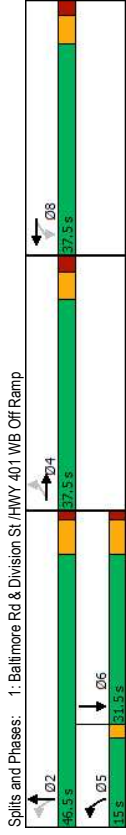
<Total 2026> AM Peak
 06-21-2021

Movement	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations										
Traffic Volume (veh/h)	0	417	0	680	141	0	773	0	0	0
Future Volume (Veh/h)	0	417	0	680	141	0	773	0	0	0
Sign Control	Yield		Free	0%		Free	0%		Stop	
Grade	0%		0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	426	0	694	144	0	789	0	0	0
Pedestrians										
Lane Width (m)										
Walking Speed (m/s)										
Percent Blockage										
Right turn flare (veh)										
Median type										
Median storage (veh)										
Upstream signal (m)										
pK platform unblocked										
VC, conflicting volume	1483	394	789			694			1514	1483
VC1, stage 1 conf vol										
VC2, stage 2 conf vol										
VCU, unblocked vol	1483	394	789			694			1514	1483
IC, single (s)	6.5	6.9	4.1			4.1			7.5	6.5
IC, 2 stage (s)										
p0 queue free %	4.0	3.3	2.2			2.2			3.5	4.0
p0 queue free (s)	100	30	100			100			100	100
ch capacity (veh/h)	126	610	840			911			25	126
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2				
Volume Total	426	347	347	144	394	394				
Volume Left	0	0	0	0	0	0				
Volume Right	426	0	0	144	0	0				
cSH	610	1700	1700	1700	1700	1700				
Volume to Capacity	0.70	0.20	0.20	0.08	0.23	0.23				
Queue Length 95th (m)	44.6	0.0	0.0	0.0	0.0	0.0				
Control Delay (s)	23.4	0.0	0.0	0.0	0.0	0.0				
Lane LOS	C									
Approach Delay (s)	23.4	0.0			0.0					
Approach LOS	C									
Intersection Summary										
Average Delay					4.9				A	
Intersection Capacity Utilization					53.9%					
Analysis Period (min)					15					

Timings
 1: Baltimore Rd & Division St / HWY 401 WB Off Ramp

<Total 2026> PM Peak
 06-21-2021

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Configurations							
Traffic Volume (vph)	9	0	136	7	54	864	553
Future Volume (vph)	9	0	136	7	54	864	553
Turn Type	Perm	NA	Perm	NA	ph+pt	NA	NA
Protected Phases	4		4		5	2	6
Permitted Phases	4		8		8	5	2
Detector Phase	4		8		8	5	2
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	20.0	20.0
Minimum Split (s)	37.5	37.5	37.5	37.5	9.0	30.5	30.5
Total Split (s)	37.5	37.5	37.5	37.5	15.0	46.5	31.5
Total Split (%)	30.9%	30.9%	30.9%	30.9%	12.3%	38.3%	25.9%
Yellow Time (s)	4.1	4.1	4.1	4.1	2.0	5.0	5.0
All-Red Time (s)	2.4	2.4	2.4	2.4	0.0	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	2.0	6.5	6.5
Lead/Lag					Lead		Lag
Lead-Lag Optimize?					Yes		Yes
Recall Mode	None	None	None	None	Max	None	None
Act Effct Green (s)	10.2	16.6	45.5	40.9	33.6		
Actuated g/C Ratio	0.12	0.20	0.55	0.49	0.40		
v/c Ratio	0.19	0.68	0.12	0.56	0.42		
Control Delay	2.6	45.3	12.6	18.7	22.5		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	2.6	45.3	12.6	18.7	22.5		
LOS	A	D	B	B	C		
Approach Delay	2.6	45.3		18.4	22.5		
Approach LOS	A	D		B	C		
Intersection Summary							
Cycle Length: 121.5							
Actuated Cycle Length: 83.2							
Natural Cycle: 115							
Control Type: Actuated-Uncoordinated							
Maximum v/c Ratio: 0.68							
Intersection Signal Delay: 21.8							
Intersection Capacity Utilization 52.5%							
Analysis Period (min) 15							



HCM Signalized Intersection Capacity Analysis 1: Baltimore Rd & Division St/Hwy 401 WB Off Ramp

<Total 2026> PM Peak

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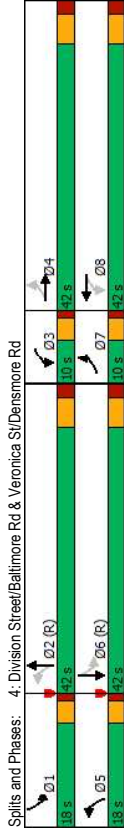
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	9	0	46	136	7	20	54	864	0	0	553	9
Traffic Volume (vph)	9	0	46	136	7	20	54	864	0	0	553	9
Future Volume (vph)	9	0	46	136	7	20	54	864	0	0	553	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	0.0	0.0	6.5	0.0	0.0	6.5	0.0	0.0	6.5	0.0	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Flt Protected	0.99	0.99	0.99	0.99	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1671	1671	1671	1642	1642	1642	1805	3282	3282	3465	3465	3465
Flt Permitted	0.97	0.97	0.97	0.72	0.72	0.72	0.35	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1634	1634	1634	1234	1234	1234	672	3282	3282	3465	3465	3465
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)	9	0	48	143	7	21	57	909	0	0	582	9
RTOR Reduction (vph)	0	52	0	0	5	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	5	0	0	166	0	57	909	0	0	590	0
Heavy Vehicles (%)	0%	0%	0%	10%	0%	7%	0%	10%	7%	0%	4%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA	NA	NA	NA	NA
Protected Phases	4	4	4	8	8	8	5	2	2	6	6	6
Permitted Phases	4	4	4	8	8	8	5	2	2	6	6	6
Actuated Green, G (s)	7.6	7.6	7.6	16.6	16.6	16.6	41.4	41.4	41.4	33.6	33.6	33.6
Effective Green, g (s)	7.6	7.6	7.6	16.6	16.6	16.6	41.4	41.4	41.4	33.6	33.6	33.6
Actuated g/C Ratio	0.09	0.20	0.20	0.49	0.49	0.49	0.49	0.49	0.49	0.39	0.39	0.39
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	2.0	6.5	6.5	6.5	6.5	6.5
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)	145	145	145	240	240	240	404	1596	1596	1368	1368	1368
v/s Ratio Prot	c0.00	c0.00	c0.00	c0.13	c0.13	c0.13	0.01	c0.28	0.17	0.17	0.17	0.17
v/s Ratio Perm	0.04	0.04	0.04	0.69	0.69	0.69	0.14	0.57	0.43	0.43	0.43	0.43
Uniform Delay, d1	35.4	35.4	35.4	31.9	31.9	31.9	11.8	15.5	18.8	18.8	18.8	18.8
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	0.1	0.1	0.1	8.3	8.3	8.3	0.2	1.5	0.2	0.2	0.2	0.2
Delay (s)	35.5	35.5	35.5	40.2	40.2	40.2	12.0	17.0	19.0	19.0	19.0	19.0
Level of Service	D	D	D	D	D	D	B	B	B	B	B	B
Approach Delay (s)	35.5	35.5	35.5	40.2	40.2	40.2	16.7	16.7	19.0	19.0	19.0	19.0
Approach LOS	D	D	D	D	D	D	B	B	B	B	B	B
Intersection Summary	HCM 2000 Level of Service											
HCM 2000 Control Delay	20.3											
HCM 2000 Volume to Capacity ratio	0.55											
Actuated Cycle Length (s)	85.1											
Intersection Capacity Utilization	52.5%											
Analysis Period (min)	15											
c. Critical Lane Group	15											

Timings 4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<Total 2026> PM Peak

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	9	0	46	136	7	20	54	864	0	0	553	9
Traffic Volume (vph)	9	0	46	136	7	20	54	864	0	0	553	9
Future Volume (vph)	9	0	46	136	7	20	54	864	0	0	553	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	0.0	0.0	6.5	0.0	0.0	6.5	0.0	0.0	6.5	0.0	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Flt Protected	0.99	0.99	0.99	0.99	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1671	1671	1671	1642	1642	1642	1805	3282	3282	3465	3465	3465
Flt Permitted	0.97	0.97	0.97	0.72	0.72	0.72	0.35	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1634	1634	1634	1234	1234	1234	672	3282	3282	3465	3465	3465
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)	9	0	48	143	7	21	57	909	0	0	582	9
RTOR Reduction (vph)	0	52	0	0	5	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	5	0	0	166	0	57	909	0	0	590	0
Heavy Vehicles (%)	0%	0%	0%	10%	0%	7%	0%	10%	7%	0%	4%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA	NA	NA	NA	NA
Protected Phases	4	4	4	8	8	8	5	2	2	6	6	6
Permitted Phases	4	4	4	8	8	8	5	2	2	6	6	6
Actuated Green, G (s)	7.6	7.6	7.6	16.6	16.6	16.6	41.4	41.4	41.4	33.6	33.6	33.6
Effective Green, g (s)	7.6	7.6	7.6	16.6	16.6	16.6	41.4	41.4	41.4	33.6	33.6	33.6
Actuated g/C Ratio	0.09	0.20	0.20	0.49	0.49	0.49	0.49	0.49	0.49	0.39	0.39	0.39
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	2.0	6.5	6.5	6.5	6.5	6.5
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)	145	145	145	240	240	240	404	1596	1596	1368	1368	1368
v/s Ratio Prot	c0.00	c0.00	c0.00	c0.13	c0.13	c0.13	0.01	c0.28	0.17	0.17	0.17	0.17
v/s Ratio Perm	0.04	0.04	0.04	0.69	0.69	0.69	0.14	0.57	0.43	0.43	0.43	0.43
Uniform Delay, d1	35.4	35.4	35.4	31.9	31.9	31.9	11.8	15.5	18.8	18.8	18.8	18.8
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	0.1	0.1	0.1	8.3	8.3	8.3	0.2	1.5	0.2	0.2	0.2	0.2
Delay (s)	35.5	35.5	35.5	40.2	40.2	40.2	12.0	17.0	19.0	19.0	19.0	19.0
Level of Service	D	D	D	D	D	D	B	B	B	B	B	B
Approach Delay (s)	35.5	35.5	35.5	40.2	40.2	40.2	16.7	16.7	19.0	19.0	19.0	19.0
Approach LOS	D	D	D	D	D	D	B	B	B	B	B	B
Intersection Summary	HCM 2000 Level of Service											
HCM 2000 Control Delay	20.3											
HCM 2000 Volume to Capacity ratio	0.55											
Actuated Cycle Length (s)	85.1											
Intersection Capacity Utilization	52.5%											
Analysis Period (min)	15											
c. Critical Lane Group	15											



HCM Signalized Intersection Capacity Analysis
 4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<Total 2026> PM Peak
 06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	8	34	203	5	206	21	998	314	269	744	24
Future Volume (vph)	49	8	34	203	5	206	21	998	314	269	744	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1805	1668	1687	1532	1805	1532	1805	3353	1656	3469	1656	3469
Flt Permitted	0.55	1.00	0.73	1.00	0.73	1.00	0.19	1.00	0.11	1.00	0.11	1.00
Satd. Flow (perm)	1043	1668	1295	1532	1043	1532	364	3353	194	3469	194	3469
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)	50	8	35	207	5	210	21	1018	320	274	759	24
RTOR Reduction (vph)	0	24	0	0	143	0	0	26	0	0	2	0
Lane Group Flow (vph)	50	19	0	207	73	0	21	1312	0	274	781	0
Heavy Vehicles (%)	0%	0%	0%	7%	0%	6%	0%	5%	0%	9%	3%	22%
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	5	2	1	6	1	6
Permitted Phases	4	8	8	2	2	2	2	2	6	6	6	6
Actuated Green, G (s)	42.0	36.0	42.0	36.0	42.0	36.0	50.0	36.0	50.0	36.0	50.0	36.0
Effective Green, g (s)	42.0	36.0	42.0	36.0	42.0	36.0	50.0	36.0	50.0	36.0	50.0	36.0
Actuated g/C Ratio	0.38	0.32	0.38	0.32	0.38	0.32	0.45	0.32	0.45	0.32	0.45	0.32
Clearance Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Grp Cap (vph)	431	536	506	492	342	1077	342	1077	269	1115	269	1115
v/s Ratio Prot	0.01	0.01	c0.02	0.05	0.01	c0.39	0.01	c0.39	c0.13	0.23	0.13	0.23
v/s Ratio Perm	0.04	0.04	0.41	0.15	0.02	1.02	0.02	1.02	0.33	0.33	0.33	0.33
Uniform Delay, d1	22.6	26.1	25.1	27.1	18.6	38.0	18.6	38.0	32.6	33.3	32.6	33.3
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	0.5	0.1	2.4	0.6	0.3	106.6	0.3	106.6	59.7	3.7	59.7	3.7
Delay (s)	23.1	26.2	27.5	27.7	19.0	144.6	19.0	144.6	92.3	37.0	92.3	37.0
Level of Service	C	C	C	C	B	F	B	F	F	D	F	D
Approach Delay (s)	24.6	24.6	27.6	27.6	142.6	142.6	142.6	142.6	51.3	51.3	51.3	51.3
Approach LOS	C	C	C	C	F	F	F	F	D	D	D	D
Intersection Summary												
HCM 2000 Control Delay	89.4											
HCM 2000 Volume to Capacity ratio	0.82											
Actuated Cycle Length (s)	112.0											
Sum of lost time (s)	20.0											
Intersection Capacity Utilization	87.2%											
ICU Level of Service	E											
Analysis Period (min)	15											
Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
 5: St Mary's S.S/West Site Access & Densmore Rd

<Total 2026> PM Peak
 06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	13	579	0	0	406	6	0	0	0	5	0	8
Future Volume (Veh/h)	13	579	0	0	406	6	0	0	0	5	0	8
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	15	651	0	0	456	7	0	0	0	6	0	9
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
VC, conflicting volume	463			651			1150	1144	651	1140	1140	460
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCU, unblocked vol	463			651			1150	1144	651	1140	1140	460
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
IC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	100	100	97	100	99
cM capacity (veh/h)	1109			945			173	199	472	178	200	606
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1							
Volume Total	666	463	0	0	15							
Volume Left	15	0	0	0	6							
Volume Right	0	7	0	0	9							
cSH	1109	945	1700	1700	308							
Volume to Capacity	0.01	0.00	0.00	0.00	0.05							
Queue Length 95th (m)	0.3	0.0	0.0	0.0	1.2							
Control Delay (s)	0.4	0.0	0.0	0.0	17.3							
Lane LOS	A	A	A	A	C							
Approach Delay (s)	0.4	0.0	0.0	0.0	17.3							
Approach LOS	A	A	A	C	C							
Intersection Summary												
Average Delay			0.4									
Intersection Capacity Utilization			50.9%									
ICU Level of Service			A									
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 6: Parkview Hills Drive & Densmore Rd <Total 2026> PM Peak 06-21-2021

Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	EB	EB	WB	WB	NB	NB	
Traffic Volume (veh/h)	507	78	1	364	48	0	
Future Volume (Veh/h)	507	78	1	364	48	0	
Sign Control	Free	Free	Free	Free	Stop	Stop	
Grade	0%	0%	0%	0%	0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	
Hourly flow rate (vph)	563	87	1	404	53	0	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None						
Median storage (veh)							
Upstream signal (m)							
pX platoon unblocked							
VC, conflicting volume		650			1012	606	
VC1, stage 1 conf vol							
VC2, stage 2 conf vol							
VCu, unblocked vol		650			1012	606	
IC, single (s)		4.1			6.4	6.2	
IC, 2 stage (s)		2.2			3.5	3.3	
p0 queue free %		100			80	100	
CM capacity (veh/h)		946			267	500	
Direction, Lane #	EB 1	WB 1	NB 1				
Volume Total	650	405	53				
Volume Left	0	1	53				
Volume Right	87	0	0				
cSH	1700	946	267				
Volume to Capacity	0.38	0.00	0.20				
Queue Length 95th (m)	0.0	0.0	5.8				
Control Delay (s)	0.0	0.0	21.8				
Lane LOS	A	C	C				
Approach Delay (s)	0.0	0.0	21.8				
Approach LOS	C						
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 7: O'Conner Crt/East Site Access & Densmore Rd <Total 2026> PM Peak 06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Traffic Volume (veh/h)	13	488	5	0	354	6	5	0	0	5	0	7
Future Volume (Veh/h)	13	488	5	0	354	6	5	0	0	5	0	7
Sign Control		Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	16	595	6	0	432	7	6	0	0	6	0	9
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None										
Median storage (veh)												
Upstream signal (m)												
pX platoon unblocked												
VC, conflicting volume	439				601		1074	1069	598	1066	1068	436
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	439				601		1074	1069	598	1066	1068	436
IC, single (s)	4.1				4.1		7.1	6.6	6.2	7.1	6.5	6.2
IC, 2 stage (s)	2.2				2.2		3.5	4.1	3.3	3.5	4.0	3.3
p0 queue free %	99				100		97	100	100	97	100	99
CM capacity (veh/h)	1132				967		194	215	506	200	220	625
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	617	439	6	15								
Volume Left	16	0	6	6								
Volume Right	6	7	0	9								
cSH	1132	967	194	338								
Volume to Capacity	0.01	0.00	0.03	0.04								
Queue Length 95th (m)	0.3	0.0	0.8	1.1								
Control Delay (s)	0.4	0.0	24.1	16.2								
Lane LOS	A	C	C	C								
Approach Delay (s)	0.4	0.0	24.1	16.2								
Approach LOS	C		C	C								
Intersection Summary												
Average Delay				0.6								
Intersection Capacity Utilization			46.5%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 19: Baltimore Rd & HWY 401 EB Off Ramp

<Total 2026> PM Peak
 06-21-2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	283	1052	0	0	586
Future Volume (Veh/h)	0	283	1052	0	0	586
Sign Control	Yield		Free		Free	Free
Grade	0%		0%		0%	0%
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	289	1073	0	0	598
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			333			
pX platoon unblocked	0.77	0.77			0.77	
VC, conflicting volume	1372	536			1073	
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCu, unblocked vol	884	0			496	
IC, single (s)	6.8	6.9			4.2	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.3	
p0 queue free %	100	65			100	
CM capacity (veh/h)	222	837			798	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	289	536	536	299	299	
Volume Left	0	0	0	0	0	
Volume Right	289	0	0	0	0	
cSH	837	1700	1700	1700	1700	
Volume to Capacity	0.35	0.32	0.32	0.18	0.18	
Queue Length 95th (m)	12.4	0.0	0.0	0.0	0.0	
Control Delay (s)	11.6	0.0	0.0	0.0	0.0	
Lane LOS	B					
Approach Delay (s)	11.6	0.0		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			1.7			
Intersection Capacity Utilization			53.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 21: Baltimore Rd & HWY 401 EB Off Ramp & HWY 401 EB ON Ramp

<Total 2026> PM Peak
 06-21-2021

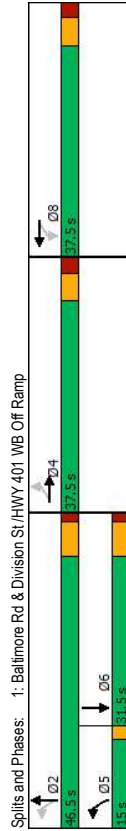
Movement	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations									
Traffic Volume (veh/h)	0	474	0	1052	201	0	562	0	0
Future Volume (Veh/h)	0	474	0	1052	201	0	562	0	0
Sign Control	Yield		Free		Free	Free	Free	Stop	Stop
Grade	0%		0%		0%	0%	0%	0%	0%
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	484	0	1073	205	0	573	0	0
Pedestrians									
Lane Width (m)									
Walking Speed (m/s)									
Percent Blockage									
Right turn flare (veh)									
Median type				None			None		
Median storage (veh)									
Upstream signal (m)				155					
pX platoon unblocked	0.71					0.71		0.71	0.71
VC, conflicting volume	1646	286	573			1073		1844	1646
VC1, stage 1 conf vol									
VC2, stage 2 conf vol									
VCu, unblocked vol	1098	286	573			294		1376	1098
IC, single (s)	6.5	6.9	4.1			4.1		7.5	6.5
IC, 2 stage (s)									
IF (s)	4.0	3.3	2.2			2.2		3.5	4.0
p0 queue free %	100	32	100			100		100	100
CM capacity (veh/h)	153	716	1010			911		25	153
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2			
Volume Total	484	536	536	205	286	286			
Volume Left	0	0	0	0	0	0			
Volume Right	484	0	0	205	0	0			
cSH	716	1700	1700	1700	1700	1700			
Volume to Capacity	0.68	0.32	0.32	0.12	0.17	0.17			
Queue Length 95th (m)	42.3	0.0	0.0	0.0	0.0	0.0			
Control Delay (s)	19.8	0.0	0.0	0.0	0.0	0.0			
Lane LOS	C								
Approach Delay (s)	19.8	0.0			0.0				
Approach LOS	C								
Intersection Summary									
Average Delay					4.1				
Intersection Capacity Utilization					51.6%			ICU Level of Service	A
Analysis Period (min)					15				

Timings

1: Baltimore Rd & Division St /HWY 401 WB Off Ramp

<Total 2031> AM Peak
06-21-2021

	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group							
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Traffic Volume (vph)	2	0	281	4	21	515	908
Future Volume (vph)	2	0	281	4	21	515	908
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	NA
Protected Phases	4	8	2	2	5	2	6
Permitted Phases	4	4	8	8	5	2	6
Detector Phase	4	4	8	8	5	2	6
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	20.0	20.0
Minimum Split (s)	37.5	37.5	37.5	37.5	9.0	30.5	30.5
Total Split (s)	37.5	37.5	37.5	37.5	15.0	46.5	31.5
Total Split (%)	30.9%	30.9%	30.9%	30.9%	12.3%	38.3%	25.9%
Yellow Time (s)	4.1	4.1	4.1	4.1	2.0	5.0	5.0
All-Red Time (s)	2.4	2.4	2.4	2.4	0.0	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	2.0	6.5	6.5
Lead/Lag					Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	Max	None	None
Act Eff Green (s)	10.1	31.2	44.8	40.3	36.9		
Actuated g/C Ratio	0.11	0.33	0.48	0.43	0.39		
v/c Ratio	0.17	0.80	0.09	0.36	0.70		
Control Delay	1.4	46.4	16.3	20.1	30.1		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	1.4	46.4	16.3	20.1	30.1		
LOS	A	D	B	C	C		
Approach Delay	1.4	46.4	20.0	30.1			
Approach LOS	A	D	B	C			
Intersection Summary							
Cycle Length: 121.5							
Actuated Cycle Length: 93.9							
Natural Cycle: 125							
Control Type: Actuated-Uncoordinated							
Maximum v/c Ratio: 0.80							
Intersection Signal Delay: 29.2							
Intersection Capacity Utilization 60.2%							
Analysis Period (min) 15							



Splits and Phases: 1: Baltimore Rd & Division St /HWY 401 WB Off Ramp

HCM Signalized Intersection Capacity Analysis

1: Baltimore Rd & Division St /HWY 401 WB Off Ramp

<Total 2031> AM Peak
06-21-2021

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	2	0	43	281	4	28	21	515	0	0	908	4
Future Volume (vph)	2	0	43	281	4	28	21	515	0	0	908	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5			6.5			2.0	6.5				
Lane Util. Factor	1.00			1.00			1.00	0.95				
Frt	0.87			0.99			1.00	1.00				
Flt Protected	1.00			0.96			0.95	1.00				
Satd. Flow (prot)	1651			1648			1805	3505				
Flt Permitted	1.00			0.71			0.15	1.00				
Satd. Flow (perm)	1647			1229			285	3505				
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)	2	0	45	296	4	29	22	542	0	0	956	4
RTOR Reduction (vph)	0	44	0	0	3	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	3	0	0	326	0	22	542	0	0	960	0
Heavy Vehicles (%)	0%	0%	0%	10%	0%	0%	0%	0%	3%	4%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	NA	NA	NA	NA
Protected Phases	4			8			5	2			6	
Permitted Phases	4			8			2				36.9	
Actuated Green, G (s)	5.6			31.2			41.6	41.6			36.9	
Effective Green, g (s)	5.6			31.2			41.6	41.6			36.9	
Actuated g/C Ratio	0.06			0.32			0.42	0.42			0.38	
Clearance Time (s)	6.5			6.5			2.0	6.5			6.5	
Vehicle Extension (s)	3.0			3.0			3.0	3.0			3.0	
Lane Grp Cap (vph)	94			391			163	1489			1307	
v/s Ratio Prot	c0.00			c0.27			0.00	c0.15			c0.28	
v/s Ratio Perm	0.03			0.83			0.13	0.36			0.73	
Uniform Delay, d1	43.6			31.0			18.4	19.2			26.3	
Progression Factor	1.00			1.00			1.00	1.00			1.00	
Incremental Delay, d2	0.1			14.2			0.4	0.7			2.2	
Delay (s)	43.7			45.1			18.7	19.8			28.5	
Level of Service	D			D			B	B			C	
Approach Delay (s)	43.7			45.1			19.8	28.5			28.5	
Approach LOS	D			D			B	C			C	
Intersection Summary												
HCM 2000 Control Delay	29.2			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	0.71											
Actuated Cycle Length (s)	97.9			Sum of lost time (s)			21.5					
Intersection Capacity Utilization	60.2%			ICU Level of Service			B					
Analysis Period (min)	15											
c. Critical Lane Group												

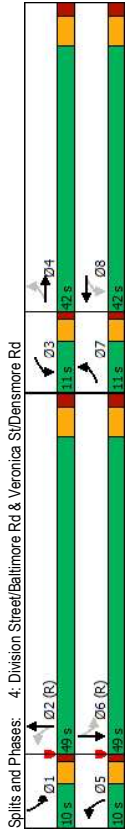
Timings

4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<Total 2031> AM Peak

06-21-2021

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	16	21	248	15	41	647	180	1203
Traffic Volume (vph)	16	21	248	15	41	647	180	1203
Future Volume (vph)	16	21	248	15	41	647	180	1203
Turn Type	pm-pt	NA	pm-pt	NA	pm-pt	NA	pm-pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4	8	2	2	6	6	6	6
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase	6.0	7.0	6.0	7.0	6.0	15.0	6.0	15.0
Minimum Initial (s)	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0
Minimum Split (s)	11.0	42.0	11.0	42.0	10.0	49.0	10.0	49.0
Total Split (%)	9.8%	37.5%	9.8%	37.5%	8.9%	43.8%	8.9%	43.8%
Total Split (%)	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0
Yellow Time (s)	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0
All-Red Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Total Lost Time (s)	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead/Lag	Max	Max	Max	Max	Max	Max	Max	Max
Recall Mode	45.0	36.0	45.0	36.0	51.0	43.0	51.0	43.0
Act Effct Green (s)	0.40	0.32	0.40	0.32	0.46	0.38	0.46	0.38
Actuated g/C Ratio	0.04	0.06	0.46	0.46	0.25	0.62	0.77	0.97
v/c Ratio	18.3	18.9	25.7	6.2	18.7	29.4	41.7	52.7
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	18.3	18.9	25.7	6.2	18.7	29.4	41.7	52.7
Total Delay	B	B	C	A	B	C	D	D
LOS	B	B	C	A	B	C	D	D
Approach Delay	18.7	14.8	14.8	28.9	51.4	51.4	51.4	51.4
Approach LOS	B	B	B	C	C	D	D	D
Intersection Summary								
Cycle Length: 112								
Actuated Cycle Length: 112								
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green								
Natural Cycle: 105								
Control Type: Prelimed								
Maximum v/c Ratio: 0.97								
Intersection Signal Delay: 37.1								
Intersection Capacity Utilization 73.9%								
Analysis Period (min) 15								



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Synchro 10 Report

HCM Signalized Intersection Capacity Analysis

4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

<Total 2031> AM Peak

06-21-2021

Movement	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Configurations									
Traffic Volume (vph)	16	21	13	248	15	300	41	647	180
Future Volume (vph)	16	21	13	248	15	300	41	647	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00
Frt	1.00	0.94	1.00	0.86	1.00	0.97	1.00	0.99	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1791	1687	1540	1805	3369	1656	3451	
Flt Permitted	0.40	1.00	0.73	1.00	0.09	1.00	0.22	1.00	
Satd. Flow (perm)	762	1791	1305	1540	177	3369	378	3451	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	16	21	13	253	15	306	42	660	184
RTOR Reduction (vph)	0	9	0	0	208	0	19	0	3
Lane Group Flow (vph)	16	25	0	253	113	0	42	801	184
Heavy Vehicles (%)	0%	0%	0%	7%	0%	6%	0%	9%	3%
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	NA
Protected Phases	7	4	3	8	5	2	1	6	
Permitted Phases	4	8	2	2	6	6	6	6	
Actuated Green, G (s)	43.0	36.0	43.0	36.0	49.0	43.0	49.0	43.0	
Effective Green, g (s)	43.0	36.0	43.0	36.0	49.0	43.0	49.0	43.0	
Actuated g/C Ratio	0.38	0.32	0.38	0.32	0.44	0.38	0.44	0.38	
Clearance Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	
Lane Grp Cap (vph)	357	575	524	495	164	1293	233	1324	
v/s Ratio Prot	0.00	0.01	c0.03	0.07	0.01	0.24	c0.04	c0.37	
v/s Ratio Perm	0.01		c0.15		0.10		0.30		
v/c Ratio	0.04	0.04	0.48	0.23	0.26	0.62	0.79	0.97	
Uniform Delay, d1	21.9	26.2	25.3	27.8	24.1	27.9	24.9	33.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	0.1	3.2	1.1	3.7	2.2	23.3	18.6	
Delay (s)	22.2	26.3	28.4	28.9	27.8	30.1	48.2	52.5	
Level of Service	C	C	C	C	C	C	D	D	
Approach Delay (s)	25.0	C	28.7	C	30.0	C	52.0	D	
Approach LOS	C	C	C	C	C	C	D	D	
Intersection Summary									
HCM 2000 Control Delay	40.6	HCM 2000 Level of Service							D
HCM 2000 Volume to Capacity ratio	0.73								
Actuated Cycle Length (s)	112.0	Sum of lost time (s)							20.0
Intersection Capacity Utilization	73.9%	ICU Level of Service							D
Analysis Period (min)	15								
Critical Lane Group									

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Synchro 10 Report

HCM Unsignalized Intersection Capacity Analysis

<Total 2031> AM Peak
06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔		↔		↔		↔↔	
Traffic Volume (veh/h)	4	350	4	4	552	2	0	0	5	7	0	10
Future Volume (Veh/h)	4	350	4	4	552	2	0	0	5	7	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	4	393	4	4	620	2	0	0	6	8	0	11
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None											
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	622			397			1043	1033	395	1038	1034	621
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vC3, stage 3 conf vol												
vC4, unblocked vol	622			397			1043	1033	395	1038	1034	621
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
IC, 2 stage (s)												
IF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	99	96	100	98
dM capacity (veh/h)	969			1173			203	233	659	208	232	491
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1							
Volume Total	401	626	0	6	19							
Volume Left	4	4	0	0	8							
Volume Right	4	2	0	6	11							
CSH	969	1173	1700	659	312							
Volume to Capacity	0.00	0.00	0.00	0.01	0.06							
Queue Length 95th (m)	0.1	0.1	0.0	0.2	1.5							
Control Delay (s)	0.1	0.1	0.0	10.5	17.3							
Lane LOS	A	A	A	B	C							
Approach Delay (s)	0.1	0.1	10.5	17.3								
Approach LOS	B			C								
Intersection Summary												
Average Delay			0.5									
Intersection Capacity Utilization			41.6%									
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
6: Parkview Hills Drive & Densmore Rd
HCM 2031 > AM Peak
< Total 2031 > 06-21-2021

<Total 2031> AM Peak
06-21-2021

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	277	85	22	478	80	9
Future Volume (Veh/h)	277	85	22	478	80	9
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)	308	94	24	531	88	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type						
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume						
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol						
tC, single (s)						
tC, 2 stage (s)						
tF (s)						
p0 queue free %						
dM capacity (veh/h)						
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	402	555	99			
Volume Left	0	24	89			
Volume Right	94	0	10			
cSH	1700	1168	310			
Volume to Capacity	0.24	0.02	0.32			
Queue Length 95th (m)	0.0	0.5	10.7			
Control Delay (s)	0.0	0.6	22.0			
Lane LOS		A	C			
Approach Delay (s)	0.0	0.6	22.0			
Approach LOS			C			
Intersection Summary						
Average Delay			2.4			A
Intersection Capacity Utilization			54.7%			
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

<Total 2031> AM Peak
06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	4	274	8	0	483	2	6	0	2	7	0	10
Future Volume (Veh/h)	4	274	8	0	483	2	6	0	2	7	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	0%
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	5	334	10	0	589	2	7	0	2	9	0	12
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None					None						
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	591		344				951	940	339	941	944	590
vC1, stage 1 cont vol												
vC2, stage 2 cont vol												
vC3, unblocked vol												
IC, single (s)	4.1		4.1				7.1	6.6	6.2	7.1	6.5	6.2
IC, 2 stage (s)												
IF (s)	2.2		2.2				3.5	4.1	3.3	3.5	4.0	3.3
p0 queue free %	99		100				97	100	100	96	100	98
dl capacity (veh/h)	995		1204				235	258	708	244	263	511
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	349	591	9	21								
Volume Left	5	0	7	9								
Volume Right	10	2	2	12								
CSH	995	1204	276	348								
Volume to Capacity	0.01	0.00	0.03	0.06								
Queue Length 95th (m)	0.1	0.0	0.8	1.5								
Control Delay (s)	0.2	0.0	18.5	16.0								
Lane LOS	A	C	C	C								
Approach Delay (s)	0.2	0.0	18.5	16.0								
Approach LOS	C	C	C	C								
Intersection Summary												
Average Delay			0.6									
Intersection Capacity Utilization			35.5%								A	
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

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Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↕↕			↕↕
Traffic Volume (veh/h)	0	155	798	0	0	961
Future Volume (Veh/h)	0	155	798	0	0	961
Sign Control	Yield		Free		Free	
Grade	0%		0%			0%
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	158	814	0	0	981
Pedestrians						
Lane Width (m)						
Walking Speed (mis)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			333			
pX, platoon unblocked						
vC, conflicting volume					814	
vC1, stage 1 conf vol	1304	407				
vC2, stage 2 conf vol						
vCu, unblocked vol	1304	407			814	
tC, single (s)	6.8	6.9			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.3	
p0 queue free %	100	74			100	
cM capacity (veh/h)	154	596			784	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	158	407	407	490	490	
Volume Left	0	0	0	0	0	
Volume Right	158	0	0	0	0	
gSH	596	1700	1700	1700	1700	0%
Volume to Capacity	0.26	0.24	0.24	0.29	0.29	
Queue Length 95th (m)	8.5	0.0	0.0	0.0	0.0	
Control Delay (s)	13.2	0.0	0.0	0.0	0.0	
Lane LOS	B					
Approach Delay (s)	13.2	0.0		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay	1.1			A		
Intersection Capacity Utilization	38.3%			ICU Level of Service		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
21: Baltimore Rd & HWY 401 EB Off Ramp & HWY 401 EB ON Ramp
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Movement	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations				↕↕	↗		↕↕			
Traffic Volume (veh/h)	0	562	0	798	166	0	939	0	0	0
Future Volume (Veh/h)	0	562	0	798	166	0	939	0	0	0
Sign Control	Yield			Free			Free		Stop	
Grade	0%			0%			0%		0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	573	0	814	169	0	958	0	0	0
Pedestrians										
Lane Width (m)										
Walking Speed (m/s)										
Percent Blockage										
Right turn flare (veh)										
Median type				None			None			
Median storage (veh)										
Upstream signal (m)				155						
pX, platoon unblocked	0.86					0.86			0.86	0.86
vC, conflicting volume	1772	479	958			814			1866	1772
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vC3, unblocked vol	1579	479	958			470			1687	1579
tC, single (s)	6.5	6.9	4.1			4.1			7.5	6.5
tC, 2 stage (s)										
tF (s)	4.0	3.3	2.2			2.2			3.5	4.0
pQ queue free %	100	0	100			100			0	100
dM capacity (veh/h)	95	538	726			953			0	95
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2				
Volume Total	573	407	407	169	479	479				
Volume Left	0	0	0	0	0	0				
Volume Right	573	0	0	169	0	0				
cSH	538	1700	1700	1700	1700	1700				
Volume to Capacity	1.06	0.24	0.24	0.10	0.28	0.28				
Queue Length 95th (m)	136.0	0.0	0.0	0.0	0.0	0.0				
Control Delay (s)	84.7	0.0	0.0	0.0	0.0	0.0				
Lane LOS	F									
Approach Delay (s)	84.7	0.0			0.0					
Approach LOS	F									
Intersection Summary										
Average Delay			19.3							
Intersection Capacity Utilization			67.4%							C
Analysis Period (min)			15							

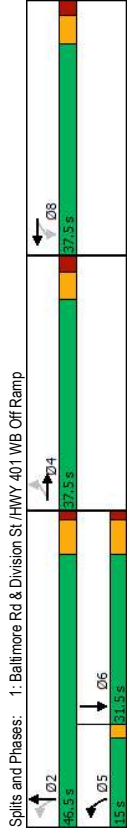
Timings

1: Baltimore Rd & Division St /HWY 401 WB Off Ramp

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Traffic Signal Timing Diagram									
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT	Directional Indicators	
Lane Configurations		↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	11	0	157	9	66	1077	666		
Future Volume (vph)	11	0	157	9	66	1077	666		
Turn Type	Perm	NA	Perm	NA	pm-pl	NA	NA		
Protected Phases		4		8	5	2	6		
Permitted Phases	4		8		2				
Detector Phase	4	4	8	8	5	2	6		
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	20.0	20.0		
Minimum Split (s)	37.5	37.5	37.5	37.5	9.0	30.5	30.5		
Total Split (s)	37.5	37.5	37.5	37.5	15.0	46.5	31.5		
Total Split (%)	30.9%	30.9%	30.9%	30.9%	12.3%	38.3%	25.9%		
Yellow Time (s)	4.1	4.1	4.1	4.1	2.0	5.0	5.0		
All-Red Time (s)	2.4	2.4	2.4	2.4	0.0	1.5	1.5		
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	6.5	6.5	6.5	6.5	2.0	6.5	6.5		
Lead/Lag					Lead		Lag		
Lead-Lag Optimize?					Yes		Yes		
Recall Mode	None	None	None	None	None	Max	None		
Act Effrt Green (s)	10.2	10.2	18.7	45.5	40.9	33.4			
Actuated g/C Ratio	0.12	0.12	0.22	0.53	0.48	0.39			
v/c Ratio	0.24		0.73	0.17	0.72	0.53			
Control Delay	5.3		47.0	14.2	23.7	25.7			
Queue Delay	0.0		0.0	0.0	0.0	0.0			
Total Delay	5.3		47.0	14.2	23.7	25.7			
LOS	A		D	B	C	C			
Approach Delay	5.3		47.0		23.1	25.7			
Approach LOS	A		D		C	C			
Intersection Summary									
Cycle Length: 121.5									
Actuated Cycle Length: 86.3									
Natural Cycle: 125									
Control Type: Actuated-Uncoordinated									
Maximum v/c Ratio: 0.73									
Intersection Signal Delay: 25.6	Intersection LOS: C								
Intersection Capacity Utilization 57.9%	ICU Level of Service B								
Analysis Period (min) 15									



HCM Signalized Intersection Capacity Analysis 1: Baltimore Rd & Division St/Hwy 401 WB Off Ramp

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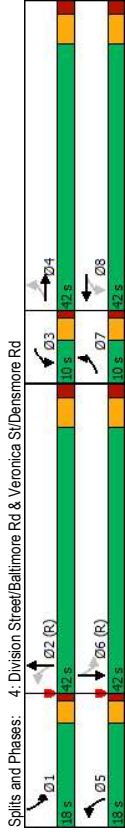
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	11	0	56	157	9	24	66	1077	0	0	666	11
Traffic Volume (vph)	11	0	56	157	9	24	66	1077	0	0	666	11
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Lane Util. Factor	0.89	0.89	0.89	0.89	0.89	0.89	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	1673	1673	1673	1643	1805	3282	3465	3465	3465	3465	3465	3465
Flt Permitted	0.97	0.71	0.28	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1631	1221	526	3282	3465	3465	3465	3465	3465	3465	3465	3465
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)	12	0	59	165	9	25	69	1134	0	0	701	12
RTOR Reduction (vph)	0	65	0	0	5	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	6	0	0	194	0	69	1134	0	0	712	0
Heavy Vehicles (%)	0%	0%	0%	10%	0%	7%	0%	10%	7%	0%	4%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA	NA	NA	NA	NA
Protected Phases	4	4	8	8	5	2	2	6	6	6	6	6
Permitted Phases	4	8	8	8	5	2	2	6	6	6	6	6
Actuated Green, G (s)	7.5	7.5	18.7	41.5	41.5	41.5	41.5	33.4	33.4	33.4	33.4	33.4
Effective Green, g (s)	7.5	7.5	18.7	41.5	41.5	41.5	41.5	33.4	33.4	33.4	33.4	33.4
Actuated g/C Ratio	0.09	0.21	0.48	0.48	0.48	0.48	0.38	0.38	0.38	0.38	0.38	0.38
Clearance Time (s)	6.5	6.5	2.0	6.5	2.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5
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)	140	261	339	1361	0.01	c0.35	0.21	1327	1327	1327	1327	1327
v/s Ratio Prot	c0.00	c0.16	0.01	0.08	0.08	0.08	0.21	0.21	0.21	0.21	0.21	0.21
v/s Ratio Perm	0.04	0.74	0.20	0.73	0.73	0.73	0.54	0.54	0.54	0.54	0.54	0.54
Uniform Delay, d1	36.6	32.0	13.0	18.3	18.3	18.3	20.9	20.9	20.9	20.9	20.9	20.9
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	0.1	10.9	0.3	3.0	3.0	3.0	0.4	0.4	0.4	0.4	0.4	0.4
Delay (s)	36.7	42.9	13.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3
Level of Service	D	D	B	C	C	C	C	C	C	C	C	C
Approach Delay (s)	36.7	42.9	20.8	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3
Approach LOS	D	D	C	C	C	C	C	C	C	C	C	C
Intersection Summary	HCM 2000 Level of Service											
HCM 2000 Control Delay	23.5											
HCM 2000 Volume to Capacity ratio	0.67											
Actuated Cycle Length (s)	87.2											
Intersection Capacity Utilization	57.9%											
Analysis Period (min)	15											
c. Critical Lane Group	15											

Timings 4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

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Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	6	8	224	9	26	1218	295	907
Traffic Volume (vph)	60	8	224	9	26	1218	295	907
Future Volume (vph)	60	8	224	9	26	1218	295	907
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	7	4	3	8	5	2	1	6
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase	6.0	7.0	6.0	7.0	6.0	15.0	6.0	15.0
Minimum Initial (s)	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0
Minimum Split (s)	10.0	42.0	10.0	42.0	10.0	42.0	10.0	42.0
Total Split (s)	8.9%	37.5%	8.9%	37.5%	16.1%	37.5%	16.1%	37.5%
Total Split (%)	8.9%	37.5%	8.9%	37.5%	16.1%	37.5%	16.1%	37.5%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Max	Max	Max	Max	Max	Max	Max	Max
Recall Mode	44.0	36.0	44.0	36.0	52.0	36.0	52.0	36.0
Act Effct Green (s)	0.39	0.32	0.39	0.32	0.46	0.32	0.46	0.32
Actuated g/C Ratio	0.15	0.09	0.44	0.41	0.09	1.44	1.11	0.86
v/c Ratio	20.1	10.4	25.9	5.9	15.0	235.1	115.8	44.5
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	20.1	10.4	25.9	5.9	15.0	235.1	115.8	44.5
Total Delay	C	B	C	A	B	F	F	D
LOS	C	B	C	A	B	F	F	D
Approach Delay	15.7	15.0	231.4	61.6	61.6	61.6	61.6	61.6
Approach LOS	B	B	F	F	F	F	F	E
Intersection Summary	Intersection LOS: F							
Cycle Length: 112	ICU Level of Service F							
Actuated Cycle Length: 112	Analysis Period (min) 15							
Offset: 0 (0%), Referenced to phase 2NBT and 6SBTL, Start of Green								
Natural Cycle: 145								
Control Type: Prelimed								
Maximum v/c Ratio: 1.44								
Intersection Signal Delay: 132.3								
Intersection Capacity Utilization 99.0%								
Analysis Period (min) 15								



HCM Signalized Intersection Capacity Analysis
 4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↰	↱	↲	↰	↱	↲	↰	↱	↲
Traffic Volume (vph)	60	8	41	224	9	258	26	1218	342	295	907	29
Future Volume (vph)	60	8	41	224	9	258	26	1218	342	295	907	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95
Frt	1.00	0.87	1.00	0.85	1.00	0.85	1.00	0.97	1.00	0.97	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1805	1661	1687	1535	1805	1535	1805	3360	1656	3468	1656	3468
Flt Permitted	0.47	1.00	0.72	1.00	0.72	1.00	0.11	1.00	0.11	1.00	0.11	1.00
Satd. Flow (perm)	890	1661	1286	1535	890	1535	211	3360	194	3468	194	3468
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)	61	8	42	229	9	263	27	1243	349	301	926	30
RTOR Reduction (vph)	0	29	0	0	178	0	0	23	0	0	2	0
Lane Group Flow (vph)	61	22	0	229	94	0	27	1569	0	301	954	0
Heavy Vehicles (%)	0%	0%	0%	7%	0%	6%	0%	5%	0%	9%	3%	22%
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	5	2	1	6	1	6
Permitted Phases	4	8	8	8	2	2	2	2	6	6	6	6
Actuated Green, G (s)	42.0	36.0	42.0	36.0	42.0	36.0	50.0	36.0	50.0	36.0	50.0	36.0
Effective Green, g (s)	42.0	36.0	42.0	36.0	42.0	36.0	50.0	36.0	50.0	36.0	50.0	36.0
Actuated g/C Ratio	0.38	0.32	0.38	0.32	0.38	0.32	0.45	0.32	0.45	0.32	0.45	0.32
Clearance Time (s)	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Lane Grp Cap (vph)	382	533	503	493	293	1080	293	1080	269	1114	269	1114
v/s Ratio Prot	0.01	0.01	c0.02	0.06	0.01	c0.47	0.01	c0.47	c0.14	0.28	0.14	0.28
v/s Ratio Perm	0.05	0.05	c0.15	0.03	0.03	0.03	0.03	0.03	0.36	0.36	0.36	0.36
v/c Ratio	0.16	0.04	0.46	0.19	0.09	1.45	0.09	1.45	1.12	0.86	1.12	0.86
Uniform Delay, d1	22.9	26.1	25.6	27.5	20.0	38.0	20.0	38.0	32.6	35.6	32.6	35.6
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	0.9	0.1	3.0	0.9	0.6	208.9	0.6	208.9	90.7	8.5	90.7	8.5
Delay (s)	23.8	26.3	28.5	28.3	20.6	246.9	20.6	246.9	123.2	44.1	123.2	44.1
Level of Service	C	C	C	C	C	C	C	C	F	F	F	D
Approach Delay (s)	24.9	24.9	28.4	28.4	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9
Approach LOS	C	C	C	C	C	C	C	C	F	F	F	E
Intersection Summary												
HCM 2000 Control Delay	140.5											
HCM 2000 Volume to Capacity ratio	0.95											
Actuated Cycle Length (s)	112.0											
Intersection Capacity Utilization	99.0%											
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
 5: St Mary's S.S/West Site Access & Densmore Rd

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔		↔		↔		↔↔	
Traffic Volume (veh/h)	13	633	0	0	483	6	1	0	1	5	0	8
Future Volume (Veh/h)	13	633	0	0	483	6	1	0	1	5	0	8
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	15	711	0	0	543	7	1	0	1	6	0	9
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	550		711		711		1296	1291	711	1288	1288	546
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vC3, unblocked vol	550		711		711		1296	1291	711	1288	1288	546
IC, single (s)	4.1		4.1		4.1		7.1	6.5	6.2	7.1	6.5	6.2
IC, 2 stage (s)	2.2		2.2		2.2		3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99		100		100		99	100	100	96	100	98
p0 capacity (veh/h)	1030		898		898		136	162	436	140	163	541
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1							
Volume Total	726	550	1	1	15							
Volume Left	15	0	1	0	6							
Volume Right	0	7	0	1	9							
cSH	1030	898	136	436	252							
Volume to Capacity	0.01	0.00	0.01	0.00	0.06							
Queue Length 95th (m)	0.4	0.0	0.2	0.1	1.5							
Control Delay (s)	0.4	0.0	31.6	13.3	20.2							
Lane LOS	A	D	D	B	C							
Approach Delay (s)	0.4	0.0	22.4	20.2	20.2							
Approach LOS	C	C	C	C	C							
Intersection Summary												
Average Delay	0.5					B						
Intersection Capacity Utilization	55.8%					B						
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis 6: Parkview Hills Drive & Densmore Rd

<Total 2031> PM Peak
06-21-2021

Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	EB	EB	WB	WB	NB	NB	
Traffic Volume (veh/h)	543	95	0	431	57	0	
Future Volume (Veh/h)	543	95	0	431	57	0	
Sign Control	Free	Free	Stop	Stop	Stop	Stop	
Grade	0%	0%	0%	0%	0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	
Hourly flow rate (vph)	603	106	0	479	63	0	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None						
Median storage (veh)							
Upstream signal (m)							
pX platoon unblocked							
VC, conflicting volume		709			1135	656	
VC1, stage 1 conf vol							
VC2, stage 2 conf vol		709			1135	656	
VCu, unblocked vol		4.1			6.4	6.2	
IC, single (s)							
IC, 2 stage (s)		2.2			3.5	3.3	
p0 queue free %		100			72	100	
CM capacity (veh/h)		899			226	469	
Direction, Lane #	EB 1	WB 1	NB 1				
Volume Total	709	479	63				
Volume Left	0	0	63				
Volume Right	106	0	0				
cSH	1700	899	226				
Volume to Capacity	0.42	0.00	0.28				
Queue Length 95th (m)	0.0	0.0	8.8				
Control Delay (s)	0.0	0.0	27.0				
Lane LOS		D					
Approach Delay (s)	0.0	0.0	27.0				
Approach LOS		D					
Intersection Summary							
Average Delay			1.4				
Intersection Capacity Utilization		44.3%			ICU Level of Service	A	
Analysis Period (min)		15					

HCM Unsignalized Intersection Capacity Analysis 7: O'Conner Crt/East Site Access & Densmore Rd

<Total 2031> PM Peak
06-21-2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Traffic Volume (veh/h)	13	524	7	0	419	6	6	0	0	5	0	7
Future Volume (Veh/h)	13	524	7	0	419	6	6	0	0	5	0	7
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	16	639	9	0	511	7	7	0	0	6	0	9
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None											
Median storage (veh)												
Upstream signal (m)												
pX platoon unblocked												
VC, conflicting volume	518			648			1199	1194	644	1190	1194	514
VC1, stage 1 conf vol												
VC2, stage 2 conf vol	518			648			1199	1194	644	1190	1194	514
VCu, unblocked vol	4.1			4.1			7.1	6.6	6.2	7.1	6.5	6.2
IC, single (s)												
IC, 2 stage (s)	2.2			2.2			3.5	4.1	3.3	3.5	4.0	3.3
p0 queue free %	98			100			96	100	100	96	100	98
CM capacity (veh/h)	1058			928			159	181	477	164	185	564
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	664	518	7	15								
Volume Left	16	0	7	6								
Volume Right	9	7	0	9								
cSH	1058	928	159	286								
Volume to Capacity	0.02	0.00	0.04	0.05								
Queue Length 95th (m)	0.4	0.0	1.1	1.3								
Control Delay (s)	0.4	0.0	28.6	18.3								
Lane LOS	A		D	C								
Approach Delay (s)	0.4	0.0	28.6	18.3								
Approach LOS			D	C								
Intersection Summary												
Average Delay				0.6								
Intersection Capacity Utilization			48.5%				ICU Level of Service	A				
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 19: Baltimore Rd & HWY 401 EB Off Ramp

<Total 2031> PM Peak
 06-21-2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	345	1296	0	0	698
Future Volume (Veh/h)	0	345	1296	0	0	698
Sign Control	Yield	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	352	1322	0	0	712
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			333			
pX platoon unblocked	0.72	0.72			0.72	
VC, conflicting volume	1678	661			1322	
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCu, unblocked vol	1166	0			672	
IC, single (s)	6.8	6.9			4.2	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.3	
p0 queue free %	100	55			100	
CM capacity (veh/h)	137	784			640	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	352	661	661	356	356	
Volume Left	0	0	0	0	0	
Volume Right	352	0	0	0	0	
cSH	784	1700	1700	1700	1700	
Volume to Capacity	0.45	0.39	0.39	0.21	0.21	
Queue Length 95th (m)	18.8	0.0	0.0	0.0	0.0	
Control Delay (s)	13.3	0.0	0.0	0.0	0.0	
Lane LOS	B					
Approach Delay (s)	13.3	0.0		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			2.0			
Intersection Capacity Utilization			63.9%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 21: Baltimore Rd & HWY 401 EB Off Ramp & HWY 401 EB ON Ramp

<Total 2031> PM Peak
 06-21-2021

Movement	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations									
Traffic Volume (veh/h)	0	562	0	1296	239	0	669	0	0
Future Volume (Veh/h)	0	562	0	1296	239	0	669	0	0
Sign Control	Yield	Free	Free	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	573	0	1322	244	0	683	0	0
Pedestrians									
Lane Width (m)									
Walking Speed (m/s)									
Percent Blockage									
Right turn flare (veh)									
Median type				None			None		
Median storage (veh)									
Upstream signal (m)				155					
pX platoon unblocked	0.69					0.69		0.69	0.69
VC, conflicting volume	2005	342	683			1322		2236	2005
VC1, stage 1 conf vol									
VC2, stage 2 conf vol									
VCu, unblocked vol	1563	342	683			577		1897	1563
IC, single (s)	6.5	6.9	4.1			4.1		7.5	6.5
IC, 2 stage (s)									
IF (s)	4.0	3.3	2.2			2.2		3.5	4.0
p0 queue free %	100	13	100			100		100	100
CM capacity (veh/h)	78	660	919			697		4	78
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2			
Volume Total	573	661	661	244	342	342			
Volume Left	0	0	0	0	0	0			
Volume Right	573	0	0	244	0	0			
cSH	660	1700	1700	1700	1700	1700			
Volume to Capacity	0.87	0.39	0.39	0.14	0.20	0.20			
Queue Length 95th (m)	81.5	0.0	0.0	0.0	0.0	0.0			
Control Delay (s)	35.6	0.0	0.0	0.0	0.0	0.0			
Lane LOS	E								
Approach Delay (s)	35.6	0.0			0.0				
Approach LOS	E								
Intersection Summary									
Average Delay			7.2						
Intersection Capacity Utilization			60.0%		ICU Level of Service			B	
Analysis Period (min)			15						

Intersection: 1: Baltimore Rd & Division St /HWY 401 WB Off Ramp

Movement	EB	WB	NB	NB	SB	SB	TR
Directions Served	LTR	LTR	L	T	T	T	TR
Maximum Queue (m)	27.1	78.2	19.6	39.4	53.0	105.7	76.7
Average Queue (m)	7.7	44.6	3.7	20.8	21.7	44.1	38.5
95th Queue (m)	17.0	72.2	12.0	36.9	40.3	79.7	62.3
Link Distance (m)	148.1	236.7		121.0	121.0	208.2	208.2
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (m)			95.0				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 2: HWY 401 WB On Ramp & Baltimore Rd

Movement	NB	SB
Directions Served	R	R
Maximum Queue (m)	36.0	48.2
Average Queue (m)	19.4	10.8
95th Queue (m)	37.1	32.1
Link Distance (m)		121.0
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	30.0	
Storage Blk Time (%)	2	
Queuing Penalty (veh)	6	

Intersection: 3: HWY 401 EB ON Ramp & Baltimore Rd

Movement	SB	SB	SB	T
Directions Served	L	T	T	
Maximum Queue (m)	9.3	14.9	20.2	
Average Queue (m)	2.4	0.5	2.7	
95th Queue (m)	9.1	4.9	11.4	
Link Distance (m)		65.8	65.8	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				55.0
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

Movement	EB	EB	WB	WB	NB	NB	SB	SB	TR
Directions Served	L	TR	L	TR	L	T	TR	L	T
Maximum Queue (m)	27.1	27.4	163.4	37.3	120.8	122.5	87.4	125.3	130.2
Average Queue (m)	3.7	8.0	24.7	73.0	12.6	54.9	70.5	47.8	100.2
95th Queue (m)	12.2	17.8	33.3	135.9	33.0	87.1	111.9	98.0	121.6
Link Distance (m)		214.2		465.5		213.1	213.1	135.3	135.3
Upstream Blk Time (%)									
Queuing Penalty (veh)									0
Storage Bay Dist (m)	20.0		20.0		30.0		80.0		0
Storage Blk Time (%)		1	31	17	22		0	18	
Queuing Penalty (veh)		0	99	43	9		0	33	

Intersection: 5: St Mary's S./West Site Access & Densmore Rd

Movement	EB	NB	SB
Directions Served	LTR	R	LTR
Maximum Queue (m)	21.1	8.1	6.4
Average Queue (m)	1.5	1.3	2.2
95th Queue (m)	9.2	6.2	7.0
Link Distance (m)		465.5	48.0
Upstream Blk Time (%)			82.5
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Parkview Hills Drive & Densmore Rd

Movement	WB	NB	SB
Directions Served	LT	LR	
Maximum Queue (m)	9.2	22.0	
Average Queue (m)	0.3	11.8	
95th Queue (m)	3.0	19.1	
Link Distance (m)		74.2	207.0
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: O'Conner Crt/East Site Access & Densmore Rd

Movement	NB	SB
Directions Served	LTR	LTR
Maximum Queue (m)	13.9	9.1
Average Queue (m)	3.0	4.0
95th Queue (m)	9.6	11.0
Link Distance (m)	66.6	103.2
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 19: Baltimore Rd & HWY 401 EB Off Ramp

Movement	WB
Directions Served	R
Maximum Queue (m)	33.0
Average Queue (m)	11.1
95th Queue (m)	22.8
Link Distance (m)	174.3
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 21: Baltimore Rd & HWY 401 EB Off Ramp & HWY 401 EB ON Ramp

Movement	EB	SB	T
Directions Served	R	T	T
Maximum Queue (m)	164.7	17.1	20.8
Average Queue (m)	164.7	0.8	11.5
95th Queue (m)	164.7	6.2	21.4
Link Distance (m)	160.1	17.1	17.1
Upstream Blk Time (%)	98	0	3
Queuing Penalty (veh)	0	0	10
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 201

Intersection: 1: Baltimore Rd & Division St /HWY 401 WB Off Ramp

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	T	T
Maximum Queue (m)	16.2	33.3	19.5	44.2
Average Queue (m)	10.9	24.3	9.6	27.7
95th Queue (m)	21.2	37.5	17.8	49.2
Link Distance (m)	148.1	236.7	121.0	208.2
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)			95.0	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: HWY 401 WB On Ramp & Baltimore Rd

Movement	NB	SB
Directions Served	R	R
Maximum Queue (m)	29.6	9.4
Average Queue (m)	10.8	1.9
95th Queue (m)	29.0	8.0
Link Distance (m)		121.0
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	30.0	
Storage Blk Time (%)	1	
Queuing Penalty (veh)	6	

Intersection: 3: Baltimore Rd/Baltimore Road & HWY 401 EB ON Ramp

Movement	SB	SB
Directions Served	L	T
Maximum Queue (m)	9.2	9.1
Average Queue (m)	3.7	1.8
95th Queue (m)	11.1	7.8
Link Distance (m)		65.8
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	55.0	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
	L	TR	L	TR	L	TR	L	TR	L	TR	TR
Directions Served											
Maximum Queue (m)	10.9	14.6	25.4	26.1	37.3	217.7	229.6	87.4	140.4	135.3	
Average Queue (m)	6.8	4.6	22.0	15.8	11.3	176.2	186.2	87.4	139.1	114.0	
95th Queue (m)	10.2	14.3	25.1	24.3	36.1	229.2	245.8	87.4	141.2	177.6	
Link Distance (m)		214.2		465.5		213.1	213.1		135.3	135.3	
Upstream Blk Time (%)					8	19		23		1	
Queuing Penalty (veh)					0	0		126		5	
Storage Bay Dist (m)	20.0		20.0		30.0			80.0			
Storage Blk Time (%)	0	0	26	5		61		92			
Queuing Penalty (veh)	0	0	62	10		13		343			

Intersection: 5: St Mary's S/SWest Site Access & Densmore Rd

Movement	EB	SB
	LTR	LTR
Directions Served		
Maximum Queue (m)	8.5	6.6
Average Queue (m)	1.7	1.3
95th Queue (m)	7.3	5.7
Link Distance (m)		465.5
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Parkview Hills Drive & Densmore Rd

Movement	NB
	LR
Directions Served	
Maximum Queue (m)	15.7
Average Queue (m)	10.3
95th Queue (m)	14.7
Link Distance (m)	207.0
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 7: O'Conner Crt/East Site Access & Densmore Rd/Densmore Road

Movement	NB	SB
	LTR	LTR
Directions Served		
Maximum Queue (m)	7.6	7.5
Average Queue (m)	3.0	1.5
95th Queue (m)	9.0	6.5
Link Distance (m)		66.6
Upstream Blk Time (%)		103.2
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 19: Baltimore Road/Baltimore Rd & HWY 401 EB Off Ramp

Movement	WB
	R
Directions Served	
Maximum Queue (m)	33.0
Average Queue (m)	22.8
95th Queue (m)	33.7
Link Distance (m)	174.3
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 21: Baltimore Rd & HWY 401 EB Off Ramp & HWY 401 EB ON Ramp

Movement	EB	SB	SB
	R	T	T
Directions Served			
Maximum Queue (m)	164.7	19.8	18.4
Average Queue (m)	127.9	12.6	12.6
95th Queue (m)	215.4	24.1	20.1
Link Distance (m)	160.1	17.1	17.1
Upstream Blk Time (%)		46	2
Queuing Penalty (veh)		0	8
Storage Bay Dist (m)			3
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 574

Queuing and Blocking Report

<Total 2031> AM Peak
06-21-2021

Intersection: 1: Baltimore Rd & Division St /HWY 401 WB Off Ramp

Movement	EB	WB	NB	NB	SB	SB	TR
Directions Served	LTR	LTR	L	T	T	T	TR
Maximum Queue (m)	21.7	81.7	14.6	49.0	43.2	66.0	57.9
Average Queue (m)	8.1	45.2	4.0	15.4	18.1	45.2	37.2
95th Queue (m)	18.8	71.5	11.0	32.3	32.8	65.9	56.9
Link Distance (m)	148.1	236.7		121.0	121.0	208.2	208.2
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (m)			95.0				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 2: HWY 401 WB On Ramp & Baltimore Rd

Movement	NB	NB	SB	SB
Directions Served	T	R	R	
Maximum Queue (m)	91.0	37.5	34.4	
Average Queue (m)	12.0	24.0	8.0	
95th Queue (m)	57.2	43.0	23.6	
Link Distance (m)	261.1		121.0	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)		30.0		
Storage Blk Time (%)	0	13		
Queuing Penalty (veh)	0	33		

Intersection: 3: HWY 401 EB ON Ramp & Baltimore Rd

Movement	SB	SB	SB	SB
Directions Served	L	T	T	
Maximum Queue (m)	15.8	16.4	21.5	
Average Queue (m)	3.9	0.5	4.3	
95th Queue (m)	12.4	5.4	16.6	
Link Distance (m)		65.8	65.8	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)		55.0		
Storage Blk Time (%)				
Queuing Penalty (veh)				

DensmoreRd_Residential_Development
Trans-Plan

SimTraffic Report

Queuing and Blocking Report

<Total 2031> AM Peak
06-21-2021

Intersection: 4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

Movement	EB	EB	WB	WB	NB	NB	SB	SB	TR
Directions Served	L	TR	L	TR	L	T	TR	L	TR
Maximum Queue (m)	6.0	34.0	27.5	130.5	37.2	90.2	87.3	112.0	113.7
Average Queue (m)	1.9	6.1	25.5	61.2	12.3	45.8	71.4	41.9	82.0
95th Queue (m)	6.2	18.9	32.7	110.4	30.3	75.4	114.3	87.2	108.7
Link Distance (m)		214.2		465.5		213.1		135.3	135.3
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (m)		20.0		20.0	30.0			80.0	
Storage Blk Time (%)		2	33	18		18		0	5
Queuing Penalty (veh)		0	103	44	7			0	9

Intersection: 5: St Mary's S/West Site Access & Densmore Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	R	LTR
Maximum Queue (m)	41.3	8.4	8.1	6.6
Average Queue (m)	1.4	1.1	2.9	2.6
95th Queue (m)	13.6	5.7	9.2	7.5
Link Distance (m)	465.5	91.6	48.0	82.5
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Parkview Hills Drive & Densmore Rd

Movement	WB	NB	SB
Directions Served	LT	LR	
Maximum Queue (m)	29.5	28.6	
Average Queue (m)	2.8	12.2	
95th Queue (m)	14.2	21.7	
Link Distance (m)	74.2	207.0	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

DensmoreRd_Residential_Development
Trans-Plan

SimTraffic Report

Intersection: 7: O'Conner Crt/East Site Access & Densmore Rd

Movement	EB	NB	SB	LTR	T
Directions Served	LTR	LTR	LTR		
Maximum Queue (m)	9.2	7.5	9.1		
Average Queue (m)	1.2	1.9	4.1		
95th Queue (m)	6.1	7.3	11.0		
Link Distance (m)	74.2	66.6	103.2		
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 19: Baltimore Rd & HWY 401 EB Off Ramp

Movement	WB	R
Directions Served	R	
Maximum Queue (m)	27.1	
Average Queue (m)	13.6	
95th Queue (m)	25.2	
Link Distance (m)	174.3	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 21: Baltimore Rd & HWY 401 EB Off Ramp & HWY 401 EB ON Ramp

Movement	EB	SB	SB	T
Directions Served	R	T	T	
Maximum Queue (m)	164.7	13.7	19.9	
Average Queue (m)	164.7	0.5	12.0	
95th Queue (m)	164.7	4.6	21.8	
Link Distance (m)	160.1	17.1	17.1	
Upstream Blk Time (%)	100	0	3	
Queuing Penalty (veh)	0	0	13	
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 210

Intersection: 1: Baltimore Rd & Division St /HWY 401 WB Off Ramp

Movement	EB	WB	NB	NB	SB	SB	TR
Directions Served	LTR	LTR	T	T	T	T	
Maximum Queue (m)	28.3	45.9	20.2	67.0	68.4	59.6	57.1
Average Queue (m)	10.5	27.7	5.4	30.2	33.9	30.4	21.2
95th Queue (m)	20.7	45.9	12.2	54.1	59.2	51.8	42.2
Link Distance (m)	148.1	236.7		121.0	121.0	208.2	208.2
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (m)				95.0			
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 2: HWY 401 WB On Ramp & Baltimore Rd

Movement	NB	NB	NB	SB	SB
Directions Served	T	T	R	R	
Maximum Queue (m)	67.2	106.0	37.5	9.3	
Average Queue (m)	2.2	8.1	19.3	1.5	
95th Queue (m)	22.2	49.5	37.8	7.0	
Link Distance (m)	261.1	261.1		121.0	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)			30.0		
Storage Blk Time (%)		0	7		
Queuing Penalty (veh)		2	38		

Intersection: 3: Baltimore Rd & HWY 401 EB ON Ramp

Movement	NB	SB	SB	SB	SB
Directions Served	T	L	T	T	
Maximum Queue (m)	16.8	15.8	22.1	36.3	
Average Queue (m)	0.8	2.5	2.4	4.0	
95th Queue (m)	6.2	9.7	13.1	18.3	
Link Distance (m)	17.1		65.8	65.8	
Upstream Blk Time (%)	0				
Queuing Penalty (veh)	0				
Storage Bay Dist (m)		55.0			
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 4: Division Street/Baltimore Rd & Veronica St/Densmore Rd

Movement	EB	EB	WB	WB	NB	NB	SB	SB	SB	SB
	L	TR	L	TR	L	TR	L	TR	L	TR
Directions Served										
Maximum Queue (m)	26.6	15.2	27.4	118.5	37.2	229.0	229.0	87.4	140.0	138.1
Average Queue (m)	7.0	5.6	23.7	52.8	8.2	220.3	220.3	86.4	113.0	91.9
95th Queue (m)	19.2	13.1	33.3	92.5	30.1	225.8	226.3	89.6	154.5	137.9
Link Distance (m)	214.2		465.5		213.1		213.1		135.3	
Upstream Blk Time (%)					58		84		6	
Queuing Penalty (veh)					0		0		34	
Storage Bay Dist (m)	20.0		20.0		30.0		80.0		2	
Storage Blk Time (%)	3		0		24		0		66	
Queuing Penalty (veh)	2		0		65		44		298	

Intersection: 5: St Mary's S/SWest Site Access & Densmore Rd

Movement	EB	NB	NB	SB	SB
	L	TR	L	R	L
Directions Served					
Maximum Queue (m)	15.1	7.9	7.4	12.9	
Average Queue (m)	2.8	0.3	0.2	3.1	
95th Queue (m)	11.1	2.6	2.5	9.6	
Link Distance (m)	465.5		48.0		82.5
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 6: Parkview Hills Drive & Densmore Rd

Movement	NB	SB
	L	R
Directions Served		
Maximum Queue (m)	21.5	
Average Queue (m)	9.6	
95th Queue (m)	16.2	
Link Distance (m)	207.0	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: O'Conner Crt/East Site Access & Densmore Rd

Movement	EB	NB	SB	SB
	L	TR	L	TR
Directions Served				
Maximum Queue (m)	26.8	7.5	9.0	
Average Queue (m)	3.1	1.2	2.2	
95th Queue (m)	14.5	5.6	8.4	
Link Distance (m)			74.2	
Upstream Blk Time (%)			66.6	
Queuing Penalty (veh)			103.2	
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 19: Baltimore Rd & HWY 401 EB Off Ramp

Movement	WB	NB	T
	R		
Directions Served			
Maximum Queue (m)	66.5	26.6	
Average Queue (m)	39.1	0.9	
95th Queue (m)	64.2	8.8	
Link Distance (m)	174.3		65.8
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 21: Baltimore Rd & HWY 401 EB Off Ramp & HWY 401 EB ON Ramp

Movement	EB	SB	SB	T
	R			
Directions Served				
Maximum Queue (m)	164.7	20.5	19.5	
Average Queue (m)	164.7	5.6	9.9	
95th Queue (m)	164.7	18.1	19.9	
Link Distance (m)	160.1	17.1	17.1	
Upstream Blk Time (%)	100	4	2	
Queuing Penalty (veh)	0	15	6	
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 527



APPENDIX D

Level of Service Definition

LEVEL OF SERVICE ANALYSIS AT UNSIGNALIZED INTERSECTIONS⁽¹⁾

The term "level of service" implies a qualitative measure of traffic flow at an intersection. It is dependent upon the vehicle delay and vehicle queue lengths at approaches. The level of service at unsignalized intersections is often related to the delay accumulated by flows on the minor streets, caused by all other conflicting movements. The following table describes the characteristics of each level.

Level of Service	Features
A	Little or no traffic delay occurs. Approaches appear open, turning movements are easily made, and drivers have freedom of operation.
B	Short traffic delays occur. Many drivers begin to feel somewhat restricted in terms of freedom of operation.
C	Average traffic delays occur. Operations are generally stable, but drivers emerging from the minor street may experience difficulty in completing their movement. This may occasionally impact on the stability of flow on the major street.
D	Long traffic delays occur. Motorists emerging from the minor street experience significant restriction and frustration. Drivers on the major street will experience congestion and delay as drivers emerging from the minor street interfere with the major through movements.
E	Very long traffic delays occur. Operations approach the capacity of the intersection.
F	Saturation occurs, with vehicle demand exceeding the available capacity. Very long traffic delays occur.

⁽¹⁾ Highway Capacity Manual - Special Report No. 209, Transportation Research Board, 1985.