



December 16, 2022

Project 171-00927-01

YGE Investments INC
c/o Mr. Gabriel Ghosn
50 Bedford Highway, Suite 300
HALIFAX NS B3M 2J2

Sent Via Email Email: [REDACTED]

**RE: Revised Traffic Impact Analysis for Proposed Multi-Unit Residential Building
Regkay Court, Sackville, NS**

Dear Mr. Ghosn:

This is a Revised Traffic Impact Analysis (TIA) that you require for the Proposed Multi-Unit Residential Building *W. M. Fares Architects* is preparing plans for on Regkay Court, Sackville, Nova Scotia. The revised TIA has been prepared to address the following changes since the original Traffic Impact Statement (WSP Canada Inc., April 28, 2022) was prepared:

1. HRM has rejected access on Sackville Drive and requires all site access on Regkay Court.
2. Nova Scotia Public Works has requested analysis of the Margeson Drive / Bambrick Road intersection.
3. The number of proposed apartments has be reduced from 100 to 98.
4. The number of parking spaces has been reduced from 152 (116 inside and 36 surface) to 128 (98 inside and 30 surface).

Description of Roads and Site Access - The site driveway will be on Regkay Court, a short cul-du-sac with connections to Bambrick Road and then Margeson Drive at existing intersections south of the site.

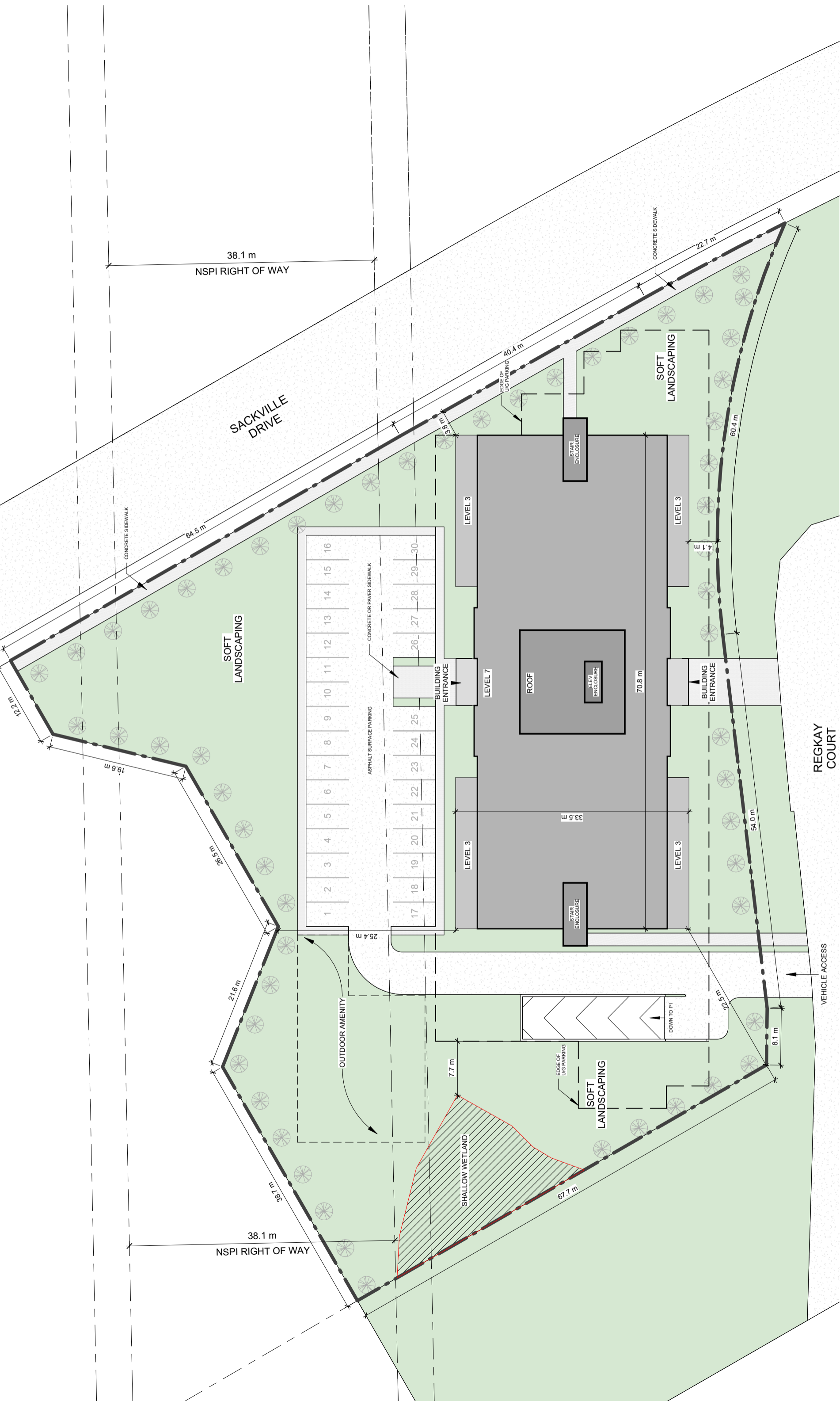
The Regkay Court driveway (Figure 1 and Photos 1 and 2), is on the west side of the street at the south edge of the site. Visibility is good on both approaches to the driveway.



Photo 1 - Looking left towards the end of Regkay Court from proposed site driveway.

Photo 2 - Looking right towards Bambrick Road from proposed site driveway.

Margeson Drive is a two lane paved connector with gravel shoulders and open ditches between Highway 101 and Sackville Drive. The posted speed limit is 80 km/h and traffic control includes roundabout intersections at both ends of the connector. Bambrick Road intersects the west side of Margeson Drive at a STOP controlled intersection approximately 200 meters south of the Sackville Drive roundabout.



Trip Generation - Trip generation estimates have been prepared (Table 1) for the proposed land use using published data from *Trip Generation, 11th Edition* (Institute of Transportation Engineers, 2021). Since the proposed number of units is only about one-half the average number of units in the database used to produce equations, trip generation rates rather than equations have been used to estimate AM and PM trips. While the *Halifax Integrated Mobility Plan* estimates that 14% of trips in the Outer Suburban areas will be non-auto trips by 2031, a non-auto trip reduction has not been considered for this location.

It is estimated that the proposed development will generate 36 two-way vehicle trips (8 entering and 28 exiting) during the AM peak hour and 38 two-way trips (23 entering and 15 exiting) during the PM peak hour.

Land Use ¹	Units ²	Trip Generation Rates ³				Trips Generated ³			
		AM Peak		PM Peak		AM Peak		PM Peak	
		In	Out	In	Out	In	Out	In	Out
Mid-Rise Apartment (Land Use 221)	98 units	AM T=0.37X (23% in / 77% out) PM T=0.39X (61% in / 39% out)				8	28	23	15
NOTES: 1. Rates are for Land Use Code 221, <i>Trip Generation, 11th Edition</i> , Institute of Transportation Engineers, 2021. 2. Units are number of residential apartments. 3. Rates are 'vehicles per hour per unit'; Trips generated are 'vehicles per hour for peak hours'.									

Transit Service - Halifax Transit Route 83 provides service on Sackville Drive and Margeson Drive to Sackville Terminal and Route 183 also provides service on the same route with express buses to Halifax in the AM peak period and from Halifax in the PM peak.

Traffic Volumes - A turning movement count (Table A-1), obtained at the Margeson Drive / Bambrick Road intersection on November 8, 2022, indicated Margeson Drive two-way volumes of 975 vehicles per hour (vph) during the AM peak hour and 1160 vph during the PM peak hour. AM and PM peak hourly volumes obtained from the count are illustrated diagrammatically in Figure A-1, Boxes A and B. Counted volumes have been increased by 10% to provide projected 2027 AM and PM design hourly volumes which are illustrated diagrammatically in Figure A-1, Boxes C and D.

Distribution and Assignment of Site Generated Trips - Site generated trips have been distributed with 10% west on Bambrick Road and 90% east on Bambrick Road to Margeson Drive. Site trips have been assigned at the Margeson Drive / Bambrick Road intersection using the same turning movement characteristics as the counted volumes and are illustrated diagrammatically in Figure A-2, Boxes A and B. Assigned trips have been added to projected 2027 background design hourly volumes to provide projected 2027 AM and PM peak hourly volumes that include site trips which are illustrated diagrammatically in Figure A-2, Boxes C and D.

Left Turn Lane Warrant Analyses - Left turn movements on a two lane road may cause both operational and safety problems. Operational problems result as a vehicle stopped waiting for an opportunity to turn across 'heavy' opposing traffic causes a queue of stopped vehicles to form. Safety problems result from rear end collisions when a stopped left turning vehicle is struck by an advancing vehicle, or from head-on or right angle collisions when a left turning vehicle is struck by an opposing vehicle.

The *Geometric Design Standards for Ontario Highways Manual* contains nomographs for left turn lane analysis for two lane roads. The analysis method, which is normally used by WSP to evaluate need for left turn lanes, uses a series of nomographs that consider speed, advancing volumes, left turns as a percentage of advancing volumes, and opposing volumes. A point, based on 'opposing'

and ‘advancing’ volumes, plotted to the right of the ‘warrant line’ of the appropriate ‘% left turns’ and ‘approach speed’ nomograph, indicates that a left turn lane is warranted for the conditions used in the analysis. Similarly, a point that is plotted to the left of the warrant line indicates that a left turn lane is not warranted.

Evaluation of left turn warrants at the Margeson Drive / Bambrick Road intersection were completed for 2027 design hourly background volumes without site generated trips (Figure A-1, Boxes C and D) and for projected 2027 AM and PM peak hourly volumes that include site generated trips (Figure A-2, Boxes C and D). Analysis results are illustrated in Figure A-3.

Significant through volumes and a posted 80 km/h speed limit combine to indicate a marginal need for a northbound left turn lane during AM peak hours and pronounced need for a left turn lane during PM peak hours for projected 2027 background volumes without added site trips. The need for a left turn lane is not affected by added site trips.

Intersection Level of Service Analysis - The level or quality of performance of an intersection in terms of traffic movement is determined by a level of service (LOS) analysis. LOS for intersections (Table 2) is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and increased travel time.

Table 2 - Level of Service (LOS) Criteria		
LOS	LOS Description	Stop Controlled) Intersections Control Delay (seconds per vehicle)
A	Very low delay; most vehicles do not stop (Excellent)	less than 10.0
B	Higher delay; more vehicles stop (Very Good)	between 10.0 and 15.0
C	Higher level of congestion; number of vehicles stopping is significant, although many still pass through intersection without stopping (Good)	between 15.0 and 25.0
D	Congestion becomes noticeable; vehicles must sometimes wait through more than one red light; many vehicles stop (Satisfactory)	between 25.0 and 35.0
E	Vehicles must often wait through more than one red light; considered by many agencies to be the limit of acceptable delay	between 35.0 and 50.0
F	This level is considered to be unacceptable to most drivers; occurs when arrival flow rates exceed the capacity of the intersection (Unacceptable)	greater than 50.0

Level of Service Analysis - *Synchro 11* software has been used for performance evaluation of projected 2027 AM and PM hourly volumes at the Margeson Drive / Bambrick Road intersection without and with site generated trips. Analysis results which are included in Pages A-5 to A-8 are summarized in Tables 3.

Level of Service Analysis Results - The LOS analyses of AM and PM peak hourly volumes of the Margeson Drive / Bambrick Road intersection indicate the following:

1. Bambrick Road approach operates at LOS ‘C’ for AM and PM hours for projected 2027 volumes without and with site generated trips.
2. Margeson Drive northbound and southbound approaches operate at LOS ‘A’ for AM and PM hours for projected 2027 volumes without and with site generated trips.
3. Added site generated trips are not expected to have any significant impact on the level of performance of the intersection.

Table 3 - LOS for Margeson Drive / Bambrick Road intersection				
LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement			Intersection LOS
	EB-LR	NB-LT	SB-TR	
AM Peak Hour - Projected 2027 Volumes without Site Trips (Page A-5)				
Delay	19.0	0.2	0.0	0.9
LOS	C	A	A	A
v/c	0.17	0.37	0.51	-
Queue	5.0	0.2	0.0	-
AM Peak Hour - Projected 2027 Volumes with Site Trips (Page A-7)				
Delay	20.9	0.5	0.0	1.5
LOS	C	A	A	A
v/c	0.26	0.37	0.52	-
Queue	8.3	0.3	0.0	-
PM Peak Hour - Projected 2027 Volumes without Site Trips (Page A-6)				
Delay	17.7	0.7	0.0	0.9
LOS	C	A	A	A
v/c	0.12	0.84	0.27	-
Queue	3.2	0.6	0.0	-
PM Peak Hour - Projected 2027 Volumes with Site Trips (Page A-8)				
Delay	18.4	1.1	0.0	1.4
LOS	C	A	A	A
v/c	0.17	0.86	0.28	-
Queue	4.7	1.0	0.0	-

Summary -

1. The proposed residential building on the west side of Regkay Court is planned to include approximately 98 apartment units and 128 parking spaces (98 inside and 30 surface).
2. The site is planned to have a driveway on Regkay Court which connects to Bambrick Road and then Margeson Drive at existing intersections south of the site.
3. Halifax Transit Route 83 provides service on Sackville Drive and Margeson Drive to Sackville Terminal and Route 183 also provides service on the same route with express buses to Halifax in the AM peak period and from Halifax in the PM peak.
4. It is estimated that the proposed development will generate 36 two-way vehicle trips (8 entering and 28 exiting) during the AM peak hour and 38 two-way trips (23 entering and 15 exiting) during the PM peak hour.
5. Left turn lane analyses indicate that projected 2027 Margeson Drive background volumes without the site warrant a northbound left turn lane at Bambrick Road due to significant through volumes and a posted 80 km/h speed limit. Site generated trips do not have a significant impact on the need for a left turn lane.

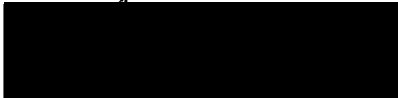
6. Level of service analyses of AM and PM peak hourly volumes of the Margeson Drive / Bambrick Road intersection indicate the following:
- Bambrick Road approach operates at LOS 'C' for AM and PM hours for projected 2027 volumes without and with site generated trips.
 - Margeson Drive northbound and southbound approaches operate at LOS 'A' for AM and PM hours for projected 2027 volumes without and with site generated trips.
 - Added site generated trips are not expected to have any significant impact on the level of performance of the intersection.

Conclusion -

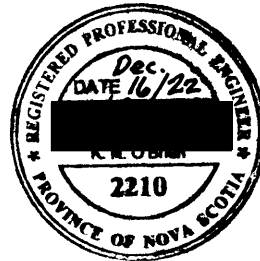
7. The low numbers of peak hour vehicle trips generated by the site are not expected to have any significant impact to the performance of adjacent streets, intersections, or the regional street network.

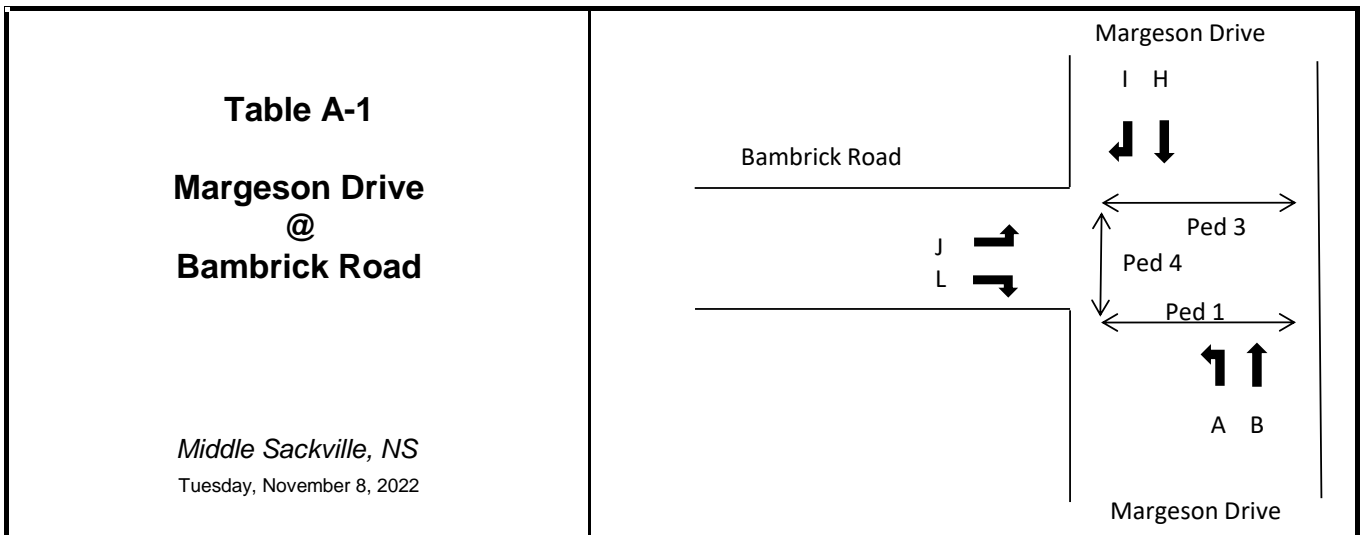
If you have any questions, please contact me by Email to ken.obrien@wsp.com or telephone 902-452-7747.

Sincerely:



Ken O'Brien, P. Eng.
Senior Traffic Engineer
WSP Canada Inc.





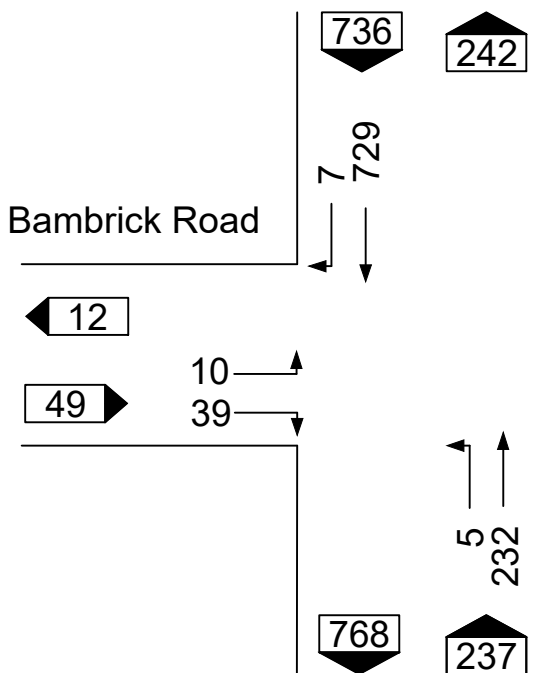
AM Peak Period Volume Data

Time	Margeson Drive Northbound Approach		Margeson Drive Southbound Approach		Bambrick Road Eastbound Approach		Total Vehicles
	A	B	H	I	J	L	
	07:00 - 07:15	0	42	202	1	3	
07:15 - 07:30	0	58	203	2	4	9	276
07:30 - 07:45	2	71	161	1	2	13	250
07:45 - 08:00	3	61	163	3	1	5	236
08:00 - 08:15	1	64	145	5	3	8	226
08:15 - 08:30	2	50	127	0	3	7	189
08:30 - 08:45	1	48	94	2	1	3	149
08:45 - 09:00	6	46	79	1	4	4	140
AM Peak Hour	5	232	729	7	10	39	1022
07:00 - 08:00	5	232	729	7	10	39	1022
08:00 - 09:00	10	208	445	8	11	22	704

PM Peak Period Volume Data

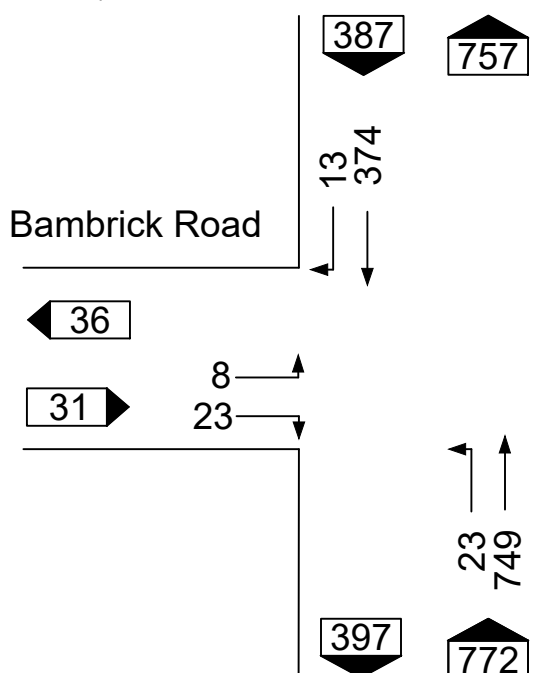
Time	Margeson Drive Northbound Approach		Margeson Drive Southbound Approach		Bambrick Road Eastbound Approach		Total Vehicles
	A	B	H	I	J	L	
16:00 - 16:15	5	179	70	7	2	3	266
16:15 - 16:30	3	186	90	4	0	5	288
16:30 - 16:45	9	179	95	3	3	5	294
16:45 - 17:00	5	173	83	3	3	9	276
17:00 - 17:15	6	211	106	3	2	4	332
17:15 - 17:30	9	166	79	6	1	3	264
17:30 - 17:45	7	141	64	3	4	2	221
17:45 - 18:00	4	130	65	2	3	1	205
PM Peak Hour	23	749	374	13	8	23	1190
16:00 - 17:00	22	717	338	17	8	22	1124
17:00 - 18:00	26	648	314	14	10	10	1022

A-1A
2022 AM Peak Hour
without Site Trips



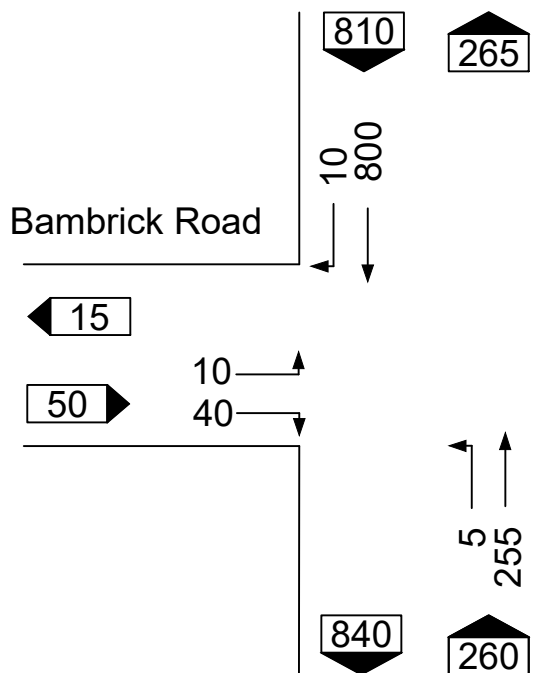
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A-1B
2022 PM Peak Hour
without Site Trips



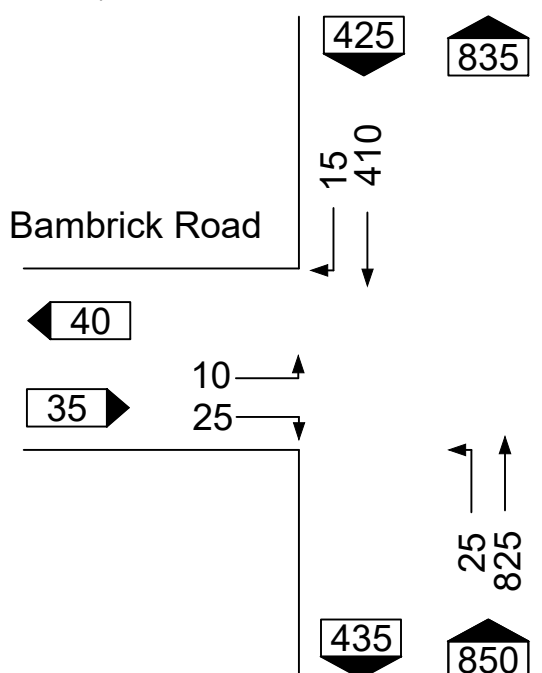
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A-1C
2027 AM Peak Hour
without Site Trips



NOT TO SCALE

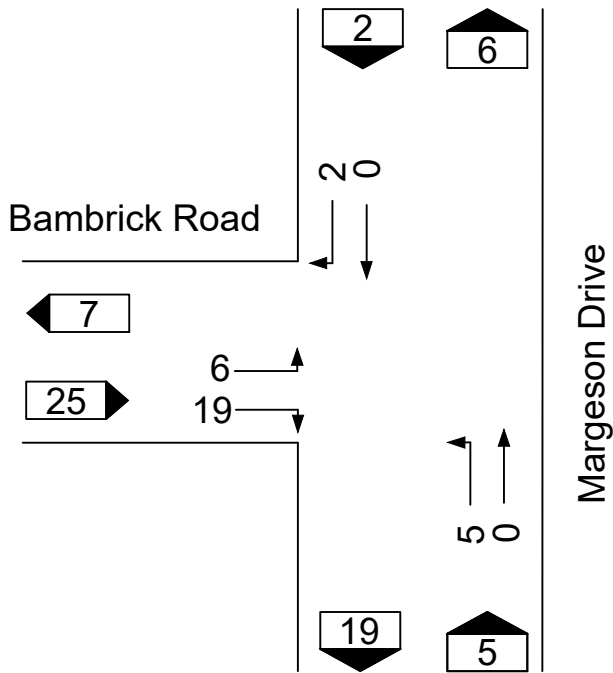
A-1D
2027 PM Peak Hour
without Site Trips



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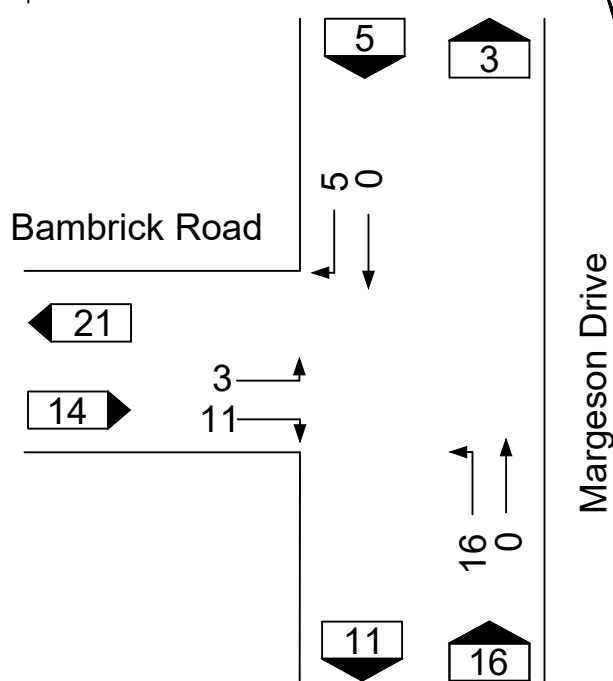


A-2A
AM Peak Hour
Site Trips



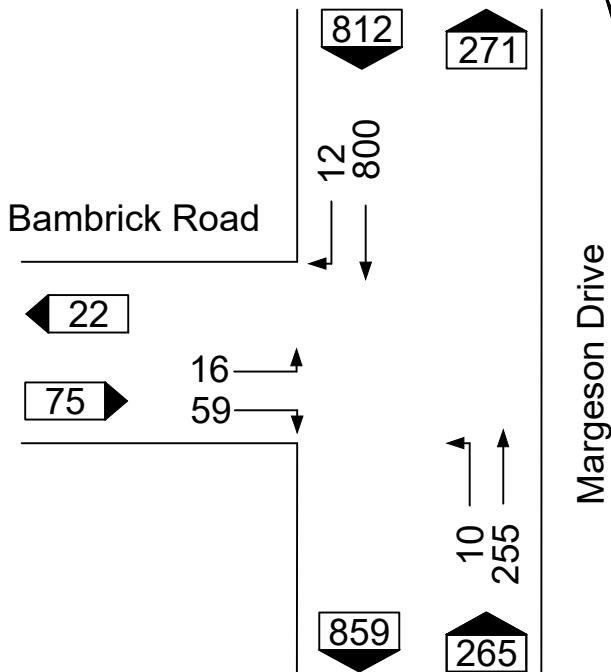
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A-2B
PM Peak Hour
Site Trips



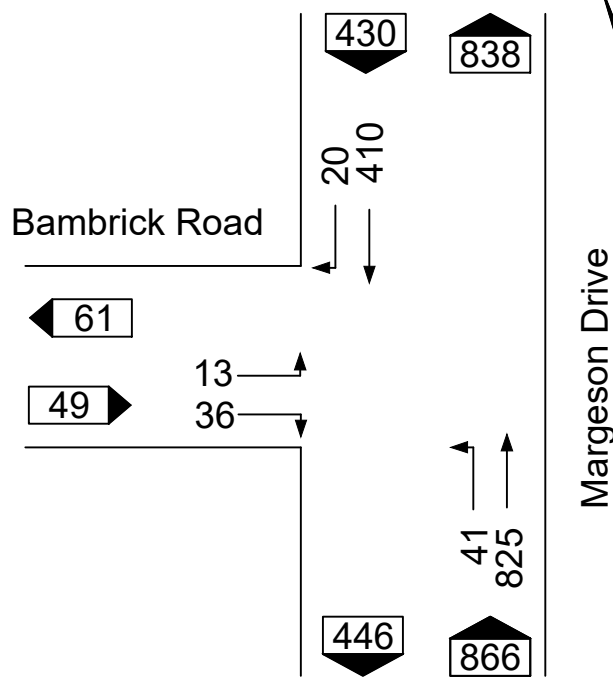
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A-2C
2027 AM Peak Hour
with Site Trips



NOT TO SCALE

A-2D
2027 PM Peak Hour
with Site Trips



NOT TO SCALE

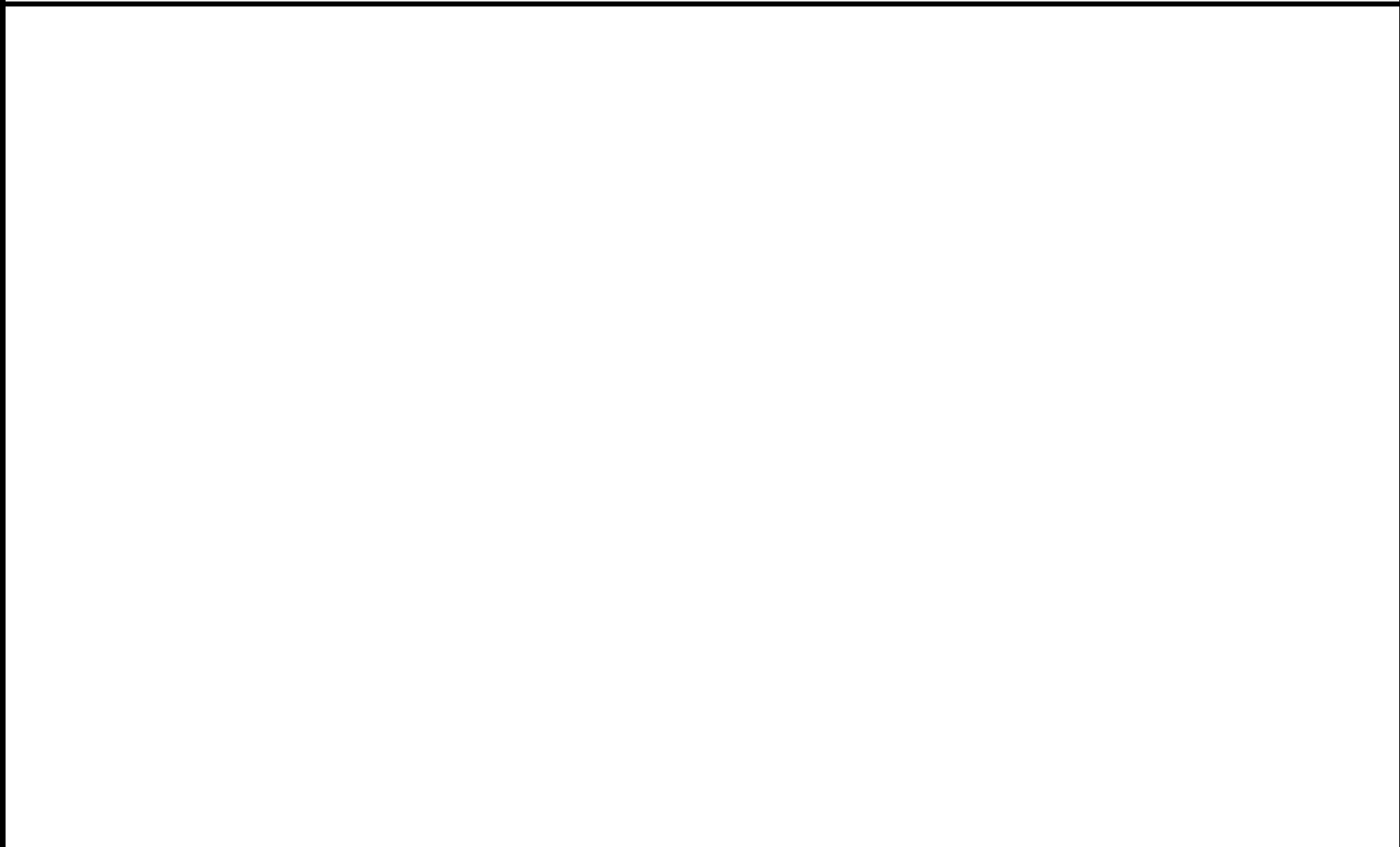
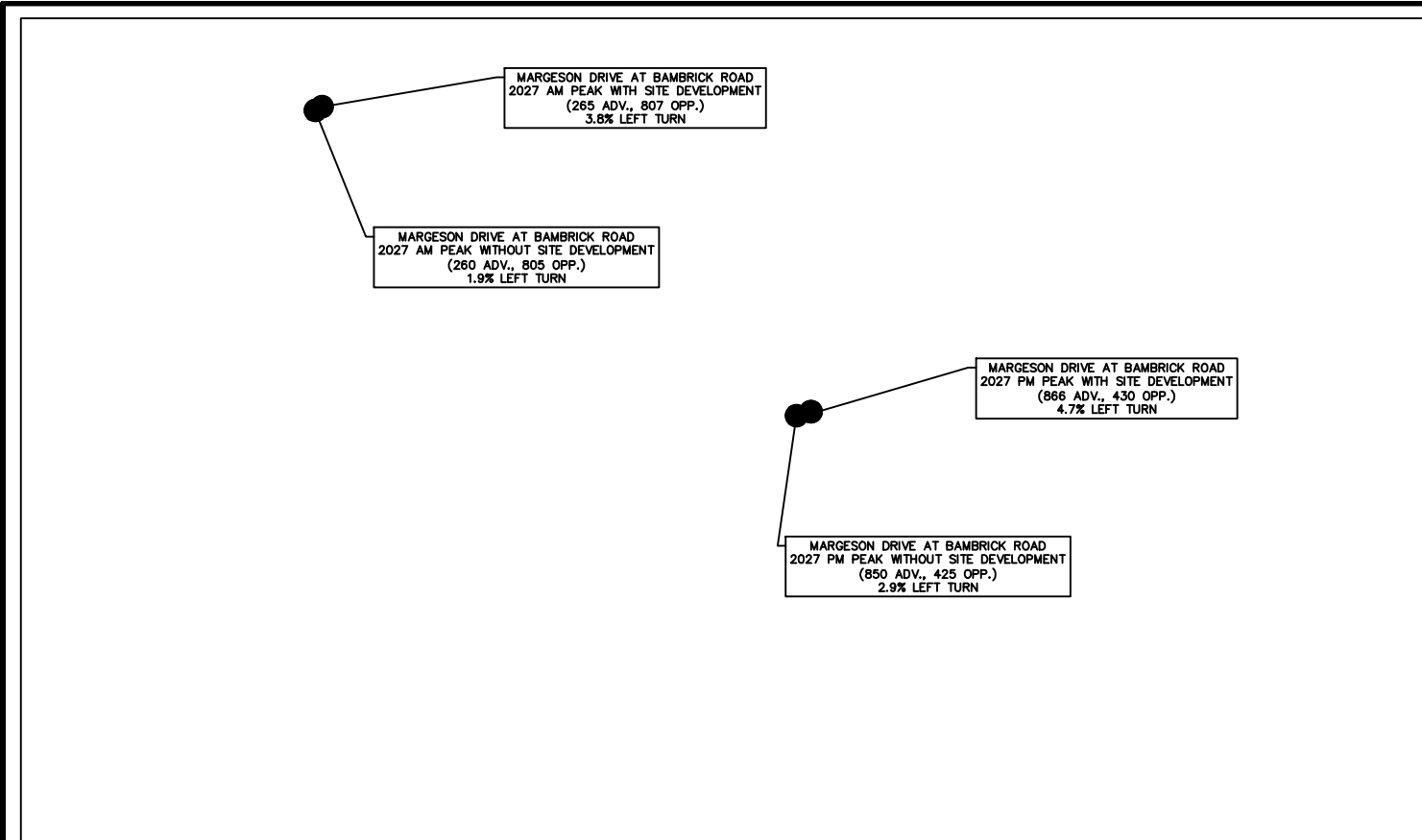


Revised Traffic Impact Analysis - Proposed Multi-Unit Residential
Regkay Court, Sackville, NS

Figure A-2

Site Generated Trips and
2027 Weekday AM and PM Peak Hour Volumes
with Site Development

December 2022



HCM Unsignalized Intersection Capacity Analysis
 1: Margeson Drive & Bambrick Road



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	40	5	255	800	5
Future Volume (Veh/h)	10	40	5	255	800	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	43	5	277	870	5
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	1160	872	875			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1160	872	875			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	88	99			
cM capacity (veh/h)	215	350	771			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	54	282	875			
Volume Left	11	5	0			
Volume Right	43	0	5			
cSH	310	771	1700			
Volume to Capacity	0.17	0.01	0.51			
Queue Length 95th (m)	5.0	0.2	0.0			
Control Delay (s)	19.0	0.2	0.0			
Lane LOS	C	A				
Approach Delay (s)	19.0	0.2	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			52.4%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 1: Margeson Drive & Bambrick Road



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	25	25	825	410	15
Future Volume (Veh/h)	10	25	25	825	410	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	27	27	897	446	16
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	1405	454	462			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1405	454	462			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	96	98			
cM capacity (veh/h)	150	606	1099			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	38	924	462			
Volume Left	11	27	0			
Volume Right	27	0	16			
cSH	322	1099	1700			
Volume to Capacity	0.12	0.02	0.27			
Queue Length 95th (m)	3.2	0.6	0.0			
Control Delay (s)	17.7	0.7	0.0			
Lane LOS	C	A				
Approach Delay (s)	17.7	0.7	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			73.6%	ICU Level of Service	D	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Margeson Drive & Bambrick Road



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	16	59	10	255	800	7
Future Volume (Veh/h)	16	59	10	255	800	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	64	11	277	870	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						
vC, conflicting volume	1173	874	878			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1173	874	878			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	92	82	99			
cM capacity (veh/h)	209	349	769			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	81	288	878			
Volume Left	17	11	0			
Volume Right	64	0	8			
cSH	306	769	1700			
Volume to Capacity	0.26	0.01	0.52			
Queue Length 95th (m)	8.3	0.3	0.0			
Control Delay (s)	20.9	0.5	0.0			
Lane LOS	C	A				
Approach Delay (s)	20.9	0.5	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization			53.7%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Margeson Drive & Bambrick Road



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	36	41	825	410	20
Future Volume (Veh/h)	13	36	41	825	410	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	39	45	897	446	22
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	1444	457	468			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1444	457	468			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	94	96			
cM capacity (veh/h)	139	604	1094			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	53	942	468			
Volume Left	14	45	0			
Volume Right	39	0	22			
cSH	321	1094	1700			
Volume to Capacity	0.17	0.04	0.28			
Queue Length 95th (m)	4.7	1.0	0.0			
Control Delay (s)	18.4	1.1	0.0			
Lane LOS	C	A				
Approach Delay (s)	18.4	1.1	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			81.8%	ICU Level of Service	D	
Analysis Period (min)			15			