

June 22, 2020

Mr. Blaise Morrison
Manager, Development & Planning
The Armour Group Limited

[Via Email: bmorrison@armourgroup.com]

RE: Addendum - Traffic Impact Statement - Kings Wood Apartments, Dartmouth, NS

Dear Mr. Morrison:

This is an Addendum Traffic Impact Statement for the infill development at the site of Kings Wood Apartments at 1000 Micmac Boulevard in Dartmouth, NS (PID 40173627) that was previously reviewed in a September 2018 Traffic Impact Statement by WSP. This Addendum is required to account for the planned modifications to the configuration and number of residential units:

- The number of residential (apartment) units has been modified from 210 to 162.
- Previously the units were being developed in two (one 14-storey, one 8-storey) apartment buildings, however the development now includes one building only.

SITE DESCRIPTION AND PLANNED DEVELOPMENT

The site is currently developed with the existing Kings Wood Apartments building, containing approximately 130 units and approximately 130 spaces of surface parking for residents and visitors. The site is bounded by Micmac Boulevard in the north and east, existing apartment developments in the south, and HRM greenspace in the west.

The proposed development now includes the construction of one additional (15-storey) apartment building. No modifications are planned for the existing 130-unit apartment building (Kings Wood Apartments, See Figure 1). With development, there is expected to be approximately 198 parking spaces including surface and underground parking.



Figure 1 – Site Plan

DESCRIPTION OF EXISTING STREETS AND INTERSECTIONS

Micmac Boulevard (See Photos 1 and 2) is a 2-lane collector street that runs just north of the site and connects to Woodland Road, Mic Mac Mall, and Highway 111 (at Exit 5). Traffic volume data provided by HRM Traffic Management indicate the two-way volume on Micmac Boulevard in this area is approximately 340 and 810 vehicles during the AM and PM peak hours, respectively. NSTIR is currently reviewing this intersection in conjunction with HRM to develop options for safety and capacity modifications. In the vicinity of the site, there is concrete sidewalk on the south (site) side of the street. The posted speed limit is 50km/h.



Photo 1 – Looking Left (to the west) on
Micmac Boulevard from the site access



Photo 2 – Looking right (to the east) on
Micmac Boulevard from the site access

Horizon Court (See Photo 3) is a 2-lane private street that runs north from Micmac Boulevard and serves as a driveway for existing apartments.

The intersection of Micmac Boulevard at Horizon Court / Site Driveway (See Photos 1, 2, and 3) operates as a four-legged intersection with STOP control on Horizon Court and the site driveway with free flow traffic on Micmac Boulevard. There is an existing marked crosswalk crossing Micmac Boulevard at the east leg of the intersection.



Photo 3 - Looking north from the site
toward Horizon Court

The intersection of Micmac Boulevard at Mic Mac Mall (the Bay) / Kings Wood Apartments (See Photo 4) is a four-legged signalized intersection with signalized pedestrian crossings at the north and east approaches.



Photo 4 – Looking west along Micmac Boulevard
toward the signalized site access (the site is on the left)

SITE ACCESS

Vehicular access to the developed site will continue to be via the driveway at Micmac Boulevard opposite Horizon Court (See Photos 1 and 2) with secondary site access to Micmac Boulevard opposite the signals at Mic Mac Mall (near The Bay, See Photo 4). There is a shrub that should be removed or pruned and growth monitored to improve visibility of eastbound traffic on Micmac Boulevard approaching the Horizon Court access (See Photo 1).

PUBLIC TRANSIT

The site is well served by public transit with stops in each direction immediately in front of the site (See Photo 2). The site is also within 200 metres of the Micmac Terminal (See Photo 5) and its six Halifax Transit routes (#10, 54, 55, 56, 66, and 72).

It is noted that the existing bus stop (ID 7211) on the north (non-site) is not currently accessible as it lacks a bus stop pad and sidewalk connecting to the marked crosswalk at Horizon Court. As Micmac Boulevard is identified as a Transit Priority Corridor, HRM should install a bus stop pad at the existing stop location and add a sidewalk connection to the marked crosswalk at Horizon Court. This will benefit existing and ongoing developments in the area and align with the priorities of the IMP.



Photo 5 – Looking east from the site toward the Micmac Terminal

TRIP GENERATION

The following trip generation estimates for the existing planned development and the proposed revised number of apartment units are summarized in Table 1:

- Original Planned Development - Trip generation estimates for the original planned development include an estimated 76 two-way trips (20 entering and 56 exiting) during the AM peak hour and an estimated 92 two-way trips (56 entering and 36 exiting) during the PM peak hour.
- Revised Planned Development - Trip generation estimates for the revised development include an estimated 58 two-way trips (15 entering and 43 exiting) during the AM peak hour and an estimated 71 two-way trips (43 entering and 28 exiting) during the PM peak hour.
- Trip Reductions - The proposed changes in land use represents a decrease of an estimated 18 two-way trips (5 less entering and 13 less exiting) during the AM peak hour and a decrease of an estimated 21 two-way trips (13 less entering and 8 less exiting) during the PM peak hour.

Table 1 – Trip Generation Estimates

Land Use	Units ²	Trip Generation Rates				Trips Generated ³			
		AM Peak		PM Peak		AM Peak		PM Peak	
		In	Out	In	Out	In	Out	In	Out
Trip Generation Estimate for original Residential Development ¹									
Multifamily Housing (Mid-Rise) (Land Use 221)	210	0.09	0.27	0.27	0.17	20	56	56	36
Trip Generation Estimate for revised Residential Development ¹									
Multifamily Housing (Mid-Rise) (Land Use 221)	162	0.09	0.27	0.27	0.17	15	43	43	28
Reduction in trips generated by the revised development						-5	-13	-13	-8
Notes: 1. Trip generation rates are 'vehicles per hour per unit' for the indicated land use, prepared using published rates from <i>Trip Generation, 10th Edition</i> (Institute of Transportation Engineers, Washington, 2017).									
2. Units are number of residential units.									
3. Vehicles per hour for peak hours									

With the proposed site expecting to generate less than 100 peak hour trips in either peak hours, the development will have little impact on operation on nearby intersections. Certain movements at the Micmac Boulevard/Woodland Avenue/Lancaster Drive intersection have been identified to be nearing capacity during peak periods, specifically the left-turn movement from Woodland Avenue to Micmac Boulevard. Review of potential site trips at that intersection during the PM peak hour indicates approximately 16 to 20 site generated trips are expected to be added to that turning movement, which currently has 371 vehicles per hour. Site traffic would represent an increase of approximately 5%. Since this intersection has been identified by HRM to be nearing capacity, HRM and NSTIR are reviewing the intersection upgrade options, which may include conversion to a roundabout.

SUMMARY

1. This *August 2019 Addendum Traffic Impact Statement* has been prepared to review changes to the proposed residential / commercial development since development plans were submitted to HRM in September 2018.
2. While previously submitted development plans included two apartment buildings (14 storey and 8 storey) with a combined 210 apartment units, the revised land use considered in this Addendum includes one building with 162 apartment units.
3. Vehicular access to the site will continue to be from Micmac Boulevard opposite Horizon Court. Access to the existing apartments within the site will continue to be via the driveway at Horizon Court and at the signalized intersection at Mic Mac Mall.
4. Trip generation estimates for the revised development include about 58 two-way trips (15 entering and 43 exiting) during the AM peak hour and 71 two-way trips (43 entering and 28 exiting) during the PM peak hour. This represents a decrease of 18 two-way trips (5 less entering and 13 less exiting) during the AM peak hour and a decrease of 21 two-way trips (13 less entering and 8 less exiting) during the PM peak hour.

RECOMMENDATIONS

5. The Micmac Boulevard/Woodland Avenue/Lancaster Drive intersection is a busy nearby intersection. Site generated trips are expected to represent less than 5% of the critical left-turn movement onto Micmac from Woodland at the Micmac Boulevard/Woodland Avenue/Lancaster Drive intersection. Since this intersection has been previously identified as nearing capacity, HRM and NSTIR should continue to work together in their review and investigation of options to provide safety and capacity modifications for the nearby Woodland Avenue at Micmac Boulevard / Lancaster Drive intersection and include surrounding developments within their review.
6. HRM should install a bus stop pad at the existing stop location and add a sidewalk connection to the marked crosswalk at Horizon Court.

CONCLUSION

7. With convenient access to transit (Micmac Terminal) and adjacent shopping (Mic Mac Mall), the trips generated by the proposed apartment units are not expected to have a significant impact on the level of performance of Micmac Boulevard or on other nearby streets and intersections.

If you have any questions or comments, please contact me by email at courtney.mccarthy@wsp.com or by telephone at 902-536-0982.

Sincerely,
Original Signed

Courtney McCarthy, P.Eng.
Traffic & Transportation Engineer
WSP Canada Inc.

August 17, 2020

Mr. Blaise Morrison
Manager, Development & Planning
The Armour Group Limited

[Via Email: bmorrison@thearmourgroup.ca]

**RE: Analysis Addendum - Traffic Impact Statement
Kingswood Apartments, Dartmouth, Nova Scotia**

Dear Mr. Morrison:

Plans are being prepared for a residential development at the Kingswood Apartment site at 1000 Micmac Boulevard in Dartmouth, NS (PID 40173627). WSP completed a Traffic Impact Statement for the proposed development in September 2018. In August 2019, WSP completed an Addendum for the proposed development to account for the change in planned residential units. In June 2020, WSP completed a Revised Addendum to address concerns related to the Woodland Avenue and Lancaster Drive/Micmac Boulevard intersection, which has been identified as nearing capacity. WSP is now building on the Revised Addendum by reviewing the anticipated distribution of site generated trips at the Woodland Avenue and Lancaster Drive/Micmac Boulevard intersection, as requested by HRM. The purpose of this Analysis Addendum is to assess the operational performance at the Woodland Avenue and Lancaster Drive/Micmac Boulevard intersection without and with build-out of the proposed development.

EXISTING CONDITIONS

Turning movement counts were obtained from HRM Traffic Management for morning and evening peak periods at the Woodland Avenue and Lancaster Drive/Micmac Boulevard intersection. The turning movements at the Study Intersection were collected on Thursday, May 11, 2017. The turning movement counts have been tabulated in Table A-1, Appendix A, with peak hour volumes indicated by shaded areas.

To project future background traffic volumes without site generated trips, annual and seasonal growth factors were taken into consideration. Based on a review of NSTIR's previous 10 years of volumes on Woodland Avenue (Highway 118), it was determined that there has been a decline in daily traffic volumes, resulting in a negative annual growth factor. The peak hour volumes at the Study Intersection have been increased by an annual growth rate of 0.5% to conservatively project background traffic volumes. Upon review of NSTIR's seasonal factors (between 2007 and 2016) it was determined that the appropriate factor for the volumes collected is 0.99, which was rounded to 1.0 to analyze a more conservative scenario. The projected 2022 AM and PM peak hour volumes without site development are shown diagrammatically in Figure 1.

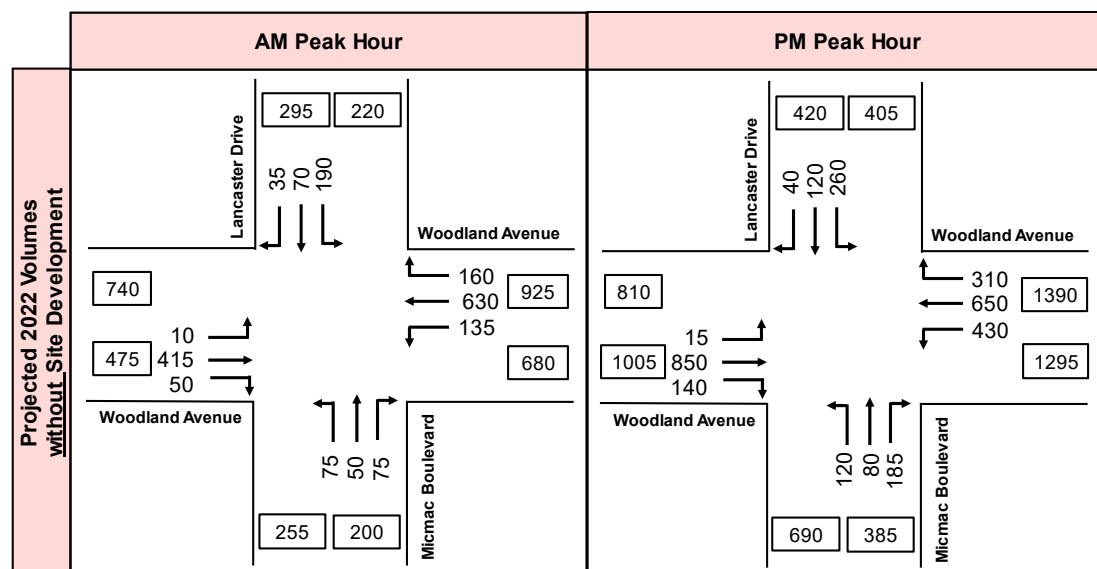


Figure 1 – Projected 2022 Volumes without Site Development

TRIP GENERATION & DISTRIBUTION

When using the published trip generation rates in *Trip Generation Manual, 10th Edition* (Institute of Transportation Engineers, Washington, 2017) the transportation engineer's objective should be to provide a realistic estimate of the number of trips that will be generated. Generated trips for Mid-Rise Apartments (Land Use 221) are estimated for the AM and PM peak hours of traffic by the number of units. The proposed residential development is planned to include 162 Mid-Rise Apartment units.

Trip generation estimates for the proposed development are summarized in Table 1. It was estimated that the residential development will generate:

- 40 two-way trips (10 entering and 30 exiting) during the AM peak hour; and,
- 50 two-way trips (30 entering and 20 exiting) during the PM peak hour.

Table 1 – Trip Generation Estimates

Land Use ¹	Units ²	Trip Generation Rates ³				Trip Generation Estimates ⁴			
		AM Peak		PM Peak		AM Peak		PM Peak	
		In	Out	In	Out	In	Out	In	Out
Trip Generation Estimate for Revised Kingswood Plaza									
Mid-Rise Apartments (Land Use 221)	162 Units	0.09	0.27	0.27	0.17	15	43	43	28
Trip Generation Estimate for Proposed Site						15	43	43	28
30% Reduction for Non-Auto Trips ⁵						5	13	13	8
Total Primary Trip Estimate for Proposed Site						10	30	30	20
NOTES: 1. Trip generation rates and equations are from Trip Generation, 10th Edition, (Institute of Transportation Engineers, Washington, 2017). 2. 'Number of Residential Units' for Mid-Rise Apartment Buildings. 3. Trip generation rates are 'vehicles per hour per unit'. 4. Trips generated are 'vehicles per hour' for AM and PM peak hours. 5. The Halifax Integrated Mobility Plan has a 60% target for non-auto trips within the Regional Centre by 2031. Census data from 2011 indicates that approximately 50% of commuting trips were made by non-auto modes. A more conservative reduction was considered at 30% for non-auto trips generated by residential land uses, which has been used to account for all transit, bicycle and walking trips.									

External trips generated by the proposed development were assigned to the roadway network based on review of past studies and WSP's local knowledge of the area considering major trip origins and destinations in the region. It is estimated that of the vehicular traffic generated by the site, 70% will enter/exit the site from the west on Micmac Boulevard and 30% will enter/exit the site from the east. Trips distributed to the west were assigned to the Study Intersection based on the existing turning movement counts available. The distribution of site generated trips during peak hours are shown diagrammatically in Figure 2.

Trips generated by the proposed site (Figure 2) have been added to the projected 2022 traffic volumes without site development (Figure 1) to provide projected 2022 AM and PM peak hourly volumes that include site generated trips (Figure 3).

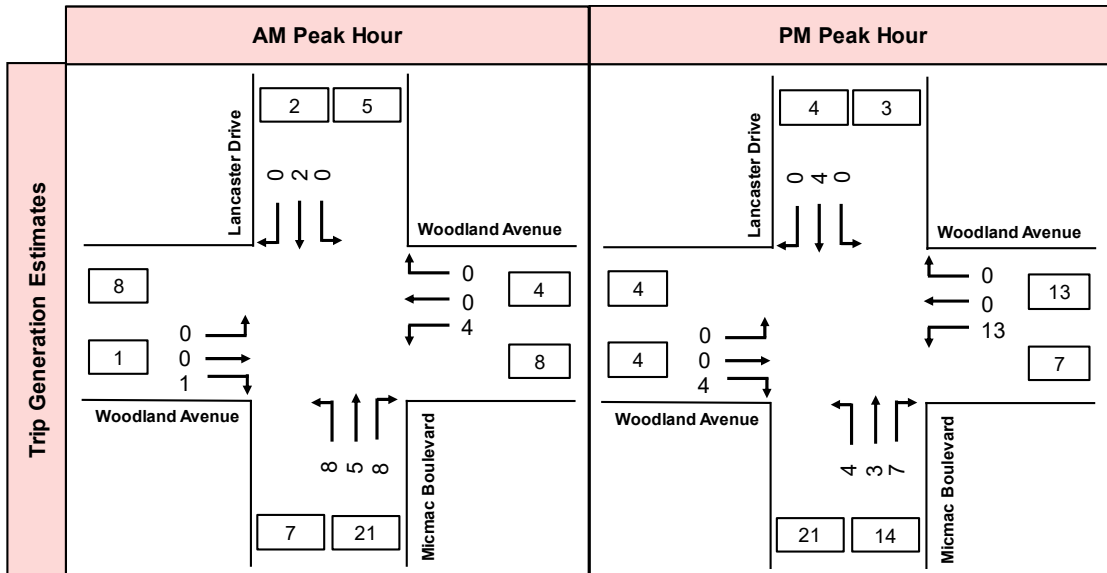


Figure 2 – Trip Generation Estimates at the Study Intersection

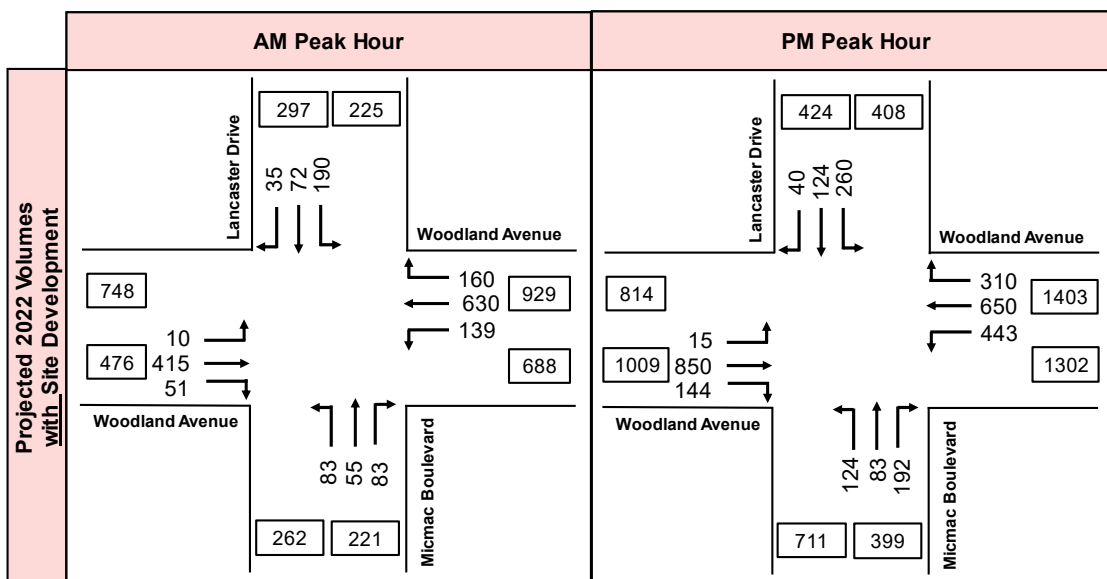


Figure 3 – Projected 2022 Volumes with Site Development

OPERATIONAL ANALYSIS

Intersection capacity analysis was completed to estimate how the Study Intersection may be expected to operate in the future without and with site generated trips.

Synchro 10.0 software was used to evaluate the performance of the Study Intersections for the following scenarios:

- Projected 2022 AM and PM peak hour volumes without site development; and,
- Projected 2022 AM and PM peak hour volumes with site development.

Woodland Avenue and Lancaster Drive/Micmac Boulevard (Table 2):

- Without site development, the intersection is expected to operate at a satisfactory performance and within available capacity during the AM and PM peak hours.
- With site development, negligible changes to seconds of delay per vehicle are projected and this intersection is expected to operate below HRM guidelines for delay and capacity.

Table 2 – Intersection Capacity Analysis for Woodland Avenue at Lancaster Drive/Micmac Boulevard

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement												Overall Intersection Delay
	Woodland Avenue						Micmac Boulevard			Lancaster Drive			
	EB-L	EB-T	EB-R	WB-L	WB-T	WB-R	NB-L	NB-T	NB-R	SB-L	SB-T	SB-R	Delay
2022 AM Peak Hour without Site Development (Page A-2)													
Delay	7.4	10.7	1.9	8.6	20.4	4.5	22.0	19.7	6.2	31.4	20.2	1.1	15.8
v/c	0.03	0.25	0.06	0.26	0.57	0.27	0.26	0.12	0.18	0.63	0.17	0.08	
Queue	2.8	36.9	3.6	18.8	62.7	12.7	20.6	14.2	9.3	47.6	18.6	1.3	
2022 PM Peak Hour without Site Development (Page A-3)													
Delay	7.2	13.3	2.5	23.0	31.4	5.3	30.6	26.3	6.1	48.5	27.2	1.6	20.8
v/c	0.06	0.48	0.16	0.79	0.70	0.49	0.38	0.17	0.35	0.80	0.26	0.09	
Queue	3.3	79.9	9.8	84.7	76.1	18.4	38.1	25.4	16.7	97.2	35.7	2.2	
2022 AM Peak Hour with Site Development (Page A-4)													
Delay	7.4	10.8	2.0	8.7	20.5	4.5	22.5	19.9	6.3	31.5	20.3	1.0	15.9
v/c	0.03	0.25	0.06	0.26	0.57	0.27	0.28	0.13	0.20	0.63	0.17	0.08	
Queue	2.8	36.8	3.7	19.3	63.0	12.7	22.2	15.4	9.9	47.9	18.9	1.3	
2022 PM Peak Hour with Site Development (Page A-5)													
Delay	7.3	13.3	2.5	24.4	31.7	5.3	30.9	26.4	6.0	49.0	27.4	1.6	21.1
v/c	0.06	0.47	0.17	0.81	0.71	0.49	0.40	0.18	0.36	0.80	0.27	0.09	
Queue	3.3	79.9	10.0	91.6	76.1	18.4	39.7	26.1	17.1	97.5	36.9	2.2	

SUMMARY

- Plans are being prepared for a residential development at the Kingswood Apartment site at 1000 Micmac Boulevard. The proposed residential development is planned to include 162 Mid-Rise Apartment units and is expected to be fully developed by 2022.
- The purpose of this Analysis Addendum is to assess the operational performance at the Woodland Avenue and Lancaster Drive/Micmac Boulevard intersection without and with build-out of the proposed development.
- It was estimated that the residential development will generate:
 - 40 two-way trips (10 entering and 30 exiting) during the AM peak hour; and,
 - 50 two-way trips (30 entering and 20 exiting) during the PM peak hour.
- The Woodland Avenue and Lancaster Drive/Micmac Boulevard intersection is expected to operate with HRM acceptable limits in 2022 with site development.

CONCLUSION

- With added trips generated by the proposed residential development, the Woodland Avenue and Lancaster Drive/Micmac Boulevard intersection is projected to operate with HRM guidelines at full occupancy. Negligible changes at the Study Intersection are expected as a result of the proposed development.

If you have any questions or comments, please contact me by email at courtney.mccarthy@wsp.com or by telephone at 902-536-0982.

Sincerely,
Original Signed

Courtney McCarthy, P.Eng.
Traffic & Transportation Engineer
WSP Canada Inc.































APPENDIX – TRAFFIC VOLUME DATA AND OPERATIONAL ANALYSIS

<p>Table A-1</p> <p>Woodland Avenue</p> <p>@</p> <p>Lancaster Drive/Micmac Boulevard</p> <p><i>Dartmouth, Nova Scotia</i></p> <p>Thursday, May 11, 2017</p>													
AM Peak Period Volume Data													
Time	Micmac Boulevard Northbound Approach			Woodland Avenue Westbound Approach			Lancaster Drive Southbound Approach			Woodland Avenue Eastbound Approach			Total Vehicles
	A	B	C	D	E	F	G	H	I	J	K	L	
07:00 07:15	10	10	18	19	173	23	28	8	1	1	67	6	364
07:15 07:30	23	11	17	26	165	22	46	14	7	0	100	8	439
07:30 07:45	12	10	17	23	167	41	46	16	8	1	82	10	433
07:45 08:00	21	10	11	22	154	26	46	10	6	1	94	11	412
08:00 08:15	23	16	17	31	158	51	39	18	7	1	91	11	463
08:15 08:30	15	9	18	36	176	26	53	19	9	3	103	13	480
08:30 08:45	19	12	20	34	150	33	37	20	10	4	116	12	467
08:45 09:00	15	11	17	29	130	46	57	13	8	1	96	15	438
AM Peak Hour	72	48	72	130	614	156	186	70	34	9	406	51	1848
07:00 08:00	66	41	63	90	659	112	166	48	22	3	343	35	1648
08:00 09:00	72	48	72	130	614	156	186	70	34	9	406	51	1848
PM Peak Period Volume Data													
Time	Micmac Boulevard Northbound Approach			Woodland Avenue Westbound Approach			Lancaster Drive Southbound Approach			Woodland Avenue Eastbound Approach			Total Vehicles
	A	B	C	D	E	F	G	H	I	J	K	L	
16:00 16:15	36	13	55	81	129	41	47	19	6	5	244	35	711
16:15 16:30	29	22	53	71	119	41	53	29	6	4	284	27	738
16:30 16:45	15	15	33	110	182	77	70	25	10	4	223	40	804
16:45 17:00	30	31	55	109	179	87	61	26	4	5	208	32	827
17:00 17:15	41	19	44	102	130	62	54	30	10	3	199	39	733
17:15 17:30	32	15	48	98	142	78	70	35	16	4	200	27	765
17:30 17:45	23	27	29	82	98	78	46	33	9	5	179	23	632
17:45 18:00	22	12	27	51	83	70	52	37	13	3	161	18	549
PM Peak Hour	118	80	180	419	633	304	255	116	40	16	830	138	3129
16:00 17:00	110	81	196	371	609	246	231	99	26	18	959	134	3080
17:00 18:00	118	73	148	333	453	288	222	135	48	15	739	107	2679

* Count not completed by WSP

1: Micmac Boulevard/Lancaster Drive & Woodland Avenue

2022 AM Peak without Site Development

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	10	415	50	135	630	160	75	50	75	190	70	35
Future Volume (vph)	10	415	50	135	630	160	75	50	75	190	70	35
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.256			0.491			0.708			0.722		
Satd. Flow (perm)	477	3539	1583	915	3539	1583	1319	1863	1583	1345	1863	1583
Satd. Flow (RTOR)			85			174			84			84
Lane Group Flow (vph)	11	451	54	147	685	174	82	54	82	207	76	38
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5!	2!		1!	6!			4			4	
Permitted Phases	2		2	6		6	4		4	4		4
Total Split (s)	25.0	50.0	50.0	25.0	50.0	50.0	30.0	30.0	30.0	30.0	30.0	30.0
Total Lost Time (s)	4.6	6.5	6.5	4.6	6.5	6.5	6.6	6.6	6.6	6.6	6.6	6.6
Act Effect Green (s)	36.3	33.2	33.2	32.3	21.8	21.8	15.6	15.6	15.6	15.6	15.6	15.6
Actuated g/C Ratio	0.57	0.52	0.52	0.50	0.34	0.34	0.24	0.24	0.24	0.24	0.24	0.24
v/c Ratio	0.03	0.25	0.06	0.26	0.57	0.27	0.26	0.12	0.18	0.63	0.17	0.08
Control Delay	7.4	10.7	1.9	8.6	20.4	4.5	22.0	19.7	6.2	31.4	20.2	1.1
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	7.4	10.7	1.9	8.6	20.4	4.5	22.0	19.7	6.2	31.4	20.2	1.1
LOS	A	B	A	A	C	A	C	B	A	C	C	A
Approach Delay		9.7			15.9			15.5			25.2	
Approach LOS		A			B			B			C	
Queue Length 50th (m)	0.5	13.3	0.0	7.2	34.8	0.0	7.8	5.0	0.0	21.8	7.1	0.0
Queue Length 95th (m)	2.8	36.9	3.6	18.8	62.7	12.7	20.6	14.2	9.3	47.6	18.6	1.3
Internal Link Dist (m)		315.3			442.4			139.4			197.6	
Turn Bay Length (m)	45.0		60.0	75.0		150.0	25.0		60.0	25.0		40.0
Base Capacity (vph)	695	2449	1121	806	2449	1149	491	693	642	500	693	642
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.18	0.05	0.18	0.28	0.15	0.17	0.08	0.13	0.41	0.11	0.06

Intersection Summary

Cycle Length: 105

Actuated Cycle Length: 64

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 15.8

Intersection Capacity Utilization 56.1%

Analysis Period (min) 15

! Phase conflict between lane groups.

Intersection LOS: B

























ICU Level of Service B

Splits and Phases: 1: Micmac Boulevard/Lancaster Drive & Woodland Avenue

 Ø1	 Ø6	 Ø4
25 s	50 s	30 s
 Ø5	 Ø2	
25 s	50 s	

1: Micmac Boulevard/Lancaster Drive & Woodland Avenue

2022 PM Peak without Site Development

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	850	140	430	650	310	120	80	185	260	120	40
Future Volume (vph)	15	850	140	430	650	310	120	80	185	260	120	40
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.153			0.309			0.674			0.701		
Satd. Flow (perm)	285	3539	1583	576	3539	1583	1255	1863	1583	1306	1863	1583
Satd. Flow (RTOR)			152			337			201			84
Lane Group Flow (vph)	16	924	152	467	707	337	130	87	201	283	130	43
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5!	2!		1!	6!			4			4	
Permitted Phases	2		2	6		6	4		4	4		4
Total Split (s)	25.0	50.0	50.0	25.0	50.0	50.0	30.0	30.0	30.0	30.0	30.0	30.0
Total Lost Time (s)	4.6	6.5	6.5	4.6	6.5	6.5	6.6	6.6	6.6	6.6	6.6	6.6
Act Effect Green (s)	49.9	46.7	46.7	46.1	24.2	24.2	23.2	23.2	23.2	23.2	23.2	23.2
Actuated g/C Ratio	0.59	0.55	0.55	0.54	0.28	0.28	0.27	0.27	0.27	0.27	0.27	0.27
v/c Ratio	0.06	0.48	0.16	0.79	0.70	0.49	0.38	0.17	0.35	0.80	0.26	0.09
Control Delay	7.2	13.3	2.5	23.0	31.4	5.3	30.6	26.3	6.1	48.5	27.2	1.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.2	13.3	2.5	23.0	31.4	5.3	30.6	26.3	6.1	48.5	27.2	1.6
LOS	A	B	A	C	C	A	C	C	A	D	C	A
Approach Delay		11.7			23.0			17.9			38.0	
Approach LOS		B			C			B			D	
Queue Length 50th (m)	1.0	44.5	0.0	40.4	57.3	0.0	17.9	11.3	0.0	44.6	17.3	0.0
Queue Length 95th (m)	3.3	79.9	9.8	#84.7	76.1	18.4	38.1	25.4	16.7	#97.2	35.7	2.2
Internal Link Dist (m)		315.3			442.4			139.4			197.6	
Turn Bay Length (m)	45.0		60.0	75.0		150.0	25.0		60.0	25.0		40.0
Base Capacity (vph)	527	1948	939	602	1816	976	346	514	582	360	514	498
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.47	0.16	0.78	0.39	0.35	0.38	0.17	0.35	0.79	0.25	0.09

Intersection Summary

Cycle Length: 105

Actuated Cycle Length: 85.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 20.8

Intersection LOS: C

Intersection Capacity Utilization 83.1%

ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.



























! Phase conflict between lane groups.

Splits and Phases: 1: Micmac Boulevard/Lancaster Drive & Woodland Avenue



1: Micmac Boulevard/Lancaster Drive & Woodland Avenue

2022 AM Peak with Site Development

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	10	415	51	139	630	160	83	55	83	190	72	35
Future Volume (vph)	10	415	51	139	630	160	83	55	83	190	72	35
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.254			0.491			0.706			0.718		
Satd. Flow (perm)	473	3539	1583	915	3539	1583	1315	1863	1583	1337	1863	1583
Satd. Flow (RTOR)			85			174			90			84
Lane Group Flow (vph)	11	451	55	151	685	174	90	60	90	207	78	38
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5!	2!		1!	6!			4			4	
Permitted Phases	2		2	6		6	4		4	4		4
Total Split (s)	25.0	50.0	50.0	25.0	50.0	50.0	30.0	30.0	30.0	30.0	30.0	30.0
Total Lost Time (s)	4.6	6.5	6.5	4.6	6.5	6.5	6.6	6.6	6.6	6.6	6.6	6.6
Act Effect Green (s)	36.3	33.3	33.3	32.4	21.8	21.8	15.7	15.7	15.7	15.7	15.7	15.7
Actuated g/C Ratio	0.57	0.52	0.52	0.50	0.34	0.34	0.24	0.24	0.24	0.24	0.24	0.24
v/c Ratio	0.03	0.25	0.06	0.26	0.57	0.27	0.28	0.13	0.20	0.63	0.17	0.08
Control Delay	7.4	10.8	2.0	8.7	20.5	4.5	22.5	19.9	6.3	31.5	20.3	1.0
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	7.4	10.8	2.0	8.7	20.5	4.5	22.5	19.9	6.3	31.5	20.3	1.0
LOS	A	B	A	A	C	A	C	B	A	C	C	A
Approach Delay		9.7			16.0			15.8			25.2	
Approach LOS		A			B			B			C	
Queue Length 50th (m)	0.5	13.4	0.0	7.5	35.2	0.0	8.6	5.6	0.0	21.9	7.3	0.0
Queue Length 95th (m)	2.8	36.8	3.7	19.3	63.0	12.7	22.2	15.4	9.9	47.9	18.9	1.3
Internal Link Dist (m)		315.3			442.4			139.4			197.6	
Turn Bay Length (m)	45.0		60.0	75.0		150.0	25.0		60.0	25.0		40.0
Base Capacity (vph)	692	2441	1118	805	2441	1145	487	691	643	496	691	640
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.18	0.05	0.19	0.28	0.15	0.18	0.09	0.14	0.42	0.11	0.06

Intersection Summary

Cycle Length: 105

Actuated Cycle Length: 64.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 15.9

Intersection Capacity Utilization 56.3%



Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B



























! Phase conflict between lane groups.

Splits and Phases: 1: Micmac Boulevard/Lancaster Drive & Woodland Avenue

 Ø1	 Ø6	 Ø4
25 s	50 s	30 s
 Ø5	 Ø2	
25 s	50 s	

1: Micmac Boulevard/Lancaster Drive & Woodland Avenue

2022 PM Peak with Site Development

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	15	850	144	443	650	310	124	83	192	260	124	40
Future Volume (vph)	15	850	144	443	650	310	124	83	192	260	124	40
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.150			0.309			0.671			0.699		
Satd. Flow (perm)	279	3539	1583	576	3539	1583	1250	1863	1583	1302	1863	1583
Satd. Flow (RTOR)			157			337			209			84
Lane Group Flow (vph)	16	924	157	482	707	337	135	90	209	283	135	43
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5!	2!		1!	6!			4			4	
Permitted Phases	2		2	6		6	4		4	4		4
Total Split (s)	25.0	50.0	50.0	25.0	50.0	50.0	30.0	30.0	30.0	30.0	30.0	30.0
Total Lost Time (s)	4.6	6.5	6.5	4.6	6.5	6.5	6.6	6.6	6.6	6.6	6.6	6.6
Act Effect Green (s)	50.3	47.1	47.1	46.6	24.2	24.2	23.3	23.3	23.3	23.3	23.3	23.3
Actuated g/C Ratio	0.59	0.55	0.55	0.54	0.28	0.28	0.27	0.27	0.27	0.27	0.27	0.27
v/c Ratio	0.06	0.47	0.17	0.81	0.71	0.49	0.40	0.18	0.36	0.80	0.27	0.09
Control Delay	7.3	13.3	2.5	24.4	31.7	5.3	30.9	26.4	6.0	49.0	27.4	1.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.3	13.3	2.5	24.4	31.7	5.3	30.9	26.4	6.0	49.0	27.4	1.6
LOS	A	B	A	C	C	A	C	C	A	D	C	A
Approach Delay		11.7			23.6			18.0			38.3	
Approach LOS		B			C			B			D	
Queue Length 50th (m)	1.0	44.5	0.0	42.2	57.3	0.0	18.7	11.7	0.0	44.6	18.0	0.0
Queue Length 95th (m)	3.3	79.9	10.0	#91.6	76.1	18.4	39.7	26.1	17.1	#97.5	36.9	2.2
Internal Link Dist (m)		315.3			442.4			139.4			197.6	
Turn Bay Length (m)	45.0		60.0	75.0		150.0	25.0		60.0	25.0		40.0
Base Capacity (vph)	522	1946	941	597	1800	970	342	509	584	356	509	494
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.47	0.17	0.81	0.39	0.35	0.39	0.18	0.36	0.79	0.27	0.09

Intersection Summary

Cycle Length: 105

Actuated Cycle Length: 85.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 21.1

Intersection LOS: C

Intersection Capacity Utilization 88.5%

ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

! Phase conflict between lane groups.

Splits and Phases: 1: Micmac Boulevard/Lancaster Drive & Woodland Avenue

