

Ref. No. 111-24455

November 30, 2011

Mr. Roger Burns
Caliber Consulting Limited
23 Arrowhead Lane
ENFIELD NS B2T 1G9

**RE: Traffic Impact Analysis, Proposed Oakfield Woods Residential Development,
Frenchmans Road, Oakfield, Halifax County**

Dear Mr. Burns:

Caliber Consulting Limited is preparing plans for additional development in Oakfield Woods on Frenchmans Road, Oakfield (Figure 1). The project will consist of hybrid residential lots. The developer will request amendment of an existing Development Agreement (DA) that includes 54 approved lots, and add a new DA for 24 lots, for a total of 78 additional single family residential lots in the development. Development is expected to be completed by 2017. This is the Traffic Impact Statement (TIS) required to accompany the development application.

Description of Site Access - Site access is planned at the existing Frenchmans Road intersection on Trunk 2. Trunk 2 is a two lane paved road with gravel shoulders as illustrated in Photos 1 and 2. Stopping sight distances are adequate on both Trunk 2 approaches for the posted 80 km/h speed limit as illustrated in Photos 1 and 2.



Photo 1 - Looking north on Trunk 2 towards Enfield from the Frenchmans Road Intersection.

Manual Traffic Count - A manual turning movement count was obtained at the Frenchmans Road / Trunk 2 intersection during AM and PM peak periods on Friday, October 28, 2011. Tabulated volumes with AM and PM peak hours indicated by shaded areas are included in Table A-2, Appendix A, and are shown diagrammatically in Figure A-2, Boxes A and B.



Photo 2 - Looking south on Trunk 2 towards Grand Lake from the Frenchmans Road Intersection.

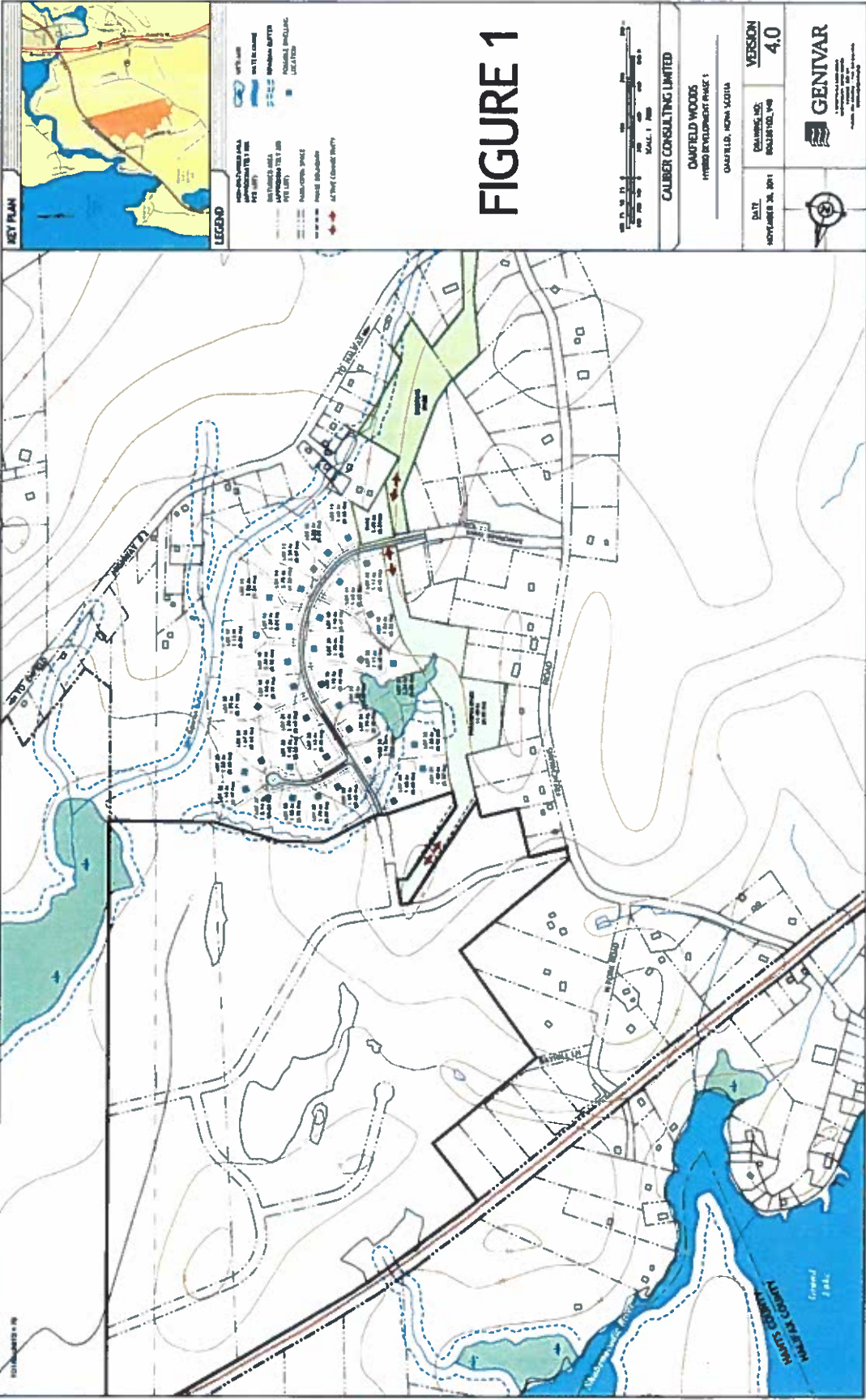


FIGURE 1

Estimation of 2022 Peak Hour Volumes - The Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) obtains machine counts periodically at a location on Trunk 2 in the Grand Lake area. Regression analysis of 1974 to 2011 Annual Average Daily Traffic (AADT) volumes (Figure A-1, Appendix A) indicates that the traffic volume growth rate is about 2.0% per year. The 2011 AM and PM peak hourly volumes obtained from the recent manual count (Table A-2, Appendix A) at the Frenchmans Road intersection have been increased by 22% to provide estimated 2022 AM and PM peak hourly volumes which are shown diagrammatically in Figure A-2, Boxes C and D.

Trip Generation - Trip Generation, 8th Edition (Institute of Transportation Engineers, Washington, 2008) provides trip generation rate estimates for single family dwellings. However, local traffic count studies have indicated that trip generation rates for subdivisions in rural and suburban areas of HRM are somewhat lower than the published ITE rates. It is assumed that these more remote developments usually will have lower trip generation characteristics since residents tend to link work, shopping, recreational and other trips. Trip generation rates from manual counts obtained for St. Andrews Village and Lake Fletcher Estates (2000) in Fall River and McCabe Lake Residential Development (2004) are compared to ITE published rates in Table 1.

Since the above analysis indicates it is reasonable to expect that rural and suburban single family resident units will generate trips at lower than the ITE published rates, AM published rates have been reduced by 10% and PM trip generation rates have been reduced by 20% to provide trip generation rates which have been used for trip estimation for the rural subdivision included in this study.

Time of Day	Value Compared (vph)	Trip Generation Rates (veh/hr per unit)				
		Counted ² (St. Andrews Village)	Counted ³ (Waterstone Village)	Average Calculated Rates ⁴	ITE Published Rates ⁵	Adjusted Rural Development Rates ⁶
AM Peak	Entering	0.15	0.13	0.14	0.19	0.17
	Exiting	0.48	0.54	0.51	0.56	0.51
	Two-Way	0.63	0.67	0.65	0.75	0.68
PM Peak	Entering	0.45	0.54	0.50	0.64	0.51
	Exiting	0.30	0.18	0.24	0.37	0.30
	Two-Way	0.75	0.72	0.74	1.01	0.81

NOTES

1. Trip Generation, 8th Edition, Institute of Transportation Engineers, Washington, 2008.
2. 'Counted' trip generation rates have been calculated from manual AM and PM peak period counts of trips entering and exiting St. Andrews Village and Lake Fletcher Estates areas on Lockview Road north of the entrance to Lockview High School (Final Report - Traffic Impact Study - St. Andrews Village, ARTM, March 2001)
3. Rates are local suburban subdivision rates for Residential Single Family Dwellings (Final Report - Traffic Impact Study - McCabe Lake Residential Development, ARTM, April, 2005).
4. Average calculated rates from two studies of suburban or rural single family residential developments.
5. ITE Land Use Code 210, Single Family Detached Housing
6. ITE published trip generation rates for AM peak hours have been reduced by 10% and PM trip generation rates have been reduced by 20% to account for lower expected trip generation rates for rural residential single family developments.

Trip Generation Estimates for the development, prepared using adjusted trip generation rates for a rural subdivision, are included in Table 2. It is estimated that the proposed development will generate 53 vehicle trips (13 entering and 40 exiting) during the AM peak hour and 63 vehicle trips (40 entering and 23 exiting) during PM peak hours.

Land Use	Number Units ²	Trip Generation Rates ¹				Trips Generated ³			
		AM Peak		PM Peak		AM Peak		PM Peak	
		In	Out	In	Out	In	Out	In	Out
Single Family Residential (Land Use Code 210)	78	0.17	0.51	0.51	0.30	13	40	40	23

NOTES: 1. Trip generation rates are 'vehicles per hour per unit' for the indicated land use which have been prepared by adjusting *Trip Generation, 8th Edition*, published rates as discussed in Table 1.
2. Units are number of residential units.
3. Vehicles per hour for peak hours.

Trip Distribution and Assignment - Based on review of the existing turning volumes at the Frenchmans Road intersection, it has been assumed that peak hour trips will be distributed with 65% to the north and 35% to the south on Trunk 2. Site generated trips for the fully developed site, shown diagrammatically in Figure A-3, Boxes A and B, have been added to 2022 projected background volumes (Figure A-2, Boxes C and D) to provide projected 2022 volumes that include site generated trips which are shown in Figure A-3, Boxes C and D.

Turn Lane Analysis - Review of both left and right turn warrant nomographs indicated that projected 2022 volumes at the Frenchmans Road intersection on Trunk 2 are considerably lower than those required to warrant either left turn or right turn lanes.

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 is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and increased travel time. LOS criteria (Table 3) 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	LOS Description	Two Way Stop Controlled (TWSC) Intersections Control Delay (seconds per vehicle)
A	Very low delay at the STOP sign (Excellent)	less than 10.0
B	Slightly higher delay at the STOP sign (Very Good)	between 10.0 and 15.0
C	Higher level of congestion; queue at the STOP sign may be two vehicles; main street may experience slight delays caused by left turning vehicles (Good)	between 15.0 and 25.0
D	Congestion becomes noticeable; vehicles must wait longer periods of time at the STOP sign; queues get longer (Satisfactory)	between 25.0 and 35.0
E	Delays at the STOP sign increase; queues at the STOP sign are often five or six vehicles; 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 at the STOP sign exceed the capacity of the intersection (Unacceptable)	greater than 50.0

Intersection Level of Service Analysis - Synchro 8.0 software has been used for performance evaluation of AM and PM peak hours at the Frenchmans Road / Trunk 2 intersection. Level of service (LOS) analysis was completed for projected 2022 volumes both without and with added site generated trips. Analysis results are included on Pages A-5 to A-8 and results are summarized in Table 4.

Summary Level of Service Analysis - Delays on the intersection approaches are low with a maximum delay of 10.3 seconds on the Frenchmans Road approach during 2022 with full site build-out. Volume / capacity ratios and 95th percentile queues are very low. Trips generated by Oakfield Woods will not have any significant impact on the level of performance Trunk 2 at this location.

Table 4 - LOS for Trunk 2 / Frenchmans 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 2022 Volumes without Site (Page A-5)				
Delay	9.4	0.7	0.0	2.0
LOS	A	A	A	A
v/c	0.04	0.08	0.05	-
Queue	0.8	0.2	0.0	-
AM Peak Hour - Projected 2022 Volumes with Site (Page A-7)				
Delay	9.7	1.0	0.0	3.2
LOS	A	A	A	A
v/c	0.07	0.08	0.08	-
Queue	1.8	0.3	0.0	-
PM Peak Hour - Projected 2022 Volumes without Site (Page A-6)				
Delay	9.9	0.7	0.0	1.3
LOS	A	A	A	A
v/c	0.03	0.09	0.10	-
Queue	0.7	0.2	0.0	-
PM Peak Hour - Projected 2022 Volumes with Site (Page A-8)				
Delay	10.3	1.5	0.0	2.1
LOS	B	A	A	A
v/c	0.06	0.11	0.11	-
Queue	1.4	0.4	0.0	-

Summary and Conclusions -

1. The proposed development will include approximately 78 single family hybrid residential lots. Site access is planned at the existing Frenchmans Road / Trunk 2 intersection.
2. Stopping sight distances on Trunk 2 approaches are adequate for the posted 80 km/h speed limit.
3. Trip generation estimates for the 78 single family dwellings include 53 vehicle trips (13 entering and 40 exiting) during the AM peak hour and 63 vehicle trips (40 entering and 23 exiting) during PM peak hours.
4. Projected volumes at the Frenchmans Road intersection on Trunk 2 are considerably lower than those required to warrant either left turn or right turn lanes.
5. Level of service analysis indicated that trips generated by the Oakfield Woods development will not have any significant impact on the level of performance Trunk 2 at this location.

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

Sincerely,

Original Signed

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

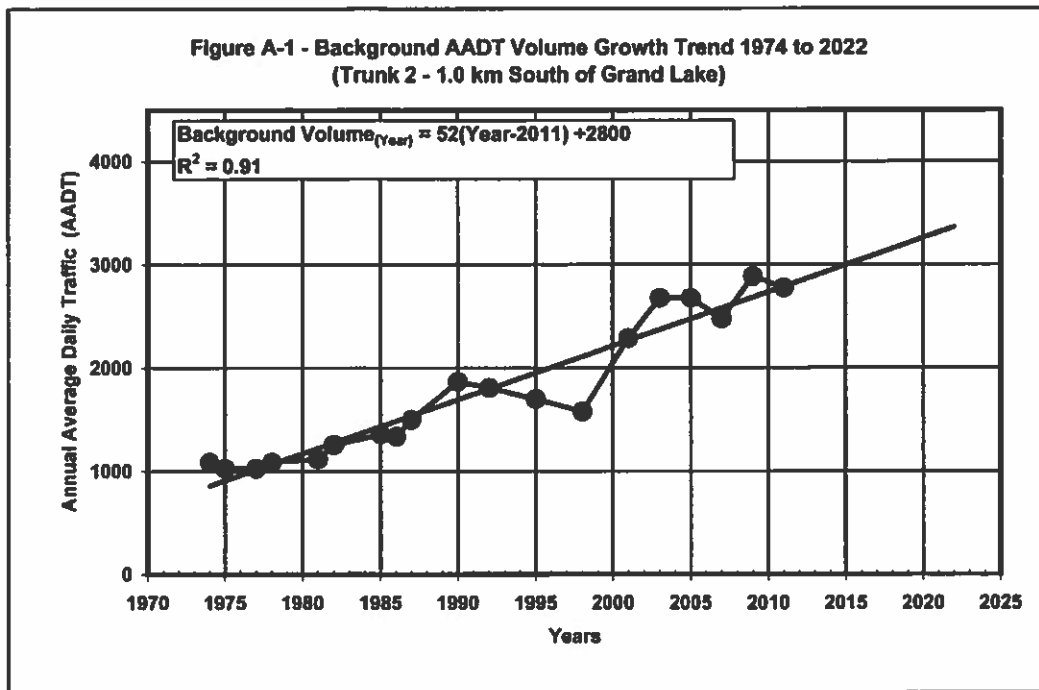


Table A-1 - Traffic Growth Trend on Trunk 2 - 1.0 km South of Grand Lake

Year	AADT Road Tube ²	AADT - Class. Count ³
1974	1240	1090
1975	1170	1030
1977	1170	1030
1978	1240	1090
1981	1270	1120
1982	1430	1260
1985	1550	1360
1986	1520	1340
1987	1710	1500
1990	2130	1870
1992	2060	1810
1995	1930	1700
1998	1800	1580
2001	2600	2290
2003	3040	2680
2005	3050	2680
2009	3280	2890
2011	3160	2780

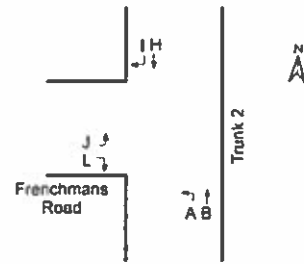
Source: NSTIR

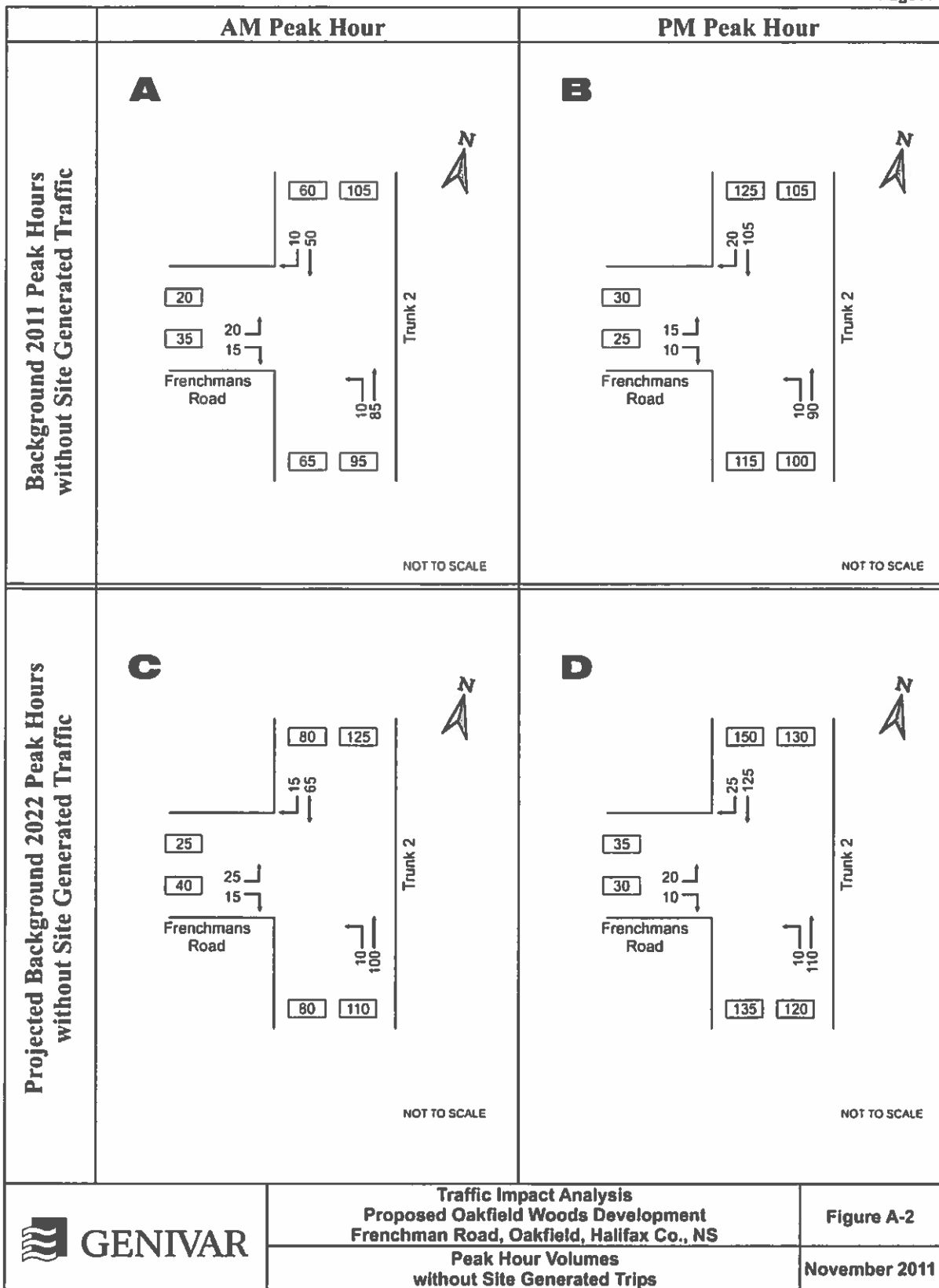
- Note:
1. The 2007 counts were obtained using a road tube counter and provide an estimate of AADT.
 2. The 1974 to 2005, and 2009 and 2011, road tube counts indicate 'number of axles divided by 2'
 3. The AADT - Class. Count column has been estimated based on 6% trucks with average 4 axles.
 4. The annual growth rate is 1.9% based on the estimated 2800 vpd 2011 AADT.

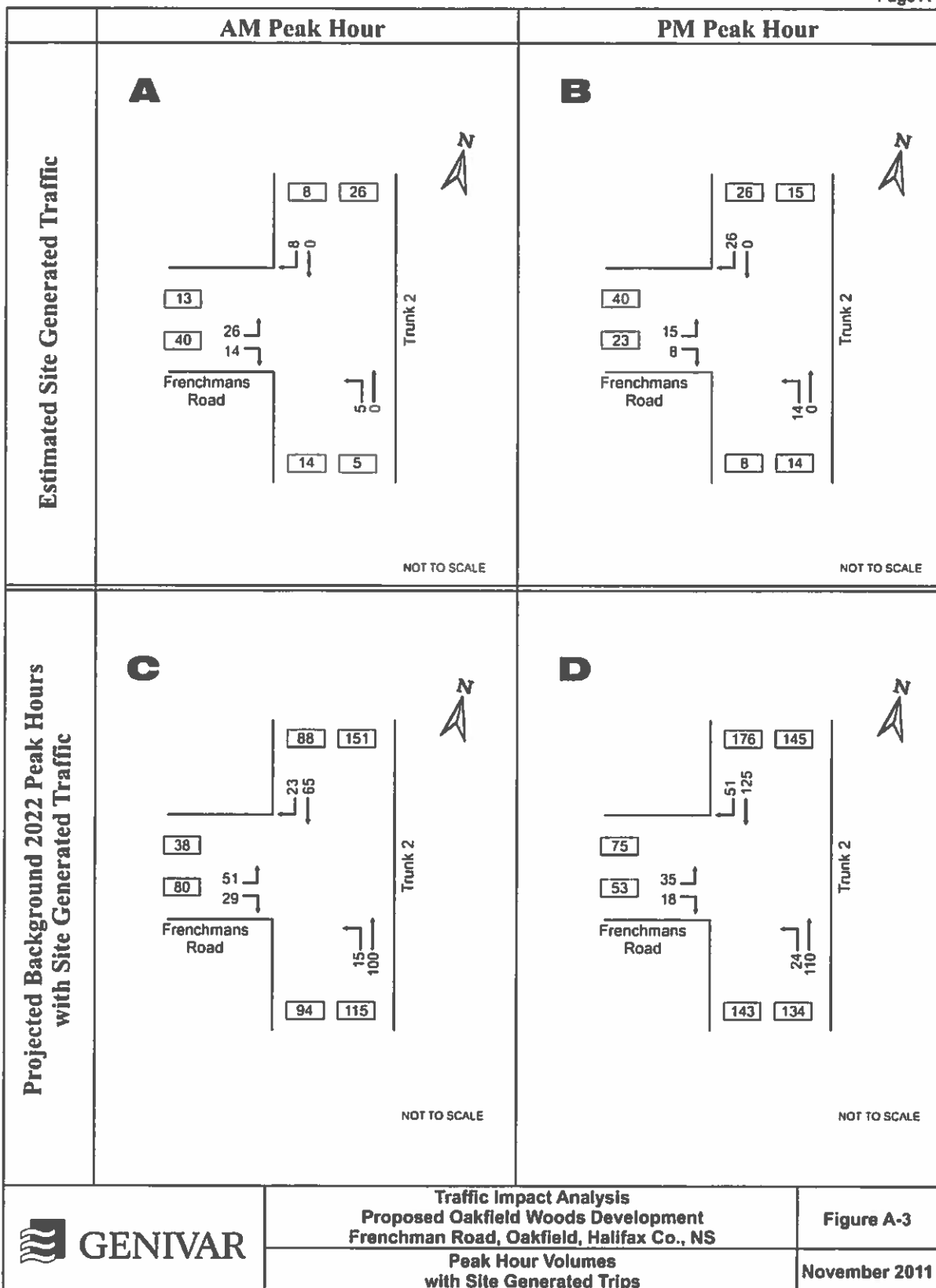


Time		Trunk 2 Northbound Approach		Trunk 2 Southbound Approach		Frenchmans Road Eastbound Approach		Total Vehicles
		A	B	H	I	J	L	
07:00-07:15		0	12	5	0	1	0	18
07:15-07:30		2	17	17	1	6	0	43
07:30-07:45		2	22	18	1	8	5	56
07:45-08:00		4	22	11	1	2	4	44
08:00-08:15		1	19	9	5	5	1	40
08:15-08:30		2	20	14	4	5	3	48
08:30-08:45		2	19	9	1	4	2	37
08:45-09:00		1	5	11	1	2	0	20
AM Peak Hour		9	83	52	11	20	13	188
16:00-16:15		1	10	8	2	0	0	21
16:15-16:30		2	31	15	3	1	1	53
16:30-16:45		2	21	12	0	3	0	38
16:45-17:00		2	30	23	6	7	3	71
17:00-17:15		3	29	32	4	3	1	72
17:15-17:30		2	3	28	8	2	1	44
17:30-17:45		1	28	20	3	4	3	59
17:45-18:00		4	34	23	4	1	2	68
PM Peak Hour		8	90	103	21	16	8	246

Table A-2
Trunk 2
@
Frenchmans Road
Oakfield, Nova Scotia
 Friday, October 28, 2011



























Appendix - Intersection Performance Analysis
1: Trunk 2 & Frenchmans Road

Page A-5
 2022 AM Peak Hour without Site Development (Fig. A2-C Vol.)

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	25	15	10	100	65	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)	27	16	11	109	71	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	209	79	87			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	209	79	87			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
pD queue free %	96	98	99			
cM capacity (veh/h)	773	982	1509			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	43	120	87			
Volume Left	27	11	0			
Volume Right	16	0	16			
cSH	1238	1509	1700			
Volume to Capacity	0.04	0.01	0.05			
Queue Length 95th (m)	0.8	0.2	0.0			
Control Delay (s)	9.4	0.7	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.4	0.7	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			2.0			
Intersection Capacity Utilization			22.5%		ICU Level of Service	A
Analysis Period (min)			15			











Appendix - Intersection Performance Analysis
1: Trunk 2 & Frenchmans Road

Page A-6
 2022 PM Peak Hour without Site Development (Fig. A2-D Vol.)

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	20	10	10	110	125	25
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)	22	11	11	120	136	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	291	149	163			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	291	149	163			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	99	99			
cM capacity (veh/h)	695	897	1416			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	33	130	163			
Volume Left	22	11	0			
Volume Right	11	0	27			
cSH	1042	1416	1700			
Volume to Capacity	0.03	0.01	0.10			
Queue Length 95th (m)	0.7	0.2	0.0			
Control Delay (s)	9.9	0.7	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.9	0.7	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			24.1%	ICU Level of Service		A
Analysis Period (min)			15			











Appendix - Intersection Performance Analysis
1: Trunk 2 & Frenchmans Road

Page A-7
 2022 AM Peak Hour with Site Development (Fig. A3-C Vol.)

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	51	29	15	100	65	23
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)	55	32	16	109	71	25
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	224	83	96			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	224	83	96			
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	97	99			
cM capacity (veh/h)	755	976	1498			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	87	125	96			
Volume Left	55	16	0			
Volume Right	32	0	25			
cSH	1185	1498	1700			
Volume to Capacity	0.07	0.01	0.06			
Queue Length 95th (m)	1.8	0.3	0.0			
Control Delay (s)	9.7	1.0	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.7	1.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			22.8%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix - Intersection Performance Analysis
1: Trunk 2 & Frenchmans Road

Page A-8
2022 PM Peak Hour with Site Development (Fig. A3-D Vol.)

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	35	18	24	110	125	51
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)	38	20	26	120	136	55
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	335	164	191			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	335	164	191			
IC, single (s)	6.4	6.2	4.1			
IC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	98	98			
cM capacity (veh/h)	648	881	1382			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	58	146	191			
Volume Left	38	26	0			
Volume Right	20	0	55			
cSH	981	1382	1700			
Volume to Capacity	0.06	0.02	0.11			
Queue Length 95th (m)	1.4	0.4	0.0			
Control Delay (s)	10.3	1.5	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.3	1.5	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			2.1			
Intersection Capacity Utilization			30.1%	ICU Level of Service		A
Analysis Period (min)			15			