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MEMORANDUM

To: Chair and Members of North West Planning Advisory Committee

From: Erin MacIntyre, Planner 1

Date: April 22, 2014

SUBJECT: **Case 19111: Application by United Gulf to rezone PID 41127564 and a portion of PID 41351669 from MU-1 to C-4, Voyageur Way and Hammonds Plains Road, Hammonds Plains.**

Background:

The four subject properties are located at the intersection of Voyageur Way and Hammonds Plains Road; one on the Western side of Voyageur Lakes entrance and three on the Eastern side, fronting on Hammonds Plains Road. The current MU-1 zoning limits commercial gross floor area to 5,000 square feet. The applicant is proposing to rezone the four parcels to C-4 (Highway Commercial). The maximum allowable gross floor area in a C-4 Zone is 10,000 square feet.

A public information meeting was held on April 10, 2014. Notes on that meeting are pending and will be provided at the PAC meeting.

Existing Use The site currently consists of four vacant parcels.

Designation 'Mixed Use B' under the Beaver Bank, Hammonds Plains and Upper Sackville Municipal Planning Strategy (MPS). Refer to Map 1 and Section II of Beaver Bank, Hammonds Plains and Upper Sackville MPS.

Zoning MU-1 (Mixed Use 1) under the Beaver Bank, Hammonds Plains and Upper Sackville Land Use By-law (LUB). Refer to Schedule 1 and Part 13 of the the Beaver Bank, Hammonds Plains and Upper Sackville LUB.

Proposal The proposal, illustrated in Attachment A, is to rezone four parcels from the current MU-1 Zone to the C-4 Zone to allow an increase from a maximum allowable commercial gross floor area of 5,000 square feet to a maximum of 10,000 square feet. The proposed uses include a restaurant, retail, coffee shop and medical building, though it should be noted that any permitted use in the C-4 zone is available on the property, pending meeting the requirements of the zone.

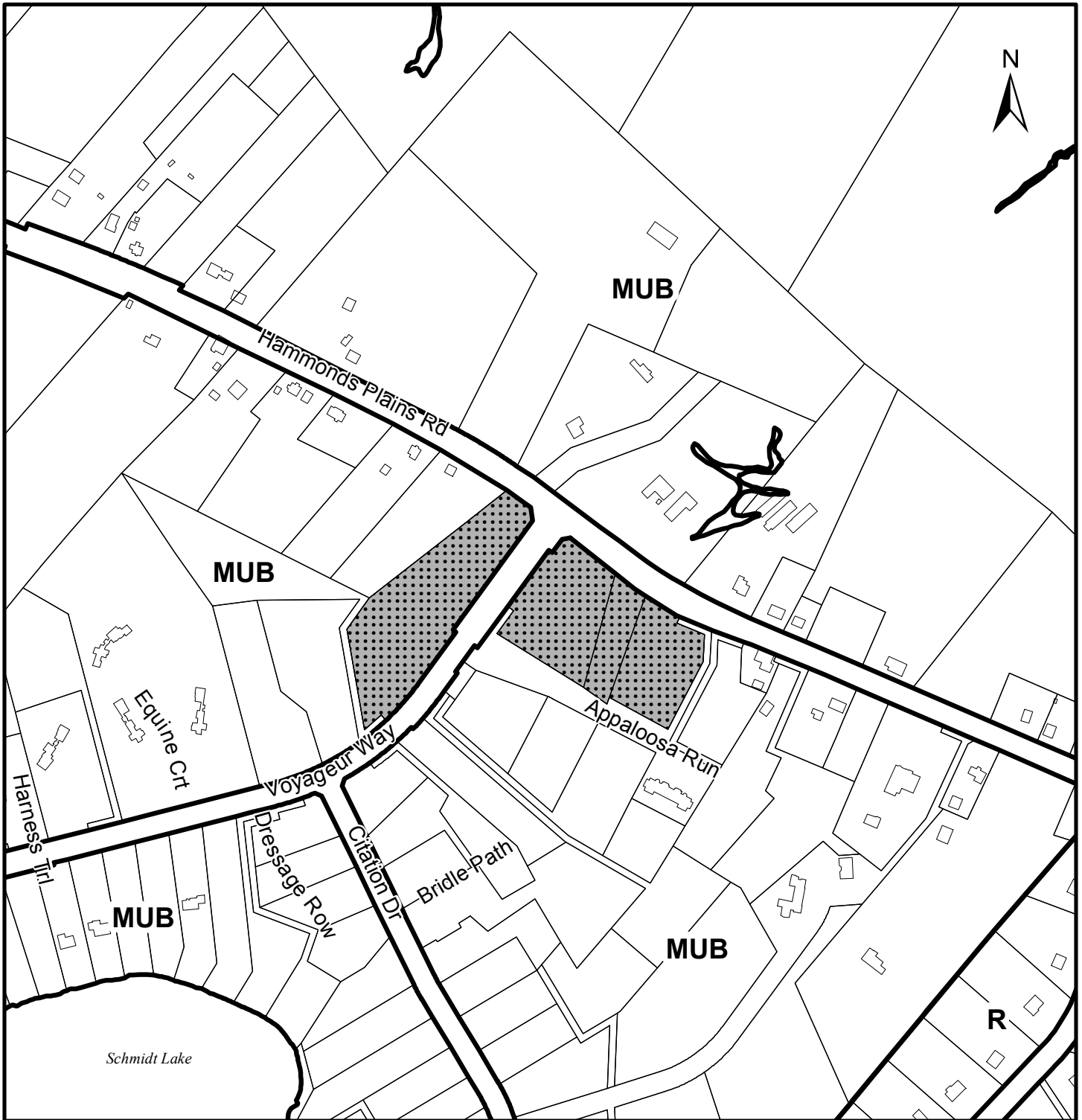
MPS Policy Policy P-24 of the Beaver Bank, Hammonds Plains and Upper Sackville MPS allows Community Council to consider amendments to the land use bylaw to allow rezonings. A copy of the policy is attached for the Committee's reference as Attachment B.

Input Sought from North West Planning Advisory Committee

Feedback is sought from NWPAC relative to this proposed rezoning and its ability to satisfy the enabling plan policy (P-24) of the Beaver Bank, Hammonds Plains and Upper Sackville MPS. NWPAC's recommendation will be included in the staff report to Community Council.

Attachments:


Map 1	Generalized Future Land Use Map (GFLUM)
Map 2	Zoning and Notification Map
Attachment A	Concept plan
Attachment B	Policy P-24 Beaver Bank, Hammonds Plains and Upper Sackville MPS
Attachment C	Traffic Impact Statement
Attachment D	Traffic Impact Statement- Addendum



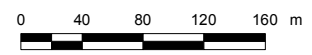
Map 1 - Generalized Future Land Use

Hammonds Plains



 Area proposed to be rezoned from MU-1 (Mixed Use 1) to C-4 (Highway Commercial)

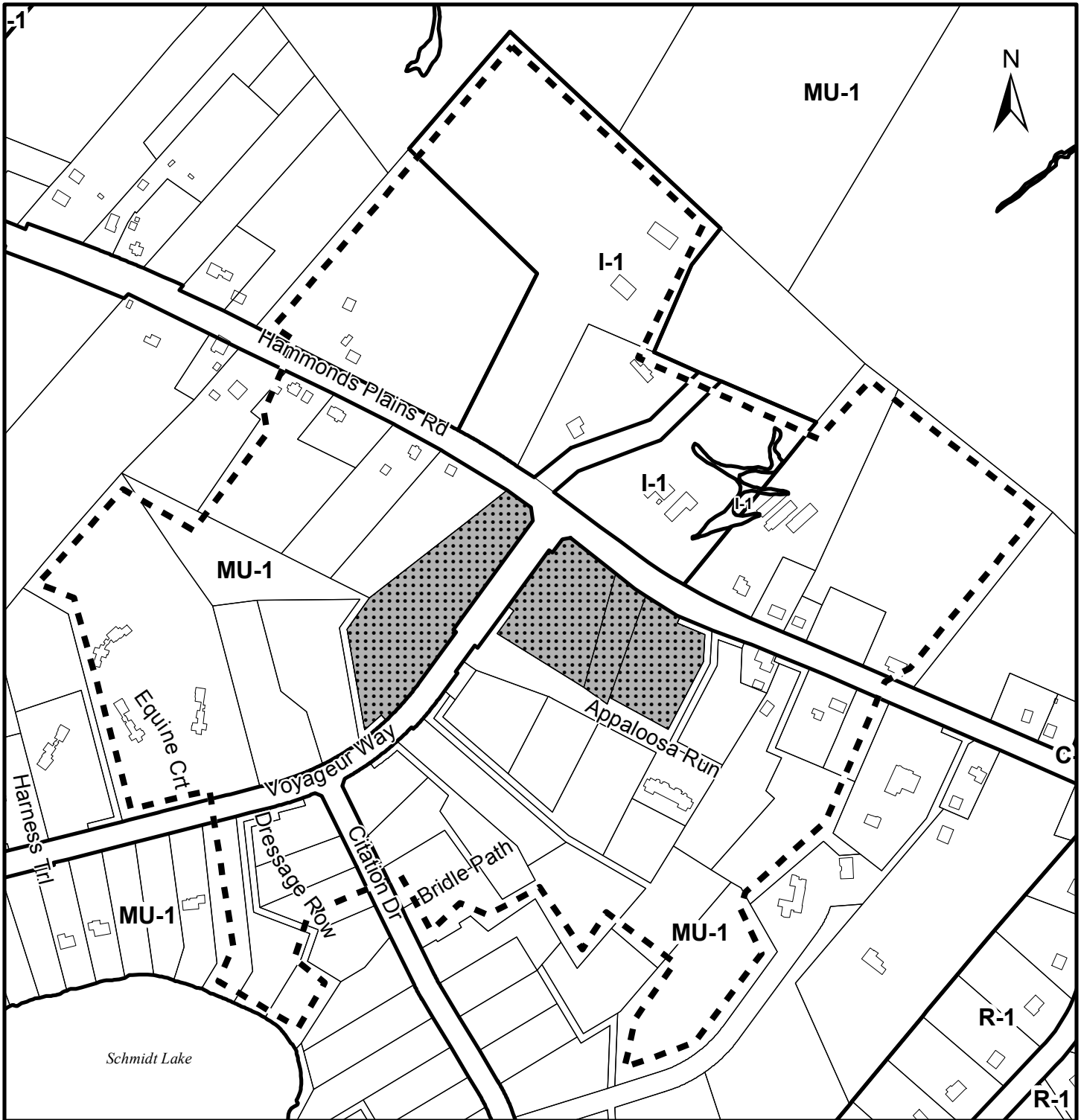
Designations
 R Residential
 MU-B Mixed Use B



Beaver Bank, Hammonds Plains and Upper Sackville Plan Area


This map is an unofficial reproduction of a portion of the Generalized Future Land Use Map for the plan area indicated.


HRM does not guarantee the accuracy of any representation on this plan.



Map 2 - Zoning and Notification

Hammonds Plains

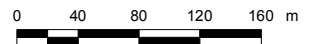
 Area proposed to be rezoned from MU-1 (Mixed Use 1) to C-4 (Highway Commercial)

 Area of notification

Beaver Bank, Hammonds Plains and Upper Sackville Land Use By-Law Area

Zones

R-1 Single Unit Dwelling
 MU-1 Mixed Use 1
 I-1 Mixed Industrial



This map is an unofficial reproduction of a portion of the Zoning Map for the plan area indicated.

HRM does not guarantee the accuracy of any representation on this plan.

Attachment B

Policy 24 of the Beaver Bank, Hammonds Plains and Upper Sackville MPS

P-24

Notwithstanding the provisions of Policy P-8, it shall be the intention of Council to establish a C-4(Highway Commercial) Zone in the land use by-law which will permit commercial uses to a maximum of ten thousand (10,000) square feet and shall include those more intensive uses which involve outdoor storage and display. Controls on outdoor storage and display as well as parking and loading areas will address compatibility concerns with adjacent development. In addition, special access requirements shall be established for service stations. This zone shall be applied to existing uses permitted within the highway commercial zone. When considering amendments to the schedules of the land use by-law to permit new highway commercial uses within the Mixed Use A and B Designations, Council shall have regard to the following:

- (a) preference for a location adjacent to or in close proximity to other commercial uses;
- (b) the potential for adversely affecting adjacent residential and community facility uses;
- (c) an evaluation of the impact which the site design and operational characteristics of the proposed use shall have on the surrounding community;
- (d) that the use has direct access to a collector highway as shown on Map 2 - Transportation;
- (e) the impact of the commercial use on traffic circulation and in particular sighting distances and entrance to and exit from the site;
- (f) that no rezoning from a R-1(Single Unit Dwelling) Zone (Policy P-34) or R-6(Rural Residential) Zone (Policy P-13) to a highway commercial zone shall be considered; and
- (g) the provisions of Policy P-137.



Ref. No. 131-21377

October 24, 2013

DRAFT LETTER

Mr. Patrick LeRoy, BBA, MBA
Vice President of Operations
United Gulf Developments Limited

Sent via Email to partick@unitedgulf.ca

**Re: Traffic Impact Statement, Proposed Commercial Development, Voyageur Way @
Hammonds Plains Road Intersection, Hammonds Plains, Nova Scotia**

Dear Mr. LeRoy:

Further to our recent telephone conversations and the site plan that you forwarded on October 16, 2013, this is the Traffic Impact Statement that you require to include with your rezoning and development application to HRM.

Description of Development and Site Accesses - The proposed development will include approximately 40,000 square feet of gross floor area in five buildings on four lots (Figure 1). The following site access locations are proposed:

- Full movement driveway to Voyageur Way opposite Appaloosa Run (Building 1);
- Full movement driveways to Appaloosa Run for Buildings 2 to 5; and
- A right-out only to Hammonds Plains Road from the lot with Building 5.

Road Descriptions - Hammonds Plains Road is a two lane collector road with a rural cross section including gravel shoulders and open ditches. The posted speed limit is 70 km/h on the approaches to the Voyageur Way intersection. There is an existing westbound left turn lane for Voyageur Way that meets Hammonds Plains Road at a T-intersection on the south side of the road. While **Voyageur Way** is a two lane street with open ditches, there is an approximately 90 metre long 'gateway' section with single travel lanes on either side of a median between Hammonds Plains Road and the approach to Appaloosa Run. **Appaloosa Run** is a narrow paved lane that meets the east side of Voyageur Way and parallels Hammonds Plains Road on the south side of the proposed lots with Buildings 2 to 5 (Figure 1).

Visibility is adequate on both Voyageur Way approaches to the Appaloosa Run intersection, as well as along Appaloosa Run in the area where site driveways are proposed.

Traffic Volumes - A manual turning movement count obtained by HRM Traffic & Right of Way services during early November 2012 indicated the following two-way peak hour volumes at the Hammonds Plains Road / Voyageur Way intersection:

- Hammonds Plains Road - AM 1225 vph; PM 1335 vph
- Voyageur Way - AM 80 vph; PM 100 vph.

Trip Generation - While exact land uses are not available for the five buildings on the four lots shown on Figure 1, the development is intended to include community oriented businesses to provide services to residents of the Hammonds Plains area, including existing and future residents in Voyageur Lakes and Kingswood subdivisions. The following potential land uses have been used in preparing trip generation estimates:

- Buildings 1 and 5 - specialty retail with a total of 20,000 square feet of gross floor area;
- Buildings 2 and 3 - site down restaurants which will not be open during the AM peak hour with a total of 10,000 square feet of gross floor area;
- Building 4 - a variety of small 'fast food' restaurants with a total of 10,000 square feet of gross floor area, including a coffee shop without a drive through lane which will operate during both AM and PM peak periods, and others that will not be open during the AM.

Table 1 - Trip Generation Estimates for Proposed Development									
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
Buildings 1 and 5 Specialty Retail (Land Use 826) ⁴	20.0 KGLA	0.76	0.60	1.19	1.52	15	12	24	30
Buildings 2 and 3 Restaurant ⁵ (Land Use 932)	10.0 KGFA	Not Open During AM Peak Hour		5.91	3.94	Not Open During AM Peak Hour		59	39
Building 4 Restaurant ⁶ (Land Use 936)	2.5 KGFA	27.68	26.60	12.50	12.50	69	67	31	31
Building 4 Restaurant ⁷ (Land Use 933)	7.5 KGFA	Not Open During AM Peak Hour		13.34	12.81	Not Open During AM Peak Hour		100	96
Trip Generation Estimates for the Proposed Commercial Development						84	79	214	196
10% Reduction for On-Site Synergy Trips ⁸						8	8	21	20
Adjusted External Trip Estimates for the Commercial Development						76	71	193	176
50% Pass-By Trips for External Vehicle Trips ⁹						37	37	92	92
Primary Site Generated Vehicle Trips						39	34	101	84
(NOTES: 1. Rates are for Land Use Codes, <i>Trip Generation, 9th Edition</i> , Institute of Transportation Engineers, 2012. 2. KGFA is 'Gross Floor Area x 1000 square feet'; KGLA is 'Gross Leasable Area x 1000 square feet'; and 'number of apartment units'. 3. Rates are 'vehicles per hour per unit'; Trips generated are 'vehicles per hour for peak hours'. 4. Specialty Retail (Land Use 826) rates have been used. Since there is no published rate for the AM peak hour for this Land Use, and since AM peak hour trips to Specialty Retail are generally low, AM trip rates have been assumed to be 50% of the PM rate with reversal of the directional split. 5. These units will be considered as High Turn-Over Sit Down restaurants. 6. This land use is considered Coffee Shop Without Drive Through Window. Due to the location and the proposed community use expected from this shop, the lower trip generation rates included on Pages 1937 and 1938 of <i>Trip Generation, 9th Edition</i> , have been used. 7. These units are considered as Fast Food Restaurants Without Drive Through Window. 8. A 10% adjustment has been applied to account for cross shopping and on-site synergies between the retail and restaurant land uses. 9. Since a significant part of the site trips is expected to be from existing trips using Hammonds Plains Road, a 50% pass-by rate has been used.									

Trip generation estimates (Table 1) have been prepared using published trip generation rates from *Trip Generation, 9th Edition*. After adjustment with a 10% reduction for on-site synergies, it is estimated that the site will generate 147 two-way external vehicle trips (76 entering and 71 exiting) during the AM peak hour and 369 two-way trips (193 entering and 176 exiting) during the PM peak hour.

Two trip types are included in the external vehicle trips generated by the site:

- *Pass-By Trips* are those that are attracted to the site by vehicles on Hammonds Plains Road that now drive by the site during AM and PM peak hours. These trips will enter the site and then resume their trips towards their destinations. Since a significant part of trips generated by this development are expected to be from vehicles already using Hammonds Plains Road, a 50% pass-by rates has been used. Pass-by trips from Hammonds Plains Road trips are estimated to include 37 vehicles entering and exiting during the AM peak hour and 92 vehicles entering and exiting during the PM peak hour.
- *Primary Trips* are those that are made specifically to visit the site. These trips enter the site and then return to the street network towards the trip origin. Primary site generated trips are estimated to include 39 entering and 34 exiting trips during the AM peak hour and 101 entering and 84 exiting trips during the PM peak hour.

Summary

1. The proposed development at the Hammonds Plains Road / Voyageur Way intersection will include approximately 40,000 square feet of gross floor area in five buildings on four lots.
2. The following site access are proposed:
 - Full movement driveway to Voyageur Way opposite Appaloosa Run;
 - Three full movement driveways to Appaloosa Run; and
 - A right-out only to Hammonds Plains Road near the east end of the site.
3. Hammonds Plains Road is a two lane collector road with a rural cross section including gravel shoulders and open ditches. The posted speed limit is 70 km/h on the approaches to the Voyageur Way intersection. There is an existing westbound left turn lane for Voyageur Way that meets Hammonds Plains Road at a T-intersection on the south side of the road.
4. A manual turning movement count obtained by HRM Traffic & Right of Way services during early November 2012 indicated the following two-way peak hour volumes at the Hammonds Plains Road / Voyageur Way intersection:
 - Hammonds Plains Road - AM 1225 vph; PM 1335 vph
 - Voyageur Way - AM 80 vph; PM 100 vph.
5. After adjustment with a 10% reduction for on-site synergies, it is estimated that the site will generate 147 two-way external vehicle trips (76 entering and 71 exiting) during the AM peak hour and 369 two-way trips (193 entering and 176 exiting) during the PM peak hour.
6. Since a significant part of trips generated by this development are expected to be from vehicles already using Hammonds Plains Road, a 50% pass-by rates has been used. Pass-by trips are estimated to include 37 vehicles entering and exiting during the AM peak hour and 92 vehicles entering and exiting during the PM peak hour.
7. Primary site generated trips are estimated to include 39 entering and 34 exiting trips during the AM peak hour and 101 entering and 84 exiting trips during the PM peak hour.

Conclusions

8. Hammonds Plains Road has high peak hour volumes adjacent to the site, however, the existing westbound left turn lane will provide refuge for left turning vehicles waiting to enter Voyageur Way.

9. The high percentage of pass-by trips included in external site trips generated by the development will reduce the number of additional vehicle trips on Hammonds Plains Road generated by the site.
10. Since it is expected that the majority AM pass-by trips will be eastbound trips turning right into and right out of the site, site generated trips are not expected to have any significant impact the Hammonds Plains Road or the Voyageur Way intersection during the AM peak hour.
11. The numbers of site generated trips are moderate to high during the PM peak hour, however, the existing volumes on Voyageur Way are very low. While there may be some delays for vehicles waiting to exit from Voyageur Way to Hammonds Plains Road, trips are not expected to have a significant impact to the performance of Hammonds Plains Road, nearby intersections, or the regional street network.

If you have any questions or comments, please contact me by Email to ken.obrien@genivar.com or telephone 443-7747.

Sincerely:

DRAFT LETTER

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



Ref. No. 131-21377-2

January 31, 2014

Mr. Patrick LeRoy, BBA, MBA
Vice President of Operations
United Gulf Developments Limited

Sent via Email to partick@unitedgulf.ca

Re: Addendum - Traffic Impact Statement, Proposed Commercial Development, Voyageur Way @ Hammonds Plains Road Intersection, Hammonds Plains, Nova Scotia : GENIVAR Inc. October 30, 2013

Dear Mr. LeRoy:

This is the Addendum Traffic Impact Analysis for the October 30, 2013, *Traffic Impact Statement Proposed Commercial Development, Voyageur Way @ Hammonds Plains Road Intersection*, to provide the following additional information requested by HRM:

- a TIS that discusses how the re-zoning may affect the local road network based on the highest traffic generating use(s) permitted under the proposed zone; and
- analyses for the Hammonds Plains Road / Voyageur Way intersection to identify any infrastructure upgrades that may be required.

Background - The October 2013 Traffic Impact Statement (TIS) considered the impacts of developing approximately 40,000 square feet of community oriented businesses in five buildings (Figure 1) based on the following potential land uses:

- Buildings 1 and 5 - specialty retail with a total of 20,000 square feet of gross floor area;
- Buildings 2 and 3 - site down restaurants which will not be open during the AM peak hour with a total of 10,000 square feet of gross floor area;
- Building 4 - a variety of small 'fast food' restaurants with a total of 10,000 square feet of gross floor area, including a coffee shop without a drive through lane which will operate during both AM and PM peak periods, and others that will not be open during the AM.

Site generated external trip estimates based on the potential land uses which included mixed / specialty retail; coffee house and takeout restaurant; full service family restaurant; multi-tenant market / specialty, organic and health food offering; and pharmacy with professional/doctor offices, with normal expected operating hours for the various land uses, included 147 two-way external vehicle trips (76 entering and 71 exiting) during the AM peak hour and 369 two-way external vehicle trips (193 entering and 176 exiting) during the PM peak hour.

Due to sensitivities around traffic volumes on Hammond Plains Road, HRM Development Services has requested a traffic analysis of the Hammonds Plains Road / Voyageur Way intersection based on the theoretical maximization of allowable land uses found under the C-4 zone.

Trip Generation for a Theoretical Development - The following assumptions for land use have been applied to provide a basis for trip generation estimates to satisfy HRM concerns:

- Uses with significantly higher trip generation rates than Specialty Retail have been used;
- While some land uses, such as Fast Food Restaurants, may not occupy the total permitted 10,000 SF per lot, it is assumed that each lot will be developed to the maximum; and
- While some food services businesses may not be open during AM peak hours, trip generation estimates have been prepared for both AM and PM peak hours.

Trip generation estimates (Table 1) have been prepared for the following assumed land uses:

- Building 1 - 10,000 SF Supermarket;
- Buildings 2 and 3 - site down restaurants with a total of 10,000 SF of gross floor area;
- Building 4 - a variety of small 'fast food' restaurants with a total of 10,000 SF; and
- Building 5 - a 10,000 SF Drug Store.

Table 1 - Trip Generation Estimates for Proposed Development									
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
Building 1 Supermarket (Land Use 850)	10.0 KGLA	0.60	0.36	4.83	4.65	6	4	48	47
Buildings 2 and 3 Restaurant ⁴ (Land Use 932)	10.0 KGFA	5.95	4.86	5.61	3.74	60	49	56	37
Building 4 Restaurant ⁵ (Land Use 936)	2.5 KGFA	55.27	53.11	20.38	20.37	138	133	51	51
Building 4 Restaurant ⁶ (Land Use 933)	7.5 KGFA	26.32	17.55	13.34	12.81	197	132	100	96
Building 5 Drug Store (Land Use 880)	10.0 KGFA	1.91	1.03	4.12	4.28	19	10	41	43
Trip Generation Estimates for the Proposed Commercial Development						420	328	296	274
20% Reduction for Local Trips and On-Site Synergy Trips ⁷						84	66	59	55
Adjusted External Trip Estimates for the Commercial Development						336	262	237	219
50% Pass-By Trips for External Vehicle Trips ⁸						150	150	114	114
Primary Site Generated Vehicle Trips						186	112	123	105
NOTES: 1. Rates are for Land Use Codes, <i>Trip Generation, 9th Edition</i> , Institute of Transportation Engineers, 2012. 2. KGFA is 'Gross Floor Area x 1000 square feet'; KGLA is 'Gross Leasable Area x 1000 square feet'; and 'number of apartment units'. 3. Rates are 'vehicles per hour per unit'; Trips generated are 'vehicles per hour for peak hours'. 4. These units will be considered as High Turn-Over Sit Down restaurants. 5. This land use is considered Coffee Shop Without Drive Through Window. Due to the location and the proposed community use expected from this shop, the lower trip generation rates included on Pages 1937 and 1938 of <i>Trip Generation, 9th Edition</i> , have been used. 6. These units are considered as Fast Food Restaurants Without Drive Through Window. 7. A 20% adjustment has been applied to account for local trips from within Voyageur Way and Kingswood, as well as cross shopping and on-site synergies between the retail and restaurant land uses. 8. Since a significant part of the site trips is expected to be from existing trips using Hammonds Plains Road, a 50% pass-by rate has been used.									

Two trip types are included in the external vehicle trips generated by the site:

- **Pass-By Trips** are those that are attracted to the site by vehicles on Hammonds Plains Road that now drive by the site during AM and PM peak hours. These trips will enter the site and then resume their trips towards their destinations. Since a significant part of trips generated by this development are expected to be from vehicles already using Hammonds Plains Road, a 50% pass-by rates has been used. Pass-by trips from Hammonds Plains Road trips are estimated to include 150 vehicles entering and exiting during the AM peak hour and 114 vehicles entering and exiting during the PM peak hour.
- **Primary Trips** are those that are made specifically to visit the site. These trips enter the site and then return to the street network towards the trip origin. Primary site generated trips are estimated to include 298 two-way vehicle trips (186 entering and 112 exiting) during the AM peak hour and 228 two-way vehicle trips (123 entering and 105 exiting) during the PM peak hour.

Projected 2014 and 2019 Volumes - A six hour turning movement count (Table A-1) obtained by HRM on November 1, 2012, has been used to estimate background volumes for this analysis. The 2012 volumes have been increased using a 1% annual volume growth rate to provide projected 2014 and 2019 AM and PM peak hourly volumes which are illustrated diagrammatically on Figure A-1, Appendix A.

Site generated trips have been assigned to the Hammonds Plains Road / Voyageur Way intersection and the right-out only driveway to Hammonds Plains Road eastbound. Pass-by trips have been distributed and assigned in accordance with the directional split of Hammonds Plains Road AM and PM peak hourly volumes. Primary trips have been distributed with 50% to the west and 50% to the east.

Site generated trips for 25% of the total development, illustrated diagrammatically in Figure A-2, Boxes A and B, have been added to projected 2014 background volumes to provide projected 2014 volumes that include 25% of the theoretical development which are illustrated diagrammatically in Figure A-2, Boxes C and D.

Site generated trips for full build-out development, illustrated diagrammatically in Figure A-3, Boxes A and B, have been added to projected 2019 background volumes to provide projected 2019 volumes that include full build-out of the theoretical development which are illustrated diagrammatically in Figure A-3, Boxes C and D.

Signal Warrant Analysis - A signal warrant analysis is completed to determine if the installation of traffic signals at an intersection will provide a positive impact on total intersection operation. That is, the benefits in time saved and improved safety that will accrue to vehicles entering from a side street will exceed the impact that signals will have in time lost and potential additional collisions for vehicles approaching the intersection on the main street. The *Canadian Traffic Signal Warrant Matrix Analysis* (Transportation Association of Canada (TAC), 2005) considers 100 warrant points, and higher than 75 vph average approach volume on the side street, as an indication that traffic signals will provide a positive impact. Signal warrant analysis uses vehicular and pedestrian volumes, and intersection, roadway and study area characteristics to calculate a warrant point value.

Signal warrant analyses were completed for the Hammonds Plains Road / Voyageur Way intersection for projected 2014 background volumes without site development, projected 2014 volumes with 25% site generated trips, and projected 2019 volumes that include trips from full site

development. Analysis sheets are included in Tables A-1 to A-3, Appendix A, and warrant point results are itemized below.

- Table A-1 - 2014 Background volumes without the site - 23 points.
- Table A-2 - 2014 volumes with 25% site development - 49 points
- Table A-3 - 2019 volumes with full site development - 137 points.

Signal warrant analysis indicates that signals will not be required for 2014 volumes that include 25% of site trips, however, signals will be warranted for intersection volumes that include trips from full site development.

Level of Service Analysis Principles - 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 is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and increased travel time. LOS criteria (Table 2) are stated in terms of average control delay per vehicle which includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. LOS 'A' describes an intersection approach with a very low control delay of up to ten seconds per vehicle. On the other hand, LOS 'F' describes an intersection with control delay greater than 80 seconds (50 seconds for STOP control), which is considered unacceptable by most drivers.

LOS	Signalized Intersections Control Delay (seconds per vehicle)	LOS Description	Two Way Stop Controlled (TWSC) Intersections Control Delay (seconds per vehicle)
A	less than 10.0	Very low delay; most vehicles do not stop (Excellent)	less than 10.0
B	between 10.0 and 20.0	Higher delay; more vehicles stop (Very Good)	between 10.0 and 15.0
C	between 20.0 and 35.0	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	between 35.0 and 55.0	Congestion becomes noticeable; vehicles must sometimes wait through more than one red light; many vehicles stop (Satisfactory)	between 25.0 and 35.0
E	between 55.0 and 80.0	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	greater than 80.0	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

HRM Critical Limits for Intersection Performance Evaluation - the HRM *Guidelines for Preparation of Transportation Impact Studies* indicates the following critical limits for intersection evaluation:

1. the v/c ratio of an intersection exceeds 0.85;
2. the v/c ratio of an individual through movement or shared through/ turning movement exceeds 0.85;
3. the v/c ratio of an exclusive turning movement exceeds 1.0;
4. an exclusive turning movement generates queues which exceed the available turning lane storage space.

Intersection Level of Service Analysis - Synchro 8.0 software has been used for performance evaluation of the Hammonds Plains Road / Voyageur Way intersection for projected 2014 AM and PM peak hour volumes, both without and with 25% of site generated volumes, as well as for 2019 AM and PM peak hour volumes without the site with STOP sign traffic control. Analysis of 2019 volumes with full build-out site generated trips was completed for traffic signal control. Analysis results are included on Pages A-8 to A-15, and results are summarized in Table 3.

Table 3 - LOS for Hammonds Plains Road @ Voyageur Way Intersection						
LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement					Intersection LOS
	EB-TR	WB-L	WB-T	NB-L	NB-R	
AM Peak Hour - Projected 2014 Background Volumes without Site (Page A-8)						
Delay	0.0	10.2	0.0	22.6	1.0	
v/c	0.56	0.05	0.21	0.11	-	
Queue	0.0	1.1	0.0	2.7	-	
AM Peak Hour - Projected 2014 Volumes with 25% Site (Page A-10)						
Delay	0.0	10.7	0.0	29.2	2.5	
v/c	0.58	0.10	0.20	0.32	-	
Queue	0.0	2.5	0.0	10.1	-	
AM Peak Hour - Projected 2019 Background Volumes without Site (Page A-12)						
Delay	0.0	10.5	0.0	26.0	1.1	
v/c	0.59	0.05	0.22	0.16	-	
Queue	0.0	1.1	0.0	4.1	-	
AM Peak Hour - Projected 2019 Volumes with 100% Site (Page A-14)						
Delay	13.5	54.7	4.0	48.2	11.6	17.9
v/c	0.81	0.89	0.23	0.63	0.50	-
Queue	158.4	32.0	21.3	35.4	16.0	-
PM Peak Hour - Projected 2014 Background Volumes without Site (Page A-9)						
Delay	0.0	8.5	0.0	28.0	1.4	
v/c	0.30	0.03	0.55	0.28	-	
Queue	0.0	0.6	0.0	8.6	-	
PM Peak Hour - Projected 2014 Volumes with 25% Site (Page A-11)						
Delay	0.0	8.7	0.0	48.7	4.0	
v/c	0.31	0.06	0.53	0.61	-	
Queue	0.0	1.5	0.0	26.4	-	
PM Peak Hour - Projected 2019 Background Volumes without Site (Page A-13)						
Delay	0.0	8.6	0.0	32.0	1.6	
v/c	0.31	0.03	0.58	0.32	-	
Queue	0.0	0.7	0.0	10.1	-	
PM Peak Hour - Projected 2019 Volumes with 100% Site (Page A-15)						
Delay	7.0	8.2	12.3	36.6	9.6	12.3
v/c	0.51	0.40	0.75	0.60	0.30	-
Queue	43.1	17.5	91.5	54.9	12.7	-

Summary Level of Service Analysis - Level of service analysis indicated the following:

- The intersection is expected to operate within HRM critical limits with STOP control for 2014 and 2019 background volumes, as well as for 2014 volumes that include 25% of site generated trips; and
- The intersection is expected to operate within HRM limits with traffic signal control for 2019 volumes that include trips from 100% site development

Addendum Summary

1. This Addendum Traffic Impact Analysis for the October 30, 2013, *Traffic Impact Statement Proposed Commercial Development, Voyageur Way @ Hammonds Plains Road Intersection*, has been prepared to provide the following additional information requested by HRM:
 - a TIS that discusses how the re-zoning may affect the local road network based on the highest traffic generating use(s) permitted under the proposed zone; and
 - analyses for the Hammonds Plains Road / Voyageur Way intersection to identify any infrastructure upgrades that may be required.
2. The following assumptions for theoretical high trip generating land uses have been used to provide a basis for trip generation estimates to satisfy HRM concerns:
 - Uses with significantly higher trip generation rates than Specialty Retail have been used;
 - While some land uses, such as Fast Food Restaurants, may not occupy the total permitted 10,000 SF per lot, it is assumed that each lot will be developed to the maximum; and
 - While some food services businesses may not be open during AM peak hours, trip generation estimates have been prepared for both AM and PM peak hours.
3. Site generated external trip estimates based on the land uses included in the October 2013 Traffic Impact Statement included 147 two-way external vehicle trips (76 entering and 71 exiting) during the AM peak hour and 369 two-way external vehicle trips (193 entering and 176 exiting) during the PM peak hour.

Site generated external trip estimates based on the theoretical maximized land uses included in Addendum include 598 two-way external vehicle trips (336 entering and 262 exiting) during the AM peak hour and 456 two-way external vehicle trips (237 entering and 219 exiting) during the PM peak hour.

4. Site generated trips have been assigned to the Hammonds Plains Road / Voyageur Way intersection and the right-out only driveway to Hammonds Plains Road eastbound. Pass-by trips have been distributed and assigned in accordance with the directional split of Hammonds Plains Road AM and PM peak hourly volumes. Primary trips have been distributed with 50% to the west and 50% to the east.
5. While signal warrant analysis indicates that signals will not be required for 2014 background volumes (23 points) or 2014 volumes that include 25% of site trips (49 points), signals will be warranted for projected 2019 intersection volumes (137 points) that include trips from full site development with theoretical maximized land uses.
6. Level of service analysis indicates the following:
 - The intersection is expected to operate within HRM critical limits with STOP control for 2014 and 2019 background volumes, as well as for 2014 volumes that include 25% of site generated trips; and

- The intersection is expected to operate within HRM limits with traffic signal control for 2019 volumes that include trips from 100% site development

Addendum Conclusions

7. Trips generated for 25% of the theoretical maximized land uses will not have a significant impact on the level of performance of the Hammonds Plains Road / Voyageur Way intersection.
8. The level of actual site development and traffic volumes at the Hammonds Plains Road / Voyageur Way intersection must be monitored as development occurs over the next five years to determine whether traffic signals will be required for actual 2019 volumes.

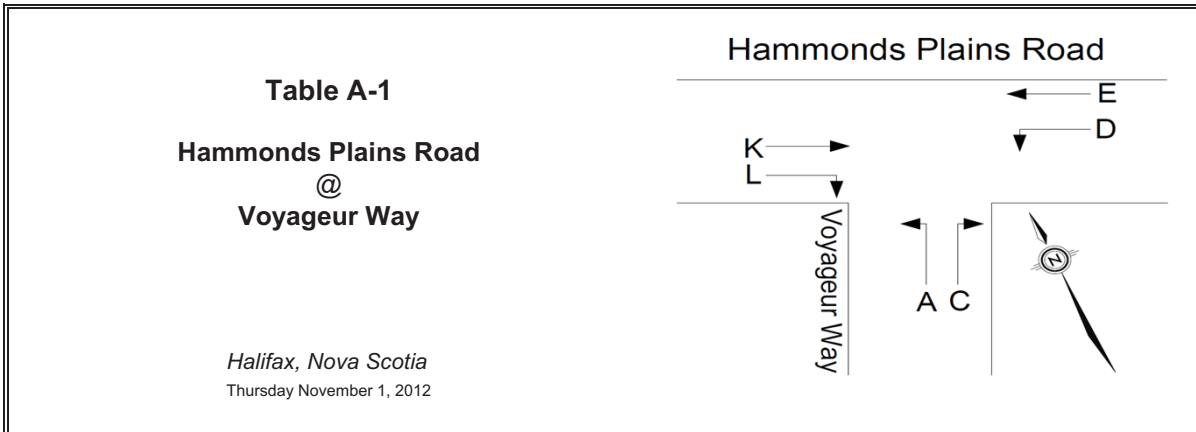
If you have any questions or comments, please contact me by Email to ken.obrien@wspgroup.com or telephone 443-7747.

Sincerely,

Original Signed

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

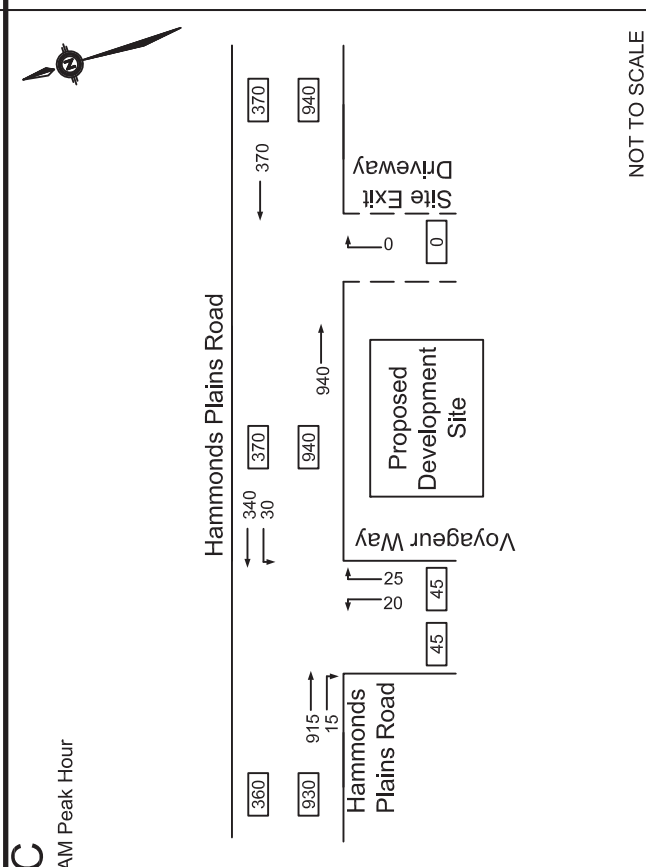
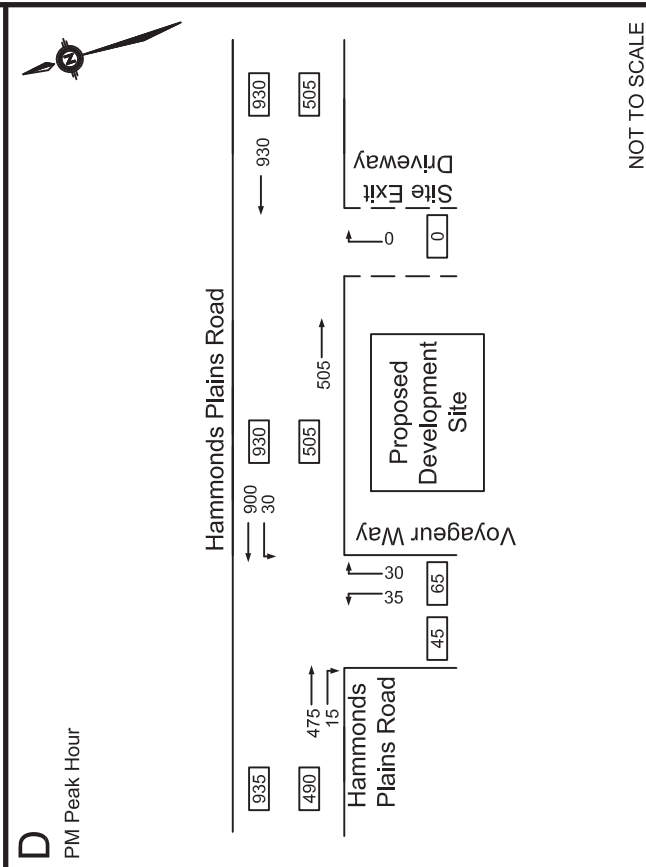
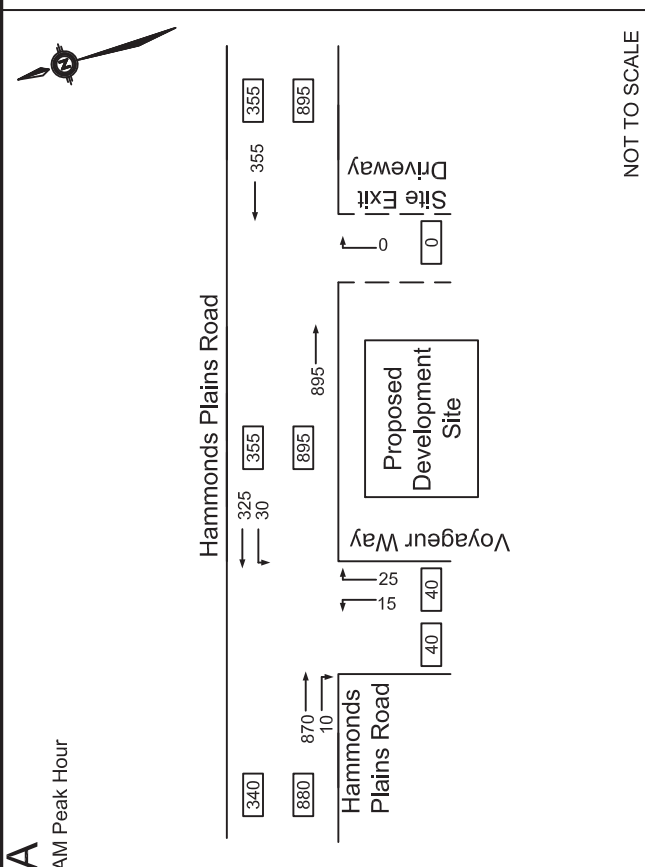
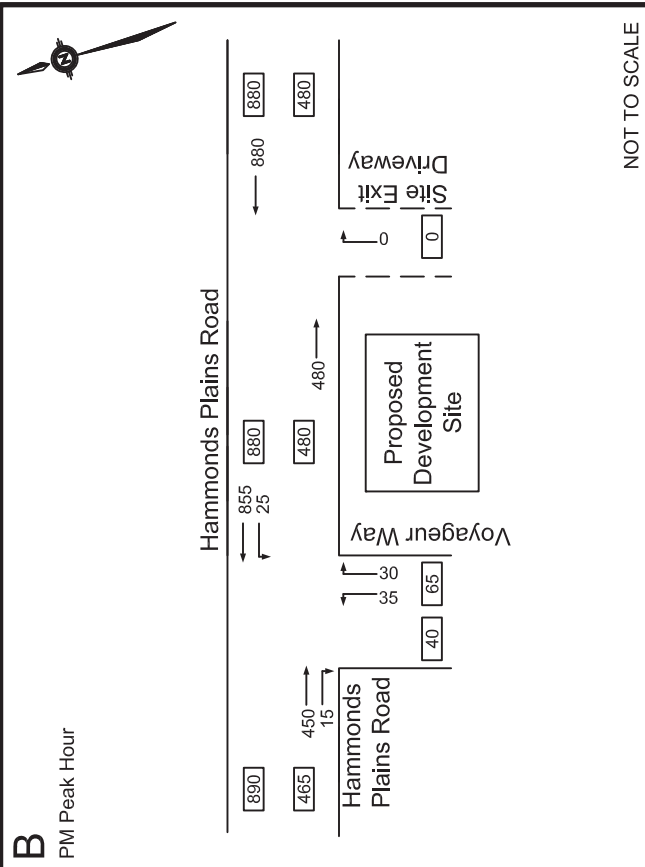




AM Peak Period Volume Data								
Time		Voyageur Way Northbound Approach		Hammonds Plains Road Westbound Approach		Hammonds Plains Road Eastbound Approach		Total Vehicles
		A	C	D	E	K	L	
07:00	07:15	5	7	11	76	210	3	312
07:15	07:30	5	7	11	76	210	3	312
07:30	07:45	4	3	5	81	222	2	317
07:45	08:00	3	6	2	85	213	4	313
08:00	08:15	7	13	4	63	187	6	280
08:15	08:30	6	11	5	82	203	4	311
08:30	08:45	4	4	2	80	175	2	267
08:45	09:00	8	10	8	97	164	5	292
7:00	8:00	17	23	29	318	855	12	1254
8:00	9:00	25	38	19	322	729	17	1150
AM Peak Hour		17	23	29	318	855	12	1254

Noon Peak Period Volume Data								
Time		Voyageur Way Northbound Approach		Hammonds Plains Road Westbound Approach		Hammonds Plains Road Eastbound Approach		Total Vehicles
		A	C	D	E	K	L	
11:00	11:15	2	8	4	73	106	4	197
11:15	11:30	1	4	5	81	98	4	193
11:30	11:45	3	5	7	89	114	2	220
11:45	12:00	2	4	3	75	103	2	189
12:00	12:15	1	3	4	89	87	5	189
12:15	12:30	5	7	9	79	86	3	189
12:30	12:45	4	3	3	90	86	3	189
12:45	13:00	3	5	2	90	96	2	198
11:00	12:00	8	21	19	318	421	12	799
12:00	13:00	13	18	18	348	355	13	765
Noon Peak Hour		8	21	19	318	421	12	799

PM Peak Period Volume Data								
Time		Voyageur Way Northbound Approach		Hammonds Plains Road Westbound Approach		Hammonds Plains Road Eastbound Approach		Total Vehicles
		A	C	D	E	K	L	
16:00	16:15	7	8	7	214	120	2	358
16:15	16:30	15	5	7	222	127	1	377
16:30	16:45	6	8	6	208	113	7	348
16:45	17:00	4	6	6	196	83	5	300
17:00	17:15	3	7	9	191	104	3	317
17:15	17:30	3	6	8	191	101	4	313
17:30	17:45	7	3	7	162	103	5	287
17:45	18:00	3	4	4	153	96	6	266
16:00	17:00	32	27	26	840	443	15	1383
17:00	18:00	16	20	28	697	404	18	1183
PM Peak Hour		32	27	26	840	443	15	1383





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Projected 2014 and 2019 Weekday AM and PM Peak Hour Background Traffic Without Site Development

Addendum Traffic Impact Analysis - Proposed Commercial Development
Voyageur Way @ Hammonds Plains Road Intersection, Hammonds Plains, NS

Figure A-1
January 2014

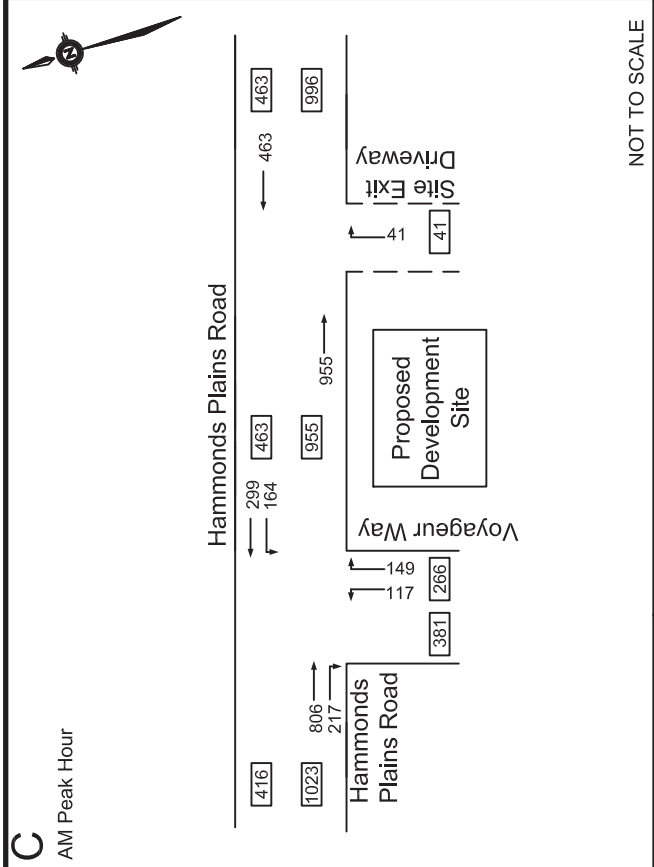
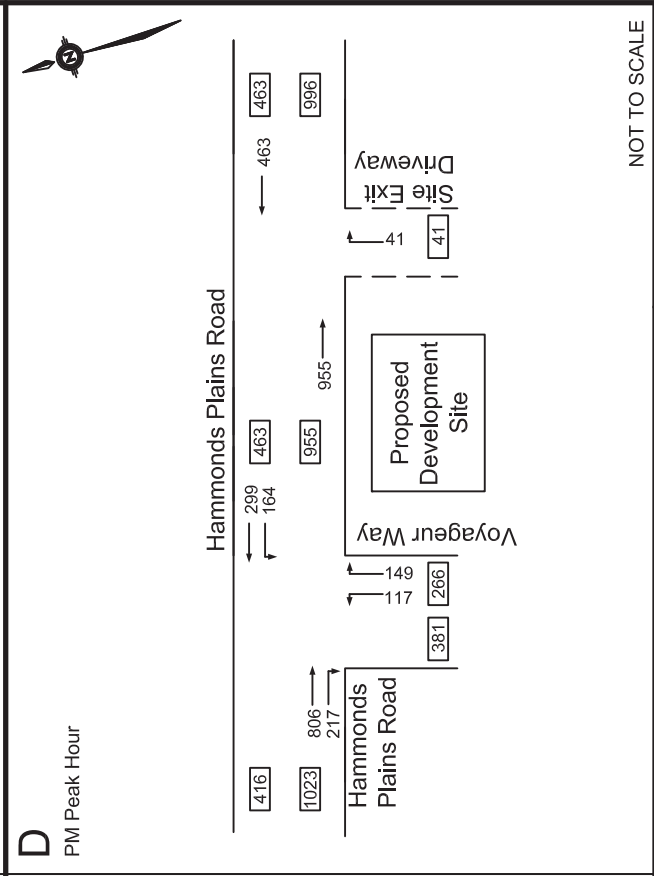
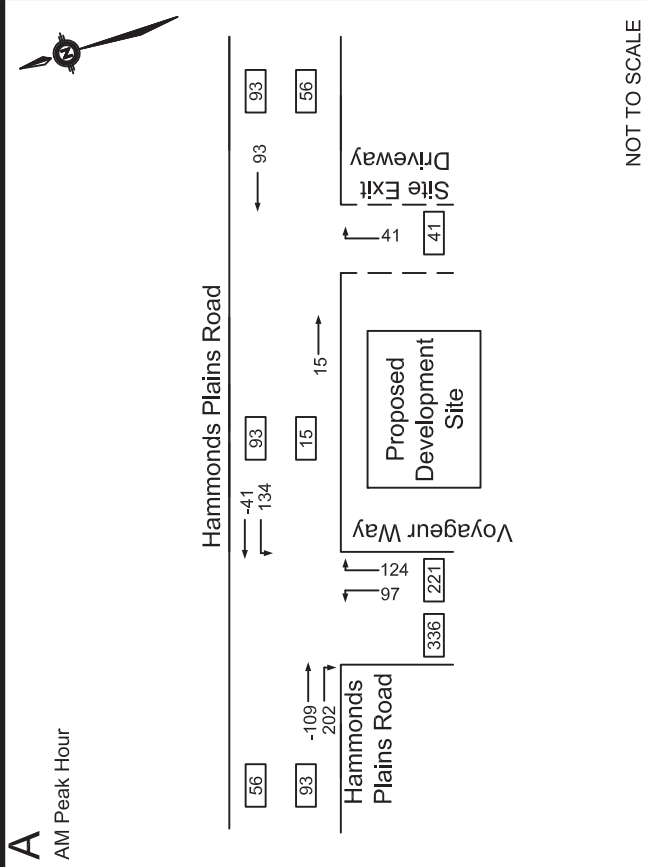
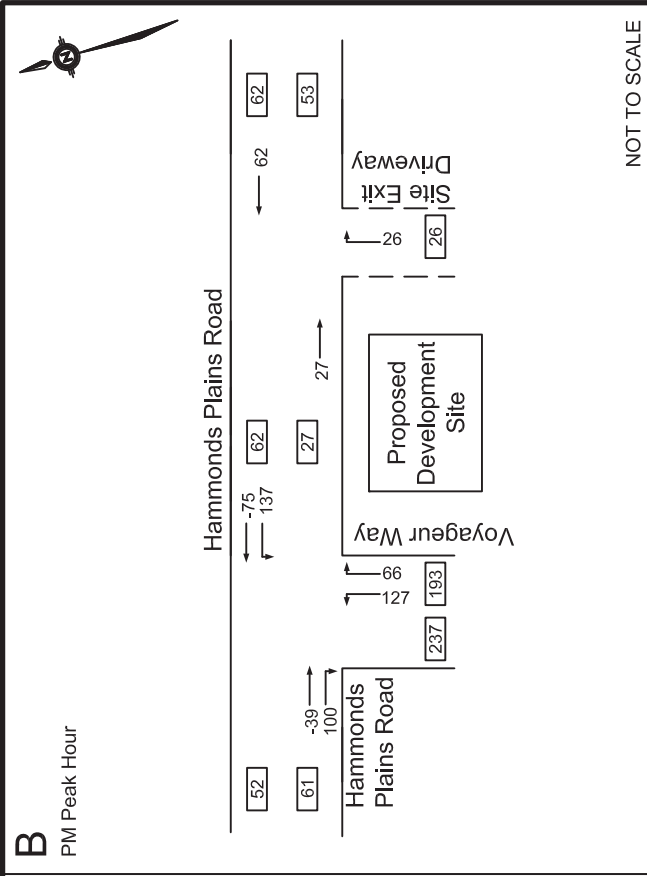
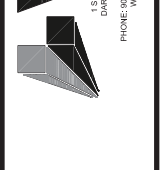


Figure A-3
January 2014

Addendum Traffic Impact Analysis - Proposed Commercial Development
Voyageur Way @ Hammonds Plains Road Intersection, Hammonds Plains, NS

Estimated Site Generated Trips (Full Buildout) and
2019 Weekday AM and PM Peak Hour Background Traffic With Site Development



2005 Canadian Traffic Signal Warrant Matrix Analysis

Table A-2 - Hammonds Plains Road @ Voyageur Way
Volumes without Development

Projected 2014

Main Street (name)	Hammonds Plains Road		Direction (EW or NS)	EW	Date:	January 2014		
Side Street (name)	Voyageur Way		Direction (EW or NS)	NS	City:	HRM		
Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Hammonds Plains Road	WB	1			1		1,200	1
Hammonds Plains Road	EB				1		800	1
Voyageur Way	NB	1				1		

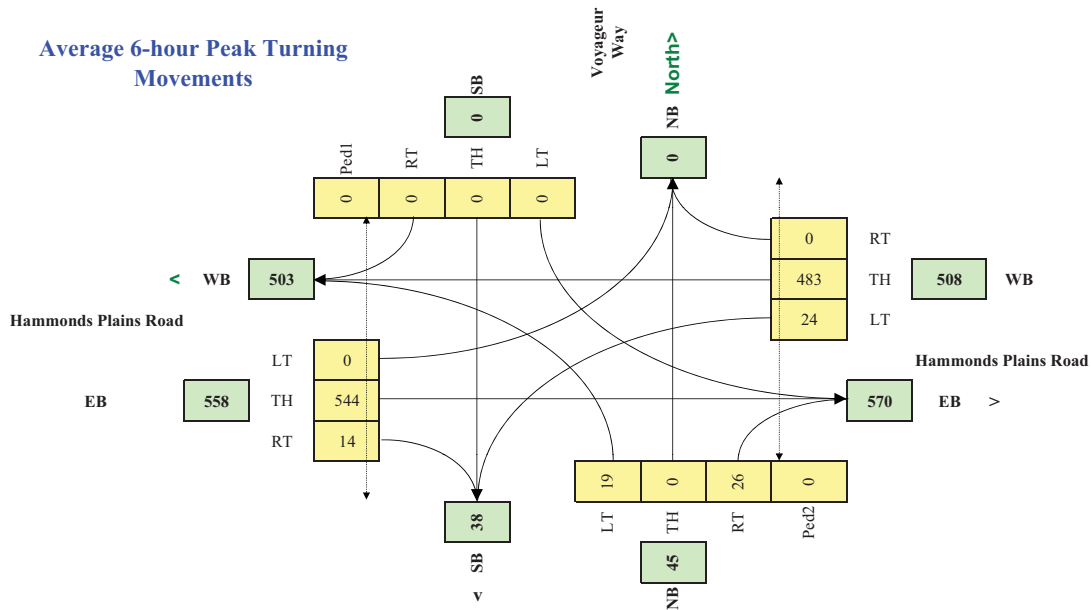
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Hammonds Plains Road	EW	70	2.0%	n	0.0
Voyageur Way	NS		2.0%	n	

	Ped1	Ped2	Ped3	Ped4
	NS	NS	EW	EW
	W Side	E Side	N Side	S side
7:00 - 8:00				
8:00 - 9:00				
11:00 - 12:00				
12:00 - 13:00				
16:00 - 17:00				
17:00 - 18:00				
Total (6-hour peak)	0	0	0	0
Average (6-hour peak)	0	0	0	0

Demographics		
Elementary School	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	380,000
Central Business District	(y/n)	n

Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:00 - 8:00	15	0	25	0	0	0	30	325	0	0	870	10
8:00 - 9:00	25	0	40	0	0	0	20	330	0	0	745	15
11:00 - 12:00	10	0	20	0	0	0	20	325	0	0	430	10
12:00 - 13:00	15	0	20	0	0	0	20	355	0	0	360	15
16:00 - 17:00	35	0	30	0	0	0	25	855	0	0	450	15
17:00 - 18:00	15	0	20	0	0	0	30	710	0	0	410	20
Total (6-hour peak)	115	0	155	0	0	0	145	2,900	0	0	3,265	85
Average (6-hour peak)	19	0	26	0	0	0	24	483	0	0	544	14

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v-v}) / K_1 + (F(X_{v-p}) L) / K_2] \times C_i$$

W =	23	23	0
		Veh	Ped

Not Warranted - Vs < 75

2005 Canadian Traffic Signal Warrant Matrix Analysis

Table A-3 - Hammonds Plains Road @ Voyageur Way

Projected 2014

Volumes with 25% Development

Main Street (name)	Hammonds Plains Road		Direction (EW or NS)	EW	Date:	January 2014		
Side Street (name)	Voyageur Way		Direction (EW or NS)	NS	City:	HRM		
Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Hammonds Plains Road	WB	1			1		1,200	1
Hammonds Plains Road	EB				1		800	1
Voyageur Way	NB	1				1		

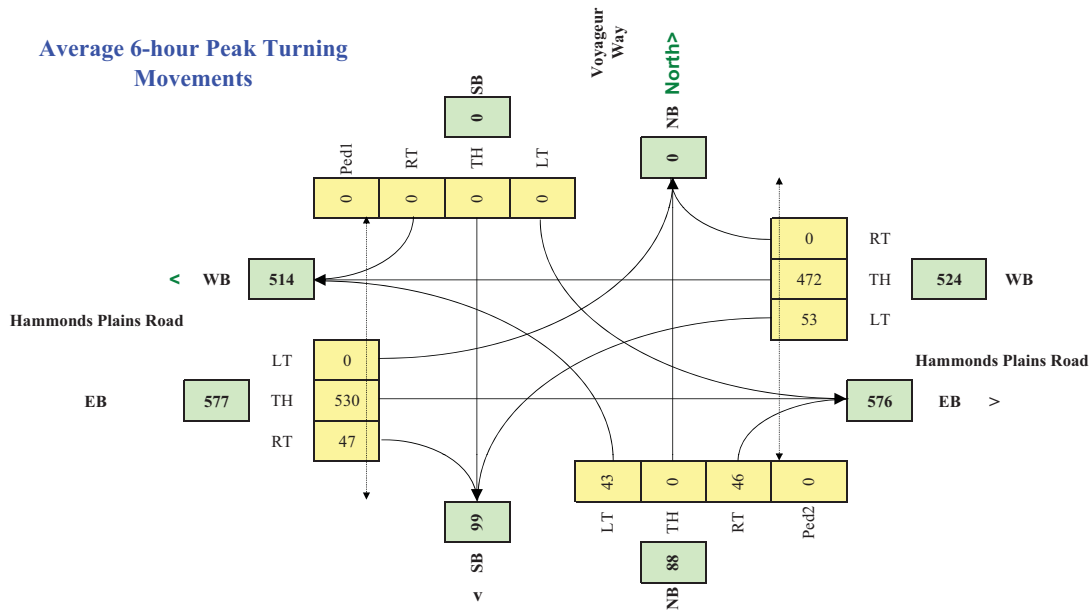
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Hammonds Plains Road	EW	70	2.0%	n	0.0
Voyageur Way	NS		2.0%	n	

	Ped1	Ped2	Ped3	Ped4
	NS	NS	EW	EW
	W Side	E Side	N Side	S side
7:00 - 8:00				
8:00 - 9:00				
11:00 - 12:00				
12:00 - 13:00				
16:00 - 17:00				
17:00 - 18:00				
Total (6-hour peak)	0	0	0	0
Average (6-hour peak)	0	0	0	0

Demographics		
Elementary School	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	380,000
Central Business District	(y/n)	n

Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:00 - 8:00	40	0	55	0	0	0	65	315	0	0	845	65
8:00 - 9:00	50	0	70	0	0	0	50	320	0	0	720	65
11:00 - 12:00	25	0	35	0	0	0	40	315	0	0	420	35
12:00 - 13:00	30	0	35	0	0	0	40	345	0	0	350	35
16:00 - 17:00	65	0	45	0	0	0	60	840	0	0	440	40
17:00 - 18:00	45	0	35	0	0	0	60	695	0	0	405	40
Total (6-hour peak)	255	0	275	0	0	0	315	2,830	0	0	3,180	280
Average (6-hour peak)	43	0	46	0	0	0	53	472	0	0	530	47

Average 6-hour Peak Turning Movements



$$W = [C_b(X_{v-v}) / K_1 + (F(X_{v-p}) L) / K_2] \times C_i$$

W =	49	49	0
		Veh	Ped
NOT Warranted			

2005 Canadian Traffic Signal Warrant Matrix Analysis

Table A-3 - Hammonds Plains Road @ Voyageur Way

Projected 2014

Volumes with 25% Development

Main Street (name)	Hammonds Plains Road		Direction (EW or NS)	EW	Date:	January 2014		
Side Street (name)	Voyageur Way		Direction (EW or NS)	NS	City:	HRM		
Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Hammonds Plains Road	WB	1			1		1,200	1
Hammonds Plains Road	EB				1		800	1
Voyageur Way	NB	1				1		

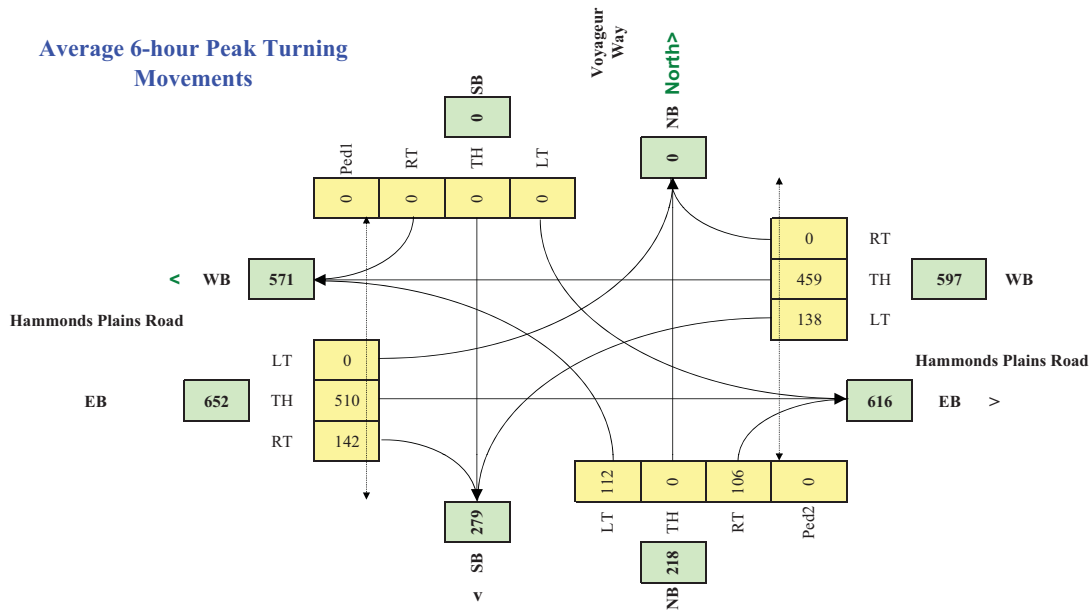
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Hammonds Plains Road	EW	70	2.0%	n	0.0
Voyageur Way	NS		2.0%	n	

	Ped1	Ped2	Ped3	Ped4
	NS	NS	EW	EW
	W Side	E Side	N Side	S side
7:00 - 8:00				
8:00 - 9:00				
11:00 - 12:00				
12:00 - 13:00				
16:00 - 17:00				
17:00 - 18:00				
Total (6-hour peak)	0	0	0	0
Average (6-hour peak)	0	0	0	0

Demographics		
Elementary School	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	380,000
Central Business District	(y/n)	n












Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:00 - 8:00	115	0	150	0	0	0	165	300	0	0	805	215
8:00 - 9:00	115	0	155	0	0	0	145	305	0	0	680	205
11:00 - 12:00	75	0	80	0	0	0	100	305	0	0	405	105
12:00 - 13:00	80	0	75	0	0	0	100	340	0	0	335	105
16:00 - 17:00	160	0	95	0	0	0	165	825	0	0	435	115
17:00 - 18:00	125	0	80	0	0	0	150	680	0	0	400	105
Total (6-hour peak)	670	0	635	0	0	0	825	2,755	0	0	3,060	850
Average (6-hour peak)	112	0	106	0	0	0	138	459	0	0	510	142












Average 6-hour Peak Turning Movements

























$$W = [C_{bt}(X_{v-v}) / K_1 + (F(X_{v-p}) L) / K_2] \times C_i$$












W =	137	137	0
		Veh	Ped
Warranted			












						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	870	10	30	325	15	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	946	11	33	353	16	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						5
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			957		1370	951
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			957		1370	951
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		89	91
cM capacity (veh/h)			719		154	315
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	957	33	353	43		
Volume Left	0	33	0	16		
Volume Right	11	0	0	27		
cSH	1700	719	1700	411		
Volume to Capacity	0.56	0.05	0.21	0.11		
Queue Length 95th (m)	0.0	1.1	0.0	2.7		
Control Delay (s)	0.0	10.2	0.0	22.6		
Lane LOS		B		C		
Approach Delay (s)	0.0	0.9		22.6		
Approach LOS				C		
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			56.4%		ICU Level of Service	B
Analysis Period (min)			15			

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	450	15	25	855	35	30
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	489	16	27	929	38	33
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						5
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			505		1481	497
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			505		1481	497
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		72	94
cM capacity (veh/h)			1059		134	573
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	505	27	929	71		
Volume Left	0	27	0	38		
Volume Right	16	0	0	33		
cSH	1700	1059	1700	250		
Volume to Capacity	0.30	0.03	0.55	0.28		
Queue Length 95th (m)	0.0	0.6	0.0	8.6		
Control Delay (s)	0.0	8.5	0.0	28.0		
Lane LOS		A		D		
Approach Delay (s)	0.0	0.2		28.0		
Approach LOS				D		
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			55.0%		ICU Level of Service	B
Analysis Period (min)			15			

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	842	61	64	315	39	57
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	915	66	70	342	42	62
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						5
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			982		1430	948
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			982		1430	948
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			90		68	80
cM capacity (veh/h)			703		134	316
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	982	70	342	104		
Volume Left	0	70	0	42		
Volume Right	66	0	0	62		
cSH	1700	703	1700	329		
Volume to Capacity	0.58	0.10	0.20	0.32		
Queue Length 95th (m)	0.0	2.5	0.0	10.1		
Control Delay (s)	0.0	10.7	0.0	29.2		
Lane LOS		B		D		
Approach Delay (s)	0.0	1.8		29.2		
Approach LOS				D		
Intersection Summary						
Average Delay			2.5			
Intersection Capacity Utilization			63.2%		ICU Level of Service	B
Analysis Period (min)			15			

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	440	40	60	836	67	46
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	478	43	65	909	73	50
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						5
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			522		1539	500
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			522		1539	500
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		39	91
cM capacity (veh/h)			1045		119	571
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	522	65	909	123		
Volume Left	0	65	0	73		
Volume Right	43	0	0	50		
cSH	1700	1045	1700	201		
Volume to Capacity	0.31	0.06	0.53	0.61		
Queue Length 95th (m)	0.0	1.5	0.0	26.4		
Control Delay (s)	0.0	8.7	0.0	48.7		
Lane LOS		A		E		
Approach Delay (s)	0.0	0.6		48.7		
Approach LOS				E		
Intersection Summary						
Average Delay			4.0			
Intersection Capacity Utilization			54.4%		ICU Level of Service	A
Analysis Period (min)			15			

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	915	15	30	340	20	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	995	16	33	370	22	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						5
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			1011		1438	1003
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1011		1438	1003
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		84	91
cM capacity (veh/h)			686		140	294
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	1011	33	370	49		
Volume Left	0	33	0	22		
Volume Right	16	0	0	27		
cSH	1700	686	1700	314		
Volume to Capacity	0.59	0.05	0.22	0.16		
Queue Length 95th (m)	0.0	1.1	0.0	4.1		
Control Delay (s)	0.0	10.5	0.0	26.0		
Lane LOS		B		D		
Approach Delay (s)	0.0	0.9		26.0		
Approach LOS				D		
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			59.1%		ICU Level of Service	B
Analysis Period (min)			15			

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	475	15	30	900	35	30
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	516	16	33	978	38	33
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						5
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			533		1568	524
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			533		1568	524
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		68	94
cM capacity (veh/h)			1035		118	553
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	533	33	978	71		
Volume Left	0	33	0	38		
Volume Right	16	0	0	33		
cSH	1700	1035	1700	220		
Volume to Capacity	0.31	0.03	0.58	0.32		
Queue Length 95th (m)	0.0	0.7	0.0	10.1		
Control Delay (s)	0.0	8.6	0.0	32.0		
Lane LOS		A		D		
Approach Delay (s)	0.0	0.3		32.0		
Approach LOS				D		
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization			57.4%		ICU Level of Service	B
Analysis Period (min)			15			

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↖	↗	↖	↗
Volume (vph)	806	217	164	299	117	149
Satd. Flow (prot)	1829	0	1789	1883	1789	1601
Flt Permitted			0.145		0.950	
Satd. Flow (perm)	1829	0	273	1883	1789	1601
Satd. Flow (RTOR)	44					162
Lane Group Flow (vph)	1112	0	178	325	127	162
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Total Split (s)	64.0		64.0	64.0	16.0	16.0
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0
Act Effect Green (s)	61.0		61.0	61.0	9.3	9.3
Actuated g/C Ratio	0.74		0.74	0.74	0.11	0.11
v/c Ratio	0.81		0.89	0.23	0.63	0.50
Control Delay	13.5		54.7	4.0	48.2	11.6
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	13.5		54.7	4.0	48.2	11.6
LOS	B		D	A	D	B
Approach Delay	13.5			21.9	27.7	
Approach LOS	B			C	C	
Queue Length 50th (m)	90.8		17.3	13.3	18.5	0.0
Queue Length 95th (m)	158.4		#32.0	21.3	#35.4	16.0
Internal Link Dist (m)	941.6			719.6	370.3	
Turn Bay Length (m)			40.0			
Base Capacity (vph)	1366		201	1394	217	337
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.81		0.89	0.23	0.59	0.48

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 82.3
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.89
 Intersection Signal Delay: 17.9
 Intersection Capacity Utilization 86.2%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Voyageur Way & Hammonds Plains Road



	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↖	↗	↖	↗
Volume (vph)	436	115	167	825	162	96
Satd. Flow (prot)	1831	0	1789	1883	1789	1601
Flt Permitted			0.382		0.950	
Satd. Flow (perm)	1831	0	719	1883	1789	1601
Satd. Flow (RTOR)	43					104
Lane Group Flow (vph)	599	0	182	897	176	104
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Total Split (s)	64.0		64.0	64.0	16.0	16.0
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0
Act Effect Green (s)	38.0		38.0	38.0	9.8	9.8
Actuated g/C Ratio	0.63		0.63	0.63	0.16	0.16
v/c Ratio	0.51		0.40	0.75	0.60	0.30
Control Delay	7.0		8.2	12.3	36.6	9.6
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	7.0		8.2	12.3	36.6	9.6
LOS	A		A	B	D	A
Approach Delay	7.0			11.6	26.6	
Approach LOS	A			B	C	
Queue Length 50th (m)	27.2		8.3	58.0	16.0	0.0
Queue Length 95th (m)	43.1		17.5	91.5	#54.9	12.7
Internal Link Dist (m)	941.6			719.6	370.3	
Turn Bay Length (m)			40.0			
Base Capacity (vph)	1717		673	1763	304	358
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.35		0.27	0.51	0.58	0.29

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 60.1
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.75
 Intersection Signal Delay: 12.3
 Intersection Capacity Utilization 63.2%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service B

95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Voyageur Way & Hammonds Plains Road

