



## MEMO

**DATE:** December 6, 2016  
**RE:** Flato North - Grey Road 9 Impacts

**FILE NO.:** 1060-4150

**TO:** Randy Scherzer, Director of Planning  
**COMPANY:** County of Grey  
**FROM:** Alexander J. W. Fleming, MBA, P.Eng; Michael A. Linton, MASc, E.I.T.

**CC:**

Dear Randy,

This memo has been prepared in regards to the concerns raised by County of Grey staff in the email titled "Comments from County Transportation Services - re: Flato North" dated November 7, 2016 regarding the application for the proposed Dundalk Meadows residential development. The comments provided by the County and associated responses are detailed below.

### **Traffic Impact Study**

- 1. Depending upon the phasing of the overall Flato developments, the County Transportation Services Department is concerned with the potential impacts to Grey Road 9 prior to the construction of Highway 10 access through the Flato East lands. Further information should be provided regarding the anticipated overall phasing of the Flato developments from a traffic impact perspective, including the anticipated timeframes for when the Highway 10 access through Flato East will be constructed so that the County Transportation Services can comment on the potential impacts of this development and the overall Flato developments on Grey Road 9.*

A draft Phasing Plan has been prepared to illustrate a forecasted buildout of the community as attached. Flato will use this plan as the basis for a phased agreement with the Municipality. The Plan is to be submitted for review at the onset of each proposed phase and is subject to adjustment by the Client and review agencies. Nonetheless, the overall phasing of the development will be determined in this manner and will ultimately depend on market demand. However, it can be reasonably assumed that construction phasing will occur eastwardly, commencing at the Flato West development. Therefore, it is anticipated that the Highway 10 access would be constructed in conjunction with the final unit phases east of the Foley Drain. In order to evaluate the sufficiency of the road network to accommodate the traffic generated by the subject development in advance of the proposed Highway 10 site access, supplementary analysis was undertaken as outlined below.

As the Highway 10 site access is not anticipated to be constructed prior to the commencement of construction of the units bounded by the Foley Drain and Highway 10, the remaining units would be required to utilize the Russell Street and Victoria Street accesses to the site. Accordingly, a total of 485 single-detached units and 56 townhouse units are expected to be constructed prior to the

construction of the Highway 10 access; thus equating to a total trip generation of 381 and 472 trips during the weekday a.m. and p.m. peak hours, respectively. The following table details the trip generation forecasts for the segments of the development as described.

**Table 1**  
**Trip Generation**

Subject Property	Use	Roadway Peak Hour	Number of Trips		
			Inbound	Outbound	Total
Flato East & Flato North	Residential Townhouse Units (Cat 230) (56 Units)	Weekday A.M.	5	27	32
		Weekday P.M.	25	12	37
	Single-Family Detached Units (Cat 210) (485 Units)	Weekday A.M.	87	262	349
		Weekday P.M.	274	161	435
Total		Weekday A.M.	92	289	381
		Weekday P.M.	299	173	472

The trip generation identified in Table 1 was distributed to the boundary road network via the Victoria Street and Russell Street access connections per the overall distributions identified in the TIS Addendum (April, 2016). The attached figure highlights the interim trip distribution expected, with 85 percent of site generated traffic utilizing the Russell Street connection. The trips generated by the proposed development were assigned to the boundary road network per the distributions in the attached Figure.

A sensitivity analysis was conducted to evaluate the traffic operations of the boundary road network prior to the construction of the Highway 10 access. Table 3 below indicates the 2040 future total traffic conditions associated with the boundary road network, with detailed capacity analyses as attached. It should be noted that the following metrics represent a conservative scenario, in which no Highway 10 access exists through the 2040 horizon year with all units west of the Foley Drain constructed and occupied. In reality, the Highway 10 access is expected to be constructed by 2030 in conjunction with the final phases of the Flato East development.

**Table 3**  
**2040 Future Total Level of Service (No Highway 10 Access)**

Intersection	Control	Peak Hour	Level of Service	Control Delay	Volume-to-Capacity Ratio
Highway 10 and Main Street	Signal	A.M.	B	14.7 s	0.43
		P.M.	B	13.7 s	0.56
Main Street and Russell Street	Stop	A.M.	C	18.0 s	0.52
		P.M.	D	34.4 s	0.63
Main Street and Mill Street/Alice Street	Stop	A.M.	B	12.2 s	0.02
		P.M.	B	12.4 s	0.03
Victoria Street North and Elm Street	Stop	A.M.	A	9.6 s	0.11
		P.M.	A	9.8 s	0.07
Main Street and Osprey Street	Stop	A.M.	B	13.7 s	0.19
		P.M.	C	18.3 s	0.09

*Note: The Level of Service of a signalized intersection is based on the average control delay per vehicle. The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach; i.e., Russell Street, Mill Street, Alice Street, Elm Street and Osprey Street.*

The intersections of Highway 10 and Main Street, Main Street and Mill Street/ Alice Street and Victoria Street North and Elm Street will operate at unchanged levels of service through the 2040 future total conditions compared to 2040 future background conditions.

The intersection of Main Street and Russell Street is anticipated to operate at LOS "C" and "D" during 2040 future total weekday a.m. and p.m. peak hours, respectively. The intersection is also anticipated to experience control delays of 18.0 and 34.4 seconds during the weekday a.m. and p.m. peak periods, respectively. The maximum 95<sup>th</sup> percentile northbound queue length is anticipated to be approximately 31 metres during the weekday p.m. peak period. This queue will not affect the operations of the existing accesses along Russell Street; thus the Highway 10 access can be constructed in conjunction with the final development phases. These traffic operations metrics represent a conservative scenario in which the Highway 10 access does not exist through the 2040 horizon year. Therefore, boundary road network is anticipated to have sufficient capacity to sufficiently facilitate the construction of the Highway 10 access in conjunction with the final phases of the Flato East development from a traffic operations perspective.

2. *County Transportation Services noted that there appears to be discrepancies in the unit totals as referenced in the TIS for this development as well as the entire Flato developments. These unit totals should be clarified in the updated totals on the phasing plan from a traffic impact perspective.*

The TIS analysis was based on conservative unit estimates for the Flato North development. After completion, Draft Plan proposed units were confirmed and it was determined that the unit estimates upon which the TIS Addendum (June, 2016) was based were slightly conservative. For reference Table 4 below summarized the Draft Plan proposed units and the units assumed in the TIS analysis.

**Table 3**  
**Development Units**

Development Phase	Land Use	Development Units	
		Draft Plan Proposed	TIS (Crozier, June 2016)
Flato North	Single Detached Units	205	300
	Semi-Detached Units	62	-
Flato East	Single Detached Units	311	302
	Townhouse Units	190	194
<b>Total</b>		<b>768</b>	<b>796</b>

As illustrated in Table 3, the TIS (Crozier, June 2016) analyzed the transportation related impacts of the proposed development while considering 28 units in excess of those proposed per the most recent Draft Plan. Accordingly, the submitted analysis is a conservative evaluation of forecasted traffic operations. Moreover, minor changes to the Draft Plan are not anticipated to materially affect conclusions per the TIS Addendum (Crozier, June 2016).

#### 4.0 Summary

Supplementary analysis was conducted and it was confirmed that the Highway 10 access can be constructed in conjunction with the final phases of the development without material impact to the boundary road network and surrounding community.

The development units upon which the TIS Addendum (Crozier, June 2016) was based were slightly more conservative compared to the units proposed per the most recent Draft Plan Applications and thus do not materially affect the conclusions per the TIS Addendum (Crozier, June 2016).

The conclusions contained in the additional analyses herein remain consistent with the original TIS addendum (Crozier, June 2016).

We trust that the above satisfies your concerns; however, if there are any additional questions or concerns, please do not hesitate to contact the undersigned.

Sincerely,

**C.F. CROZIER & ASSOCIATES INC.**



Michael A. Linton, MASC., E.I.T.

**C.F. CROZIER & ASSOCIATES INC.**

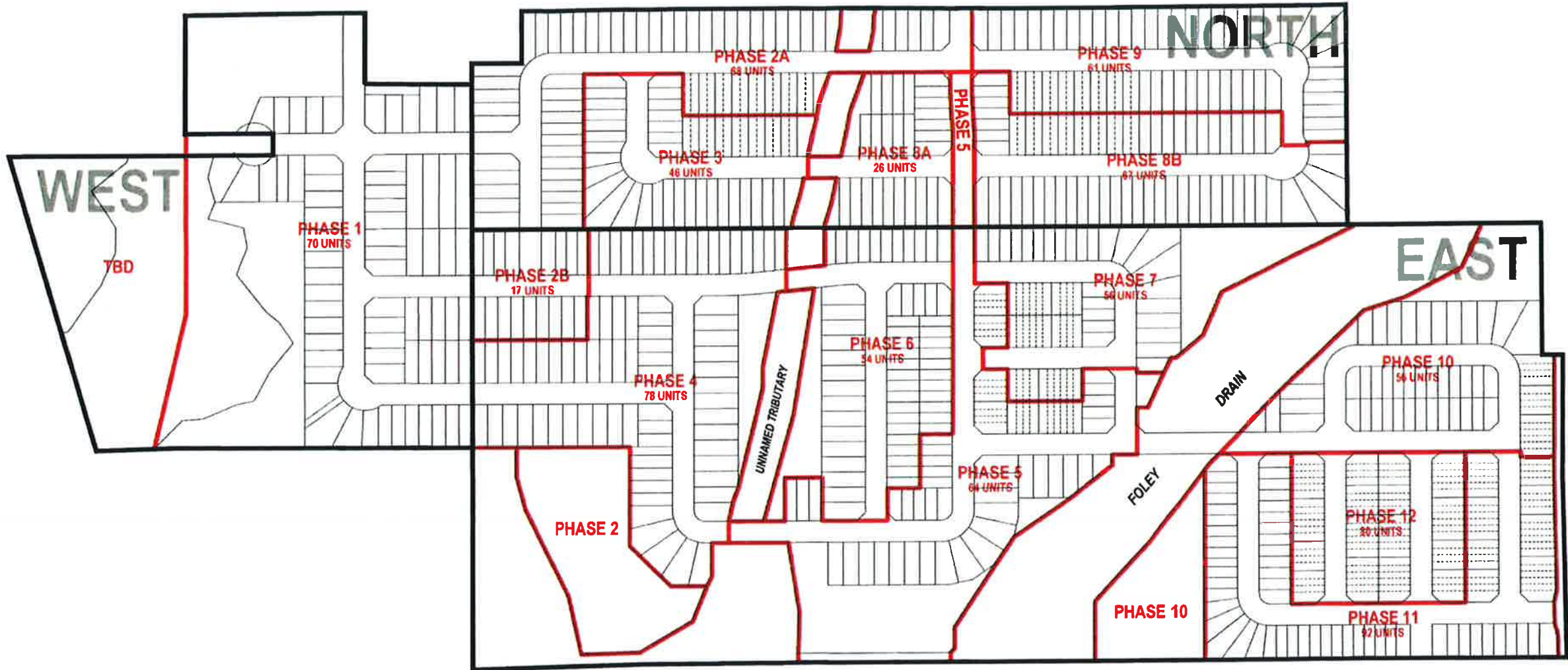


Alexander J.W. Fleming, MBA, P.Eng.  
Associate

/MAL

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

# FLATO DUNDALK PHASING PLAN



HCM Signalized Intersection Capacity Analysis  
3: Hwy 10 & Main St.

2040 Future Total PM (No Connection)










11/25/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	91	96	143	18	128	28	241	179	28	33	168	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.5	7.5		7.5	7.5		7.6	7.6		7.6	7.6	7.6
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.91		1.00	0.97		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1601	1462		1484	1412		1560	1647		1496	1642	1458
Flt Permitted	0.65	1.00		0.59	1.00		0.64	1.00		0.61	1.00	1.00
Satd. Flow (perm)	1088	1462		925	1412		1047	1647		964	1642	1458
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	103	109	162	20	145	32	274	203	32	38	191	107
RTOR Reduction (vph)	0	57	0	0	8	0	0	6	0	0	0	56
Lane Group Flow (vph)	103	214	0	20	169	0	274	229	0	38	191	51
Heavy Vehicles (%)	14%	28%	14%	23%	36%	16%	17%	14%	16%	22%	17%	12%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	13.6	13.6		13.6	13.6		26.5	26.5		26.5	26.5	26.5
Effective Green, g (s)	13.6	13.6		13.6	13.6		26.5	26.5		26.5	26.5	26.5
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.48	0.48		0.48	0.48	0.48
Clearance Time (s)	7.5	7.5		7.5	7.5		7.6	7.6		7.6	7.6	7.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.5	4.5		4.5	4.5	4.5
Lane Grp Cap (vph)	268	360		227	347		502	790		462	788	699
v/s Ratio Prot		c0.15			0.12			0.14			0.12	
v/s Ratio Perm	0.09			0.02			c0.26			0.04		0.04
v/c Ratio	0.38	0.59		0.09	0.49		0.55	0.29		0.08	0.24	0.07
Uniform Delay, d1	17.3	18.4		16.0	17.8		10.1	8.7		7.8	8.4	7.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.9	2.6		0.2	1.1		1.8	0.4		0.1	0.3	0.1
Delay (s)	18.2	21.0		16.2	18.9		11.9	9.0		7.9	8.7	7.8
Level of Service	B	C		B	B		B	A		A	A	A
Approach Delay (s)		20.2			18.6			10.6			8.3	
Approach LOS		C			B			B			A	

Intersection Summary												
HCM 2000 Control Delay		13.7		HCM 2000 Level of Service				B				
HCM 2000 Volume to Capacity ratio		0.56										
Actuated Cycle Length (s)		55.2		Sum of lost time (s)				15.1				
Intersection Capacity Utilization		80.7%		ICU Level of Service				D				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis  
6: Russell Street & Main St/Main St.

2040 Future Total PM (No Connection)  
11/25/2016

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	341	58	226	424	41	140
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)	371	63	246	461	45	152
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			434		1354	402
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			434		1354	402
tC, single (s)			4.1		6.6	6.4
tC, 2 stage (s)						
tF (s)			2.2		3.7	3.4
p0 queue free %			78		61	75
cM capacity (veh/h)			1137		115	621
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	434	707	197			
Volume Left	0	246	45			
Volume Right	63	0	152			
cSH	1700	1137	312			
Volume to Capacity	0.26	0.22	0.63			
Queue Length 95th (m)	0.0	6.2	30.5			
Control Delay (s)	0.0	4.9	34.4			
Lane LOS		A	D			
Approach Delay (s)	0.0	4.9	34.4			
Approach LOS			D			
Intersection Summary						
Average Delay		7.6				
Intersection Capacity Utilization		77.2%		ICU Level of Service		D
Analysis Period (min)		15				



HCM Unsignalized Intersection Capacity Analysis  
10: Elm St. & Victoria St N/Victoria St. N

2040 Future Total PM (No Connection)

11/25/2016

















	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↕	↕	
Volume (veh/h)	37	78	18	22	42	11
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)	40	85	20	24	46	12
Pedestrians					23	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			148		169	106
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			148		169	106
tC, single (s)			4.1		6.4	6.7
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.8
p0 queue free %			99		94	99
cM capacity (veh/h)			1418		799	816
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	125	43	58			
Volume Left	0	20	46			
Volume Right	85	0	12			
cSH	1700	1418	802			
Volume to Capacity	0.07	0.01	0.07			
Queue Length 95th (m)	0.0	0.3	1.8			
Control Delay (s)	0.0	3.5	9.8			
Lane LOS		A	A			
Approach Delay (s)	0.0	3.5	9.8			
Approach LOS			A			
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization		21.0%		ICU Level of Service		A
Analysis Period (min)		15				



# HCM Unsignalized Intersection Capacity Analysis 14: Osprey St./Osprey St & Main St

2040 Future Total PM (No Connection)










11/25/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	14	282	64	31	302	0	35	2	24	20	0	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	307	70	34	328	0	38	2	26	22	0	4
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	328			376			772	767	341	795	802	328
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	328			376			772	767	341	795	802	328
tC, single (s)	4.1			4.1			7.1	6.5	6.4	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.7	4.0	3.3
p0 queue free %	99			97			88	99	96	92	100	99
cM capacity (veh/h)	1243			1193			308	321	673	266	307	718
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	391	362	66	26								
Volume Left	15	34	38	22								
Volume Right	70	0	26	4								
cSH	1243	1193	392	298								
Volume to Capacity	0.01	0.03	0.17	0.09								
Queue Length 95th (m)	0.3	0.7	4.6	2.2								
Control Delay (s)	0.4	1.0	16.1	18.3								
Lane LOS	A	A	C	C								
Approach Delay (s)	0.4	1.0	16.1	18.3								
Approach LOS			C	C								
Intersection Summary												
Average Delay			2.5									
Intersection Capacity Utilization			38.5%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
16: Main St & Mill St.

2040 Future Total PM (No Connection)

11/25/2016

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	394	423	4	1	3
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)	5	428	460	4	1	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	464				901	462
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	464				901	462
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	99
cM capacity (veh/h)	1108				310	604
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	434	464	4			
Volume Left	5	0	1			
Volume Right	0	4	3			
cSH	1108	1700	488			
Volume to Capacity	0.00	0.27	0.01			
Queue Length 95th (m)	0.1	0.0	0.2			
Control Delay (s)	0.2	0.0	12.4			
Lane LOS	A		B			
Approach Delay (s)	0.2	0.0	12.4			
Approach LOS			B			
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization		34.7%		ICU Level of Service	A	
Analysis Period (min)		15				

# HCM Unsignalized Intersection Capacity Analysis 17: Alice St. & Main St

2040 Future Total PM (No Connection)






















11/25/2016

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↶			↷	↶	
Volume (veh/h)	402	6	23	424	3	12
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)	437	7	25	461	3	13
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			443		951	440
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			443		951	440
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		99	98
cM capacity (veh/h)			1127		284	621
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	443	486	16			
Volume Left	0	25	3			
Volume Right	7	0	13			
cSH	1700	1127	502			
Volume to Capacity	0.26	0.02	0.03			
Queue Length 95th (m)	0.0	0.5	0.8			
Control Delay (s)	0.0	0.7	12.4			
Lane LOS		A	B			
Approach Delay (s)	0.0	0.7	12.4			
Approach LOS			B			
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			51.1%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis  
3: Hwy 10 & Main St.

2040 Future Total AM (No Hwy10 Access)

11/25/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	86	237	16	80	14	115	166	32	14	149	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.5	7.5		7.5	7.5		7.6	7.6		7.6	7.6	7.6
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.89		1.00	0.98		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1342	1483		1674	1550		1508	1617		1496	1731	1338
Flt Permitted	0.69	1.00		0.44	1.00		0.65	1.00		0.62	1.00	1.00
Satd. Flow (perm)	972	1483		774	1550		1032	1617		973	1731	1338
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	128	98	269	18	91	16	131	189	36	16	169	88
RTOR Reduction (vph)	0	103	0	0	7	0	0	8	0	0	0	48
Lane Group Flow (vph)	128	264	0	18	100	0	131	217	0	16	169	40
Heavy Vehicles (%)	36%	19%	14%	9%	21%	22%	21%	18%	5%	22%	11%	22%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	14.8	14.8		14.8	14.8		25.2	25.2		25.2	25.2	25.2
Effective Green, g (s)	14.8	14.8		14.8	14.8		25.2	25.2		25.2	25.2	25.2
Actuated g/C Ratio	0.27	0.27		0.27	0.27		0.46	0.46		0.46	0.46	0.46
Clearance Time (s)	7.5	7.5		7.5	7.5		7.6	7.6		7.6	7.6	7.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.5	4.5		4.5	4.5	4.5
Lane Grp Cap (vph)	261	398		207	416		471	739		445	791	611
v/s Ratio Prot		c0.18			0.06			c0.13			0.10	
v/s Ratio Perm	0.13			0.02			0.13			0.02		0.03
v/c Ratio	0.49	0.66		0.09	0.24		0.28	0.29		0.04	0.21	0.07
Uniform Delay, d1	17.0	17.9		15.1	15.8		9.3	9.4		8.2	9.0	8.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.5	4.1		0.2	0.3		0.6	0.4		0.1	0.2	0.1
Delay (s)	18.4	22.1		15.3	16.1		9.9	9.8		8.3	9.2	8.4
Level of Service	B	C		B	B		A	A		A	A	A
Approach Delay (s)		21.1			15.9			9.8			8.9	
Approach LOS		C			B			A			A	

Intersection Summary

HCM 2000 Control Delay	14.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	55.1	Sum of lost time (s)	15.1
Intersection Capacity Utilization	71.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

















HCM Unsignalized Intersection Capacity Analysis 2040 Future Total AM (No Hwy10 Access)  
 6: Russell Street & Main St/Main St. 11/25/2016

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↗	
Volume (veh/h)	300	20	67	270	47	220
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)	326	22	73	293	51	239
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			348		776	337
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			348		776	337
tC, single (s)			4.1		6.6	6.4
tC, 2 stage (s)						
tF (s)			2.2		3.7	3.4
p0 queue free %			94		84	65
cM capacity (veh/h)			1222		315	676
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	348	366	290			
Volume Left	0	73	51			
Volume Right	22	0	239			
cSH	1700	1222	563			
Volume to Capacity	0.20	0.06	0.52			
Queue Length 95th (m)	0.0	1.4	22.3			
Control Delay (s)	0.0	2.1	18.0			
Lane LOS		A	C			
Approach Delay (s)	0.0	2.1	18.0			
Approach LOS			C			
Intersection Summary						
Average Delay			6.0			
Intersection Capacity Utilization			61.1%	ICU Level of Service	B	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 2040 Future Total AM (No Hwy10 Access)  
 10: Elm St. & Victoria St N/Victoria St. N 11/25/2016

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰	↱
Volume (veh/h)	28	26	5	15	71	19
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)	30	28	5	16	77	21
Pedestrians					23	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			82		95	68
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			82		95	68
tC, single (s)			4.1		6.4	6.7
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.8
p0 queue free %			100		91	98
cM capacity (veh/h)			1498		889	859
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	59	22	98			
Volume Left	0	5	77			
Volume Right	28	0	21			
cSH	1700	1498	882			
Volume to Capacity	0.03	0.00	0.11			
Queue Length 95th (m)	0.0	0.1	2.8			
Control Delay (s)	0.0	1.9	9.6			
Lane LOS		A	A			
Approach Delay (s)	0.0	1.9	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			5.5			
Intersection Capacity Utilization			20.8%	ICU Level of Service		A
Analysis Period (min)			15			










# HCM Unsignalized Intersection Capacity Analysis 2040 Future Total AM (No Hwy10 Access) 14: Osprey St./Osprey St & Main St 11/25/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	225	21	7	238	0	57	1	33	24	0	14
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	245	23	8	259	0	62	1	36	26	0	15
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	259			267			556	541	256	577	552	259
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	259			267			556	541	256	577	552	259
tC, single (s)	4.1			4.1			7.1	6.5	6.4	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.7	4.0	3.3
p0 queue free %	100			99			86	100	95	93	100	98
cM capacity (veh/h)	1318			1308			433	447	752	382	440	785
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	273	266	99	41								
Volume Left	5	8	62	26								
Volume Right	23	0	36	15								
cSH	1318	1308	512	471								
Volume to Capacity	0.00	0.01	0.19	0.09								
Queue Length 95th (m)	0.1	0.1	5.4	2.2								
Control Delay (s)	0.2	0.3	13.7	13.4								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.2	0.3	13.7	13.4								
Approach LOS			B	B								
Intersection Summary												
Average Delay			3.0									
Intersection Capacity Utilization			28.9%		ICU Level of Service				A			
Analysis Period (min)			15									



# HCM Unsignalized Intersection Capacity Analysis 2040 Future Total AM (No Hwy10 Access) 16: Main St & Mill St.

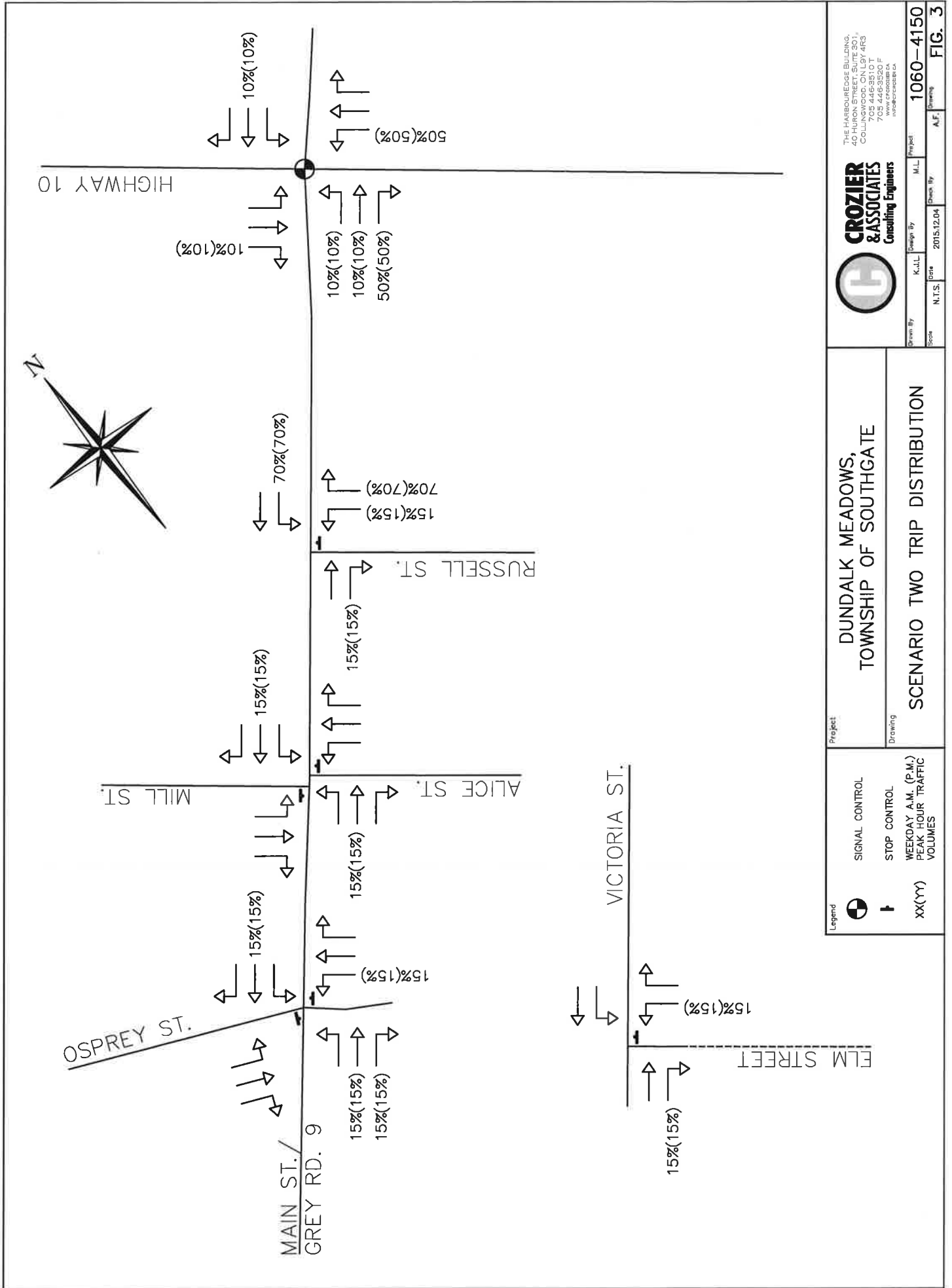
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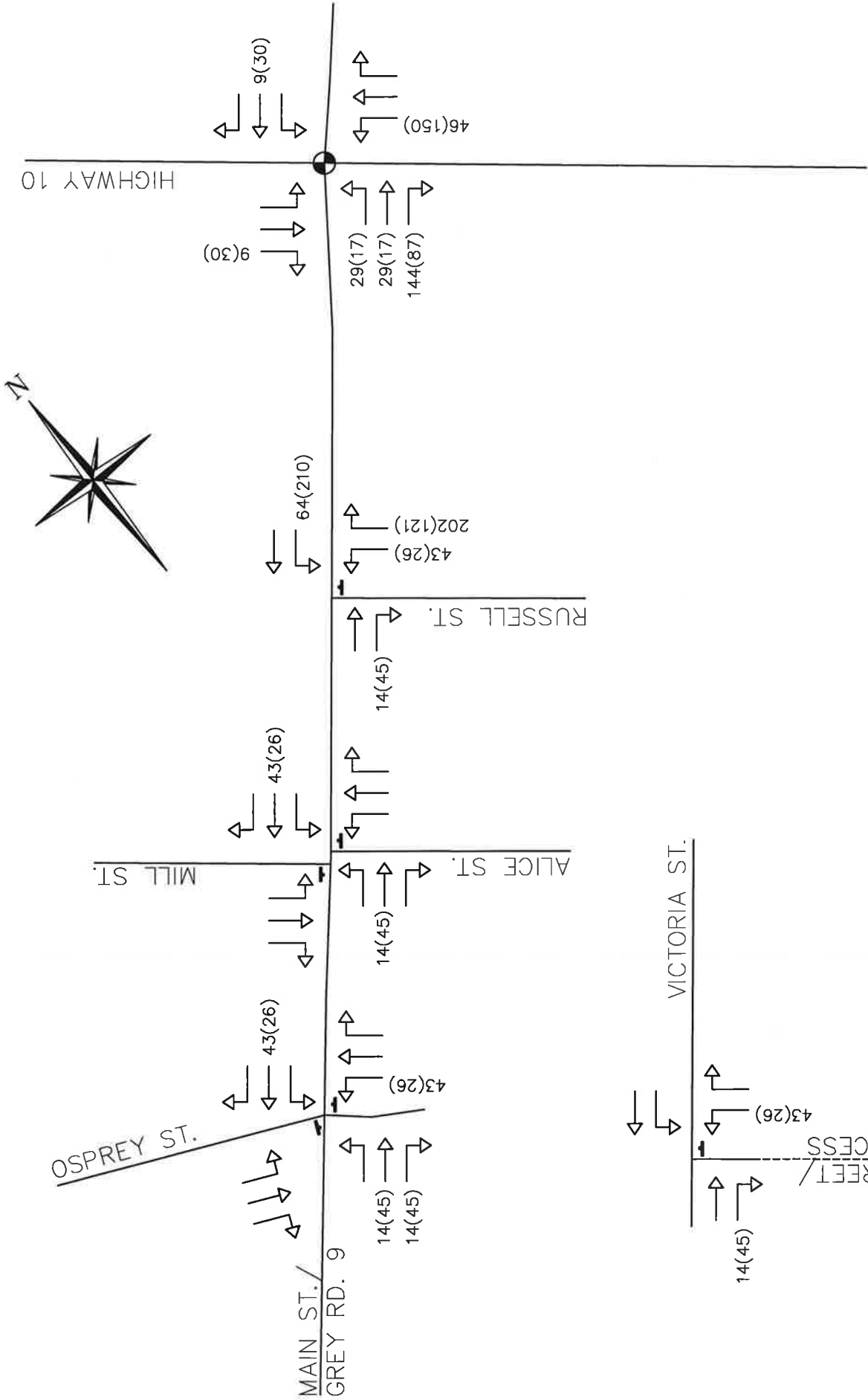
						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	2	295	312	2	6	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	321	339	2	7	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	341				665	340
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	341				665	340
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				98	99
cM capacity (veh/h)	1229				427	707
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	323	341	11			
Volume Left	2	0	7			
Volume Right	0	2	4			
cSH	1229	1700	508			
Volume to Capacity	0.00	0.20	0.02			
Queue Length 95th (m)	0.0	0.0	0.5			
Control Delay (s)	0.1	0.0	12.2			
Lane LOS	A		B			
Approach Delay (s)	0.1	0.0	12.2			
Approach LOS			B			
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization		27.1%		ICU Level of Service		A
Analysis Period (min)		15				

# HCM Unsignalized Intersection Capacity Analysis 2040 Future Total AM (No Hwy10 Access) 17: Alice St. & Main St

11/25/2016

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↰	↰	
Volume (veh/h)	293	2	6	314	1	22
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)	318	2	7	341	1	24
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			321		674	320
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			321		674	320
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	97
cM capacity (veh/h)			1251		421	726
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	321	348	25			
Volume Left	0	7	1			
Volume Right	2	0	24			
cSH	1700	1251	704			
Volume to Capacity	0.19	0.01	0.04			
Queue Length 95th (m)	0.0	0.1	0.8			
Control Delay (s)	0.0	0.2	10.3			
Lane LOS		A	B			
Approach Delay (s)	0.0	0.2	10.3			
Approach LOS			B			
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			31.3%	ICU Level of Service		A
Analysis Period (min)			15			





**CROZIER & ASSOCIATES**  
Consulting Engineers

THE HARBOURCOAST BUILDING,  
40 HURON STREET, SUITE 301,  
COLLINGWOOD ON L9Y 4R3  
TEL: 705 446 3520  
FAX: 705 446 3520  
WWW.CROZIER.CA  
INFO@CROZIER.CA

Drawn By	K.J.L.	Design By	M.L.	Project	1060-4150
Date	N.T.S.	Date	2015.12.04	Drawn By	A.F.
					FIG. 4

**Project**

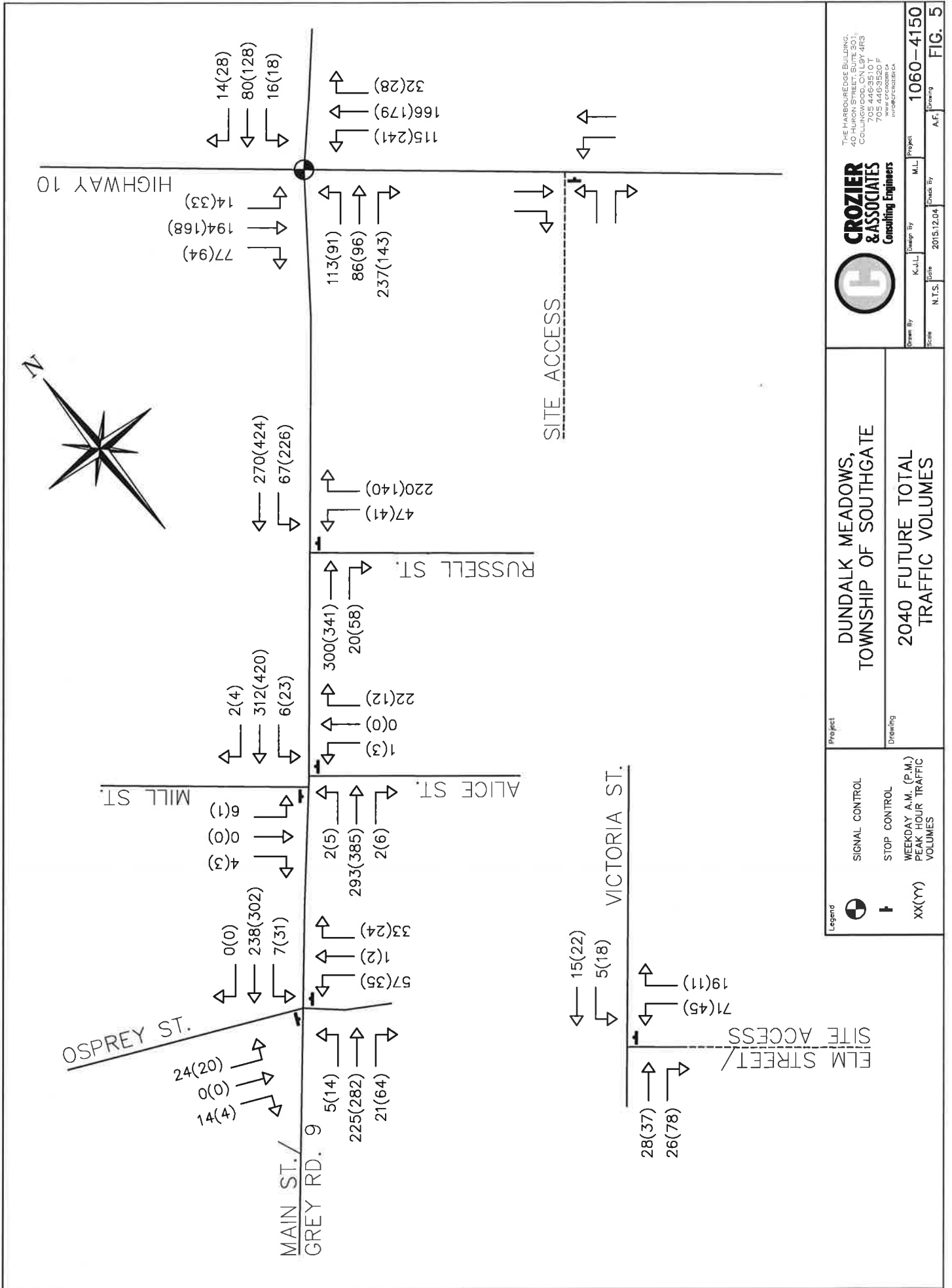
DUNDALK MEADOWS,  
TOWNSHIP OF SOUTHGATE

**Drawing**

TRIP ASSIGNMENT  
(NO HWY 10 ACCESS)

**Legend**

- SIGNAL CONTROL
- STOP CONTROL
- WEEKDAY A.M. (P.M.) PEAK HOUR TRAFFIC VOLUMES
- xx(yy)



THE HARBOUREDGE BUILDING,  
40 HURON STREET, SUITE 301,  
COLLINGSWOOD, ONTARIO M9W 4R5  
705 446-3310  
www.crozier.ca  
info@crozier.ca

Drawn By	K.J.L.	Design By	M.L.L.	Project	1060-4150
Scale	N.T.S.	Date	2015.12.04	Check By	A.F.
				Drawing	FIG. 5