

APPENDIX

A

TMC AND GROWTH
RATE
CALCULATIONS

REGIONAL MUNICIPALITY OF WATERLOO TURNING MOVEMENT COUNT



Morning Peak Diagram

Count Period
From: 7:30 AM
To: 10:30 AM

Peak Hour
From: 8:00 AM
To: 9:00 AM

Municipality: Waterloo
Intersection: Erbville Rd & Conservation Dr
Control: Non Signalized
Major Road: Erbville Rd

Weather conditions:
Sunny
Person(s) who counted:
AT09-JK

GeoID: 4247
Count Date: Tuesday, 26-Sep-17

North Leg Total:	368	% Trks	0%	8%	11%	
North Entering:	173	Heavys	0	8	5	13
North Peds:	1	Trucks	0	1	1	2
Peds Cross:	∞	Cars	2	107	49	158
		Total	2	116	55	

Heavys	15
Trucks	1
Cars	179
Total	195

East Leg Total:	376
East Entering:	154
East Peds:	0
Peds Cross:	∞

Heavys	0
Trucks	1
Cars	28
Total	29



Conservation Dr

% Trks	0%	Heavys	0	Trucks	0	Cars	6	Total	6
	0%		0		0		43		43
	0%		0		0		4		4
			0		0		53		53



Erbville Rd



Total	37	Cars	29	Trucks	0	Heavys	8	% Trks	23%
	26		25		1		0		4%
	91		87		0		4		4%
			141		1		12		

Conservation Dr



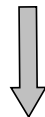
Cars	210
Trucks	3
Heavys	9
Total	222

Erbville Rd



Peds Cross:	∞
West Peds:	1
West Entering:	53
West leg Total:	82

Heavys	12
Trucks	1
Cars	198
Total	211



Total	1	152	124	
Cars	1	144	118	263
Trucks	0	1	2	3
Heavys	0	7	4	11
% Trks	0%	5%	5%	

Peds Cross:	∞
South Peds:	0
South Entering:	277
South leg Total:	488

Comments

To determine total vehicles entering the intersection during morning peak hour, add all leg totals entering.

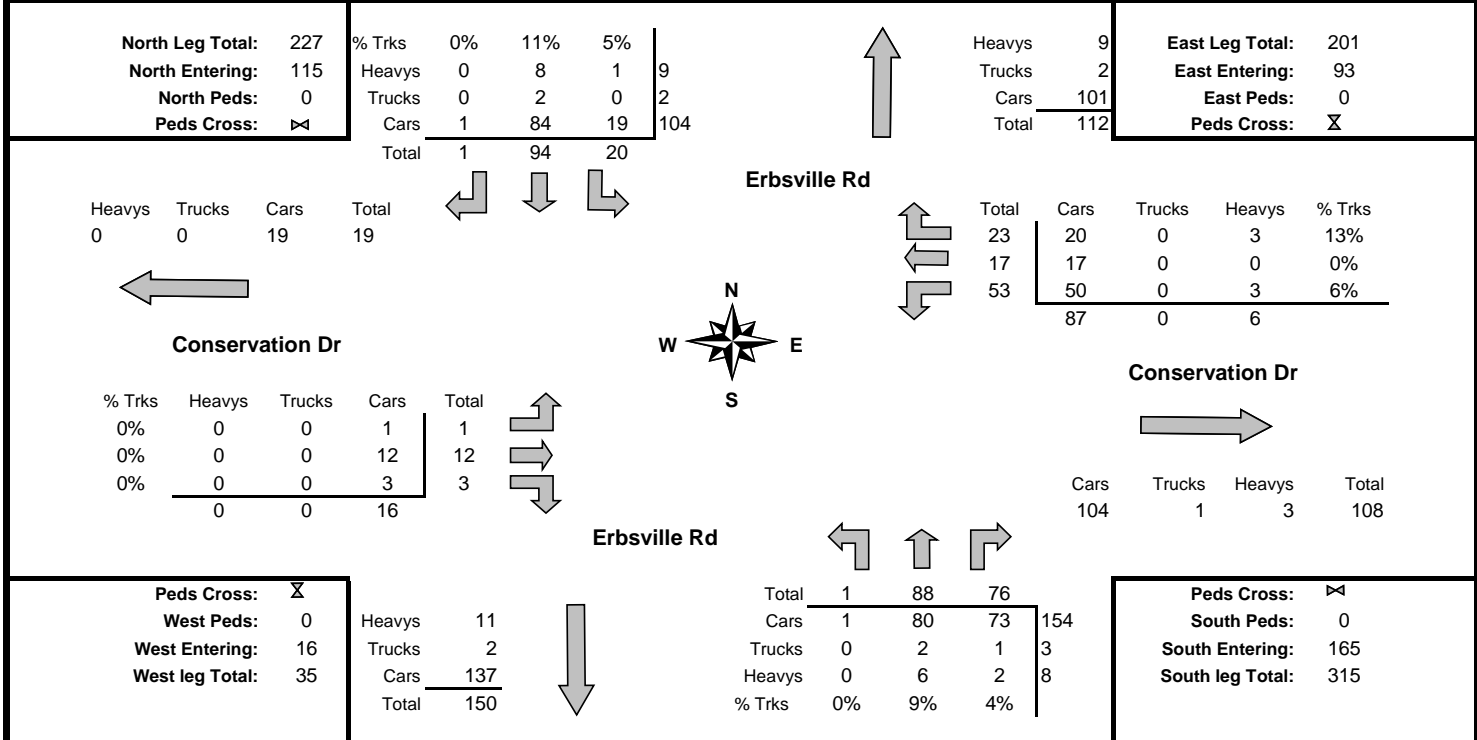
Example 1: Total Entering = West leg total entering + South leg total entering + East leg total entering + North leg total entering
Therefore, total vehicles entering intersection = **657**

Example 2: Total vehicles entering from the west = eastbound left turn + eastbound through + eastbound right turn
Therefore, vehicles entering from the west = **53**

REGIONAL MUNICIPALITY OF WATERLOO TURNING MOVEMENT COUNT



<h2>Mid-day Peak Diagram</h2>	Count Period From: 12:00 PM To: 2:00 PM	Peak Hour From: 12:30 PM To: 1:30 PM
Municipality: Waterloo Intersection: Erbville Rd & Conservation Dr Control: Non Signalized Major Road: Erbville Rd	Weather conditions: Sunny Person(s) who counted: AT09-JK	GeoID: 4247 Count Date: Tuesday, 26-Sep-17



Comments

To determine total vehicles entering the intersection during mid-day peak hour, add all leg totals entering.

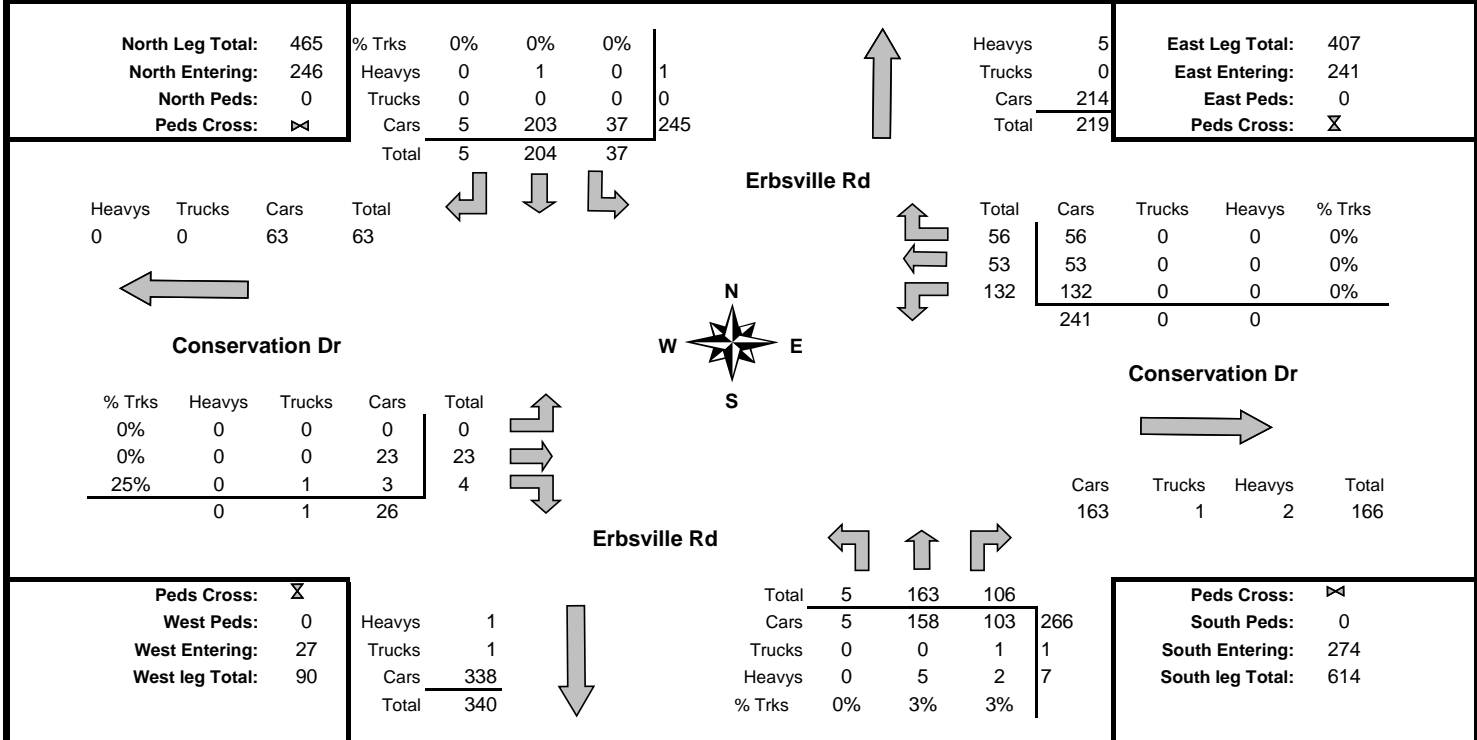
Example 1: Total Entering = West leg total entering + South leg total entering + East leg total entering + North leg total entering
 Therefore, total vehicles entering intersection = **389**

Example 2: Total vehicles entering from the west = eastbound left turn + eastbound through + eastbound right turn
 Therefore, vehicles entering from the west = **16**

REGIONAL MUNICIPALITY OF WATERLOO TURNING MOVEMENT COUNT



<h2 style="margin: 0;">Afternoon Peak Diagram</h2>	Count Period From: 3:00 PM To: 6:00 PM	Peak Hour From: 4:45 PM To: 5:45 PM
Municipality: Waterloo Intersection: Erbsville Rd & Conservation Dr Control: Non Signalized Major Road: Erbsville Rd	Weather conditions: Sunny Person(s) who counted: AT09-JK	GeoID: 4247 Count Date: Tuesday, 26-Sep-17



REGIONAL MUNICIPALITY OF WATERLOO TURNING MOVEMENT COUNT



Total Count Diagram

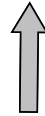
Municipality: Waterloo
Intersection: Erbsville Rd & Conservation Dr
Control: Non Signalized
Major Road: Erbsville Rd

Weather conditions:
Sunny
Person(s) who counted:
AT09-JK

GeoID: 4247
Count Date: Tuesday, 26-Sep-17

North Leg Total: 2,434
North Entering: 1,179
North Peds: 1
Peds Cross: X
Bicycles Entering: 17
Buggies Entering: 0

	% Trks	0%	6%	5%	
Heavys	0	43	12	55	
Trucks	0	11	2	13	
Cars	24	830	257	1,111	
Total	24	884	271		



Heavys	79
Trucks	12
Cars	1,164
Total	1,255

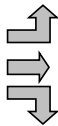
East Leg Total: 2,264
East Entering: 1,067
East Peds: 0
Peds Cross: X
Bicycles Entering: 15
Buggies Entering: 0

Heavys	Trucks	Cars	Total
1	3	243	247



Conservation Dr

% Trks	Heavys	Trucks	Cars	Total
0%	0	0	13	13
1%	1	1	168	170
4%	0	1	25	26
	1	2	206	



Erbsville Rd



Total	Cars	Trucks	Heavys	% Trks
258	234	0	24	9%
203	200	2	1	1%
606	589	2	15	3%
	1,023	4	40	

Conservation Dr



Cars	Trucks	Heavys	Total
1,153	10	34	1,197

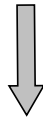
Erbsville Rd



Total	20	984	756	
Cars	19	917	728	1,664
Trucks	1	12	7	20
Heavys	0	55	21	76
% Trks	5%	7%	4%	

Peds Cross: X
West Peds: 2
West Entering: 209
West leg Total: 456
Bicycles Entering: 2
Buggies Entering: 0

Heavys	58
Trucks	14
Cars	1,444
Total	1,516



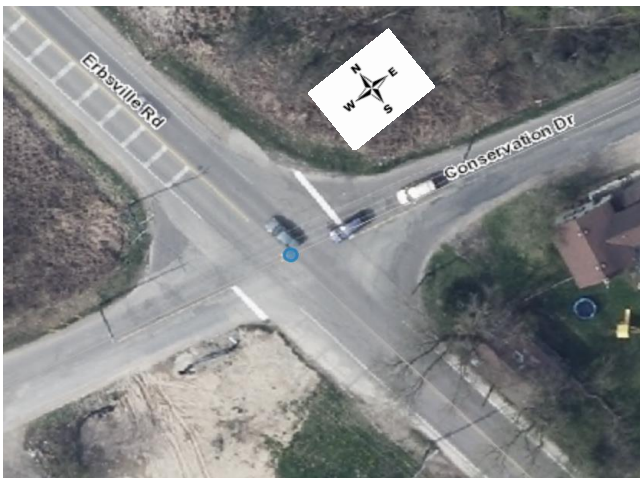
Peds Cross: X
South Peds: 1
South Entering: 1,760
South leg Total: 3,276
Bicycles Entering: 26
Buggies Entering: 0

Comments

To determine total vehicles entering the intersection, add all leg totals entering.

Example 1: Total Entering = West leg total entering + South leg total entering + East leg total entering + North leg total entering
 Therefore, total vehicles entering intersection = **4,215**

Example 2: Total vehicles entering from the west = eastbound left turn + eastbound through + eastbound right turn
 Therefore, vehicles entering from the west = **209**



Notes: None

REGIONAL MUNICIPALITY OF WATERLOO TURNING MOVEMENT COUNT



Estimated Daily Traffic

Total Factor = Monthly Factor 1 x Daily Factor 1 x 24 Hour Factor 1.74 = 1.740000

Municipality: Waterloo
Intersection: Erbsville Rd & Conservation Dr
Control: Non Signalized
Major Road: Erbsville Rd

Weather conditions:
Sunny
Person(s) who counted:
AT09-JK

GeoID: 4247
Count Date: Tuesday, 26-Sep-17

North Leg Total: 4,235	% Trks	0%	6%	5%	
North Entering: 2,051	Heavys	0	75	21	96
North Peds: N/A	Trucks	0	19	3	23
Peds Cross: ☒	Cars	42	1,444	447	1,933
	Total	42	1,538	472	

Heavys	137
Trucks	21
Cars	2,025
Total	2184

East Leg Total: 3,939
East Entering: 1,857
East Peds: N/A
Peds Cross: ☒

Heavys	Trucks	Cars	Total
2	5	423	430

Erbsville Rd



Total	Cars	Trucks	Heavys	% Trks
449	407	0	42	9%
353	348	3	2	1%
1,054	1,025	3	26	3%
	1,780	7	70	

Conservation Dr

% Trks	Heavys	Trucks	Cars	Total
0%	0	0	23	23
1%	2	2	292	296
4%	0	2	44	45
	2	3	358	



Conservation Dr

Cars	Trucks	Heavys	Total
2,006	17	59	2,083

Erbsville Rd



Total	35	1,712	1,315	
Cars	33	1,596	1,267	2,895
Trucks	2	21	12	35
Heavys	0	96	37	132
% Trks	5%	7%	4%	

Peds Cross: ☒	Heavys	101
West Peds: N/A	Trucks	24
West Entering: 364	Cars	2,513
West leg Total: 793	Total	2,638

Peds Cross: ☒
South Peds: N/A
South Entering: 3,062
South leg Total: 5,700

Comments

To determine the EDT (Estimated Daily Traffic), add all four leg totals and divide by two.
 This will give you the approximate number of vehicles entering and exiting the intersection in a 24-hour period

Example:
$$\frac{(\text{West leg total} + \text{South leg total} + \text{East leg total} + \text{North leg total})}{2} \quad \text{EDT} = \quad 7,334$$

REGIONAL MUNICIPALITY OF WATERLOO TURNING MOVEMENT COUNT



Peak Hour Factor By Movement

Municipality: Waterloo
Intersection: Erbsville Rd & Conservation Dr
Control: Non Signalized
Major Road: Erbsville Rd

Weather conditions:
 Sunny
Person(s) who counted:
 AT09-JK

GeoID: 4247
Count Date: Tuesday, 26-Sep-17

North Approach PHF

AM Peak: 0.82
 Mid-day Peak: 0.72
 PM Peak: 0.79

	Movement		
PM	0.42	0.81	0.77
MID	0.25	0.76	0.63
AM	0.25	0.67	0.68

East Approach PHF

AM Peak: 0.84
 Mid-day Peak: 0.73
 PM Peak: 0.79

AM AM Peak Hour
 MID Mid-day Peak Hour
 PM PM Peak Hour

Conservation Dr

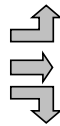
	PM	MID	AM
Movement	0.00	0.25	0.30
	0.82	0.60	0.91
	0.50	0.38	0.50

Erbsville Rd



	AM	MID	PM	
	0.80	0.58	0.82	Movement
	0.72	0.71	0.78	
	0.66	0.78	0.75	

Conservation Dr



Erbsville Rd



West Approach PHF

AM Peak: 0.83
 Mid-day Peak: 0.67
 PM Peak: 0.96

0.25	0.88	0.82	AM
0.25	0.92	0.83	MID
0.63	0.97	0.83	PM
Movement			

South Approach PHF

AM Peak: 0.87
 Mid-day Peak: 0.90
 PM Peak: 0.93

Comments

Intersection: Erbsville Rd & Conservation Dr
GeoID: 4247
Municipality: Waterloo
Major Road: Erbsville Rd

Intersection Control: Non Signalized
Date: Tuesday, 26-Sep-17
Name: AT09-JK
Weather: Sunny

Approach Control Movement Approach Lanes	EASTBOUND			WESTBOUND			NORTHBOUND			SOUTHBOUND			TOTAL	TOTAL HOUR
	Stop Control			Stop Control			Free Flow			Free Flow				
	LT 0	THRU 1	RT 0	LT 0	THRU 1	RT 0	LT 0	THRU 1	RT 0	LT 0	THRU 1	RT 0		
7:30 to 7:45	0	8	1	11	5	6	1	53	18	10	10	0	123	
7:45 to 8:00	0	11	1	25	4	12	0	31	16	16	24	1	141	
8:00 to 8:15	1	11	1	30	5	6	0	41	22	8	43	0	168	
8:15 to 8:30	0	11	1	20	9	10	0	35	38	19	23	1	167	599
8:30 to 8:45	5	10	0	14	7	7	0	43	36	11	22	0	155	631
8:45 to 9:00	0	8	2	15	5	9	1	32	28	14	27	0	141	631
9:00 to 9:15	0	10	1	8	3	7	0	37	24	10	23	0	123	586
9:15 to 9:30	0	4	1	12	4	5	0	20	36	11	16	0	109	528
9:30 to 9:45	1	6	1	16	5	9	1	30	23	7	16	0	115	488
9:45 to 10:00	0	3	0	13	4	5	0	15	26	5	22	1	94	441
10:00 to 10:15	0	4	0	8	4	4	1	18	17	13	17	0	86	404
10:15 to 10:30	0	8	1	14	3	4	0	14	22	5	20	0	91	386
AM Peak Hour 8:00 to 9:00	6	43	4	89	26	35	1	151	124	54	115	2	631	
# of trucks in peak	0	0	0	0	1	0	0	1	2	1	1	0	6	
# of heavies in peak	0	0	0	4	0	8	0	7	4	5	8	0	34	
% heavies (Total)	0%	0%	0%	4%	4%	23%	0%	5%	5%	11%	8%	0%	6%	
12:00 to 12:15	2	0	2	16	4	7	3	23	13	7	23	0	100	
12:15 to 12:30	0	2	0	11	4	7	1	27	14	2	19	1	88	
12:30 to 12:45	0	2	0	16	2	4	0	20	14	8	31	1	98	
12:45 to 13:00	1	3	0	9	4	1	0	24	22	6	25	0	95	381
13:00 to 13:15	0	2	2	17	5	10	1	23	17	3	23	0	103	384
13:15 to 13:30	0	5	1	11	6	8	0	21	23	3	15	0	93	389
13:30 to 13:45	0	2	2	10	3	7	0	26	21	8	13	0	92	383
13:45 to 14:00	0	3	0	14	4	1	0	16	15	8	27	1	89	377
Midday Peak Hour 12:30 to 13:30	1	12	3	53	17	23	1	88	76	20	94	1	389	
# of trucks in peak	0	0	0	0	0	0	0	2	1	0	2	0	5	
# of heavies in peak	0	0	0	3	0	3	0	6	2	1	8	0	23	
% heavies (Total)	0%	0%	0%	6%	0%	13%	0%	9%	4%	5%	11%	0%	7%	
15:00 to 15:15	1	3	0	16	11	2	0	45	24	2	23	1	128	
15:15 to 15:30	2	4	1	21	4	7	0	36	25	7	26	1	134	
15:30 to 15:45	0	6	0	19	8	7	0	32	30	8	25	1	136	
15:45 to 16:00	0	2	1	23	3	15	0	31	18	6	20	1	120	518
16:00 to 16:15	0	6	0	18	7	5	0	38	23	9	34	0	140	530
16:15 to 16:30	0	1	0	33	6	16	1	30	33	8	36	4	168	564
16:30 to 16:45	0	6	1	21	11	12	4	30	22	12	35	2	156	584
16:45 to 17:00	0	7	0	28	13	14	2	40	32	12	41	1	190	654
17:00 to 17:15	0	5	2	26	17	16	0	40	30	7	57	1	201	715
17:15 to 17:30	0	4	2	44	15	17	1	42	24	12	63	3	227	774
17:30 to 17:45	0	7	0	34	8	9	2	41	20	6	43	0	170	788
17:45 to 18:00	0	6	2	33	10	9	1	30	30	8	42	3	174	772
PM Peak Hour 16:45 to 17:45	0	23	4	132	53	56	5	163	106	37	204	5	788	
# of trucks in peak	0	0	1	0	0	0	0	0	1	0	0	0	2	
# of heavies in peak	0	0	0	0	0	0	0	5	2	0	1	0	8	
% heavies (Total)	0%	0%	25%	0%	0%	0%	0%	3%	3%	0%	0%	0%	1%	

Intersection: Erbsville Rd & Conservation Dr
GeoID: 4247
Municipality: Waterloo
Major Road: Erbsville Rd

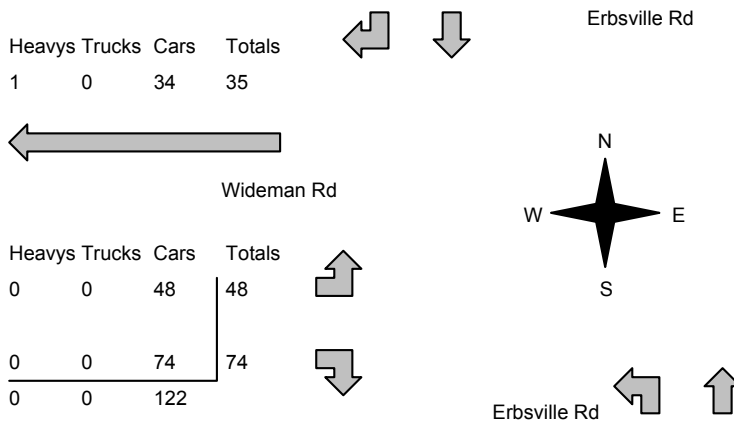
Intersection Control: Non Signalized
Date: Tuesday, 26-Sep-17
Name: AT09-JK
Weather: Sunny

PEDESTRIAN CROSSING							
Time	Crossing Approach					TOTAL	TOTAL HOUR
	East App.	West App.	North App.	South App.			
7:30 to 7:45	0	0	0	0	0	0	
7:45 to 8:00	0	0	0	0	0	0	
8:00 to 8:15	0	0	0	0	0	0	
8:15 to 8:30	0	1	1	0	2	2	2
8:30 to 8:45	0	0	0	0	0	0	2
8:45 to 9:00	0	0	0	0	0	0	2
9:00 to 9:15	0	0	0	0	0	0	2
9:15 to 9:30	0	1	0	0	1	1	1
9:30 to 9:45	0	0	0	1	1	1	2
9:45 to 10:00	0	0	0	0	0	0	2
10:00 to 10:15	0	0	0	0	0	0	2
10:15 to 10:30	0	0	0	0	0	0	1
AM Peak Hour 8:00 to 9:00	0	1	1	0	2		
12:00 to 12:15	0	0	0	0	0	0	
12:15 to 12:30	0	0	0	0	0	0	
12:30 to 12:45	0	0	0	0	0	0	
12:45 to 13:00	0	0	0	0	0	0	0
13:00 to 13:15	0	0	0	0	0	0	0
13:15 to 13:30	0	0	0	0	0	0	0
13:30 to 13:45	0	0	0	0	0	0	0
13:45 to 14:00	0	0	0	0	0	0	0
Midday Peak Hour 12:30 to 13:30	0	0	0	0	0		
15:00 to 15:15	0	0	0	0	0	0	
15:15 to 15:30	0	0	0	0	0	0	
15:30 to 15:45	0	0	0	0	0	0	
15:45 to 16:00	0	0	0	0	0	0	0
16:00 to 16:15	0	0	0	0	0	0	0
16:15 to 16:30	0	0	0	0	0	0	0
16:30 to 16:45	0	0	0	0	0	0	0
16:45 to 17:00	0	0	0	0	0	0	0
17:00 to 17:15	0	0	0	0	0	0	0
17:15 to 17:30	0	0	0	0	0	0	0
17:30 to 17:45	0	0	0	0	0	0	0
17:45 to 18:00	0	0	0	0	0	0	0
PM Peak Hour 16:45 to 17:45	0	0	0	0	0		

Accu-Traffic Inc.

Morning Peak Diagram	Specified Period From: 7:30:00 To: 10:30:00	One Hour Peak From: 7:45:00 To: 8:45:00
Municipality: Waterloo Site #: 1902900001 Intersection: Erbville Rd & Wideman Rd TFR File #: 1 Count date: 6-Mar-19	Weather conditions: Person counted: Person prepared: Person checked:	

**** Non-Signalized Intersection **** **Major Road:** Erbville Rd runs N/S

North Leg Total: 473 North Entering: 215 North Peds: 0 Peds Cross: \bowtie	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-right: 1px solid black; padding: 2px;"> Heavys 1 3 Trucks 0 1 Cars 9 201 Totals 10 205 </td> <td style="width: 50%; padding: 2px;"> 4 1 210 </td> </tr> </table>	Heavys 1 3 Trucks 0 1 Cars 9 201 Totals 10 205	4 1 210	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-right: 1px solid black; padding: 2px;"> Heavys 4 Trucks 1 Cars 253 Totals 258 </td> <td style="width: 50%; padding: 2px;"> 4 1 253 </td> </tr> </table>	Heavys 4 Trucks 1 Cars 253 Totals 258	4 1 253																																																						
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Heavys	Trucks	Cars	Totals																																																									
1	0	34	35	←																																																								
Heavys	Trucks	Cars	Totals																																																									
0	0	48	48	↑																																																								
0	0	74	74	↓																																																								
0	0	122																																																										
Cars	Trucks	Heavys	Totals																																																									
275	1	3	279	↓																																																								
Cars	Trucks	Heavys	Totals																																																									
25	0	0	25	←																																																								
205	1	4	210	↑																																																								

Comments

Accu-Traffic Inc.

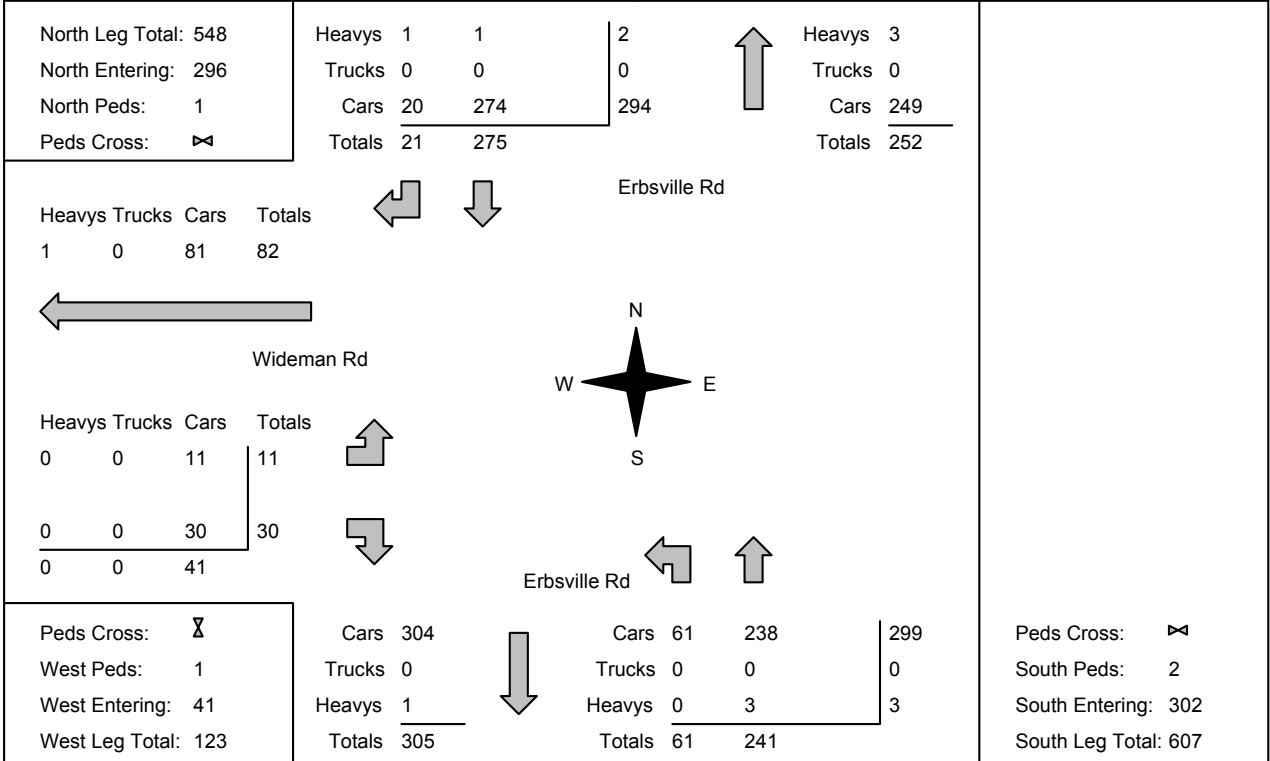
Mid-day Peak Diagram	Specified Period From: 12:00:00 To: 14:00:00	One Hour Peak From: 12:45:00 To: 13:45:00																									
Municipality: Waterloo Site #: 1902900001 Intersection: Erbville Rd & Wideman Rd TFR File #: 1 Count date: 6-Mar-19	Weather conditions: Person counted: Person prepared: Person checked:																										
** Non-Signalized Intersection **		Major Road: Erbville Rd runs N/S																									
<table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 50%;">North Leg Total: 256</td><td style="width: 50%;">Heavys 0 2</td></tr> <tr><td>North Entering: 113</td><td>Trucks 0 0</td></tr> <tr><td>North Peds: 0</td><td>Cars 3 108</td></tr> <tr><td>Peds Cross: ∇</td><td>Totals 3 110</td></tr> </table>	North Leg Total: 256	Heavys 0 2	North Entering: 113	Trucks 0 0	North Peds: 0	Cars 3 108	Peds Cross: ∇	Totals 3 110	<table style="margin: auto;"> <tr><td style="border-right: 1px solid black; padding: 0 5px;">2</td><td style="padding: 0 5px;">↑</td><td style="padding: 0 5px;">2</td></tr> <tr><td style="border-right: 1px solid black; padding: 0 5px;">0</td><td style="padding: 0 5px;"></td><td style="padding: 0 5px;">0</td></tr> <tr><td style="border-right: 1px solid black; padding: 0 5px;">111</td><td style="padding: 0 5px;"></td><td style="padding: 0 5px;">111</td></tr> </table>	2	↑	2	0		0	111		111	<table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 50%;">Heavys 2</td><td style="width: 50%;">Heavys 2</td></tr> <tr><td>Trucks 1</td><td>Trucks 1</td></tr> <tr><td>Cars 140</td><td>Cars 140</td></tr> <tr><td>Totals 143</td><td>Totals 143</td></tr> </table>	Heavys 2	Heavys 2	Trucks 1	Trucks 1	Cars 140	Cars 140	Totals 143	Totals 143
North Leg Total: 256	Heavys 0 2																										
North Entering: 113	Trucks 0 0																										
North Peds: 0	Cars 3 108																										
Peds Cross: ∇	Totals 3 110																										
2	↑	2																									
0		0																									
111		111																									
Heavys 2	Heavys 2																										
Trucks 1	Trucks 1																										
Cars 140	Cars 140																										
Totals 143	Totals 143																										
<div style="display: flex; justify-content: space-around; align-items: center;"> <table style="border-collapse: collapse;"> <tr><td style="padding: 2px;">Heavys</td><td style="padding: 2px;">Trucks</td><td style="padding: 2px;">Cars</td><td style="padding: 2px;">Totals</td></tr> <tr><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">27</td><td style="padding: 2px;">27</td></tr> </table> <div style="text-align: center;"> </div> <div style="text-align: center;"> </div> </div> <p style="text-align: center;">Erbville Rd</p> <div style="display: flex; justify-content: center; align-items: center;"> <div style="text-align: center;"> </div> <div style="text-align: center;"> </div> </div> <div style="text-align: center;"> </div> <div style="text-align: center;"> </div> <div style="text-align: center;"> </div>			Heavys	Trucks	Cars	Totals	0	0	27	27																	
Heavys	Trucks	Cars	Totals																								
0	0	27	27																								

Heavys	Trucks	Cars	Totals
0	0	10	10
0	0	28	28
0	0	38	38

Accu-Traffic Inc.

Afternoon Peak Diagram	Specified Period From: 15:00:00 To: 18:00:00	One Hour Peak From: 16:45:00 To: 17:45:00
Municipality: Waterloo Site #: 1902900001 Intersection: Erbville Rd & Wideman Rd TFR File #: 1 Count date: 6-Mar-19	Weather conditions: Person counted: Person prepared: Person checked:	

**** Non-Signalized Intersection **** **Major Road:** Erbville Rd runs N/S



Comments

Accu-Traffic Inc.

Total Count Diagram

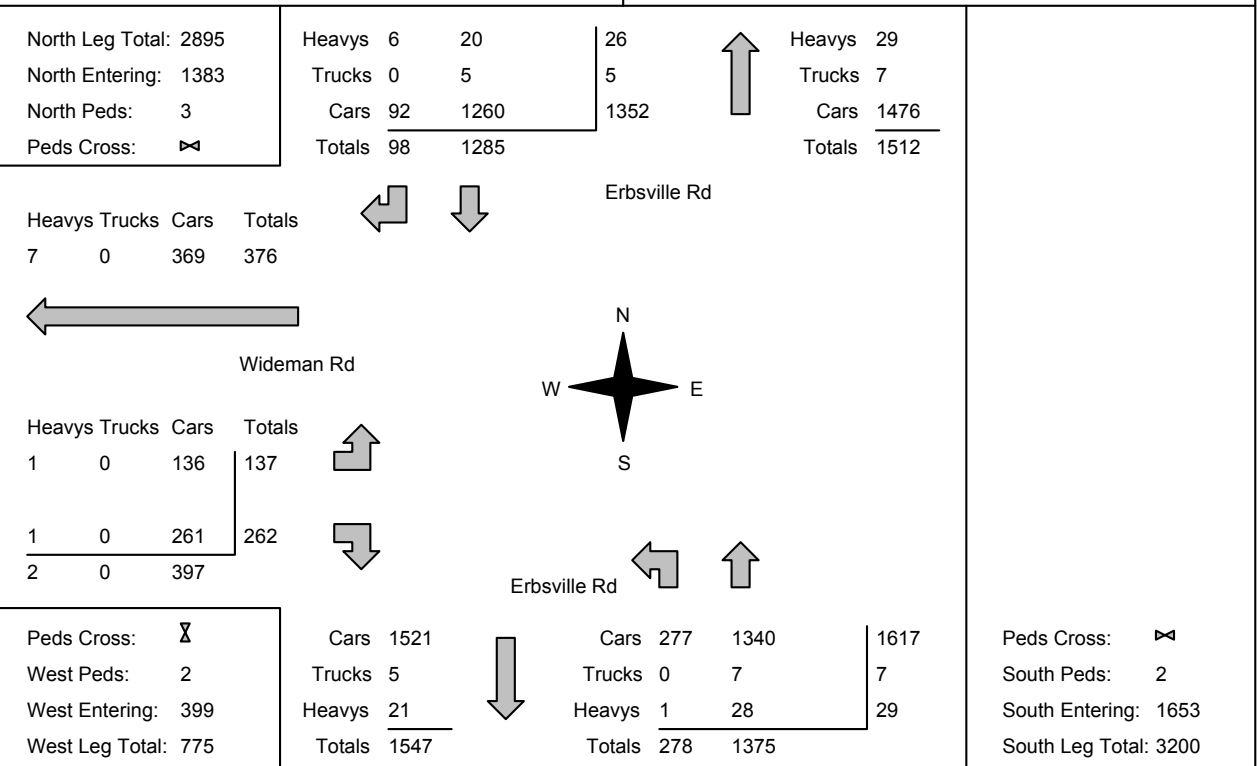
Municipality: Waterloo
Site #: 1902900001
Intersection: Erbsville Rd & Wideman Rd
TFR File #: 1
Count date: 6-Mar-19

Weather conditions:

Person counted:
Person prepared:
Person checked:

**** Non-Signalized Intersection ****

Major Road: Erbsville Rd runs N/S



Comments

Accu-Traffic Inc.

Traffic Count Summary

Intersection: Erbsville Rd & Wideman Rd					Count Date: 6-Mar-19		Municipality: Waterloo					
North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total			Left	Thru	Right	Grand Total		
8:00:00	0	73	4	77	0	171	8:00:00	12	82	0	94	0
9:00:00	0	194	8	202	0	439	9:00:00	20	217	0	237	0
10:00:00	0	119	8	127	0	285	10:00:00	26	132	0	158	0
12:00:00	0	50	4	54	0	106	12:00:00	11	41	0	52	0
13:00:00	0	108	8	116	0	268	13:00:00	25	127	0	152	0
14:00:00	0	112	4	116	0	271	14:00:00	22	133	0	155	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	0	130	21	151	1	341	16:00:00	39	151	0	190	0
17:00:00	0	234	16	250	1	575	17:00:00	68	257	0	325	2
18:00:00	0	265	25	290	1	580	18:00:00	55	235	0	290	0
Totals:	0	1285	98	1383	3	3036	S Totals:	278	1375	0	1653	2
East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total			Left	Thru	Right	Grand Total		
8:00:00	0	0	0	0	0	32	8:00:00	13	0	19	32	0
9:00:00	0	0	0	0	0	123	9:00:00	48	0	75	123	0
10:00:00	0	0	0	0	0	53	10:00:00	20	0	33	53	0
12:00:00	0	0	0	0	0	15	12:00:00	3	0	12	15	1
13:00:00	0	0	0	0	0	30	13:00:00	11	0	19	30	0
14:00:00	0	0	0	0	0	37	14:00:00	8	0	29	37	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	0	0	0	0	0	32	16:00:00	12	0	20	32	0
17:00:00	0	0	0	0	0	39	17:00:00	13	0	26	39	0
18:00:00	0	0	0	0	0	38	18:00:00	9	0	29	38	1
Totals:	0	0	0	0	0	399	W Totals:	137	0	262	399	2
Calculated Values for Traffic Crossing Major Street												
Hours Ending:	8:00	9:00	10:00	13:00		14:00	16:00	17:00	18:00			
Crossing Values:	13	48	20	11		8	13	16	10			

Growth Rate Calculations

Roadway	Peak Hour	Segment	Traffic Volume (veh/h)		Compounded Annual Growth Rate
			2015 Traffic Volumes	2035 Ultimate Forecast	
Conservation Drive	AM	East of Erbsville Road	94	311	5.14%
		West of Erbsville Road	33	35	
		Birectional	127	346	
	PM	East of Erbsville Road	299	518	2.66%
		West of Erbsville Road	29	36	
		Birectional	328	554	
	Average Peak Hour	Birectional	228	450	3.46%
Erbsville Road	AM	North of Conservation Drive	200	274	2.10%
		South of Conservation Drive	201	334	
		Birectional	401	608	
	PM	North of Conservation Drive	201	283	3.05%
		South of Conservation Drive	221	486	
		Birectional	422	769	
	Average Peak Hour	Birectional	412	689	2.60%

Notes: The 2015 and 2037 ultimate Traffic Volumes are based on the Beaver Creek Road and Conservation Drive Widening EA study completed by Stanted in 2015 and updated in July 2017.

APPENDIX

B

LOS

DEFINITIONS

Levels of Service – Highway Capacity Manual

Unsignalized Intersection

Level of Service	Average Control Delays (s/veh)	Expected delay to Minor Street traffic from the Major Street
A	0 - 10	Little or no delay.
B	> 10 – 15	Short traffic delay.
C	> 15 – 25	Average traffic delay.
D	> 25 – 35	Long traffic delay.
E	> 35 – 50	Very long traffic delay.
F	> 50	Extreme delay encountered with queuing, which may cause severe congestion affecting other traffic movements in the intersection.

Source: Highway Capacity Manual, HCM 2000

UNSIGNALIZED LOS 12-09-18













APPENDIX

C

SYNCHRO
RESULTS










HCM Unsignalized Intersection Capacity Analysis
 1: Erbsville Road & Conservation Drive

<Existing> AM Peak Hour
 03/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	6	46	4	97	28	40	1	160	131	58	122	2
Future Volume (Veh/h)	6	46	4	97	28	40	1	160	131	58	122	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	6	49	4	103	30	43	1	170	139	62	130	2
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	554	566	131	525	498	240	132			309		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	554	566	131	525	498	240	132			309		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.4	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.5	2.2			2.3		
p0 queue free %	98	88	100	74	93	94	100			95		
cM capacity (veh/h)	383	414	924	400	447	750	1466			1202		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	59	176	310	194								
Volume Left	6	103	1	62								
Volume Right	4	43	139	2								
cSH	426	461	1466	1202								
Volume to Capacity	0.14	0.38	0.00	0.05								
Queue Length 95th (m)	3.6	13.4	0.0	1.2								
Control Delay (s)	14.8	17.6	0.0	2.9								
Lane LOS	B	C	A	A								
Approach Delay (s)	14.8	17.6	0.0	2.9								
Approach LOS	B	C										
Intersection Summary												
Average Delay			6.1									
Intersection Capacity Utilization			52.2%		ICU Level of Service					A		
Analysis Period (min)			15									













HCM Unsignalized Intersection Capacity Analysis
 2: Erbsville Road/ & Wideman Road

<Existing> AM Peak Hour
 03/22/2019

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	48	74	25	244	213	10
Future Volume (Veh/h)	48	74	25	244	213	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	55	84	28	277	242	11
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	580	248	253			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	580	248	253			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	88	89	98			
cM capacity (veh/h)	469	796	1324			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	139	305	253			
Volume Left	55	28	0			
Volume Right	84	0	11			
cSH	624	1324	1700			
Volume to Capacity	0.22	0.02	0.15			
Queue Length 95th (m)	6.4	0.5	0.0			
Control Delay (s)	12.4	0.9	0.0			
Lane LOS	B	A				
Approach Delay (s)	12.4	0.9	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			2.9			
Intersection Capacity Utilization			43.2%	ICU Level of Service	A	
Analysis Period (min)			15			










HCM Unsignalized Intersection Capacity Analysis
 1: Erbsville Road & Conservation Drive

<Existing> PM Peak Hour
 03/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	0	25	4	141	57	60	5	172	112	39	215	5
Future Volume (Veh/h)	0	25	4	141	57	60	5	172	112	39	215	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	0	29	5	162	66	69	6	198	129	45	247	6
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	716	679	250	634	618	262	253			327		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	716	679	250	634	618	262	253			327		
tC, single (s)	7.1	6.5	6.5	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.5	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	92	99	55	83	91	100			96		
cM capacity (veh/h)	268	361	736	357	391	781	1324			1244		
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	34	297	333	298								
Volume Left	0	162	6	45								
Volume Right	5	69	129	6								
cSH	390	418	1324	1244								
Volume to Capacity	0.09	0.71	0.00	0.04								
Queue Length 95th (m)	2.2	41.3	0.1	0.9								
Control Delay (s)	15.1	32.2	0.2	1.5								
Lane LOS	C	D	A	A								
Approach Delay (s)	15.1	32.2	0.2	1.5								
Approach LOS	C	D										
Intersection Summary												
Average Delay			11.0									
Intersection Capacity Utilization			61.1%	ICU Level of Service	B							
Analysis Period (min)			15									













HCM Unsignalized Intersection Capacity Analysis
 2: Erbsville Road/ & Wideman Road

<Existing> PM Peak Hour
 03/22/2019

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	11	30	61	278	339	21
Future Volume (Veh/h)	11	30	61	278	339	21
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	33	66	302	368	23
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						228
pX, platoon unblocked						
vC, conflicting volume	814	380	391			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	814	380	391			
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	95	94			
cM capacity (veh/h)	331	672	1179			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	45	368	391			
Volume Left	12	66	0			
Volume Right	33	0	23			
cSH	527	1179	1700			
Volume to Capacity	0.09	0.06	0.23			
Queue Length 95th (m)	2.1	1.4	0.0			
Control Delay (s)	12.5	1.9	0.0			
Lane LOS	B	A				
Approach Delay (s)	12.5	1.9	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization			50.5%	ICU Level of Service	A	
Analysis Period (min)			15			











HCM Unsignalized Intersection Capacity Analysis
 1: Erbsville Road & Conservation Drive

<2029 FB> AM Peak Hour
 03/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	8	65	6	136	39	56	1	207	169	75	158	3
Future Volume (Veh/h)	8	65	6	136	39	56	1	207	169	75	158	3
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	9	69	6	145	41	60	1	220	180	80	168	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	722	732	170	682	643	310	171			400		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	722	732	170	682	643	310	171			400		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.4	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.5	2.2			2.3		
p0 queue free %	97	79	99	49	89	91	100			93		
cM capacity (veh/h)	271	325	880	284	361	684	1418			1111		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	84	246	401	251								
Volume Left	9	145	1	80								
Volume Right	6	60	180	3								
cSH	333	346	1418	1111								
Volume to Capacity	0.25	0.71	0.00	0.07								
Queue Length 95th (m)	7.4	39.7	0.0	1.8								
Control Delay (s)	19.4	37.4	0.0	3.2								
Lane LOS	C	E	A	A								
Approach Delay (s)	19.4	37.4	0.0	3.2								
Approach LOS	C	E										
Intersection Summary												
Average Delay				11.8								
Intersection Capacity Utilization			63.6%		ICU Level of Service					B		
Analysis Period (min)			15									













HCM Unsignalized Intersection Capacity Analysis
 2: Erbsville Road/ & Wideman Road

<2029 FB> AM Peak Hour
 03/26/2019

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	59	90	32	315	275	13
Future Volume (Veh/h)	59	90	32	315	275	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	67	102	36	358	313	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	750	320	328			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	750	320	328			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	82	86	97			
cM capacity (veh/h)	371	725	1243			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	169	36	358	328		
Volume Left	67	36	0	0		
Volume Right	102	0	0	15		
cSH	526	1243	1700	1700		
Volume to Capacity	0.32	0.03	0.21	0.19		
Queue Length 95th (m)	10.5	0.7	0.0	0.0		
Control Delay (s)	15.1	8.0	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	15.1	0.7		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay	3.2					
Intersection Capacity Utilization	37.4%			ICU Level of Service	A	
Analysis Period (min)	15					











HCM Unsignalized Intersection Capacity Analysis
 1: Erbsville Road & Conservation Drive

<2029 FB > PM Peak Hour
 03/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	0	35	6	198	80	84	6	222	145	50	278	6
Future Volume (Veh/h)	0	35	6	198	80	84	6	222	145	50	278	6
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	0	40	7	228	92	97	7	255	167	57	320	7
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	933	874	324	817	794	338	327			422		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	933	874	324	817	794	338	327			422		
tC, single (s)	7.1	6.5	6.5	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.5	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	85	99	9	70	86	99			95		
cM capacity (veh/h)	158	275	667	251	305	708	1244			1148		
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	47	417	429	384								
Volume Left	0	228	7	57								
Volume Right	7	97	167	7								
cSH	301	310	1244	1148								
Volume to Capacity	0.16	1.35	0.01	0.05								
Queue Length 95th (m)	4.1	158.9	0.1	1.2								
Control Delay (s)	19.2	209.4	0.2	1.7								
Lane LOS	C	F	A	A								
Approach Delay (s)	19.2	209.4	0.2	1.7								
Approach LOS	C	F										
Intersection Summary												
Average Delay			69.7									
Intersection Capacity Utilization			75.6%		ICU Level of Service					D		
Analysis Period (min)			15									


















HCM Unsignalized Intersection Capacity Analysis
 2: Erbsville Road/ & Wideman Road

<2029 FB> PM Peak Hour
 03/26/2019

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	37	79	359	438	27
Future Volume (Veh/h)	13	37	79	359	438	27
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)	14	40	86	390	476	29
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	1052	490	505			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1052	490	505			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	93	92			
cM capacity (veh/h)	233	582	1070			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	54	86	390	505		
Volume Left	14	86	0	0		
Volume Right	40	0	0	29		
cSH	419	1070	1700	1700		
Volume to Capacity	0.13	0.08	0.23	0.30		
Queue Length 95th (m)	3.3	2.0	0.0	0.0		
Control Delay (s)	14.9	8.7	0.0	0.0		
Lane LOS	B	A				
Approach Delay (s)	14.9	1.6		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization			42.4%	ICU Level of Service	A	
Analysis Period (min)			15			
















HCM Unsignalized Intersection Capacity Analysis
 1: Erbsville Road & Conservation Drive

<2029 FB w Recom> AM Peak Hour
 03/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	8	65	6	136	39	56	1	207	169	75	158	3
Future Volume (vph)	8	65	6	136	39	56	1	207	169	75	158	3
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	9	69	6	145	41	60	1	220	180	80	168	3
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	84	145	101	401	251							
Volume Left (vph)	9	145	0	1	80							
Volume Right (vph)	6	0	60	180	3							
Hadj (s)	-0.02	0.57	-0.16	-0.18	0.21							
Departure Headway (s)	6.3	7.0	6.3	5.2	5.8							
Degree Utilization, x	0.15	0.28	0.18	0.58	0.40							
Capacity (veh/h)	478	474	527	662	587							
Control Delay (s)	10.4	11.5	9.4	14.9	12.6							
Approach Delay (s)	10.4	10.7		14.9	12.6							
Approach LOS	B	B		B	B							
Intersection Summary												
Delay			12.9									
Level of Service			B									
Intersection Capacity Utilization			58.1%		ICU Level of Service		B					
Analysis Period (min)			15									













HCM Unsignalized Intersection Capacity Analysis
 1: Erbsville Road & Conservation Drive

<2029 FB w Recom> PM Peak Hour
 03/22/2019

															
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR			
Lane Configurations		↕						↕							
Sign Control		Stop			Stop			Stop			Stop				
Traffic Volume (vph)	0	35	6	198	80	84	6	222	145	50	278	6			
Future Volume (vph)	0	35	6	198	80	84	6	222	145	50	278	6			
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87			
Hourly flow rate (vph)	0	40	7	228	92	97	7	255	167	57	320	7			
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1										
Volume Total (vph)	47	228	189	429	384										
Volume Left (vph)	0	228	0	7	57										
Volume Right (vph)	7	0	97	167	7										
Hadj (s)	-0.03	0.50	-0.36	-0.18	0.02										
Departure Headway (s)	7.5	7.5	6.6	5.9	6.2										
Degree Utilization, x	0.10	0.48	0.35	0.70	0.66										
Capacity (veh/h)	386	453	512	588	554										
Control Delay (s)	11.4	15.9	11.9	21.7	20.2										
Approach Delay (s)	11.4	14.1		21.7	20.2										
Approach LOS	B	B		C	C										
Intersection Summary															
Delay			18.4												
Level of Service			C												
Intersection Capacity Utilization			66.3%				ICU Level of Service				C				
Analysis Period (min)			15												











HCM Unsignalized Intersection Capacity Analysis
 1: Erbsville Road & Conservation Drive

<2029 FT> AM Peak Hour
 03/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	8	65	7	149	39	56	1	264	213	75	175	3
Future Volume (vph)	8	65	7	149	39	56	1	264	213	75	175	3
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	9	69	7	159	41	60	1	281	227	80	186	3
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	85	159	101	509	269							
Volume Left (vph)	9	159	0	1	80							
Volume Right (vph)	7	0	60	227	3							
Hadj (s)	-0.03	0.57	-0.16	-0.18	0.20							
Departure Headway (s)	6.9	7.5	6.7	5.4	6.1							
Degree Utilization, x	0.16	0.33	0.19	0.76	0.46							
Capacity (veh/h)	458	444	490	652	545							
Control Delay (s)	11.2	12.9	10.1	23.2	14.2							
Approach Delay (s)	11.2	11.8		23.2	14.2							
Approach LOS	B	B		C	B							
Intersection Summary												
Delay			17.5									
Level of Service			C									
Intersection Capacity Utilization			65.4%		ICU Level of Service		C					
Analysis Period (min)			15									











HCM Unsignalized Intersection Capacity Analysis
2: Erbsville Road/ & Wideman Road

<2029 FT> AM Peak Hour
03/26/2019

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	59	90	32	343	345	13
Future Volume (Veh/h)	59	90	32	343	345	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	67	102	36	390	392	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	862	400	407			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	862	400	407			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	79	84	97			
cM capacity (veh/h)	318	655	1163			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	169	36	390	407		
Volume Left	67	36	0	0		
Volume Right	102	0	0	15		
cSH	461	1163	1700	1700		
Volume to Capacity	0.37	0.03	0.23	0.24		
Queue Length 95th (m)	12.6	0.7	0.0	0.0		
Control Delay (s)	17.2	8.2	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	17.2	0.7		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			41.1%	ICU Level of Service		A
Analysis Period (min)			15			











HCM Unsignalized Intersection Capacity Analysis
 3: Erbsville Road/ & Schnarr Street

<2029 FT> AM Peak Hour
 03/22/2019

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	28	19	8	450	311	8
Future Volume (Veh/h)	28	19	8	450	311	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)	30	21	9	489	338	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	850	342	347			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	850	342	347			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	97	99			
cM capacity (veh/h)	329	700	1212			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	51	9	489	347		
Volume Left	30	9	0	0		
Volume Right	21	0	0	9		
cSH	421	1212	1700	1700		
Volume to Capacity	0.12	0.01	0.29	0.20		
Queue Length 95th (m)	3.1	0.2	0.0	0.0		
Control Delay (s)	14.7	8.0	0.0	0.0		
Lane LOS	B	A				
Approach Delay (s)	14.7	0.1		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay	0.9					
Intersection Capacity Utilization	33.7%			ICU Level of Service	A	
Analysis Period (min)	15					











HCM Unsignalized Intersection Capacity Analysis
 4: Erbsville Road/ & East Access

<2029 FT> AM Peak Hour
 03/22/2019

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	20	29	429	8	9	321
Future Volume (Veh/h)	20	29	429	8	9	321
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	32	466	9	10	349
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	840	470			475	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	840	470			475	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	95			99	
cM capacity (veh/h)	333	593			1087	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	54	475	10	349		
Volume Left	22	0	10	0		
Volume Right	32	9	0	0		
cSH	450	1700	1087	1700		
Volume to Capacity	0.12	0.28	0.01	0.21		
Queue Length 95th (m)	3.1	0.0	0.2	0.0		
Control Delay (s)	14.1	0.0	8.3	0.0		
Lane LOS	B		A			
Approach Delay (s)	14.1	0.0	0.2			
Approach LOS	B					
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			33.1%		ICU Level of Service	A
Analysis Period (min)			15			













HCM Unsignalized Intersection Capacity Analysis
5: Erbsville Road/ & West Access

<2029 FT> AM Peak Hour
03/22/2019

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	44	31	12	393	327	14
Future Volume (Veh/h)	44	31	12	393	327	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)	48	34	13	427	355	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	816	362	370			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	816	362	370			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	95	99			
cM capacity (veh/h)	343	682	1189			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	82	13	427	370		
Volume Left	48	13	0	0		
Volume Right	34	0	0	15		
cSH	432	1189	1700	1700		
Volume to Capacity	0.19	0.01	0.25	0.22		
Queue Length 95th (m)	5.3	0.3	0.0	0.0		
Control Delay (s)	15.3	8.1	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	15.3	0.2		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay	1.5					
Intersection Capacity Utilization	31.7%			ICU Level of Service	A	
Analysis Period (min)	15					












HCM Unsignalized Intersection Capacity Analysis
 1: Erbsville Road & Conservation Drive

<2029 FT> PM Peak Hour
 03/26/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	35	8	243	80	84	7	257	168	50	346	6
Future Volume (vph)	0	35	8	243	80	84	7	257	168	50	346	6
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	0	40	9	279	92	97	8	295	193	57	398	7
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	49	279	189	496	462							
Volume Left (vph)	0	279	0	8	57							
Volume Right (vph)	9	0	97	193	7							
Hadj (s)	-0.03	0.50	-0.36	-0.18	0.02							
Departure Headway (s)	8.7	8.1	7.3	6.5	6.7							
Degree Utilization, x	0.12	0.63	0.38	0.89	0.86							
Capacity (veh/h)	384	424	473	541	525							
Control Delay (s)	12.8	22.9	13.5	41.6	38.3							
Approach Delay (s)	12.8	19.1		41.6	38.3							
Approach LOS	B	C		E	E							
Intersection Summary												
Delay			32.5									
Level of Service			D									
Intersection Capacity Utilization			74.9%		ICU Level of Service		D					
Analysis Period (min)			15									












HCM Unsignalized Intersection Capacity Analysis
 2: Erbsville Road/ & Wideman Road

<2029 FT> PM Peak Hour
 03/26/2019

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	37	79	439	492	27
Future Volume (Veh/h)	13	37	79	439	492	27
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)	14	40	86	477	535	29
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	1198	550	564			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1198	550	564			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	93	92			
cM capacity (veh/h)	189	539	1018			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	54	86	477	564		
Volume Left	14	86	0	0		
Volume Right	40	0	0	29		
cSH	365	1018	1700	1700		
Volume to Capacity	0.15	0.08	0.28	0.33		
Queue Length 95th (m)	3.9	2.1	0.0	0.0		
Control Delay (s)	16.6	8.9	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	16.6	1.4		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			45.2%	ICU Level of Service	A	
Analysis Period (min)			15			











HCM Unsignalized Intersection Capacity Analysis
 3: Erbsville Road/ & Schnarr Street

<2029 FT> PM Peak Hour
 03/26/2019

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	16	15	22	417	549	31
Future Volume (Veh/h)	16	15	22	417	549	31
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)	17	16	24	453	597	34
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	1115	614	631			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1115	614	631			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	92	97	97			
cM capacity (veh/h)	224	492	951			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	33	24	453	631		
Volume Left	17	24	0	0		
Volume Right	16	0	0	34		
cSH	305	951	1700	1700		
Volume to Capacity	0.11	0.03	0.27	0.37		
Queue Length 95th (m)	2.7	0.6	0.0	0.0		
Control Delay (s)	18.3	8.9	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	18.3	0.4		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay	0.7					
Intersection Capacity Utilization	40.8%			ICU Level of Service	A	
Analysis Period (min)	15					











HCM Unsignalized Intersection Capacity Analysis
 4: Erbsville Road/ & East Access

<2029 FT> PM Peak Hour
 03/26/2019

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	15	17	422	23	33	531
Future Volume (Veh/h)	15	17	422	23	33	531
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)	16	18	459	25	36	577
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	1120	472			484	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1120	472			484	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	97			97	
cM capacity (veh/h)	221	592			1079	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	34	484	36	577		
Volume Left	16	0	36	0		
Volume Right	18	25	0	0		
cSH	330	1700	1079	1700		
Volume to Capacity	0.10	0.28	0.03	0.34		
Queue Length 95th (m)	2.6	0.0	0.8	0.0		
Control Delay (s)	17.1	0.0	8.5	0.0		
Lane LOS	C		A			
Approach Delay (s)	17.1	0.0	0.5			
Approach LOS	C					
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			37.9%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
5: Erbsville Road/ & West Access

<2029 FT> PM Peak Hour
03/26/2019

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	26	24	35	419	495	51
Future Volume (Veh/h)	26	24	35	419	495	51
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	26	38	455	538	55
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	1096	566	593			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1096	566	593			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	88	95	96			
cM capacity (veh/h)	227	524	983			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	54	38	455	593		
Volume Left	28	38	0	0		
Volume Right	26	0	0	55		
cSH	312	983	1700	1700		
Volume to Capacity	0.17	0.04	0.27	0.35		
Queue Length 95th (m)	4.7	0.9	0.0	0.0		
Control Delay (s)	18.9	8.8	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	18.9	0.7		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			39.1%	ICU Level of Service	A	
Analysis Period (min)			15			

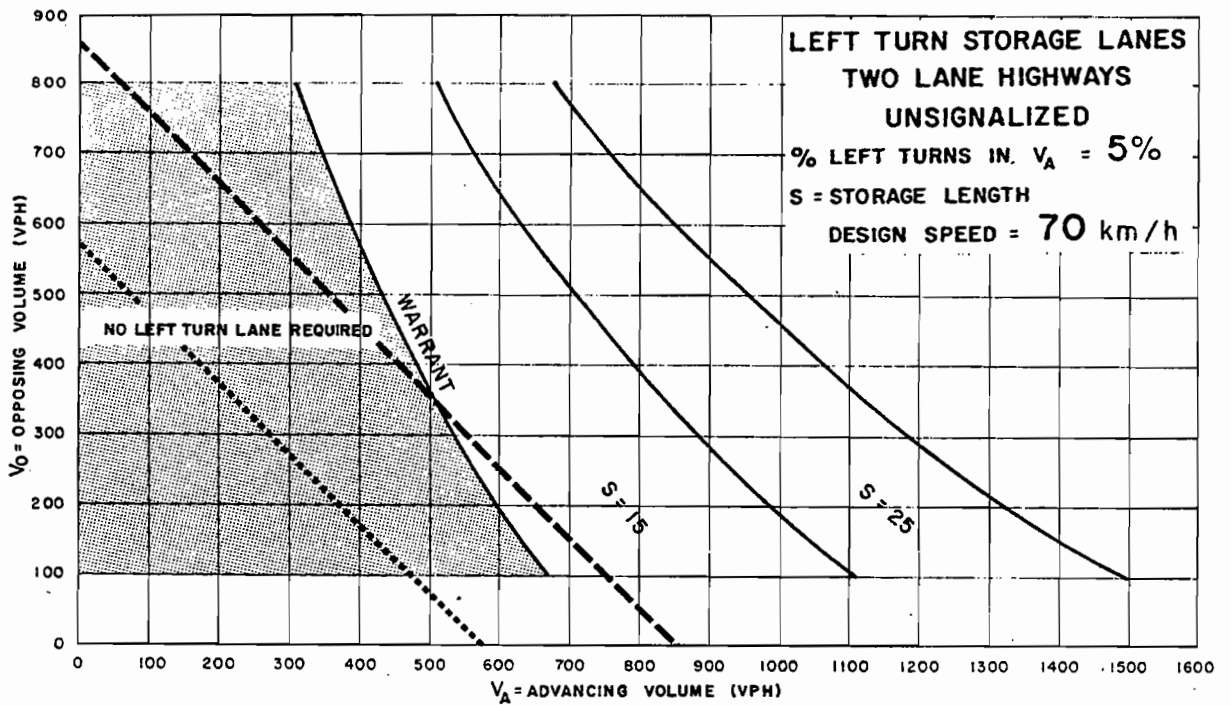
APPENDIX

D LEFT-TURN WARRANT ANALYSIS

Intersection: Erbsville Road at Wideman Road
Major Street: Erbsville Road
Major Street Approach Lanes (Per Direction): 1
Minor Street Approach Lanes (Per Direction): 1
Design Speed (km/h) (10 over the posted speed): 70
Scenario: 2029 FB

Left-Turn Warrant

Movement	AM Peak Hour					PM Peak Hour					Turning Lane Warranted?	
	Left-Turn Volume	Advancing Volume	Opposing Volume	Left-Turn Percentage	Reference Figure	Warranted?	Left-turn Volume	Advancing Volume	Opposing Volume	Left-Turn Percentage		Reference Figure
NBL	32	347	288	9%	EA-10	NO	79	438	465	18%	EA-11	YES



--- TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

..... TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

AM

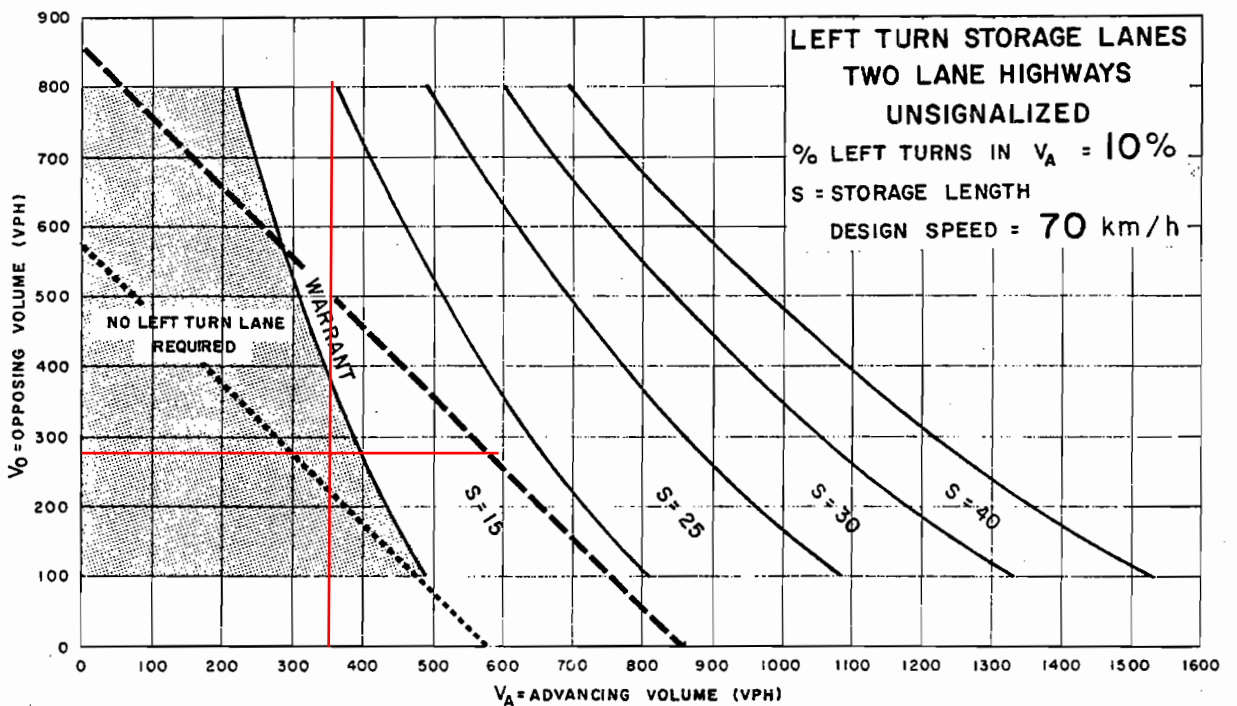
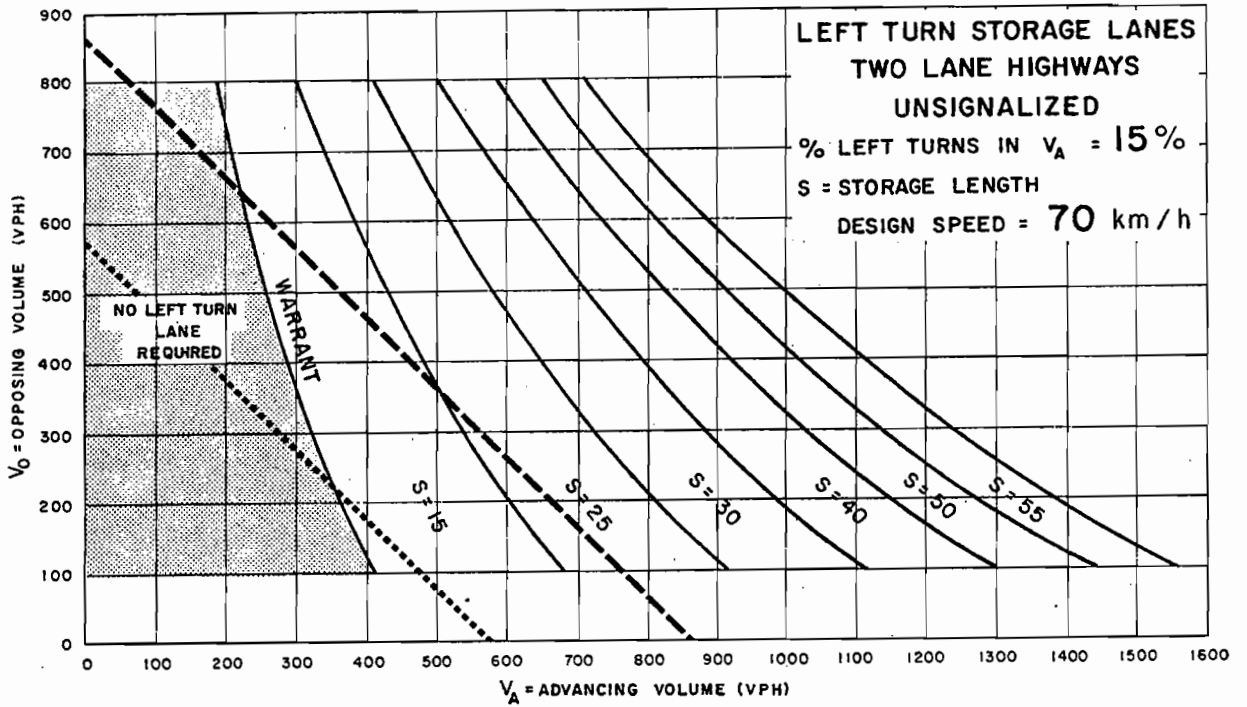


Figure EA-10



--- TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

..... TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

PM

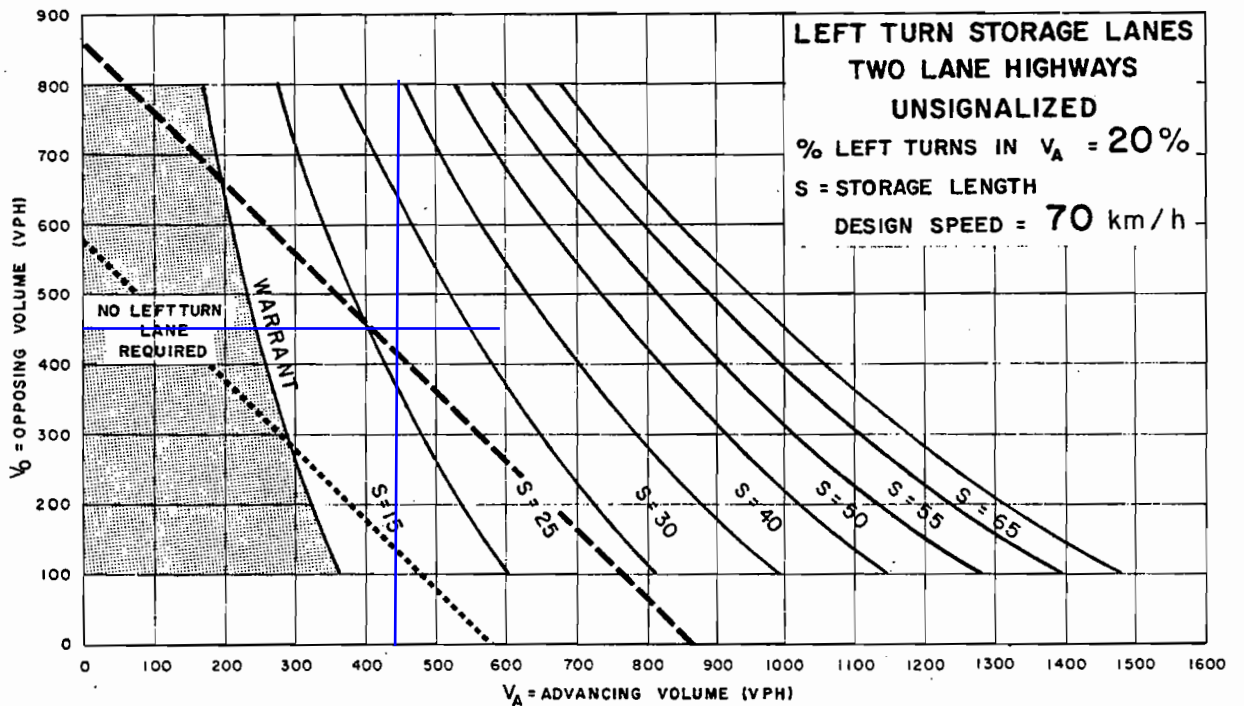


Figure EA-11

Intersection: Erbsville Road at Schnarr Street

Major Street: Erbsville Road

Major Street Approach Lanes (Per Direction): 1

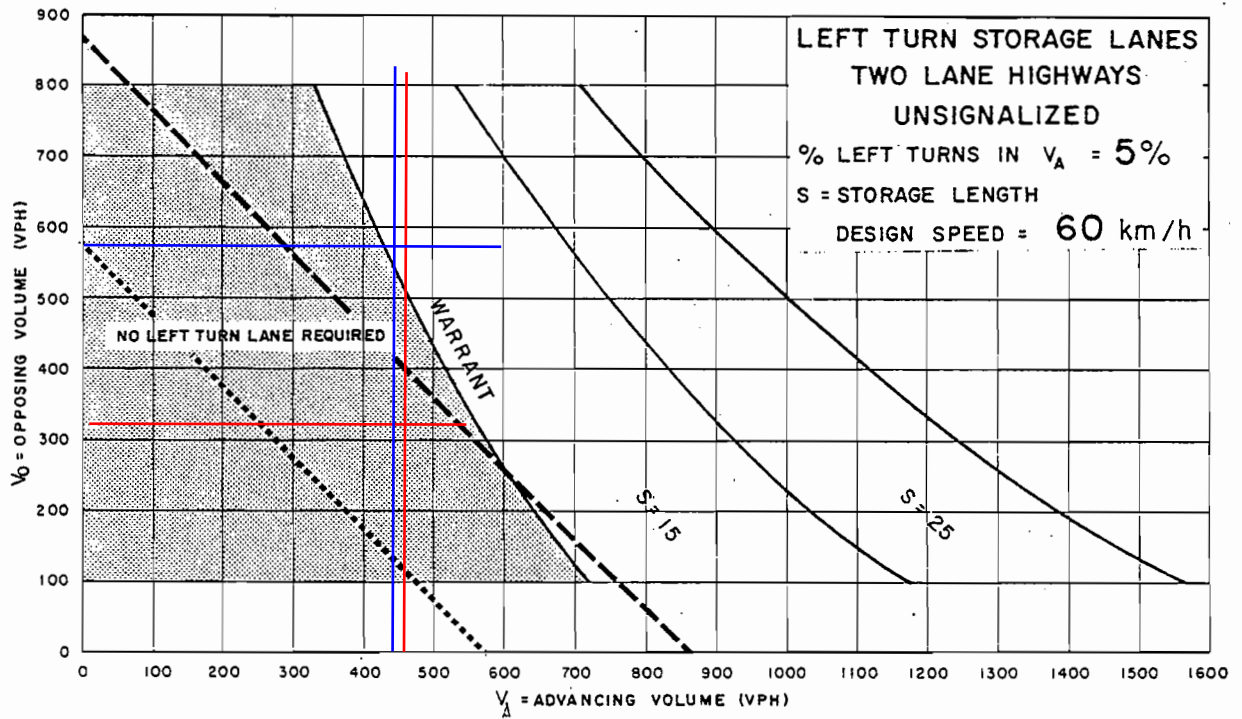
Minor Street Approach Lanes (Per Direction): 1

Design Speed (km/h) (10 over the posted speed): 60

Scenario: 2029 FT

Left-Turn Warrant

Movement	AM Peak Hour					PM Peak Hour					Turning Lane Warranted?	
	Left-Turn Volume	Advancing Volume	Opposing Volume	Left-Turn Percentage	Reference Figure	Warranted?	Left-turn Volume	Advancing Volume	Opposing Volume	Left-Turn Percentage		Reference Figure
NBL	8	458	319	2%	EA-2	NO	22	439	580	5%	EA-2	YES



--- TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

..... TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

AM
PM

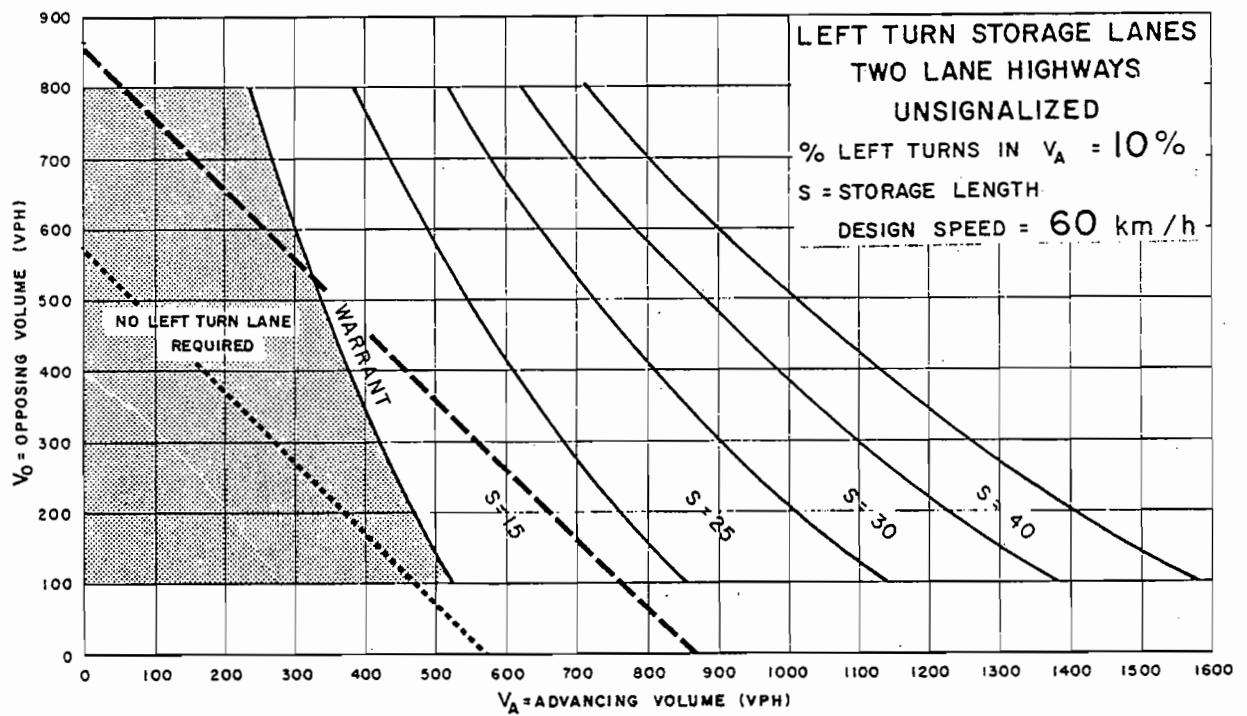


Figure EA-6

Intersection: Erbsville Road at East Access

Major Street: Erbsville Road

Major Street Approach Lanes (Per Direction): 1

Minor Street Approach Lanes (Per Direction): 1

Design Speed (km/h) (10 over the posted speed): 60

Scenario: 2029 FT

Left-Turn Warrant

Movement	AM Peak Hour				PM Peak Hour				Turning Lane Warranted?			
	Left-Turn Volume	Advancing Volume	Opposing Volume	Left-Turn Percentage	Reference Figure	Warranted?	Left-Turn Volume	Advancing Volume		Opposing Volume	Left-Turn Percentage	Reference Figure
SBL	9	330	437	3%	EA-2	NO	33	564	445	6%	EA-2	YES

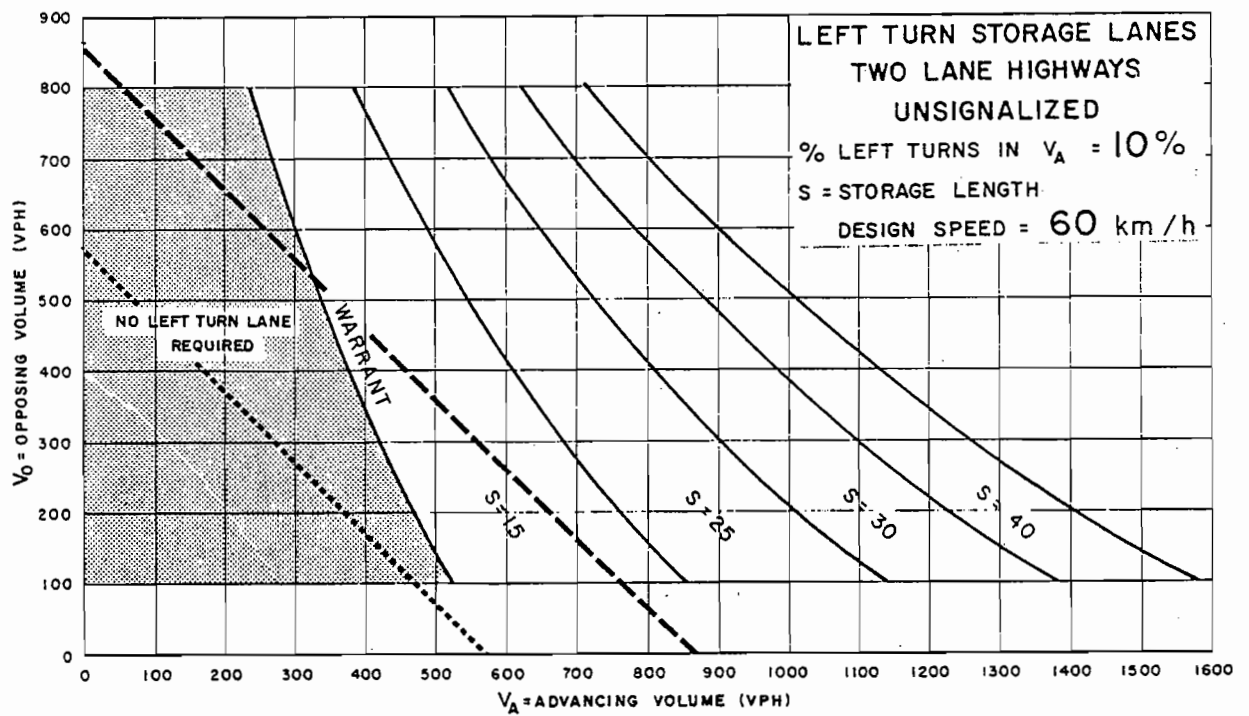
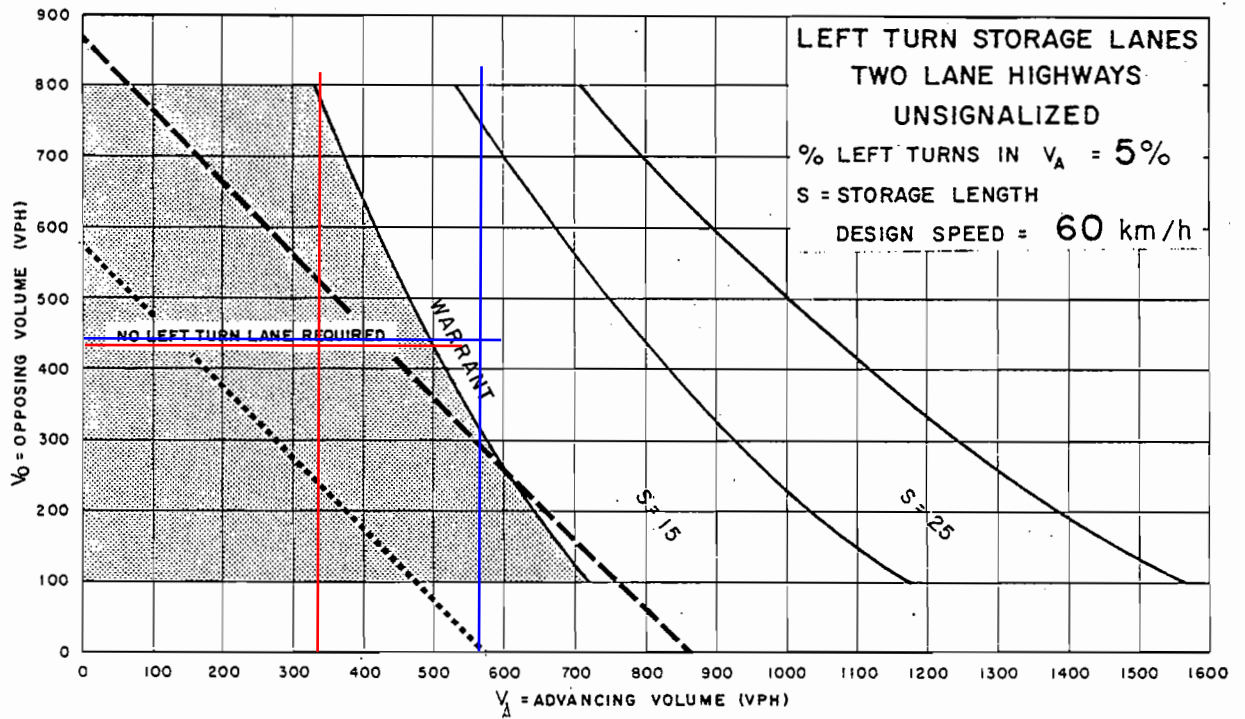
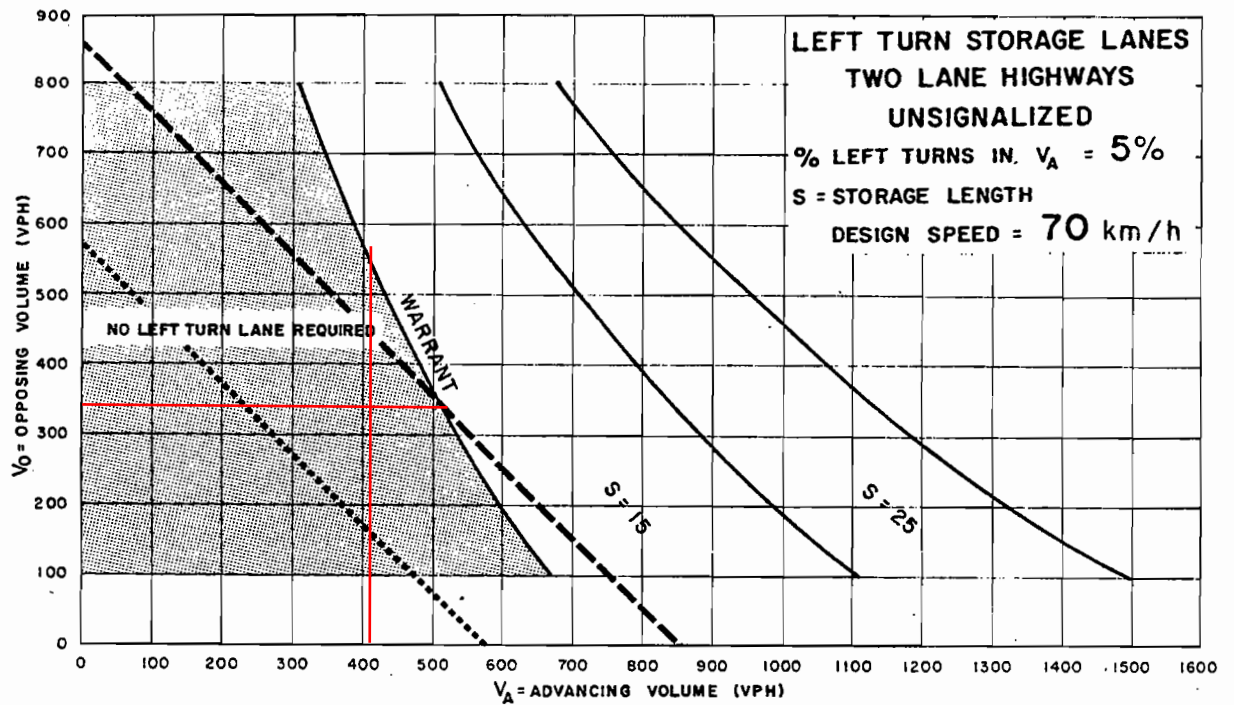


Figure EA-6

Intersection: Erbsville Road at West Access
Major Street: Erbsville Road
Major Street Approach Lanes (Per Direction): 1
Minor Street Approach Lanes (Per Direction): 1
Design Speed (km/h) (10 over the posted speed): 70
Scenario: 2029 FT

Left-Turn Warrant

Movement	AM Peak Hour					PM Peak Hour					Turning Lane Warranted?	
	Left-Turn Volume	Advancing Volume	Opposing Volume	Left-Turn Percentage	Reference Figure	Warranted?	Left-turn Volume	Advancing Volume	Opposing Volume	Left-Turn Percentage		Reference Figure
NBL	12	405	341	3%	EA-10	NO	35	454	546	8%	EA-10	YES



--- TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

..... TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

AM
PM

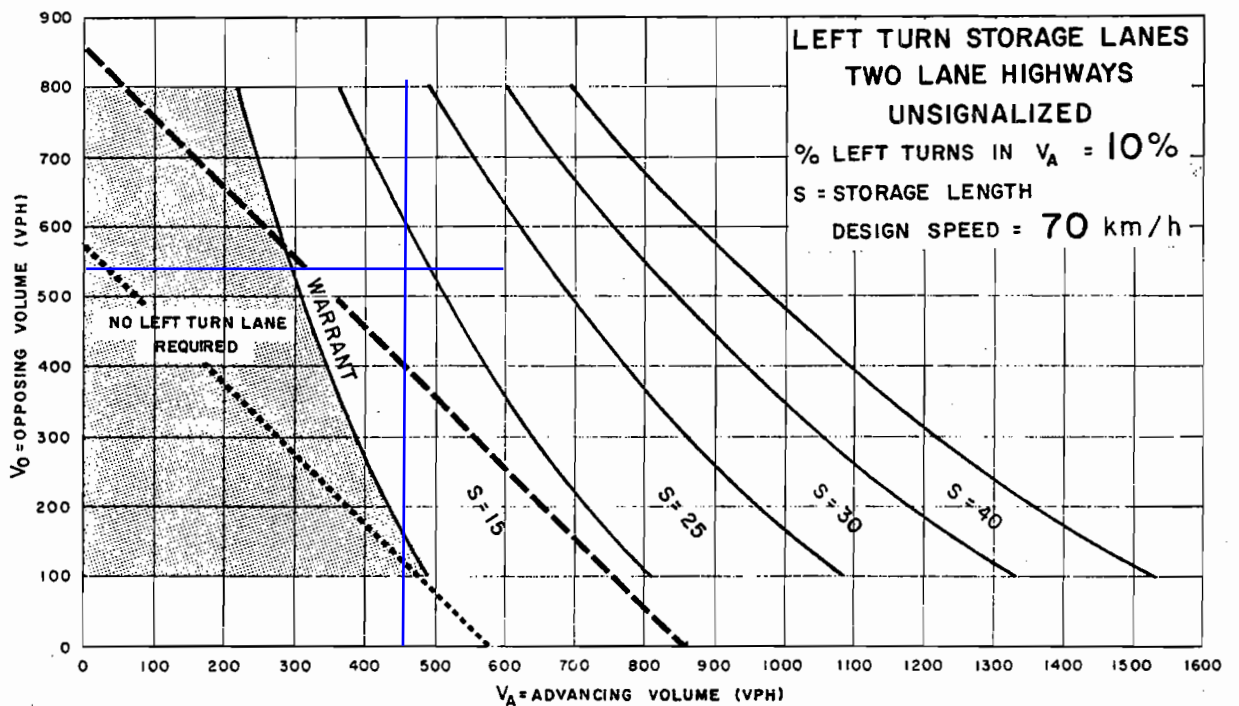


Figure EA-10

APPENDIX

E TTS DATA

Tue Apr 02 2019 13:14:07 GMT-0400 (Eastern Daylight Time) - Run Time: 2037ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of destination - pd_dest

Column: Planning district of origin - pd_orig

Filters:

Planning district of origin - pd_orig In 63

and

Start time of trip - start_time In 600-900

and

Primary travel mode of tri

Trip 2016

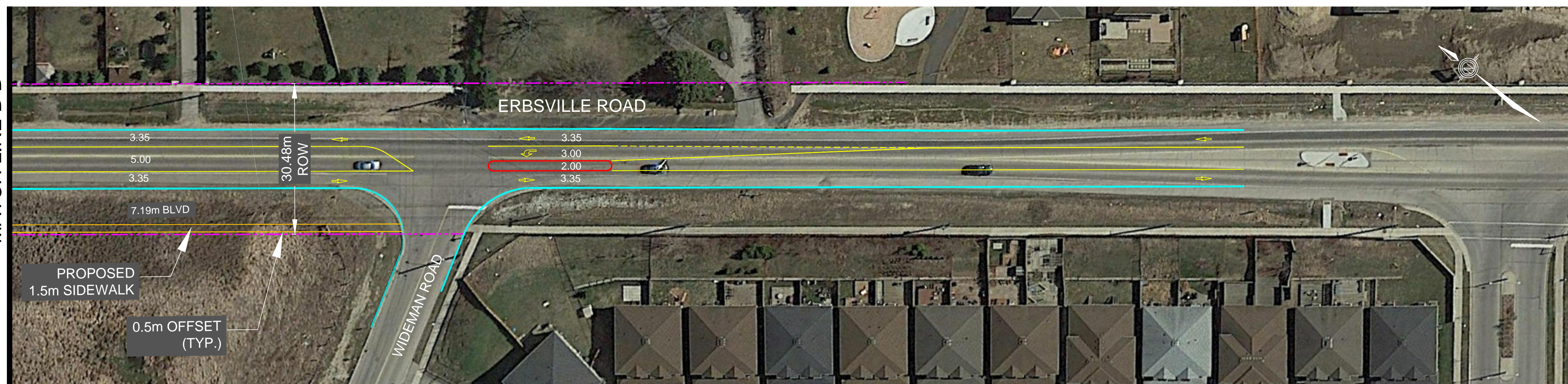
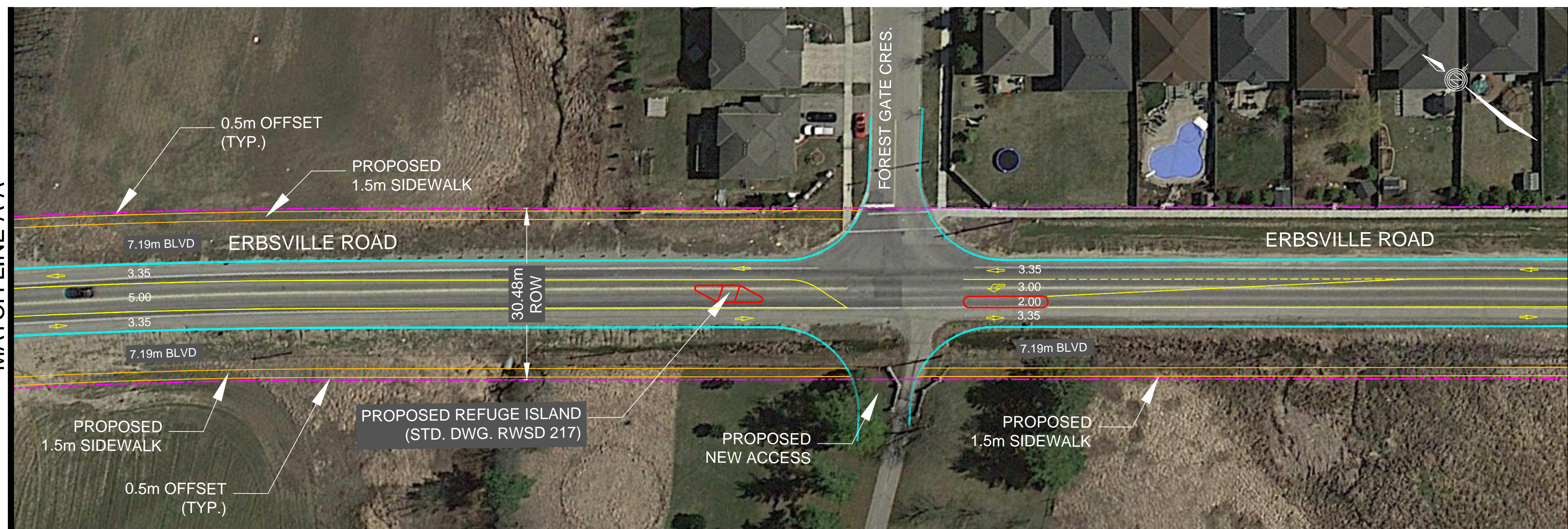
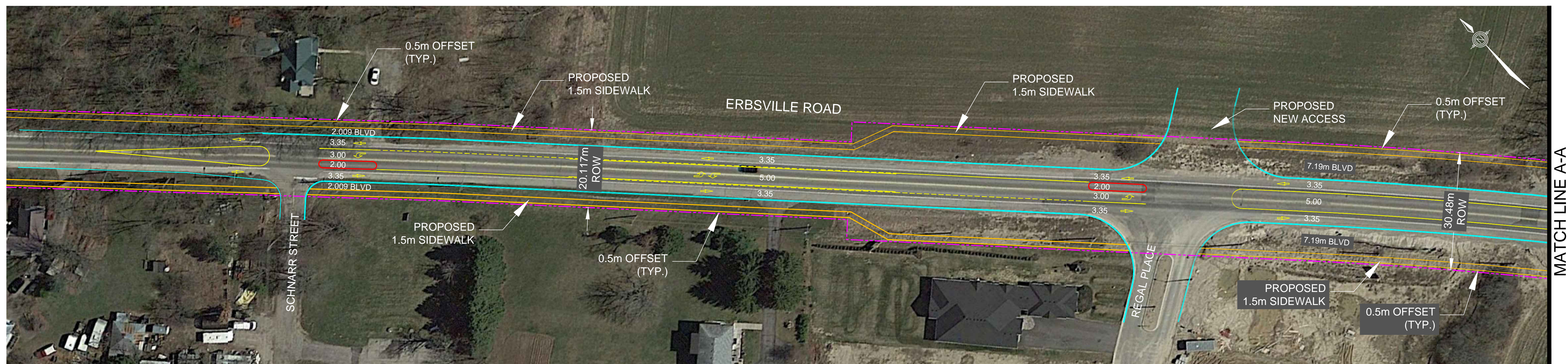
Table:

	Waterloo	
PD 1 of Toronto	107	0%
PD 7 of Toronto	13	0%
PD 8 of Toronto	14	0%
PD 9 of Toronto	19	0%
PD 10 of Toronto	69	0%
PD 11 of Toronto	26	0%
Markham	41	0%
Brampton	9	0%
Mississauga	297	1%
Milton	99	0%
Oakville	29	0%
Burlington	72	0%
Ancaster	35	0%
Stoney Creek	44	0%
Hamilton	112	0%
Grimsby	14	0%
Waterloo	18099	49%
Kitchener	10866	30%
Cambridge	1940	5%
North Dumfries	157	0%
Wilmot	325	1%
Wellesley	199	1%
Woolwich	1520	4%
City of Guelph	1360	4%
Puslinch	104	0%
Guelph/Eramosa	52	0%
Centre Wellington	214	1%
Barrie	29	0%
Rest of Wellington	57	0%
Perth	249	1%
Oxford	224	1%
Brant	32	0%
Brantford	119	0%
External	282	1%
	36828	

APPENDIX

F

RECOMMENDED
LANE
CONFIGURATIONS



NOTE:

1. Per the Region of Waterloo Official Plan, the Ultimate ROW for Erbsville Road is 20.117m between Conservation Drive and 0.4km south of Conservation Drive, and increases to 30.48m south of that section.
2. Any recommendations with regards to active transportation facilities have yet to be confirmed and were not included in this figure.

**Recommended Left-turn Lane Configuration along Erbsville Road
Erbsville South Block Plan Transportation Study**



X:\17107181\17107181-0200-02-ERBSVILLE SOUTH BLOCK TRANSPORTATION STUDY\ERBSVILLE ROAD TURNING LANES VIZ.DWG

APPENDIX

G SIGNAL TIMING WARRANT

TRAFFIC SIGNAL WARRANTS - JUSTIFICATION 7 (PROJECTED VOLUMES)

GENERAL INFORMATION

FUTURE WEEKDAY PEAK HOUR

Analyst	NK	Jurisdiction	City of Waterloo
Agency or Company	WSP Canada Inc.	Date	March 26, 2019
Analysis Period	2029 Total	East-West Street	Conservation Drive
Flow Conditions	Restricted flow (urban) ▼	North-South Street	Erbsville Road
'T' Intersection	No ▼	Major Street	North-South ▼
Existing Intersection	Yes ▼	Approach lanes per direction	1 ▼ Major Street
		Approach lanes per direction	1 ▼ Minor Street
Additional Comments			

TRAFFIC & PEDESTRIAN VOLUMES

Hour Ending	Main Road Approaches							Minor Road Approaches							Pedestrian Crossing Major Road	Pedestrian Crossing Minor Road	
	Northbound			Southbound				Total	Eastbound			Westbound					
	LT	TH	RT	LT	TH	RT	LT		TH	RT	LT	TH	RT	Total			
AM Peak Hour	1	264	213	75	175	3	731	8	65	7	149	39	56	324			
PM Peak Hour	7	257	168	50	346	6	834	0	35	8	243	80	84	450			
Total	8	521	381	125	521	9	1565	8	100	15	392	119	140	774	0	0	

Parameter	AM	PM	Average Hourly Volume (AHV)
Vehicle volume, all approaches	1055	1284	585
Vehicle volume, along minor street	324	450	194
Vehicle volume, along major street	731	834	391
Combined vehicle and pedestrian volume crossing from minor streets	222	323	136

NOTES

1. The traffic control signal justification was done as per criteria defined in Ontario Traffic Manual, Book: 12 (March 2012) Justification 7 - Projected Volumes.

2. Traffic crossing MAJOR street defined as:

- a. Left turns from both minor street approaches
- b. The heaviest through volume from the minor street
- c. 50% of the heavier left turn movement from the major street when both of the following are met:
 1. the left turn volume > 120
 2. the left turn volume + opposing volume > 720
- d. Pedestrians crossing the major street

	AM	PM
a.	157	243
b.	65	80
c.	0	0
1.	No	No
2.	No	No
d.	0	0

3. Justifications 1 and 2 are required to be met to 120% in the case of an existing intersection and 150% in the case of a new intersection

4. For 'T' intersection, the threshold values to be increased by 50%

TRAFFIC SIGNAL WARRANTS - JUSTIFICATION 7 (PROJECTED VOLUMES)

GENERAL INFORMATION

FUTURE WEEKDAY PEAK HOUR

Analyst	NK	Jurisdiction	City of Waterloo	
Agency or Company	WSP Canada Inc.	Date	March 26, 2019	
Analysis Period	2029 Total	East-West Street	Conservation Drive	
Flow Conditions	Restricted flow (urban)	North-South Street	Erbsville Road	
'T' Intersection	No	Major Street	North-South	
Existing Intersection	Yes	Approach lanes per direction	1	Major Street
		Approach lanes per direction	1	Minor Street
Additional Comments				

Justification 1: Minimum Vehicle Volumes

JUSTIFIED

No

Justification	Guidance Approach Lanes				Compliance			120% Satisfied
	1 Lanes		2 or More Lanes		Sectional		Entire %	
Flow Conditions	Free Flow	Restricted Flow	Free Flow	Restricted Flow	Average Hourly Volumes	%		
A. Vehicle volume, all approaches		720			585	81%	81%	No
B. Vehicle volume, along minor streets		170			194	114%	114%	No

Justification 2: Delay To Cross Traffic

JUSTIFIED

No

Justification	Guidance Approach Lanes				Compliance			120% Satisfied
	1 Lanes		2 or More Lanes ¹		Sectional		Entire %	
Flow Conditions	Free Flow	Restricted Flow	Free Flow	Restricted Flow	Average Hourly Volumes	%		
A. Vehicle volume, major street		720			391	54%	54%	No
B. Combined vehicle and pedestrian volume crossing artery from minor streets		75			136	182%	182%	Yes

CONCLUSION

The results of the calculations show that justifications are **not met**.

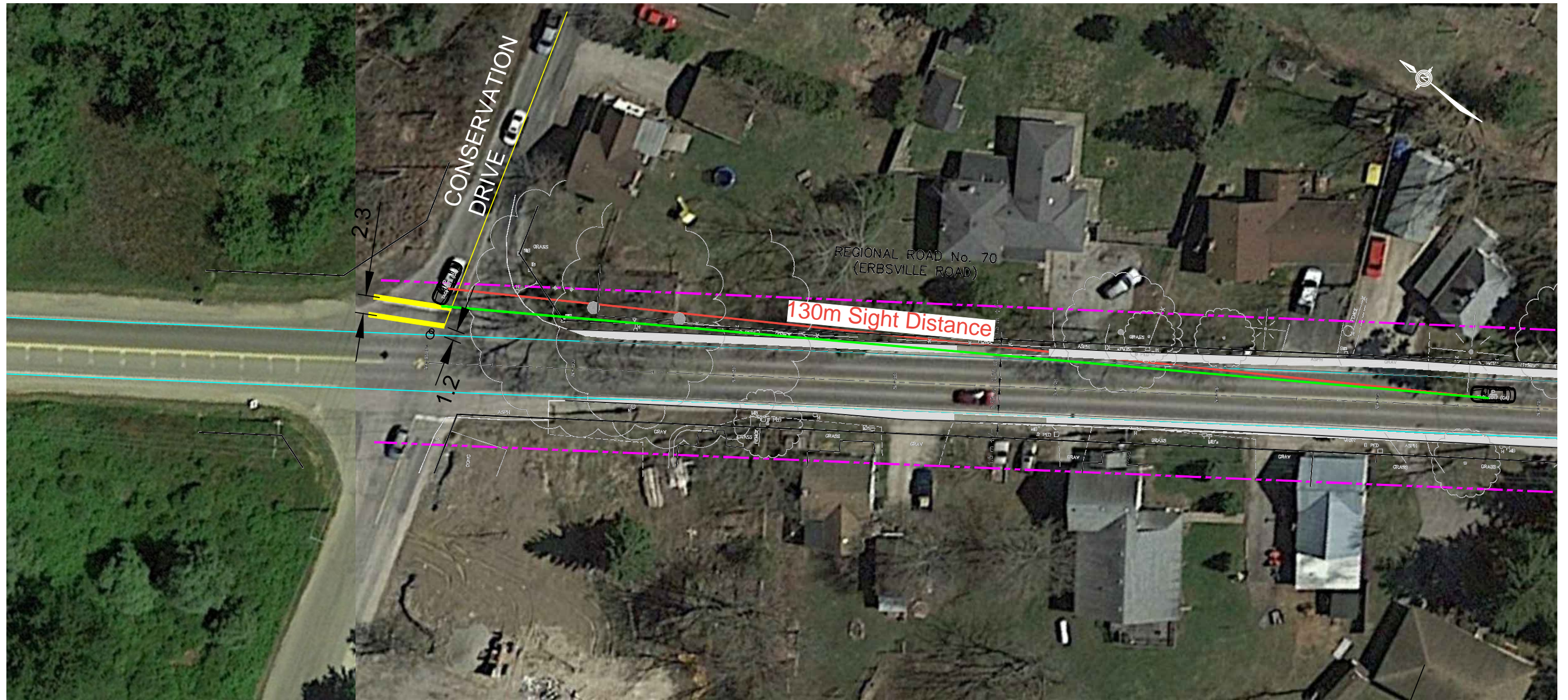
Therefore traffic control signal is **not justified at this intersection for the horizon year 2029 Total**

Note: 1. The minimum volumes were corrected from 120 vehicles and 170 vehicles in OTM, March 2012 to 50 vehicles and 70 vehicles to match Justification 2B.

APPENDIX

H

ERBSVILLE ROAD AT
CONSERVATION
DRIVE SIGHTLINE
ANALYSIS



NOTE:

1. According to TAC Table 9.9.4, for a design speed of 60km/h, the required sight distance is 130m.
2. At the existing stop bar on Conservation Drive, the barn and trees at the southeast corner of the intersection currently obstruct the sight line.
3. Assuming that the driver is located 2.4m from the front of the vehicle, relocating the stop bar 2.3m forward towards the intersection would minimize the offset from the edge of pavement to 1.2m. Using the recommended stop bar location, the 130m sight distance would be met without obstruction by the existing barn.

**Sight Distance investigation at Conservation Drive
Erbsville South Block Plan Transportation Study**

