



**McCORMICK
RANKIN
CORPORATION**

2655 North Sheridan Way
Mississauga, Ontario, L5K 2P8
Tel: (905)823-8500
Fax: (905) 823-8503
E-mail: mrc@mrc.ca
Website: www.mrc.ca

TECHNICAL MEMORANDUM

TO: Steve Schijns, P. Eng.
FROM: Scott Fortner, P. Eng.
DATE: June 1, 2008
COPIES:
OUR FILE: WO 106964
SUBJECT: BRT West Traffic Analysis
Glen Erin Drive Construction Staging Impacts

Introduction

Traffic analysis was carried out to reflect existing conditions along Glen Erin Drive between Credit Valley Road and Folkway Drive. A detailed evaluation of the impacts related to proposed construction staging configuration in the vicinity of Glen Erin Drive was undertaken to confirm the adequacy of the temporary operating conditions at these locations.

The traffic impact evaluation of existing conditions and construction staging impacts reflects two levels of analysis. A capacity analysis was first carried out using *Synchro 7* to assess the degree of capacity utilization and this was supplemented by a detailed micro-simulation analysis (using *VISSIM*) to assess vehicular delay and queuing impacts. Each of these analysis tools was applied to evaluate weekday operational impacts during the morning and afternoon peak hours.

Existing Conditions

The existing lane configuration and travel demand on Glen Erin Drive at Credit Valley Road and Folkway Drive are illustrated below in **Exhibit 1**. A brief description of the current operating conditions at these minor arterial road intersections is also provided and reflects the detailed level-of-service calculations summarized in **Exhibit 2**. Capacity analysis output is attached for reference.

Operating conditions along Glen Erin Drive and at the traffic signal controlled intersections with Credit Valley Road and Folkway Drive reflect good levels of service during each of the weekday morning and afternoon peak hours. Critical movement volume-to-capacity ratios do not exceed 0.75 and average delays reflect levels-of-service 'C' or better with the exception of the eastbound and westbound left-turn movements from Folkway Drive during the afternoon peak hour when average delays reflect levels-of-service 'D'. Vehicle queue lengths on Glen Erin Drive do not exceed 45 metres during the weekday morning and afternoon peak hours while side-street queues do not extend more than 65 metres.

Exhibit 1 Existing Conditions - Glen Erin Drive

AM Peak Hour

PM Peak Hour

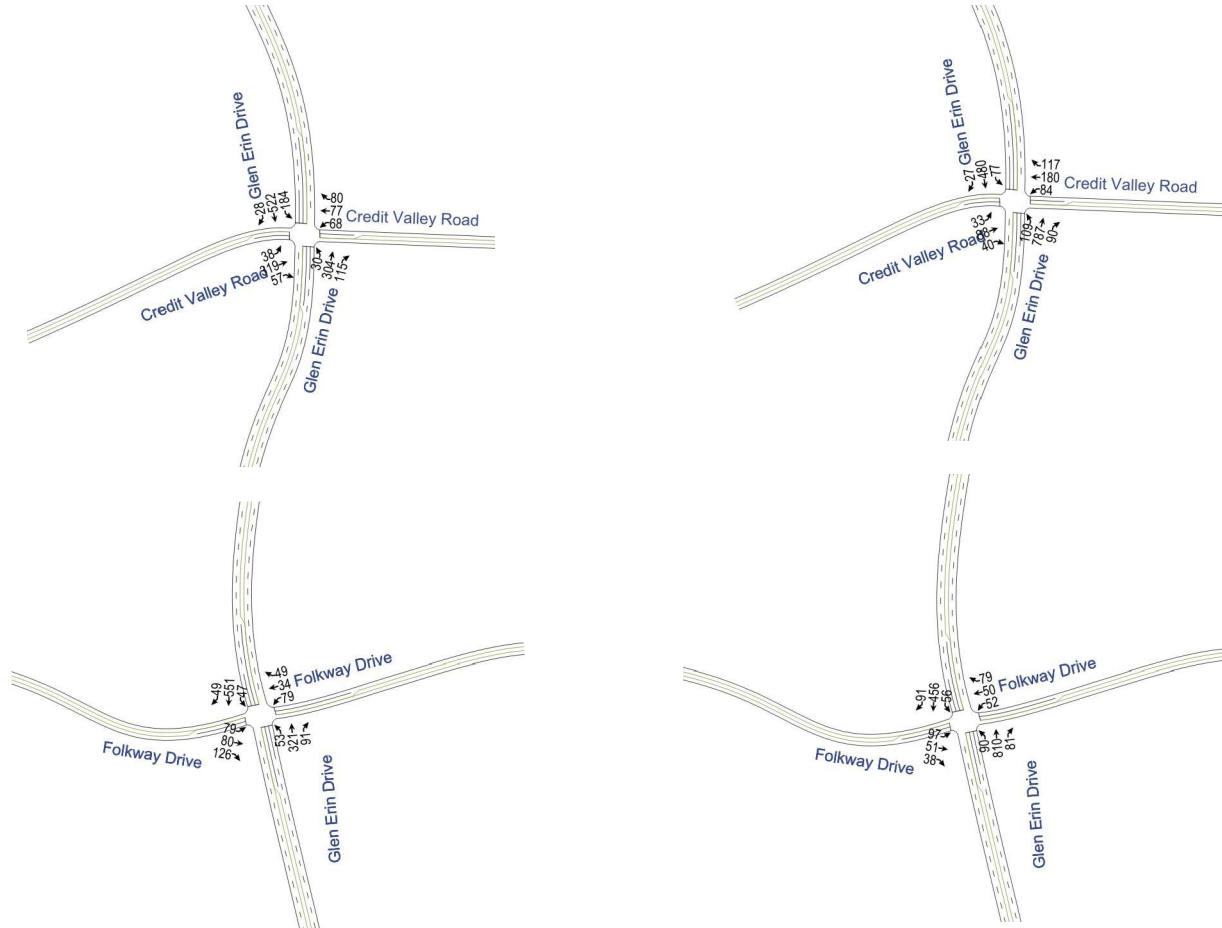


Exhibit 2 Existing Intersection Levels of Service: Glen Erin Drive

Intersection/Movement	Level of Service							
	Weekday A.M. Peak Hour				Weekday P.M. Peak Hour			
	V/C	Delay	LOS	Queue ¹	V/C	Delay	LOS	Queue ¹
<i>Glen Erin Dr at Credit Valley Rd</i>								
Eastbound Left	0.13	30 s	C	10 m	0.26	33 s	C	8 m
Eastbound Through/ Right	0.77	29/23 s	C/C	74 m	0.33	28/11 s	C/B	22 m
Westbound Left	0.45	33 s	C	16 m	0.32	35 s	C	21 m
Westbound Through/ Right	0.32	26/11 s	C/B	26 m	0.75	33/23 s	C/C	65 m
Northbound Left	0.07	14 s	B	6 m	0.24	13 s	B	13 m
Northbound Through/ Right	0.23	11/9 s	B/A	26 m	0.45	10/8 s	A/A	44 m
Southbound Left	0.38	13 s	B	21 m	0.30	14 s	B	7 m
Southbound Through /Right	0.30	9/7 s	A/A	28 m	0.26	8/5 s	A/A	23 m

Note: 1. Queue length reflects 95th percentile conditions

Exhibit 2 (Cont'd) Existing Intersection Levels of Service: Glen Erin Drive

Intersection/Movement	Level of Service							
	Weekday A.M. Peak Hour				Weekday P.M. Peak Hour			
	V/C	Delay	LOS	Queue ¹	V/C	Delay	LOS	Queue ¹
<i>Glen Erin Dr at Folkway Dr</i>								
Eastbound Left	0.46	30 s	C	22 m	0.60	38 s	D	27 m
Eastbound Through/ Right	0.67	29/10 s	C/A	30 m	0.36	35/6 s	C/A	15 m
Westbound Left	0.70	34 s	C	21 m	0.31	36 s	D	15 m
Westbound Through/ Right	0.31	30/6 s	C/A	12 m	0.46	34/9 s	C/A	20 m
Northbound Left	0.12	8 s	A	6 m	0.20	9 s	A	7 m
Northbound Through/ Right	0.19	3/4 s	A/A	16 m	0.43	4/4 s	A/A	29 m
Southbound Left	0.09	11 s	B	6 m	0.20	12 s	B	6 m
Southbound Through/ Right	0.28	10/8 s	A/A	36 m	0.27	7/5 s	A/A	24 m

Note: 1. Queue length reflects 95th percentile conditions

Construction Staging

Staging at Glen Erin Drive is required to accommodate the construction of the Glen Erin Drive structure over the BRT facility north of Highway 403. This proposed structure will be constructed in two stages while accommodating Glen Erin Drive traffic in two of the existing four lanes. Traffic impacts were assessed assuming that no traffic will divert to alternative adjacent facilities and that the existing demand will be accommodated through the work zones.

It has also been assumed that any construction at Winston Churchill Boulevard that results in lane reductions or ramp closures will not be carried out while the lane reductions on Glen Erin Drive are in place. During periods of lane reductions (or ramp closures) at Winston Churchill Boulevard, it is reasonable to expect the diversion of a portion of the existing traffic to adjacent facilities such as Glen Erin Drive and Ridgeway Drive (depending on the timing of construction of the overpass at Highway 403). Existing operating conditions along Winston Churchill Boulevard are constrained, particularly during the afternoon peak hour and capacity on adjacent facilities will need to be fully available to accommodate diversion resulting from lane reductions and any ramp access restrictions.

Glen Erin Drive traffic can be adequately accommodated during the temporary reduction to a two-lane cross-section in the vicinity of the new structure over the BRT facility. The delays and corresponding levels of service summarized in **Exhibit 3** reflect the combined impact of intersection delay and the lane reduction. Specifically, northbound delays at the Credit Valley Road intersection account for the intersection delay plus any additional delay related to the upstream merging impacts through the work zone. Southbound delays at the Folkway Drive intersection account similarly for the work zone impacts. A comparison of the operating conditions summarized in **Exhibit 3** to the existing conditions described in **Exhibit 2** demonstrates that the incremental impact of the proposed lane reduction is not noticeable or marginal at best. The micro-simulation reflects increases in delay of no more than 3 seconds confirming existing traffic volumes can be accommodated with the proposed lane reductions.

Exhibit 3 Intersection Levels of Service: Glen Erin Drive Construction Impacts

Intersection/Movement	Level of Service							
	Weekday A.M. Peak Hour				Weekday P.M. Peak Hour			
	V/C	Delay	LOS	Queue ¹	V/C	Delay	LOS	Queue ¹
<i>Glen Erin Dr at Credit Valley Rd</i>								
Eastbound Left	0.13	31 s	C	13 m	0.26	34 s	C	11 m
Eastbound Through/ Right	0.77	29/23 s	C/C	72 m	0.33	27/12 s	C/B	23 m
Westbound Left	0.45	35 s	C	15 m	0.32	34 s	C	20 m
Westbound Through/ Right	0.32	26/11 s	C/B	25 m	0.75	33/23 s	C/C	63 m
Northbound Left	0.07	16 s	B	6 m	0.24	16 s	B	14 m
Northbound Through/ Right	0.23	11/7 s	B/A	23 m	0.45	12/10 s	B/A	48 m
Southbound Left	0.38	13 s	B	21 m	0.30	14 s	B	8 m
Southbound Through /Right	0.30	8/7 s	A/A	27 m	0.26	6/6 s	A/A	22 m
<i>Glen Erin Dr at Folkway Dr</i>								
Eastbound Left	0.46	32 s	C	21 m	0.60	38 s	D	28 m
Eastbound Through/ Right	0.67	30/11 s	C/B	31 m	0.36	36/7 s	D/A	14 m
Westbound Left	0.70	35 s	C	21 m	0.31	37 s	D	15 m
Westbound Through/ Right	0.31	31/7 s	C/A	12 m	0.46	34/10 s	C/A	20 m
Northbound Left	0.12	9 s	A	6 m	0.20	9 s	A	7 m
Northbound Through/ Right	0.19	3/4 s	A/A	14 m	0.43	4/4 s	A/A	29 m
Southbound Left	0.09	13 s	B	6 m	0.20	15 s	B	6 m
Southbound Through/ Right	0.28	11/7 s	B/A	34 m	0.27	8/6 s	A/A	25 m

Note: 1. Queue length reflects 95th percentile conditions

**Glen Erin Drive
Existing Conditions Capacity Analysis Output**

Timings
1: Glen Erin Drive & Credit Valley Road

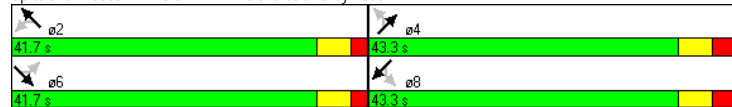
Glen Erin Drive
Existing AM Peak Hour

	←		↖		↗		→	
Lane Group	SEL	SET	NWL	NWT	NEL	NET	SWL	SWT
Lane Configurations	↖	↗	↖	↗	↖	↗	↖	↗
Volume (vph)	184	522	30	304	38	319	68	77
Turn Type	Perm		Perm		Perm		Perm	
Protected Phases		6		2		4		8
Permitted Phases	6		2		4		8	
Detector Phase	6	6	2	2	4	4	8	8
Switch Phase								
Minimum Initial (s)	35.7	35.7	35.7	35.7	8.0	8.0	8.0	8.0
Minimum Split (s)	41.7	41.7	41.7	41.7	15.0	15.0	15.0	15.0
Total Split (s)	41.7	41.7	41.7	41.7	43.3	43.3	43.3	43.3
Total Split (%)	49.1%	49.1%	49.1%	49.1%	50.9%	50.9%	50.9%	50.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	7.0	7.0	7.0	7.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None
Act Effect Green (s)	48.0	48.0	48.0	48.0	24.0	24.0	24.0	24.0
Actuated g/C Ratio	0.56	0.56	0.56	0.56	0.28	0.28	0.28	0.28
v/c Ratio	0.38	0.29	0.07	0.23	0.13	0.77	0.45	0.32
Control Delay	14.8	11.0	12.2	10.0	21.1	36.8	32.8	13.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.8	11.0	12.2	10.0	21.1	36.8	32.8	13.3
LOS	B	B	B	B	C	D	C	B
Approach Delay		12.0		10.2		35.3		19.2
Approach LOS		B		B		D		B

Intersection Summary

Cycle Length: 85
 Actuated Cycle Length: 85
 Offset: 4.3 (5%), Referenced to phase 2:NWTL and 6:SETL, Start of Green
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.77
 Intersection Signal Delay: 17.7
 Intersection Capacity Utilization 108.1%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service G

Splits and Phases: 1: Glen Erin Drive & Credit Valley Road



Timings
6: Glen Erin Drive & Folkway Drive

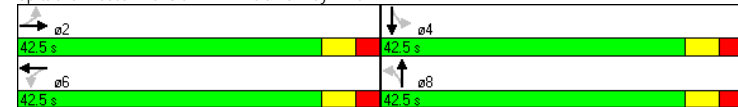
Glen Erin Drive
Existing AM Peak Hour

	←		↖		↗		→	
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↖	↗	↖	↗	↖	↗	↖	↗
Volume (vph)	47	551	53	321	79	80	79	34
Turn Type	Perm		Perm		Perm		Perm	
Protected Phases		2		6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	2	2	6	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	35.5	35.5	35.5	35.5	8.0	8.0	8.0	8.0
Minimum Split (s)	42.5	42.5	42.5	42.5	15.0	15.0	15.0	15.0
Total Split (s)	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None
Act Effect Green (s)	58.5	58.5	58.5	58.5	12.5	12.5	12.5	12.5
Actuated g/C Ratio	0.69	0.69	0.69	0.69	0.15	0.15	0.15	0.15
v/c Ratio	0.09	0.28	0.12	0.19	0.46	0.67	0.70	0.31
Control Delay	6.4	7.9	6.3	4.9	39.8	26.5	61.8	17.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.4	7.9	6.3	4.9	39.8	26.5	61.8	17.4
LOS	A	A	A	A	D	C	E	B
Approach Delay		7.8		5.1		30.2		39.1
Approach LOS		A		A		C		D

Intersection Summary

Cycle Length: 85
 Actuated Cycle Length: 85
 Offset: 8.5 (10%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.70
 Intersection Signal Delay: 14.3
 Intersection Capacity Utilization 80.1%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service D

Splits and Phases: 6: Glen Erin Drive & Folkway Drive



Timings
1: Glen Erin Drive & Credit Valley Road

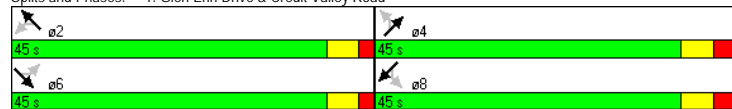
Glen Erin Drive
Existing PM Peak Hour

Lane Group	SEL	SET	NWL	NWT	NEL	NET	SWL	SWT
Lane Configurations								
Volume (vph)	77	480	109	787	33	88	84	180
Turn Type	Perm		Perm		Perm		Perm	
Protected Phases		6		2		4		8
Permitted Phases	6		2		4		8	
Detector Phase	6	6	2	2	4	4	8	8
Switch Phase								
Minimum Initial (s)	39.0	39.0	39.0	39.0	8.0	8.0	8.0	8.0
Minimum Split (s)	45.0	45.0	45.0	45.0	15.0	15.0	15.0	15.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	7.0	7.0	7.0	7.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None
Act Effect Green (s)	56.2	56.2	56.2	56.2	20.8	20.8	20.8	20.8
Actuated g/C Ratio	0.62	0.62	0.62	0.62	0.23	0.23	0.23	0.23
v/c Ratio	0.29	0.26	0.24	0.45	0.26	0.33	0.33	0.76
Control Delay	13.3	8.7	16.2	16.6	30.5	22.9	29.9	38.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.3	8.7	16.2	16.6	30.5	22.9	29.9	38.2
LOS	B	A	B	B	C	C	C	D
Approach Delay		9.3		16.6		24.5		36.4
Approach LOS		A		B		C		D

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 1.8 (2%), Referenced to phase 2:NWTL and 6:SETL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.76
 Intersection Signal Delay: 18.7
 Intersection Capacity Utilization 109.9%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service H

Splits and Phases: 1: Glen Erin Drive & Credit Valley Road



Timings
6: Glen Erin Drive & Folkway Drive

Glen Erin Drive
Existing PM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	56	456	90	810	97	51	52	50
Turn Type	Perm		Perm		Perm		Perm	
Protected Phases		2		6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	2	2	6	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	44.3	44.3	44.3	44.3	8.0	8.0	8.0	8.0
Minimum Split (s)	51.3	51.3	51.3	51.3	15.0	15.0	15.0	15.0
Total Split (s)	51.3	51.3	51.3	51.3	38.7	38.7	38.7	38.7
Total Split (%)	57.0%	57.0%	57.0%	57.0%	43.0%	43.0%	43.0%	43.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None
Act Effect Green (s)	62.3	62.3	62.3	62.3	13.7	13.7	13.7	13.7
Actuated g/C Ratio	0.69	0.69	0.69	0.69	0.15	0.15	0.15	0.15
v/c Ratio	0.20	0.27	0.20	0.43	0.60	0.36	0.31	0.46
Control Delay	11.6	9.2	7.1	7.2	47.7	23.0	36.2	20.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.6	9.2	7.1	7.2	47.7	23.0	36.2	20.4
LOS	B	A	A	A	D	C	D	C
Approach Delay		9.4		7.2		35.8		24.9
Approach LOS		A		A		D		C

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 87.3 (97%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.60
 Intersection Signal Delay: 12.2
 Intersection Capacity Utilization 106.4%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service G

Splits and Phases: 6: Glen Erin Drive & Folkway Drive

