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2023-12-14  
Project: (210066)

David Medeiros  
Broker/Owner  
RE/MAX Real Estate Centre Inc. Brokerage  
766 Hespeler Road  
Cambridge ON N3H 5L8

**RE: 961 ST. DAVID STREET NORTH, FERGUS, ON  
ADDENDUM LETTER**

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RE/MAX Real Estate Centre Inc. retained Paradigm Transportation Solutions Limited (Paradigm) to undertake a Transportation Impact Study (TIS)<sup>1</sup> for a proposed residential development located at 961 St. David Street North (Highway 6) in the Township of Centre Wellington.

The TIS included an analysis of existing traffic conditions, a description of the proposed development (13 single detached homes and 37 townhomes), traffic forecasts for an opening year horizon (2023), five-year horizon from full build-out (2028), and ten-year horizon from full build-out (2033), and recommendations required to improve future traffic conditions.

The TIS found that the addition of the site generated traffic did not increase the overall delay at the study area intersections. The minor approach of Sideroad 19 at St. David Street was forecast to operate with delay (LOS E with v/c ratio 0.65) under 2033 future background conditions. Traffic control signals were not warranted under 2033 total traffic conditions at the St. David Street (Highway 6) intersections with Sideroad 18 and Sideroad 19. A northbound left-turn lane on St. David Street at the proposed site driveway was not warranted due to the forecast left-turn volumes being less than 2% of the advancing volumes (5% left-turn volumes are needed as a minimum to proceed with the left-turn lane warrant analysis).

Since the submission of the TIS, it has been queried if the traffic from the proposed development at 950-960 St. David Street North would impact the final conclusions and recommendation of the TIS.

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<sup>1</sup> Paradigm Transportation Solutions Limited, 961 St. David Street North, Fergus, ON Transportation Impact Study, June 2022.

## Pre-Study Consultation

In the initial pre-study consultation with the Ministry of Transportation (MTO), no background developments were provided to be included in the future background traffic forecasts. Other known developments to the west (Beatty Line and Sideroad 19) were included in the background forecasts.

## 950 & 960 St. David Street North Fergus

950-960 St. David Street North is a proposed mix-used development consisting of 112 townhouse units and a 13,500 sq.ft. retail store. The development is forecast<sup>2</sup> to generate a total of 93 AM peak hour trips and 165 PM peak hour trips. **Figure 1** illustrates the site generated traffic volumes from 950-960 St. David Street North.

## 2033 Total Traffic Horizon

**Figure 2** shows the updated 2033 future background traffic volumes. **Figure 3** shows the revised 2033 Total traffic volumes. **Table 1** details the level of service conditions for the weekday AM and PM peak hours.

All study area intersections are forecast to operate within acceptable levels of service during the AM and PM peak hour with the following critical movement noted:

- ▶ The eastbound left/right-turn movement at St. David Street North and Sideroad 19 is forecast to operate with delays in the LOS F range and v/c ratio 0.77 during the PM peak hour. The v/c ratio indicates that while there is delay, there remains excess capacity for this movement.

The above noted problem movement is present under the 2033 background horizon year and is not triggered by the addition of the site-generated traffic volumes.

With the addition of the site generated traffic volumes, the overall intersection delays at the study area intersections do not increase from 2033 background conditions during the AM and PM peak hours.

**Appendix A** contains the supporting detailed Synchro reports.

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<sup>2</sup> Paradigm Transportation Solutions Limited, 950 & 960 St. David Street North, Fergus Transportation Impact Study, May 2022.



**TABLE 1: 2033 TOTAL TRAFFIC OPERATIONS**

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach											Overall
				Eastbound				Northbound				Southbound			
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	
AM Peak Hour	St David Street North (Hwy 6) & Sideroad 18	TWSC	LOS Delay V/C Q Ex Avail.	B 14 0.27 8 -- --	> > > > >	B 14	A 9 0.07 2 110 108	A 0 0.24 0 -- --		A 1		A 0 > > > >	A 0 > > > >	A 2	
	St David Street North (Hwy 6) & Sideroad 19	TWSC	LOS Delay V/C Q Ex Avail.	C 17 0.23 7 -- --	> > > > >	C 17	A 9 0.05 1 30 29	A 0 0.29 0 -- --		A 1		A 0 > > > >	A 0 > > > >	A 2	
	St David Street North (Hwy 6) & Site Driveway	TWSC	LOS Delay V/C Q Ex Avail.	C 16 0.06 2 -- --	> > > > >	C 16	< < < < < <	A 0 0.00 0 -- --		A 0		A 0 > > > >	A 0 > > > >	A 0	
PM Peak Hour	St David Street North (Hwy 6) & Sideroad 18	TWSC	LOS Delay V/C Q Ex Avail.	D 27 0.48 19 -- --	> > > > >	D 27	A 10 0.19 5 110 105	A 0 0.35 0 -- --		A 2		A 0 > > > >	A 0 > > > >	A 4	
	St David Street North (Hwy 6) & Sideroad 19	TWSC	LOS Delay V/C Q Ex Avail.	F 64 0.77 40 -- --	> > > > >	F 64	A 10 0.13 4 30 26	A 0 0.47 0 -- --		A 1		A 0 > > > >	A 0 > > > >	A 6	
	St David Street North (Hwy 6) & Site Driveway	TWSC	LOS Delay V/C Q Ex Avail.	C 23 0.07 2 -- --	> > > > >	C 23	< < < < < <	A 0 0.02 0 -- --		A 0		A 0 > > > >	A 0 > > > >	A 0	

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length (m)

Ex. - Existing Available Storage (m)

Avail. - Available Storage (m)

TWSC - Two-Way Stop Control

< - Shared Left-Turn

> - Shared Right-Turn



## Left-Turn Lanes

The intersection of St. David Street North (Highway 6) and the proposed site driveway was assessed to determine if the projected traffic volumes warrant installation of left-turn lanes. The warrants for left-turn lanes follow the requirements in the Ministry of Transportation's (MTO) Geometric Design Standards<sup>3</sup>. A design speed of 80 km/h (20 km/h over the posted speed limit) was used for St. David Street North (Highway 6).

The percentages of left-turning vehicles in the approaching volume is 2% or less for all horizon years. The percentage of left-turning vehicles does not meet the minimum requirement of 5% for calculating a left-turn lane, based on the nomographs for 5% increments.

The proposed intersection of St. David Street North (Highway 6) and the site driveway is forecast to operate with very good level of service. The forecast left-turn volumes are generally very low and represent less than 1% of the future AM peak hour approaching traffic volume and less than 2% of the PM peak hour traffic volumes.

The proposed development is in a low-speed urban area with the northbound through traffic forecast to operate with excellent level of service without a left-turn lane.

## Traffic Control Improvements

The intersections of St. David Street North (Highway 6) at Sideroad 18 and at Sideroad 19 were assessed using the Ontario Traffic Manual (OTM Book 12 – Justification 7) procedures<sup>4</sup>. **Appendix B** contains the detailed analysis. **Table 2** summarizes the results. It indicates that traffic control signals are not justified at the intersections of St. David Street North (Highway 6) at Sideroad 18 and St. David Street North at Sideroad 19 under 2033 horizon year.

**TABLE 3: TRAFFIC SIGNAL WARRANT SUMMARY**

St. David Street North (Highway 6)	Horizon Year	OTM Warrants				
		1A	1B	2A	2B	120%
Sideroad 18	2033 Total	83.4%	26.4%	74.1%	11.0%	No
Sideroad 19	2033 Total	98.8%	22.4%	90.8%	14.3%	No

As traffic volumes increase over time, actual traffic volumes may satisfy the minimum warrant criteria post 2033 horizon year. It is recommended that the MTO and Township of Centre Wellington monitor the future traffic volumes to ensure appropriate forms of traffic control are in place.

<sup>3</sup> Design Supplement for TAC Geometric Design Guide for Canadian Roads, Ministry of Transportation Ontario, June 2017

<sup>4</sup> Ontario Traffic Manual Book 12, Ministry of Transportation of Ontario, July 2001.



No changes with the conclusions and recommendations from the June 2022 TIS are expected with the addition of the traffic generated by 950-960 St. David Street North in the future background traffic forecasts,

We trust that this response is sufficient at this time. Please feel free to contact me should you have any questions.

Yours very truly,

**PARADIGM TRANSPORTATION SOLUTIONS LIMITED**

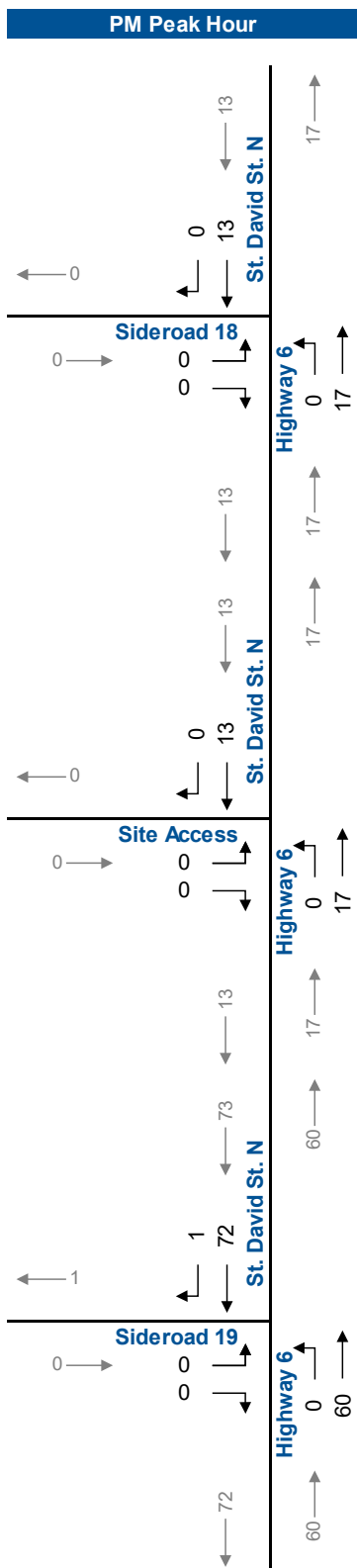
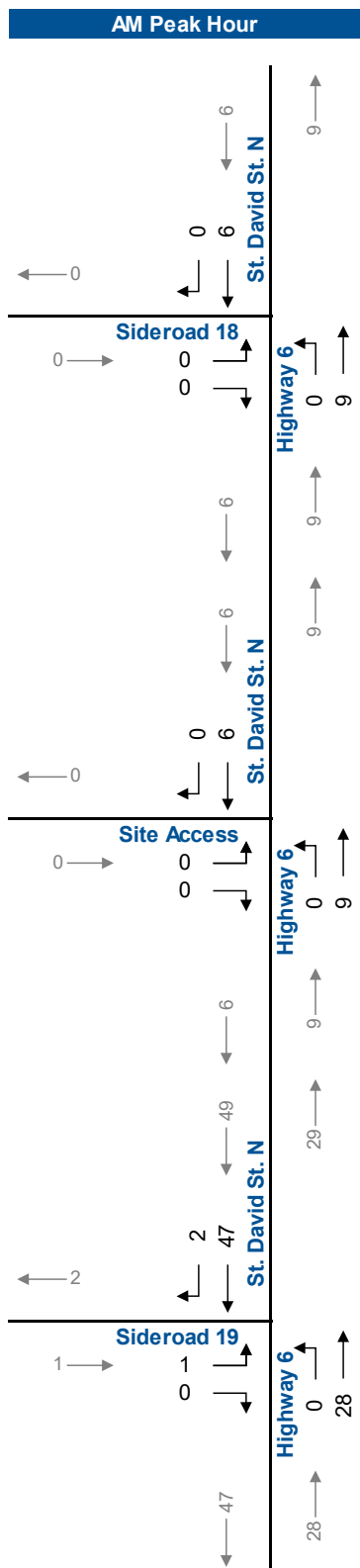
<< Original Signed By >>

**Erica Bayley**

P.Eng.

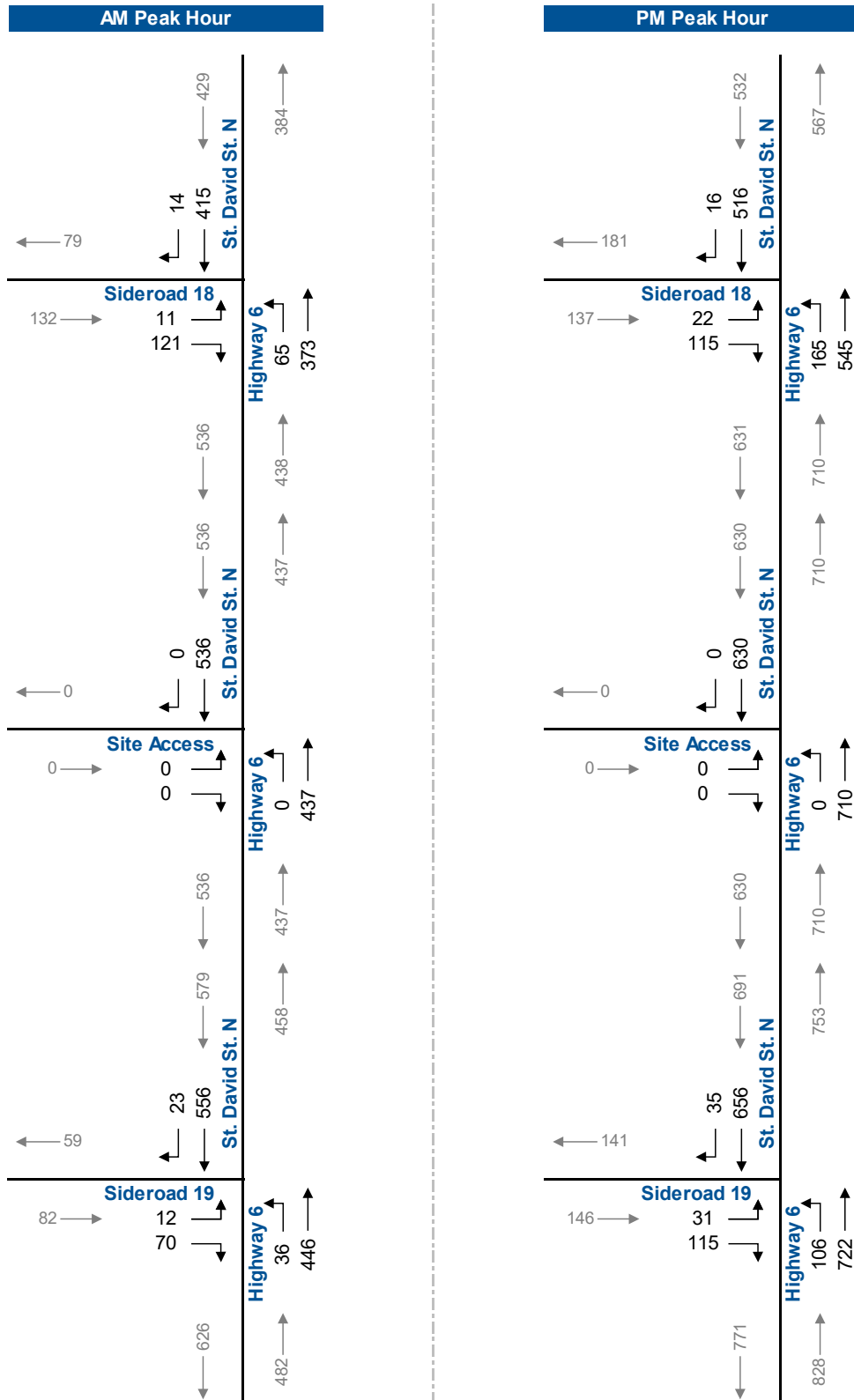
Senior Project Manager, Associate



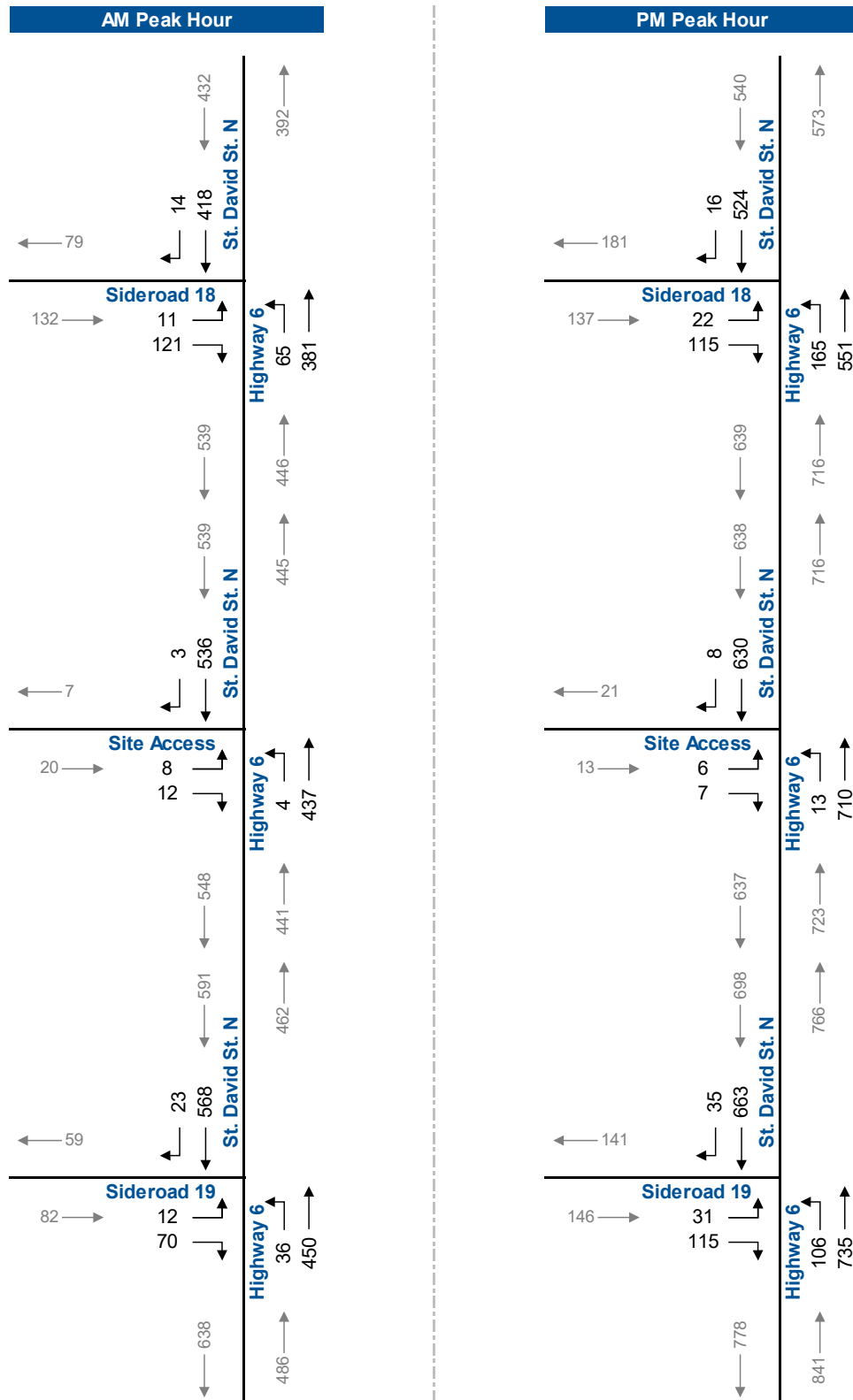


# 950 & 960 St. David Street North Traffic Volumes

Figure 1



## 2033 Background Traffic Volumes



# 2033 Total Traffic Volumes

Figure 3



## APPENDIX A

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Lanes, Volumes, Timings  
3: St David St (Hwy 6) & SR 18

Total (2033)  
AM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	W	W	
Traffic Volume (vph)	11	121	65	381	418	14
Future Volume (vph)	11	121	65	381	418	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0	110.0			0.0
Storage Lanes	1	0	1			0
Taper Length (m)	7.5		65.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.876			0.996		
Flt Protected	0.996		0.950			
Satd. Flow (prot)	1599	0	1671	1681	1851	0
Flt Permitted	0.996		0.950			
Satd. Flow (perm)	1599	0	1671	1681	1851	0
Link Speed (k/h)	50			60	60	
Link Distance (m)	484.7			166.2	474.5	
Travel Time (s)	34.9			10.0	28.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	4%	8%	13%	2%	9%
Adj. Flow (vph)	12	132	71	414	454	15
Shared Lane Traffic (%)						
Lane Group Flow (vph)	144	0	71	414	469	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	44.5%
ICU Level of Service A	
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis  
3: St David St (Hwy 6) & SR 18

Total (2033)  
AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	W	W	
Traffic Volume (veh/h)	11	121	65	381	418	14
Future Volume (Veh/h)	11	121	65	381	418	14
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)	12	132	71	414	454	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	1018	462	469			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1018	462	469			
tC, single (s)	6.4	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	95	78	93			
cM capacity (veh/h)	248	596	1062			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	144	71	414	469
Volume Left	12	71	0	0
Volume Right	132	0	0	15
sSH	533	1062	1700	1700
Volume to Capacity	0.27	0.07	0.24	0.28
Queue Length 95th (m)	8.2	1.6	0.0	0.0
Control Delay (s)	14.2	8.6	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	14.2	1.3		0.0
Approach LOS	B			

Intersection Summary

Average Delay	2.4
Intersection Capacity Utilization	44.5%
ICU Level of Service A	
Analysis Period (min)	15

Lanes, Volumes, Timings  
5: St David St (Hwy 6) & SR 19

Total (2033)  
AM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	12	70	36	450	568	23
Future Volume (vph)	12	70	36	450	568	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0	30.0			0.0
Storage Lanes	1	0	1			0
Taper Length (m)	7.5		25.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.885			0.995		
Flt Protected	0.993		0.950			
Satd. Flow (prot)	1563	0	1517	1712	1829	0
Flt Permitted	0.993		0.950			
Satd. Flow (perm)	1563	0	1517	1712	1829	0
Link Speed (k/h)	50			50	60	
Link Distance (m)	418.5			96.3	248.9	
Travel Time (s)	30.1			6.9	14.9	
Confl. Peds. (#/hr)			2			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	8%	19%	11%	3%	13%
Adj. Flow (vph)	13	76	39	489	617	25
Shared Lane Traffic (%)						
Lane Group Flow (vph)	89	0	39	489	642	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	42.9%
ICU Level of Service	A
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis  
5: St David St (Hwy 6) & SR 19

Total (2033)  
AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	12	70	36	450	568	23
Future Volume (Veh/h)	12	70	36	450	568	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)	13	76	39	489	617	25
Pedestrians	2					
Lane Width (m)	3.6					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1198	632	644			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1198	632	644			
tC, single (s)	6.4	6.3	4.3			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.4			
p0 queue free %	93	84	95			
cM capacity (veh/h)	197	469	863			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	89	39	489	642		
Volume Left	13	39	0	0		
Volume Right	76	0	0	25		
eSH	391	863	1700	1700		
Volume to Capacity	0.23	0.05	0.29	0.38		
Queue Length 95th (m)	6.6	1.1	0.0	0.0		
Control Delay (s)	16.9	9.4	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	16.9	0.7		0.0		
Approach LOS	C					

Intersection Summary	
Average Delay	1.5
Intersection Capacity Utilization	42.9%
ICU Level of Service	A
Analysis Period (min)	15

Lanes, Volumes, Timings  
8: St David St (Hwy 6) & Site Driveway

Total (2033)  
AM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	8	12	4	437	536	3
Future Volume (vph)	8	12	4	437	536	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.920			0.999		
Satd. Flow (prot)	1713	0	0	1863	1861	0
Flt Permitted	0.980					
Satd. Flow (perm)	1713	0	0	1863	1861	0
Link Speed (k/h)	50			60	60	
Link Distance (m)	182.7			248.9	166.2	
Travel Time (s)	13.2			14.9	10.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	2%	2%	0%
Adj. Flow (vph)	9	13	4	475	583	3
Shared Lane Traffic (%)						
Lane Group Flow (vph)	22	0	0	479	586	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	38.4%
ICU Level of Service A	
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis  
8: St David St (Hwy 6) & Site Driveway

Total (2033)  
AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	8	12	4	437	536	3
Future Volume (Veh/h)	8	12	4	437	536	3
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)	9	13	4	475	583	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	1068	584	586			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1068	584	586			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	97	100			
cM capacity (veh/h)	247	515	999			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	22	479	586
Volume Left	9	4	0
Volume Right	13	0	3
eSH	356	999	1700
Volume to Capacity	0.06	0.00	0.34
Queue Length 95th (m)	1.5	0.1	0.0
Control Delay (s)	15.8	0.1	0.0
Lane LOS	C	A	
Approach Delay (s)	15.8	0.1	0.0
Approach LOS	C		

Intersection Summary	
Average Delay	0.4
Intersection Capacity Utilization	38.4%
ICU Level of Service A	
Analysis Period (min)	15

Lanes, Volumes, Timings  
3: St David St (Hwy 6) & SR 18

Total (2033)  
PM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	22	115	165	551	524	16
Future Volume (vph)	22	115	165	551	524	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0	110.0			0.0
Storage Lanes	1	0	1			0
Taper Length (m)	7.5		65.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.887			0.996		
Flt Protected	0.992		0.950			
Satd. Flow (prot)	1603	0	1671	1681	1852	0
Flt Permitted	0.992		0.950			
Satd. Flow (perm)	1603	0	1671	1681	1852	0
Link Speed (k/h)	50			60	60	
Link Distance (m)	484.7			164.8	474.5	
Travel Time (s)	34.9			9.9	28.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	4%	8%	13%	2%	9%
Adj. Flow (vph)	24	125	179	599	570	17
Shared Lane Traffic (%)						
Lane Group Flow (vph)	149	0	179	599	587	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	56.0%		ICU Level of Service B			
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis  
3: St David St (Hwy 6) & SR 18

Total (2033)  
PM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	22	115	165	551	524	16
Future Volume (Veh/h)	22	115	165	551	524	16
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)	24	125	179	599	570	17
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	1536	578	587			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1536	578	587			
tC, single (s)	6.5	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.6	3.3	2.3			
p0 queue free %	76	76	81			
cM capacity (veh/h)	102	511	959			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>		
Volume Total	149	179	599	587		
Volume Left	24	179	0	0		
Volume Right	125	0	0	17		
eSH	310	959	1700	1700		
Volume to Capacity	0.48	0.19	0.35	0.35		
Queue Length 95th (m)	18.8	5.2	0.0	0.0		
Control Delay (s)	26.9	9.6	0.0	0.0		
Lane LOS	D	A				
Approach Delay (s)	26.9	2.2		0.0		
Approach LOS	D					
<b>Intersection Summary</b>						
Average Delay			3.8			
Intersection Capacity Utilization	56.0%		ICU Level of Service	B		
Analysis Period (min)	15					

Lanes, Volumes, Timings  
5: St David St (Hwy 6) & SR 19

Total (2033)  
PM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	31	115	106	735	663	35
Future Volume (vph)	31	115	106	735	663	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0	30.0			0.0
Storage Lanes	1	0	1			0
Taper Length (m)	7.5		25.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.894			0.993		
Flt Protected	0.989		0.950			
Satd. Flow (prot)	1607	0	1805	1827	1769	0
Flt Permitted	0.989		0.950			
Satd. Flow (perm)	1607	0	1805	1827	1769	0
Link Speed (k/h)	50		50	60	60	
Link Distance (m)	418.5		96.3	250.3		
Travel Time (s)	30.1		6.9	15.0		
Confl. Peds. (#/hr)			5			5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	14%	2%	0%	4%	7%	0%
Adj. Flow (vph)	34	125	115	799	721	38
Shared Lane Traffic (%)						
Lane Group Flow (vph)	159	0	115	799	759	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	61.7% ICU Level of Service B
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis  
5: St David St (Hwy 6) & SR 19

Total (2033)  
PM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	31	115	106	735	663	35
Future Volume (Veh/h)	31	115	106	735	663	35
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)	34	125	115	799	721	38
Pedestrians	5					
Lane Width (m)	3.6					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1774	745	764			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1774	745	764			
tC, single (s)	6.5	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.3	2.2			
p0 queue free %	54	70	87			
cM capacity (veh/h)	73	412	854			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	159	115	799	759		
Volume Left	34	115	0	0		
Volume Right	125	0	0	38		
eSH	207	854	1700	1700		
Volume to Capacity	0.77	0.13	0.47	0.45		
Queue Length 95th (m)	40.1	3.5	0.0	0.0		
Control Delay (s)	63.6	9.9	0.0	0.0		
Lane LOS	F	A				
Approach Delay (s)	63.6	1.2		0.0		
Approach LOS	F					

Intersection Summary	
Average Delay	6.1
Intersection Capacity Utilization	61.7% ICU Level of Service B
Analysis Period (min)	15

Lanes, Volumes, Timings  
8: St David St (Hwy 6) & Site Driveway

Total (2033)  
PM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	6	7	13	710	630	8
Future Volume (vph)	6	7	13	710	630	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.928				0.998	
Fit Protected	0.977			0.999		
Satd. Flow (prot)	1723	0	0	1862	1859	0
Fit Permitted	0.977			0.999		
Satd. Flow (perm)	1723	0	0	1862	1859	0
Link Speed (k/h)	50			60	60	
Link Distance (m)	210.3			250.3	164.8	
Travel Time (s)	15.1			15.0	9.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	2%	2%	0%
Adj. Flow (vph)	7	8	14	772	685	9
Shared Lane Traffic (%)						
Lane Group Flow (vph)	15	0	0	786	694	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	57.8%
ICU Level of Service	B
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis  
8: St David St (Hwy 6) & Site Driveway

Total (2033)  
PM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	7	13	710	630	8
Future Volume (Veh/h)	6	7	13	710	630	8
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)	7	8	14	772	685	9
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	1490	690	694			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1490	690	694			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	98	98			
cM capacity (veh/h)	136	449	911			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	15	786	694
Volume Left	7	14	0
Volume Right	8	0	9
sSH	216	911	1700
Volume to Capacity	0.07	0.02	0.41
Queue Length 95th (m)	1.7	0.4	0.0
Control Delay (s)	22.9	0.4	0.0
Lane LOS	C	A	
Approach Delay (s)	22.9	0.4	0.0
Approach LOS	C		

Intersection Summary

Average Delay		0.4	
Intersection Capacity Utilization	57.8%	ICU Level of Service	B
Analysis Period (min)	15		

## APPENDIX B

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# Signal Justification Calculation for Forecasted Volumes (OTM Book 12 - Justification 7)



Horizon Year: Total (2033)  
 Region/City/Township: Fergus, Centre Wellington

Major Street: St David St North (Hwy 6)  
 Minor Street: Sideroad 19

North/South?: Y

Number of Approach Lanes: 1  
 Tee Intersection?: Y  
 Flow Conditions: Restricted  
 PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

Time Period	Major Street St David St North (Hwy 6)						Minor Street Sideroad 19						Peds Crossing Main Road
	Northbound			Southbound			Eastbound			Westbound			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
AM Peak Hour	36	450			568	23	12		70				0
PM Peak Hour	106	735			663	35	31		115				0
Average Hourly Volume	36	296	0	0	308	15	11	0	46	0	0	0	0

Warrant	AHV
1A - All	711
1B - Minor	57
2A - Major	654
2B - Cross	11

### Warrant 1 - Minimum Vehicular Volume

1A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	All Approaches	480	720	600	900	
					% Fulfilled	98.8%

1B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Minor Street Approaches	180	255	180	255	
					% Fulfilled	22.4%

### Warrant 2 - Delay To Cross Traffic

2A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Major Street Approaches	480	720	600	900	
					% Fulfilled	90.8%

2B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Traffic Crossing Major Street	50	75	50	75	
					% Fulfilled	14.3%

# Signal Justification Calculation for Forecasted Volumes (OTM Book 12 - Justification 7)



Horizon Year: Total (2033)  
 Region/City/Township: Fergus, Centre Wellington

Major Street: St David St North (Hwy 6)  
 Minor Street: Sideroad 18

North/South?: Y

Number of Approach Lanes: 1  
 Tee Intersection?: Y  
 Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

Time Period	Major Street St David St North (Hwy 6)						Minor Street Sideroad 18						Peds Crossing Main Road
	Northbound			Southbound			Eastbound			Westbound			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
AM Peak Hour	65	381			418	14	11		121				0
PM Peak Hour	165	551			524	16	22		115				0
Average Hourly Volume	58	233	0	0	236	8	8	0	59	0	0	0	0

Warrant	AHV
1A - All	601
1B - Minor	67
2A - Major	534
2B - Cross	8

### Warrant 1 - Minimum Vehicular Volume

1A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	All Approaches	480	720	600	900	
					% Fulfilled	83.4%

1B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Minor Street Approaches	180	255	180	255	
					% Fulfilled	26.4%

### Warrant 2 - Delay To Cross Traffic

2A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Major Street Approaches	480	720	600	900	
					% Fulfilled	74.1%

2B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Traffic Crossing Major Street	50	75	50	75	
					% Fulfilled	11.0%