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2023-11-08
Project: 210670

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RE: 436, 440, AND 462 RIDGE ROAD NORTH FORT ERIE (RIDGEWAY) ON TRANSPORTATION IMPACT ASSESSMENT – ADDENDUM

Paradigm Transportation Solutions Limited has reviewed the latest site plan for the proposed development of 436, 440, and 462 Ridge Road North in the Town of Fort Erie (Ridgeway). Since submission of the January 2022 Transportation Impact Assessment[1] (January 2022 TIA), the site plan has changed to create a Fire Route through an easement across the #436 Ridge Road North lands and the land uses and densities have changed.

Background

The January 2022 TIA assessed the transportation impacts of 13 townhouse units and 72 mid-rise apartment units on the #440 and #462 Ridge Road North site. The site's trip generation was estimated to be approximately 47 AM peak hour trips and 54 PM peak hour trips.

The January 2022 TIA concluded that the traffic generated by the proposed development can adequately be accommodated by the existing transportation network with minimal traffic impacts. The January 2022 TIA did not include the lands at #436 Ridge Road North as the Town of Fort Erie did not require a TIA for the proposed three-storey mixed use building.

Updated Site Concept Plan

The updated site concept plan for #440 and #462 Ridge Road North includes 12 semi-detached units and four-storey 91-unit mid-rise apartment building. The site plan for the #436 Ridge Road North lands includes a three-storey building containing 12 low-rise apartment units and approximately 155 m^2 (1,672 sq.ft.) of ground floor retail.

Figure 1 (attached) illustrates the site concept plan. The proposed site driveways to Ridge Road North remain unchanged. The driveways are proposed approximately 160 metre and 80

[1] 436,440, & 462 Ridge Road North Fore Erie (Ridgeway) ON Transportation Impact Assessment, January 2022, Paradigm Transportation Solutions Limited. Project No. 210670

metres south of Hazel Street. There is no vehicle connection between the #436 Ridge Road North lands and the #440 and #462 Ridge Road North lands.

Updated Trip Generation

The trip generation for the site has been updated using the methodology outlined in the January 2022 TIA. The Institute of Transportation Engineers (ITE) Trip Generation[2] methods are used to estimate the site trip generation. Land Use Codes for Single-Family Attached Housing (215), Multifamily Housing (Mid-Rise) - Not Close to Rail Transit (221), Multifamily Housing (Low-Rise) - Not Close to Rail Transit (220) and Strip Retail Plaza (<40k) (822) was used to estimate the site's vehicular trip generation.

Table 1 summarizes the estimated trip generation. The subject site is forecast to generate approximately 48 and 71 total vehicle trips during the AM and PM peak hours, respectively.

TABLE 1: TRIP GENERATION ESTIMATE

Land Use	AM Peak Hour			PM Peak Hour		
	In	Out	Sum	In	Out	Sum
Single-Family Attached Housing (215) - 12 Units	1	5	**6**	4	3	**7**
Multifamily Housing (Mid-Rise) - Not Close to Rail Transit (221) - 91 Units	7	21	**28**	22	14	**36**
Multifamily Housing (Low-Rise) - Not Close to Rail Transit (220) - 12 Units	1	4	**5**	4	2	**6**
Strip Retail Plaza (<40k) (822) - 1,672 sq.ft.	5	4	**9**	11	11	**22**
Total Generation	**14**	**34**	**48**	**41**	**30**	**71**

LUC 215 AM Average Rate = 0.48 | PM Average Rate = 0.57
LUC 221 AM T = 0.44(X) - 11.61 | PM T = 0.39(X) + 0.34
LUC 220 AM Average Rate = 0.40 | PM Average Rate = 0.51
LUC 822 AM Ln(T) = 0.66 Ln(X) + 1.84 | PM Ln(T) = 0.71 Ln(X) + 2.72

Table 2 compares the updated trip generation for the subject site to the January 2022 TIA. The updated site concept plan is forecast to generate approximately one and 17 additional trips during the AM and PM Peak hours, respectively.

[2] Institute of Transportation Engineers, *Trip Generation Manual,* 11th ed., (Washington DC: ITE, 2021).

TABLE 2: TRIP GENERATION COMPARISON

Site Concept Plan	AM Peak Hour			PM Peak Hour		
	In	Out	Sum	In	Out	Sum
January 2022 TIA	11	36	47	33	21	54
Updated Site Concept Plan	14	34	48	41	30	71
Change (vehicle trips)	**3**	**-2**	**1**	**8**	**9**	**17**

Parking Demand – Mid-Rise Building

The parking supply for the four-storey 91-unit mid-rise apartment building is 123 spaces (1.35 spaces per unit). The building is proposed to contain 58 one-bedroom units and 33 two-bedroom units (124 total bedrooms). The proposed parking supply does not meet the Town of Fort Erie's zoning requirements as currently planned.

The site's parking demand is forecast using the Institute of Transportation Engineers (ITE) Trip Parking Generation, 5th Edition[3]. Land Use Code Multifamily Housing (Mid-Rise) (221) is used to estimate the peak hour trip generation for the subject site.

The ITE Parking Generation manual is a nationally recognised resource and is the preeminent source for estimating parking generation for a wide range of land uses.

Table 2 summarizes the site's forecast parking demand. The site's parking demand, inclusive of occupant and visitor parking demand, is forecast to be approximately from 81. With a parking supply of 123 the site's parking demand is forecast to be less than the proposed supply. The parking demand for the mid-rise building is expected to be contained on-site.

TABLE 3: FORECAST PARKING DEMAND

Land Use	Number of Units	Forecast Parking Demand
Multifamily Housing (Mid-Rise)	124 bedrooms	81 spaces
Proposed Supply		**123 spaces**
Surplus		**+42 spaces**

[3] Institute of Transportation Engineers, Parking Generation Manual, 5th ed., (Washington, DC: ITE, 2019),

Forecast Traffic

Figure 2 (attached) illustrates the updated site traffic assignment. Site generated traffic is distributed through the study area intersections using the distribution estimated in the January 2022 TIA.

Figure 3 (attached) illustrates the updated five-year background traffic volumes at the study area intersections. The horizon year is five years from the date of the study and assumes a generalized background growth rate of 2.0% per annum, which is consistent with the January 2022 TIA.

Figure 4 (attached) illustrates the updated five-year total traffic volumes.

Forecast Traffic Operations

The operations of the intersections in the study area were evaluated under existing conditions using Synchro 11 and HCM 2000 procedures. The intersection analysis considered three separate measures of performance:

- The LOS for each turning movement;
- The volume to capacity ratio (v/c) for each movement; and
- The 95th percentile queue lengths using Synchro 11.

Under the Region's TIS Guidelines[4], the operational analysis must include identification of signalized and unsignalized intersections where:

- At signalized intersections, movements with v/c ratio greater than 0.85 and/or LOS "E" or worse;
- At unsignalized intersections, movements expected to operate at LOS "D" or worse and/or where the estimated 95th percentile queue length for an individual movement exceeds the available queuing space.
- Any site accesses where entrances or egress is anticipated to be blocked by traffic queues from an upstream/downstream intersection.
- An exclusive turning movement in which the 95th percentile queue will exceed the available storage space.
- Exclusive left- and right turn lanes that are inaccessible due to the length of queues in the adjacent through lanes.

[4] Niagara Region, *Transportation Impact Assessment Guidelines,* (Thorold: Niagara Region, 2023).

Background Traffic

Table 4 summarizes the background traffic level of service conditions. No changes to the existing signal timings or lane configurations are assumed.

The study area intersections are forecast to operate with acceptable levels of service and well within capacity during the weekday AM and PM peak hours. No critical movements are noted.

Appendix A contains the detailed Synchro reports.

TABLE 4: BACKGROUND TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Dominion Road & Ridge Road North	TCS	LOS	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	**B**
			Delay	<	12	>	**12**	<	13	>	**13**	<	14	>	**14**	<	14	>	**14**	**13**
			V/C	<	0.33	>		<	0.38	>		<	0.23	>		<	0.18	>		**0.31**
			Q	<	30	>		<	35	>		<	23	>		<	19	>		
	Hazel Street & Ridge Road North	TWSC	LOS	<	B	>	**B**	<	B	>	**B**	<	A	>	**A**	<	A	>	**A**	
			Delay	<	10	>	**10**	<	11	>	**11**	<	1	>	**1**	<	1	>	**1**	
			V/C	<	0.05	>		<	0.06	>		<	0.01	>		<	0.01	>		
			Q	<	1	>		<	2	>		<	0	>		<	0	>		
PM Peak Hour	Dominion Road & Ridge Road North	TCS	LOS	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	**B**
			Delay	<	13	>	**13**	<	13	>	**13**	<	17	>	**17**	<	15	>	**15**	**15**
			V/C	<	0.39	>		<	0.40	>		<	0.46	>		<	0.30	>		**0.43**
			Q	<	40	>		<	39	>		<	44	>		<	30	>		
	Hazel Street & Ridge Road North	TWSC	LOS	<	B	>	**B**	<	B	>	**B**	<	A	>	**A**	<	A	>	**A**	
			Delay	<	11	>	**11**	<	11	>	**11**	<	1	>	**1**	<	1	>	**1**	
			V/C	<	0.07	>		<	0.07	>		<	0.01	>		<	0.01	>		
			Q	<	2	>		<	2	>		<	0	>		<	0	>		

Delay - Average Delay per Vehicle in Seconds
LOS - Level of Service
MOE - Measure of Effectiveness
Q - 95th Percentile Queue Length
TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
V/C - Volume to Capacity Ratio
< - Shared Left-turn
> - Shared Right-turn

Total Traffic

Table 5 summarizes the background traffic level of service conditions. No changes to the existing signal timings or lane configurations are assumed.

The study area intersections are forecast to operate with acceptable levels of service and well within capacity during the weekday AM and PM peak hours. No critical movements are noted.

The site driveway is forecast to operate in the LOS A range with a v/c ratio of 0.10 or less during the weekday AM and PM peak hours. Queues on the Ridge Road North approaches to the site driveway are forecast to be one vehicle or less during the AM and PM peak hours.

Appendix B contains the detailed Synchro reports.

TABLE 5: TOTAL TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																	
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Dominion Road & Ridge Road North	TCS	LOS	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	**B**
			Delay	<	12	>	**12**	<	13	>	**13**	<	15	>	**15**	<	14	>	**14**	**13**
			V/C	<	0.32	>		<	0.38	>		<	0.29	>		<	0.19	>		**0.34**
			Q	<	31	>		<	36	>		<	28	>		<	20	>		
	Hazel Street & Ridge Road North	TWSC	LOS	<	B	>	**B**	<	B	>	**B**	<	A	>	**A**	<	A	>	**A**	
			Delay	<	11	>	**11**	<	11	>	**11**	<	2	>	**2**	<	1	>	**1**	
			V/C	<	0.05	>		<	0.06	>		<	0.03	>		<	0.01	>		
			Q	<	1	>		<	2	>		<	1	>		<	0	>		
	Ridge Road North & Site Driveway	TWSC	LOS					A		>	**A**		A	>	**A**	<	A		**A**	
			Delay					9		>	**0**		0	>	**0**	<	0		**0**	
			V/C					0.03		>			0.08	>		<	0.00			
			Q					1		>			0	>		<	0			
	Ridge Road North & #436 Driveway	TWSC	LOS					A		>	**A**		A	>	**A**	<	A		**A**	
			Delay					9		>	**0**		0	>	**0**	<	0		**0**	
			V/C					0.01		>			0.08	>		<	0.00			
			Q					0		>			0	>		<	0			
PM Peak Hour	Dominion Road & Ridge Road North	TCS	LOS	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	**B**
			Delay	<	13	>	**13**	<	13	>	**13**	<	18	>	**18**	<	15	>	**15**	**15**
			V/C	<	0.42	>		<	0.41	>		<	0.47	>		<	0.32	>		**0.44**
			Q	<	42	>		<	40	>		<	45	>		<	32	>		
	Hazel Street & Ridge Road North	TWSC	LOS	<	B	>	**B**	<	B	>	**B**	<	A	>	**A**	<	A	>	**A**	
			Delay	<	11	>	**11**	<	12	>	**12**	<	1	>	**1**	<	1	>	**1**	
			V/C	<	0.10	>		<	0.08	>		<	0.01	>		<	0.01	>		
			Q	<	3	>		<	2	>		<	0	>		<	0	>		
	Ridge Road North & Site Driveway	TWSC	LOS					A		>	**A**		A	>	**A**	<	A		**A**	
			Delay					10		>	**0**		0	>	**0**	<	1		**1**	
			V/C					0.02		>			0.10	>		<	0.01			
			Q					1		>			0	>		<	0			
	Ridge Road North & #436 Driveway	TWSC	LOS					A		>	**A**		A	>	**A**	<	A		**A**	
			Delay					10		>	**0**		0	>	**0**	<	0		**0**	
			V/C					0.02		>			0.10	>		<	0.01			
			Q					0		>			0	>		<	0			

Delay - Average Delay per Vehicle in Seconds
LOS - Level of Service
MOE - Measure of Effectiveness
Q - 95th Percentile Queue Length
TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
V/C - Volume to Capacity Ratio
< - Shared Left-turn
> - Shared Right-turn

Conclusion

The expected change in trip generation does not impact the findings of the January 2022 TIA. The Town of Fort Erie can rely upon the January 2022 TIA and the updated operational analysis contained herein to identify the site's transportation impacts.

The parking demand for the proposed four-story mid-rise building is forecast to be less than the proposed supply. The parking demand for the mid-rise building is expected to be contained on-site.

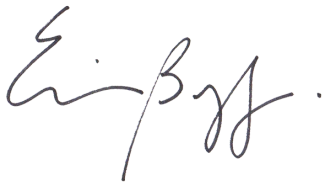
We trust that the foregoing information address your requirements. Please do not hesitate to contact us if we can be of further assistance.

Yours very truly,

PARADIGM TRANSPORTATION SOLUTIONS LIMITED

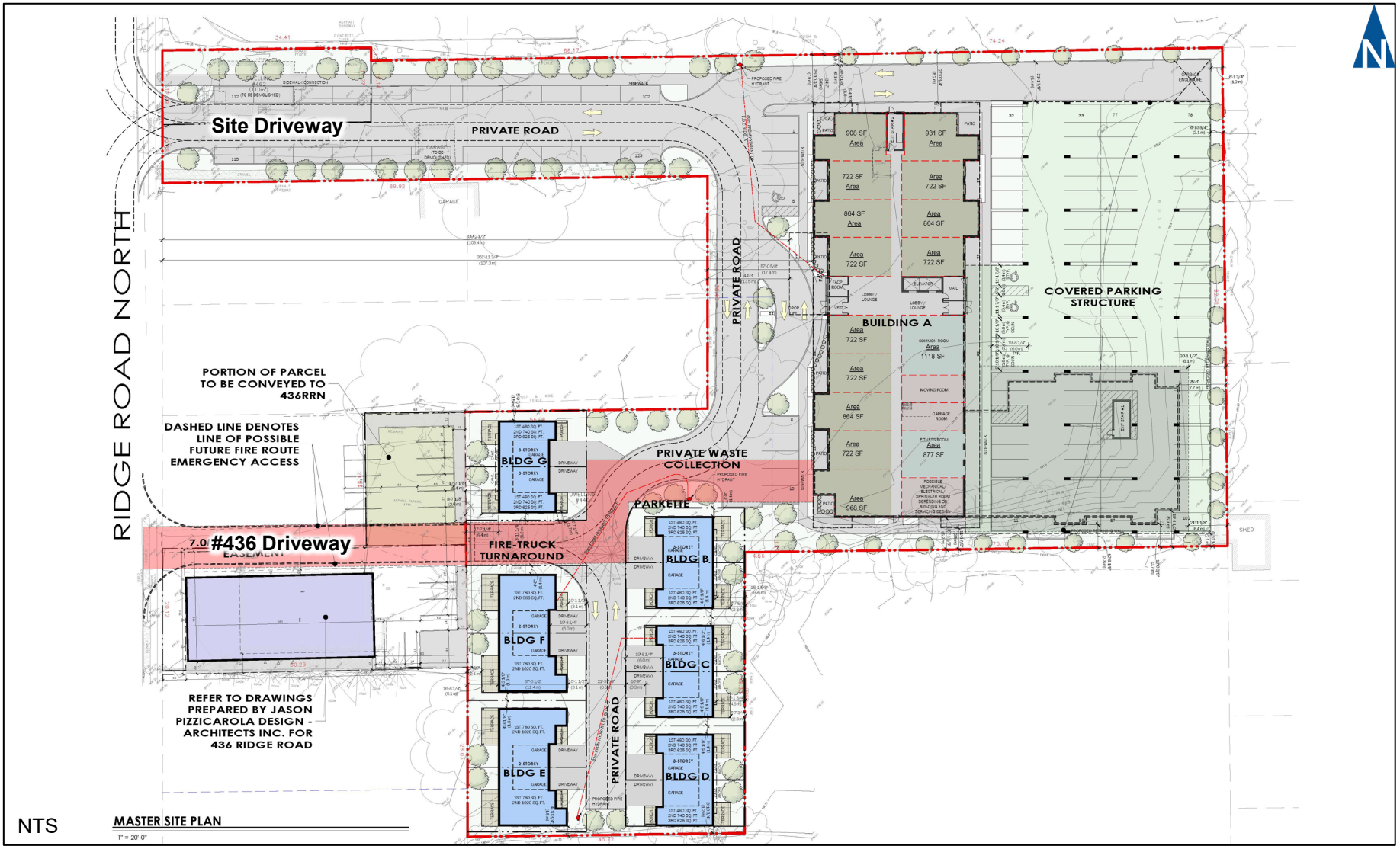
Scott Catton, C.E.T.
Senior Project Manager, Associate

Stew Elkins, B.E.S.
Vice President and CRO, Principal



Erica Bayley, P.Eng.
Senior Project Manager, Associate

Attachments

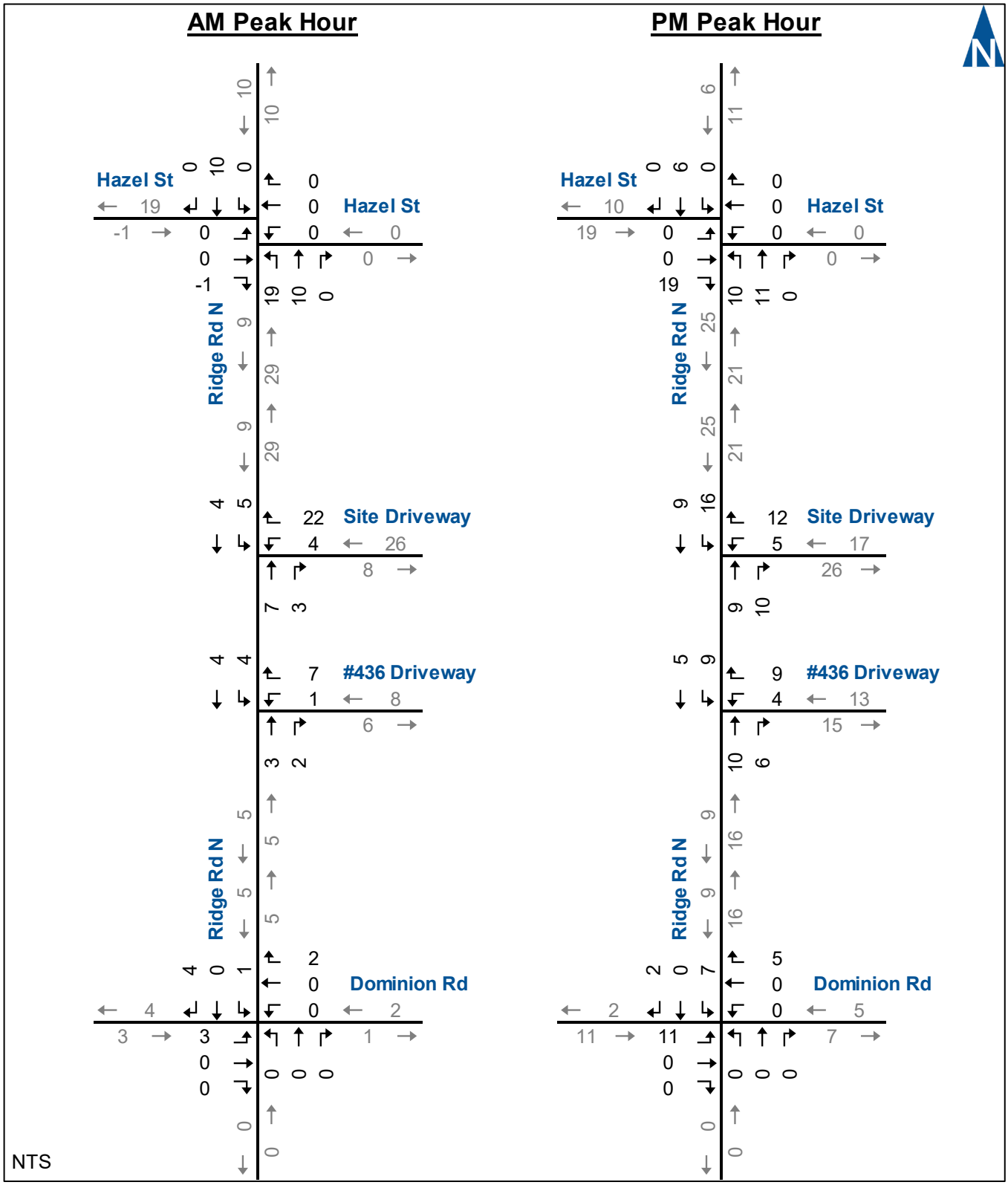


paradigm TRANSPORTATION SOLUTIONS LIMITED

Site Concept Plan

Ridge Road North
210670

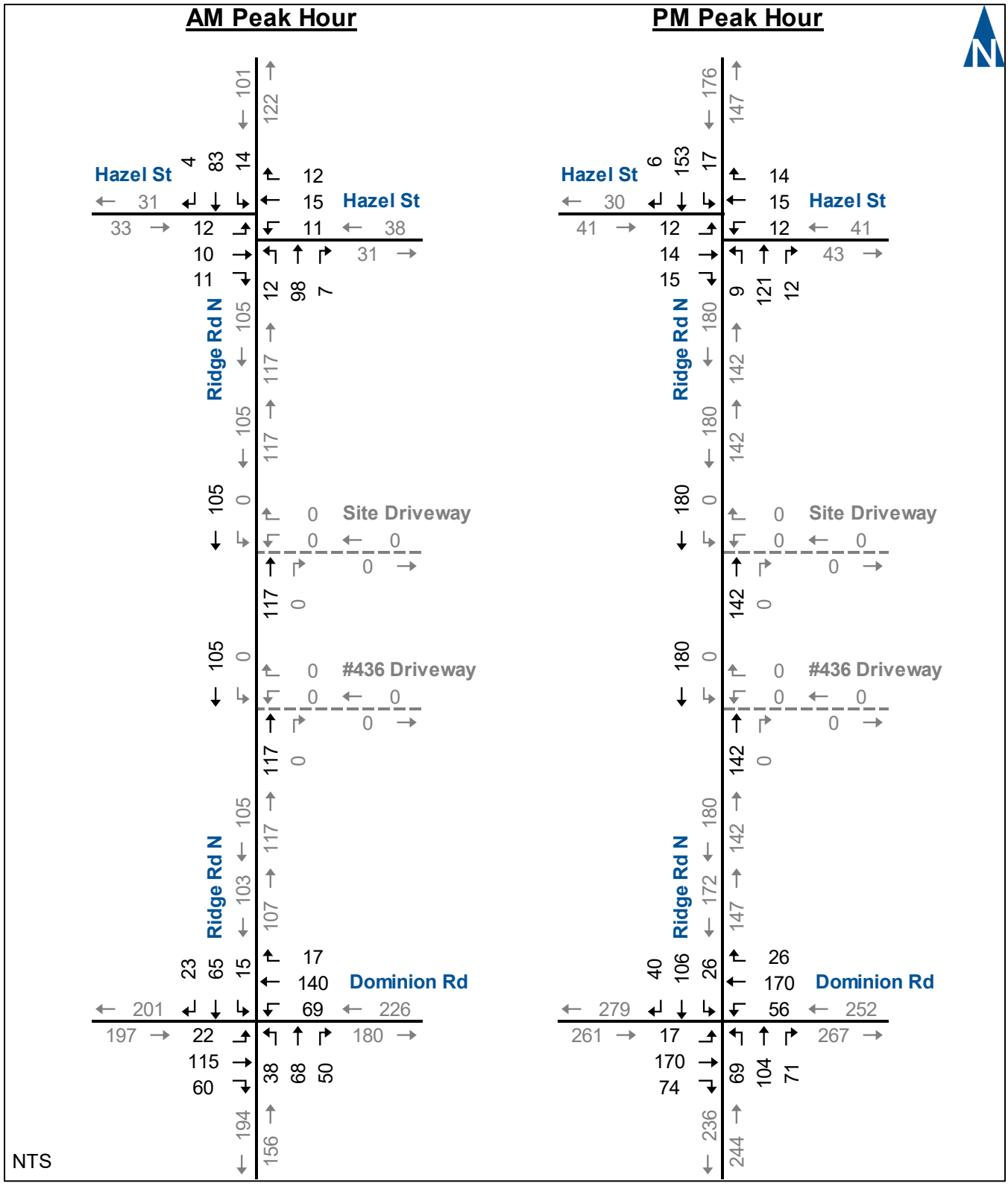
Figure 1



Forecast Site Traffic

Ridge Road North
210670

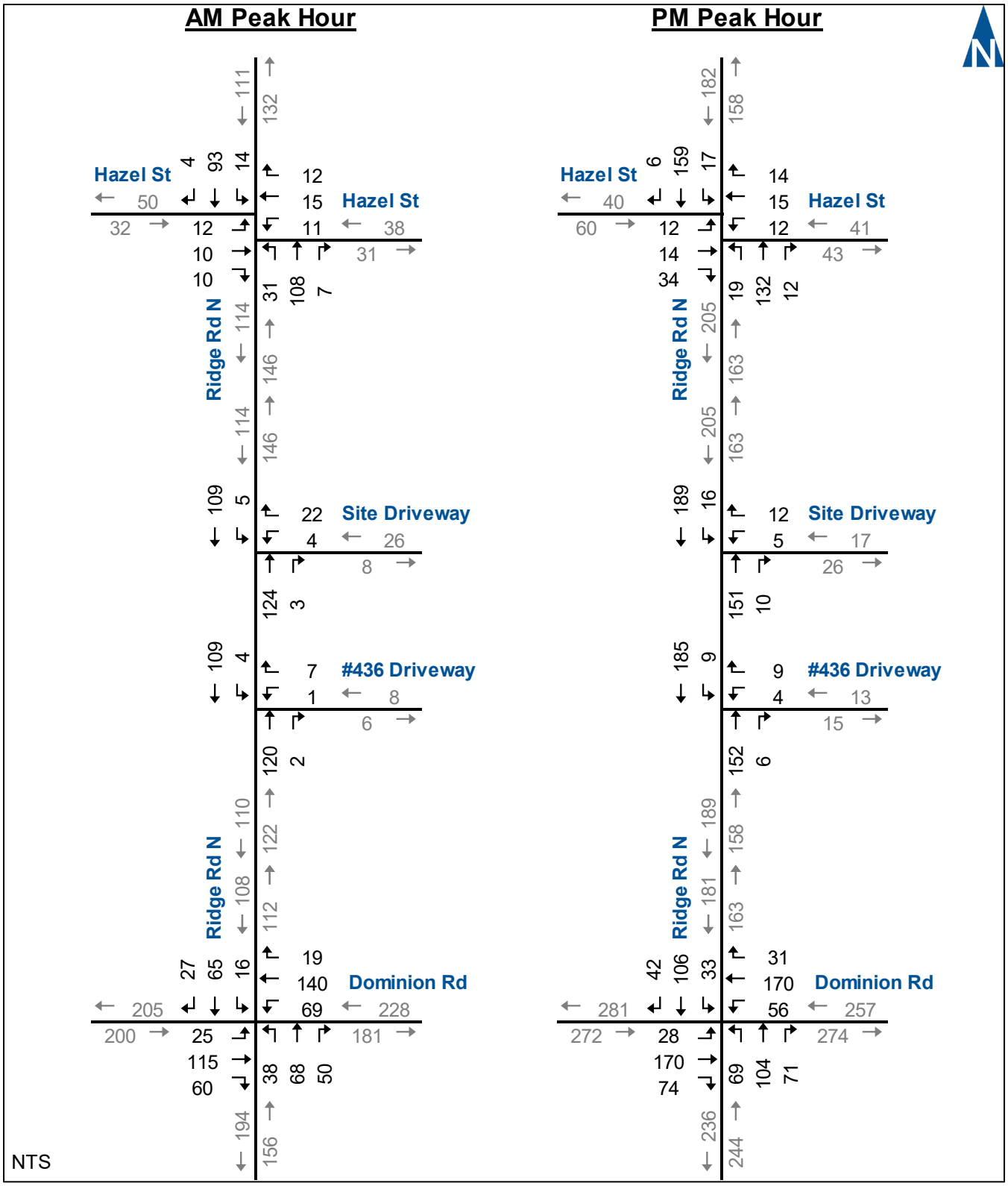
Figure 2



Forecast Background Traffic

Ridge Road North
210670

Figure 3



Forecast Total Traffic

Ridge Road North
210670

Figure 4

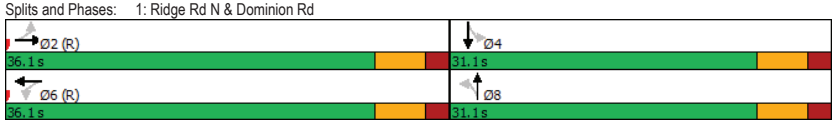
Appendix A

Background Traffic Operations

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	22	115	69	140	38	68	15	65
Future Volume (vph)	22	115	69	140	38	68	15	65
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
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)	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0
Minimum Split (s)	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1
Total Split (s)	36.1	36.1	36.1	36.1	31.1	31.1	31.1	31.1
Total Split (%)	53.7%	53.7%	53.7%	53.7%	46.3%	46.3%	46.3%	46.3%
Yellow Time (s)	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		-2.1		-2.1		-2.1		-2.1
Total Lost Time (s)		4.0		4.0		4.0		4.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		32.1		32.1		27.1		27.1
Actuated g/C Ratio		0.48		0.48		0.40		0.40
v/c Ratio		0.31		0.38		0.23		0.18
Control Delay		12.3		13.3		14.6		13.9
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		12.3		13.3		14.6		13.9
LOS		B		B		B		B
Approach Delay		12.3		13.3		14.6		13.9
Approach LOS		B		B		B		B

Intersection Summary	
Cycle Length: 67.2	
Actuated Cycle Length: 67.2	
Offset: 25 (37%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	
Natural Cycle: 55	
Control Type: Pretimed	
Maximum v/c Ratio: 0.38	
Intersection Signal Delay: 13.4	Intersection LOS: B
Intersection Capacity Utilization 50.4%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Ridge Rd N & Dominion Rd



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	214	245	137	112
v/c Ratio	0.31	0.38	0.23	0.18
Control Delay	12.3	13.3	14.6	13.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	12.3	13.3	14.6	13.9
Queue Length 50th (m)	16.3	19.3	11.5	9.2
Queue Length 95th (m)	30.0	35.3	22.9	18.9
Internal Link Dist (m)	90.5	151.5	105.4	413.0
Turn Bay Length (m)				
Base Capacity (vph)	691	652	588	626
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.31	0.38	0.23	0.18

Intersection Summary

HCM Signalized Intersection Capacity Analysis
1: Ridge Rd N & Dominion Rd

Background AM
210670

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	115	60	69	140	17	38	68	20	15	65	23
Future Volume (vph)	22	115	60	69	140	17	38	68	20	15	65	23
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.99			1.00			1.00			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.96			0.99			0.98			0.97	
Flt Protected		0.99			0.98			0.99			0.99	
Satd. Flow (prot)		1509			1575			1596			1609	
Flt Permitted		0.95			0.85			0.90			0.96	
Satd. Flow (perm)		1448			1367			1459			1554	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	125	65	75	152	18	41	74	22	16	71	25
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	214	0	0	245	0	0	137	0	0	112	0
Confl. Peds. (#/hr)	3		3	3		3	8		2	2		8
Heavy Vehicles (%)	0%	14%	5%	0%	12%	8%	4%	6%	3%	9%	2%	6%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		30.0			30.0			25.0			25.0	
Effective Green, g (s)		32.1			32.1			27.1			27.1	
Actuated g/C Ratio		0.48			0.48			0.40			0.40	
Clearance Time (s)		6.1			6.1			6.1			6.1	
Lane Grp Cap (vph)		691			652			588			626	
v/s Ratio Prot												
v/s Ratio Perm		0.15			c0.18			c0.09			0.07	
v/c Ratio		0.31			0.38			0.23			0.18	
Uniform Delay, d1		10.8			11.2			13.2			12.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.2			1.7			0.9			0.6	
Delay (s)		11.9			12.8			14.1			13.5	
Level of Service		B			B			B			B	
Approach Delay (s)		11.9			12.8			14.1			13.5	
Approach LOS		B			B			B			B	

Intersection Summary				
HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.31			
Actuated Cycle Length (s)	67.2	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	50.4%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
2: Ridge Rd N & Hazel St

Background AM
210670

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	10	11	11	15	12	12	98	7	14	83	4
Future Volume (Veh/h)	12	10	11	11	15	12	12	98	7	14	83	4
Sign Control		Stop			Stop			Free			Free	
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)	13	11	12	12	16	13	13	107	8	15	90	4
Pedestrians		3			2			1			2	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	285	268	96	280	266	115	97			117		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	285	268	96	280	266	115	97			117		
tC, single (s)	7.1	6.7	6.2	7.3	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.1	3.3	3.7	4.0	3.3	2.4			2.2		
p0 queue free %	98	98	99	98	97	99	99			99		
cM capacity (veh/h)	635	602	963	600	628	940	1371			1482		

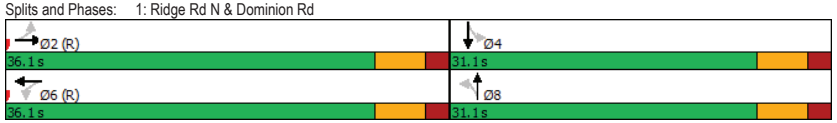
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	36	41	128	109
Volume Left	13	12	13	15
Volume Right	12	13	8	4
cSH	703	691	1371	1482
Volume to Capacity	0.05	0.06	0.01	0.01
Queue Length 95th (m)	1.3	1.5	0.2	0.2
Control Delay (s)	10.4	10.5	0.8	1.1
Lane LOS	B	B	A	A
Approach Delay (s)	10.4	10.5	0.8	1.1
Approach LOS	B	B		

Intersection Summary				
Average Delay	3.3			
Intersection Capacity Utilization	19.6%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	17	170	56	170	69	104	26	106
Future Volume (vph)	17	170	56	170	69	104	26	106
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
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)	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0
Minimum Split (s)	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1
Total Split (s)	36.1	36.1	36.1	36.1	31.1	31.1	31.1	31.1
Total Split (%)	53.7%	53.7%	53.7%	53.7%	46.3%	46.3%	46.3%	46.3%
Yellow Time (s)	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		-2.1		-2.1		-2.1		-2.1
Total Lost Time (s)		4.0		4.0		4.0		4.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		32.1		32.1		27.1		27.1
Actuated g/C Ratio		0.48		0.48		0.40		0.40
v/c Ratio		0.39		0.40		0.46		0.30
Control Delay		13.3		13.6		18.1		15.3
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		13.3		13.6		18.1		15.3
LOS		B		B		B		B
Approach Delay		13.3		13.6		18.1		15.3
Approach LOS		B		B		B		B

Intersection Summary	
Cycle Length: 67.2	
Actuated Cycle Length: 67.2	
Offset: 25 (37%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	
Natural Cycle: 55	
Control Type: Pretimed	
Maximum v/c Ratio: 0.46	
Intersection Signal Delay: 15.0	Intersection LOS: B
Intersection Capacity Utilization 64.6%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Ridge Rd N & Dominion Rd



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	283	274	265	186
v/c Ratio	0.39	0.40	0.46	0.30
Control Delay	13.3	13.6	18.1	15.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	13.3	13.6	18.1	15.3
Queue Length 50th (m)	22.5	22.0	24.7	16.0
Queue Length 95th (m)	39.7	39.4	44.4	30.0
Internal Link Dist (m)	90.5	151.5	105.4	413.0
Turn Bay Length (m)				
Base Capacity (vph)	726	678	571	622
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.39	0.40	0.46	0.30

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	170	74	56	170	26	69	104	71	26	106	40
Future Volume (vph)	17	170	74	56	170	26	69	104	71	26	106	40
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.99			1.00			0.99			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.96			0.99			0.96			0.97	
Flt Protected		1.00			0.99			0.99			0.99	
Satd. Flow (prot)		1555			1597			1612			1646	
Flt Permitted		0.97			0.88			0.87			0.93	
Satd. Flow (perm)		1519			1420			1418			1544	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	185	80	61	185	28	75	113	77	28	115	43
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	283	0	0	274	0	0	265	0	0	186	0
Confl. Peds. (#/hr)	4		4	4		4	13		1	1		13
Heavy Vehicles (%)	8%	10%	0%	5%	8%	0%	4%	0%	2%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		30.0			30.0			25.0			25.0	
Effective Green, g (s)		32.1			32.1			27.1			27.1	
Actuated g/C Ratio		0.48			0.48			0.40			0.40	
Clearance Time (s)		6.1			6.1			6.1			6.1	
Lane Grp Cap (vph)		725			678			571			622	
v/s Ratio Prot												
v/s Ratio Perm		0.19			c0.19			c0.19			0.12	
v/c Ratio		0.39			0.40			0.46			0.30	
Uniform Delay, d1		11.3			11.4			14.7			13.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.6			1.8			2.7			1.2	
Delay (s)		12.8			13.1			17.4			14.8	
Level of Service		B			B			B			B	
Approach Delay (s)		12.8			13.1			17.4			14.8	
Approach LOS		B			B			B			B	

Intersection Summary				
HCM 2000 Control Delay	14.5	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.43			
Actuated Cycle Length (s)	67.2	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	64.6%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	14	15	12	15	14	9	121	12	17	153	6
Future Volume (Veh/h)	12	14	15	12	15	14	9	121	12	17	153	6
Sign Control		Stop			Stop			Free			Free	
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)	13	15	16	13	16	15	10	132	13	18	166	7
Pedestrians		2						1				
Lane Width (m)		3.6						3.6				
Walking Speed (m/s)		1.2						1.2				
Percent Blockage		0						0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	389	372	172	388	370	138	175			145		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	389	372	172	388	370	138	175			145		
tC, single (s)	7.3	6.5	6.2	7.1	6.5	6.3	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.7	4.0	3.3	3.5	4.0	3.4	2.2			2.2		
p0 queue free %	97	97	98	98	97	98	99			99		
cM capacity (veh/h)	504	549	874	542	551	889	1411			1450		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	44	44	155	191
Volume Left	13	13	10	18
Volume Right	16	15	13	7
cSH	616	630	1411	1450
Volume to Capacity	0.07	0.07	0.01	0.01
Queue Length 95th (m)	1.8	1.8	0.2	0.3
Control Delay (s)	11.3	11.1	0.5	0.8
Lane LOS	B	B	A	A
Approach Delay (s)	11.3	11.1	0.5	0.8
Approach LOS	B	B		

Intersection Summary				
Average Delay	2.8			
Intersection Capacity Utilization	25.2%	ICU Level of Service	A	
Analysis Period (min)	15			

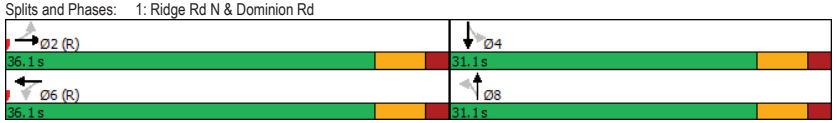
Appendix B

Total Traffic Operations

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	25	115	69	140	38	68	16	65
Future Volume (vph)	25	115	69	140	38	68	16	65
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
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)	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0
Minimum Split (s)	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1
Total Split (s)	36.1	36.1	36.1	36.1	31.1	31.1	31.1	31.1
Total Split (%)	53.7%	53.7%	53.7%	53.7%	46.3%	46.3%	46.3%	46.3%
Yellow Time (s)	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		-2.1		-2.1		-2.1		-2.1
Total Lost Time (s)		4.0		4.0		4.0		4.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		32.1		32.1		27.1		27.1
Actuated g/C Ratio		0.48		0.48		0.40		0.40
v/c Ratio		0.32		0.38		0.29		0.19
Control Delay		12.4		13.4		15.3		14.0
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		12.4		13.4		15.3		14.0
LOS		B		B		B		B
Approach Delay		12.4		13.4		15.3		14.0
Approach LOS		B		B		B		B

Intersection Summary	
Cycle Length: 67.2	
Actuated Cycle Length: 67.2	
Offset: 25 (37%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	
Natural Cycle: 55	
Control Type: Pretimed	
Maximum v/c Ratio: 0.38	
Intersection Signal Delay: 13.6	Intersection LOS: B
Intersection Capacity Utilization 49.1%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Ridge Rd N & Dominion Rd



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	217	248	169	117
v/c Ratio	0.32	0.38	0.29	0.19
Control Delay	12.4	13.4	15.3	14.0
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	12.4	13.4	15.3	14.0
Queue Length 50th (m)	16.6	19.6	14.5	9.6
Queue Length 95th (m)	30.5	35.9	27.8	19.7
Internal Link Dist (m)	90.5	151.5	105.4	160.5
Turn Bay Length (m)				
Base Capacity (vph)	688	652	585	620
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.32	0.38	0.29	0.19

Intersection Summary

HCM Signalized Intersection Capacity Analysis — Total AM
1: Ridge Rd N & Dominion Rd — 210670

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	115	60	69	140	19	38	68	50	16	65	27
Future Volume (vph)	25	115	60	69	140	19	38	68	50	16	65	27
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.99			1.00			0.99			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.96			0.99			0.96			0.97	
Flt Protected		0.99			0.99			0.99			0.99	
Satd. Flow (prot)		1511			1572			1566			1600	
Flt Permitted		0.95			0.86			0.92			0.95	
Satd. Flow (perm)		1441			1365			1453			1537	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	27	125	65	75	152	21	41	74	54	17	71	29
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	217	0	0	248	0	0	169	0	0	117	0
Confl. Peds. (#/hr)	3		3	3		3	8		2	2		8
Heavy Vehicles (%)	0%	14%	5%	0%	12%	8%	4%	6%	3%	9%	2%	6%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		30.0			30.0			25.0			25.0	
Effective Green, g (s)		32.1			32.1			27.1			27.1	
Actuated g/C Ratio		0.48			0.48			0.40			0.40	
Clearance Time (s)		6.1			6.1			6.1			6.1	
Lane Grp Cap (vph)		688			652			585			619	
v/s Ratio Prot												
v/s Ratio Perm		0.15			c0.18			c0.12			0.08	
v/c Ratio		0.32			0.38			0.29			0.19	
Uniform Delay, d1		10.8			11.2			13.5			13.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.2			1.7			1.2			0.7	
Delay (s)		12.0			12.9			14.8			13.6	
Level of Service		B			B			B			B	
Approach Delay (s)		12.0			12.9			14.8			13.6	
Approach LOS		B			B			B			B	

Intersection Summary				
HCM 2000 Control Delay	13.2	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.34			
Actuated Cycle Length (s)	67.2	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	49.1%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis — Total AM
2: Ridge Rd N & Hazel St — 210670

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	10	10	11	15	12	31	108	7	14	93	4
Future Volume (Veh/h)	12	10	10	11	15	12	31	108	7	14	93	4
Sign Control		Stop			Stop			Free			Free	
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)	13	11	11	12	16	13	34	117	8	15	101	4
Pedestrians		3			2			1			2	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	348	331	107	342	329	125	108			127		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	348	331	107	342	329	125	108			127		
tC, single (s)	7.1	6.7	6.2	7.3	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.1	3.3	3.7	4.0	3.3	2.4			2.2		
p0 queue free %	98	98	99	98	97	99	97			99		
cM capacity (veh/h)	569	546	949	538	570	928	1358			1469		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	35	41	159	120
Volume Left	13	12	34	15
Volume Right	11	13	8	4
cSH	641	637	1358	1469
Volume to Capacity	0.05	0.06	0.03	0.01
Queue Length 95th (m)	1.4	1.6	0.6	0.2
Control Delay (s)	10.9	11.0	1.8	1.0
Lane LOS	B	B	A	A
Approach Delay (s)	10.9	11.0	1.8	1.0
Approach LOS	B	B		

Intersection Summary				
Average Delay	3.5			
Intersection Capacity Utilization	24.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	4	22	124	3	5	109
Future Volume (Veh/h)	4	22	124	3	5	109
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)	4	24	135	3	5	118
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			260			
pX, platoon unblocked						
vC, conflicting volume	264	136			138	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	264	136			138	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	97			100	
cM capacity (veh/h)	726	917			1458	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	28	138	123
Volume Left	4	0	5
Volume Right	24	3	0
cSH	884	1700	1458
Volume to Capacity	0.03	0.08	0.00
Queue Length 95th (m)	0.8	0.0	0.1
Control Delay (s)	9.2	0.0	0.3
Lane LOS	A		A
Approach Delay (s)	9.2	0.0	0.3
Approach LOS	A		

Intersection Summary				
Average Delay		1.0		
Intersection Capacity Utilization		20.6%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	1	7	120	2	4	109
Future Volume (Veh/h)	1	7	120	2	4	109
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)	1	8	130	2	4	118
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			184			
pX, platoon unblocked						
vC, conflicting volume	257	131			132	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	257	131			132	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	99			100	
cM capacity (veh/h)	734	924			1466	

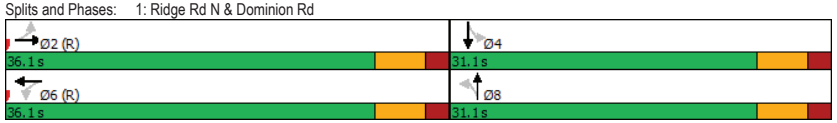
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	9	132	122
Volume Left	1	0	4
Volume Right	8	2	0
cSH	898	1700	1466
Volume to Capacity	0.01	0.08	0.00
Queue Length 95th (m)	0.2	0.0	0.1
Control Delay (s)	9.0	0.0	0.3
Lane LOS	A		A
Approach Delay (s)	9.0	0.0	0.3
Approach LOS	A		

Intersection Summary				
Average Delay		0.4		
Intersection Capacity Utilization		19.7%	ICU Level of Service	A
Analysis Period (min)		15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	28	170	56	170	69	104	33	106
Future Volume (vph)	28	170	56	170	69	104	33	106
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
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)	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0
Minimum Split (s)	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1
Total Split (s)	36.1	36.1	36.1	36.1	31.1	31.1	31.1	31.1
Total Split (%)	53.7%	53.7%	53.7%	53.7%	46.3%	46.3%	46.3%	46.3%
Yellow Time (s)	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		-2.1		-2.1		-2.1		-2.1
Total Lost Time (s)		4.0		4.0		4.0		4.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		32.1		32.1		27.1		27.1
Actuated g/C Ratio		0.48		0.48		0.40		0.40
v/c Ratio		0.42		0.41		0.47		0.32
Control Delay		13.7		13.8		18.1		15.7
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		13.7		13.8		18.1		15.7
LOS		B		B		B		B
Approach Delay		13.7		13.8		18.1		15.7
Approach LOS		B		B		B		B

Intersection Summary	
Cycle Length: 67.2	
Actuated Cycle Length: 67.2	
Offset: 25 (37%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	
Natural Cycle: 55	
Control Type: Pretimed	
Maximum v/c Ratio: 0.47	
Intersection Signal Delay: 15.2	Intersection LOS: B
Intersection Capacity Utilization 57.4%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Ridge Rd N & Dominion Rd



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	295	280	265	197
v/c Ratio	0.42	0.41	0.47	0.32
Control Delay	13.7	13.8	18.1	15.7
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	13.7	13.8	18.1	15.7
Queue Length 50th (m)	23.8	22.6	24.7	17.2
Queue Length 95th (m)	42.0	40.4	44.5	31.9
Internal Link Dist (m)	90.5	151.5	105.4	160.5
Turn Bay Length (m)				
Base Capacity (vph)	710	676	569	609
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.42	0.41	0.47	0.32

Intersection Summary

HCM Signalized Intersection Capacity Analysis — Total PM
1: Ridge Rd N & Dominion Rd — 210670

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	170	74	56	170	31	69	104	71	33	106	42
Future Volume (vph)	28	170	74	56	170	31	69	104	71	33	106	42
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.99			1.00			0.99			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.96			0.98			0.96			0.97	
Flt Protected		0.99			0.99			0.99			0.99	
Satd. Flow (prot)		1554			1594			1612			1643	
Flt Permitted		0.95			0.88			0.86			0.91	
Satd. Flow (perm)		1487			1417			1413			1513	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	185	80	61	185	34	75	113	77	36	115	46
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	295	0	0	280	0	0	265	0	0	197	0
Confl. Peds. (#/hr)	4		4	4		4	13		1	1		13
Heavy Vehicles (%)	8%	10%	0%	5%	8%	0%	4%	0%	2%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		30.0			30.0			25.0			25.0	
Effective Green, g (s)		32.1			32.1			27.1			27.1	
Actuated g/C Ratio		0.48			0.48			0.40			0.40	
Clearance Time (s)		6.1			6.1			6.1			6.1	
Lane Grp Cap (vph)		710			676			569			610	
v/s Ratio Prot												
v/s Ratio Perm		c0.20			0.20			c0.19			0.13	
v/c Ratio		0.42			0.41			0.47			0.32	
Uniform Delay, d1		11.4			11.4			14.7			13.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.8			1.9			2.7			1.4	
Delay (s)		13.2			13.3			17.5			15.2	
Level of Service		B			B			B			B	
Approach Delay (s)		13.2			13.3			17.5			15.2	
Approach LOS		B			B			B			B	

Intersection Summary				
HCM 2000 Control Delay	14.7	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.44			
Actuated Cycle Length (s)	67.2	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	57.4%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis — Total PM
2: Ridge Rd N & Hazel St — 210670

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	14	34	12	15	14	19	132	12	17	159	6
Future Volume (Veh/h)	12	14	34	12	15	14	19	132	12	17	159	6
Sign Control		Stop			Stop			Free			Free	
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)	13	15	37	13	16	15	21	143	13	18	173	7
Pedestrians		2						1				
Lane Width (m)		3.6						3.6				
Walking Speed (m/s)		1.2						1.2				
Percent Blockage		0						0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	429	412	180	450	410	150	182			156		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	429	412	180	450	410	150	182			156		
tC, single (s)	7.3	6.5	6.2	7.1	6.5	6.3	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.7	4.0	3.3	3.5	4.0	3.4	2.2			2.2		
p0 queue free %	97	97	96	97	97	98	99			99		
cM capacity (veh/h)	470	517	866	479	519	876	1403			1436		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	65	44	177	198
Volume Left	13	13	21	18
Volume Right	37	15	13	7
cSH	654	586	1403	1436
Volume to Capacity	0.10	0.08	0.01	0.01
Queue Length 95th (m)	2.6	1.9	0.4	0.3
Control Delay (s)	11.1	11.6	1.0	0.8
Lane LOS	B	B	A	A
Approach Delay (s)	11.1	11.6	1.0	0.8
Approach LOS	B	B		

Intersection Summary				
Average Delay	3.2			
Intersection Capacity Utilization	24.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	5	12	151	10	16	189
Future Volume (Veh/h)	5	12	151	10	16	189
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)	5	13	164	11	17	205
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			260			
pX, platoon unblocked						
vC, conflicting volume	408	170			175	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	408	170			175	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	99			99	
cM capacity (veh/h)	596	880			1414	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	18	175	222
Volume Left	5	0	17
Volume Right	13	11	0
cSH	777	1700	1414
Volume to Capacity	0.02	0.10	0.01
Queue Length 95th (m)	0.6	0.0	0.3
Control Delay (s)	9.7	0.0	0.7
Lane LOS	A		A
Approach Delay (s)	9.7	0.0	0.7
Approach LOS	A		

Intersection Summary				
Average Delay		0.8		
Intersection Capacity Utilization		34.4%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	4	9	152	6	9	185
Future Volume (Veh/h)	4	9	152	6	9	185
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)	4	10	165	7	10	201
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			184			
pX, platoon unblocked						
vC, conflicting volume	390	168			172	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	390	168			172	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	99			99	
cM capacity (veh/h)	614	881			1417	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	14	172	211
Volume Left	4	0	10
Volume Right	10	7	0
cSH	783	1700	1417
Volume to Capacity	0.02	0.10	0.01
Queue Length 95th (m)	0.4	0.0	0.2
Control Delay (s)	9.7	0.0	0.4
Lane LOS	A		A
Approach Delay (s)	9.7	0.0	0.4
Approach LOS	A		

Intersection Summary				
Average Delay		0.6		
Intersection Capacity Utilization		28.5%	ICU Level of Service	A
Analysis Period (min)		15		