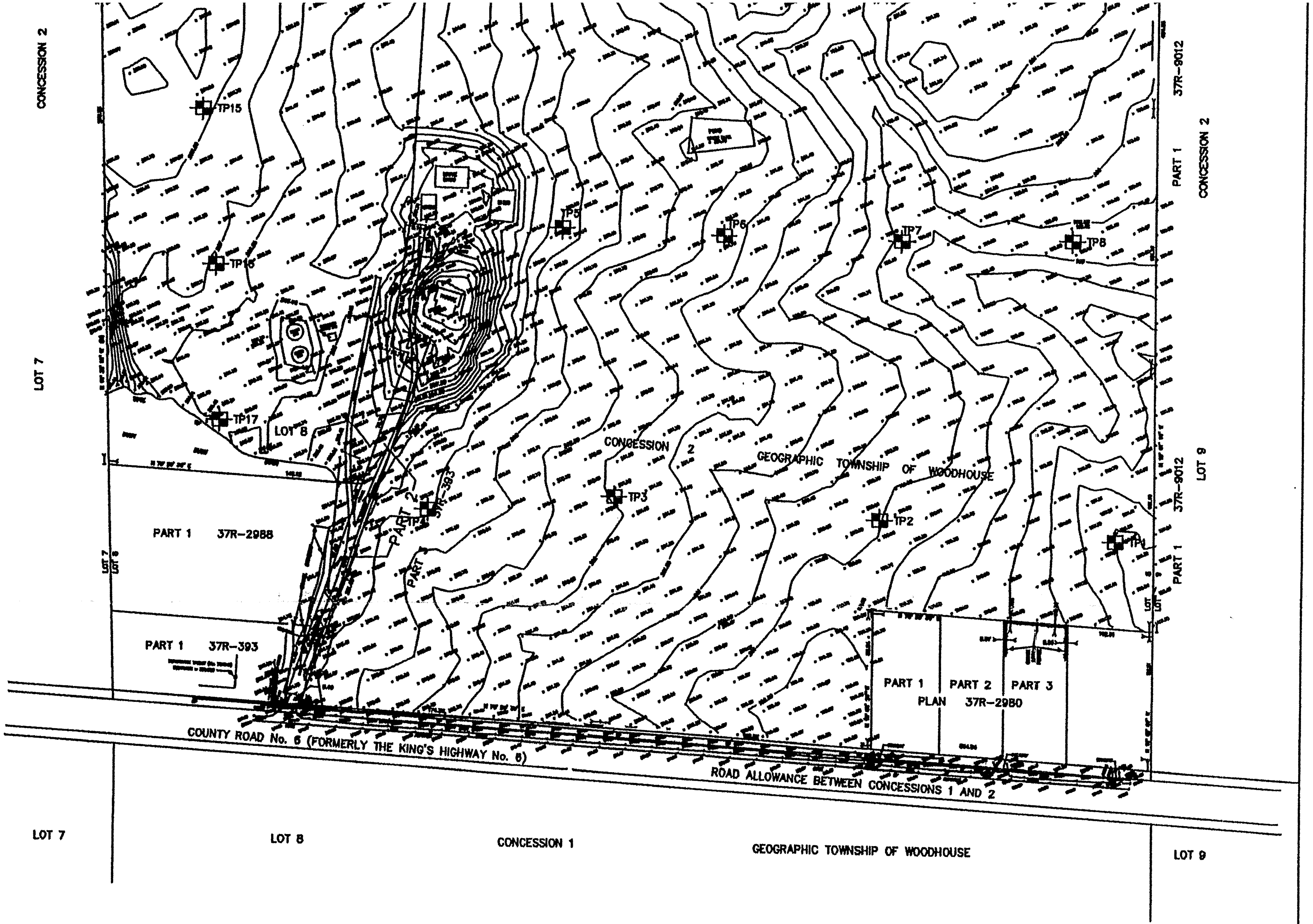
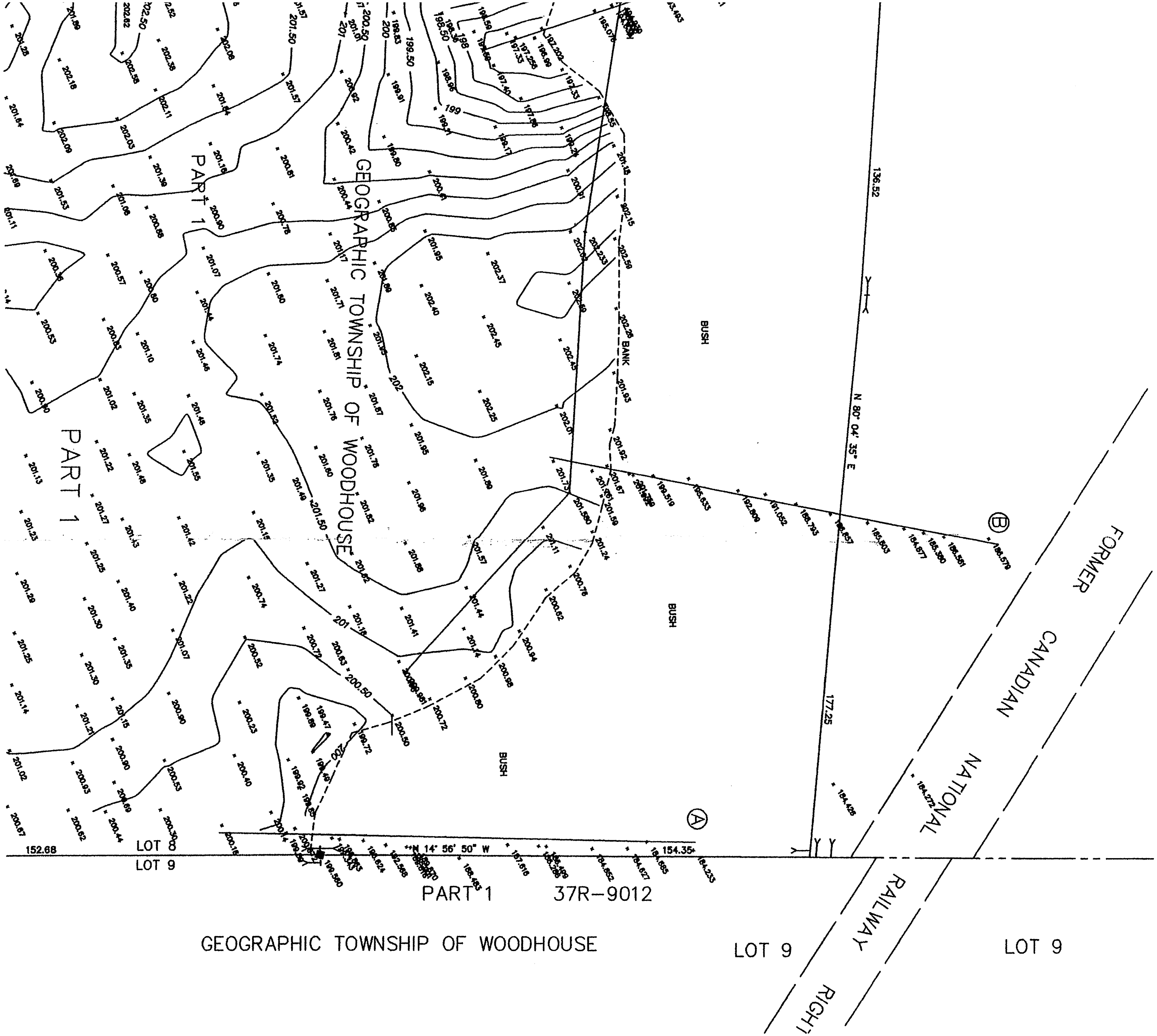


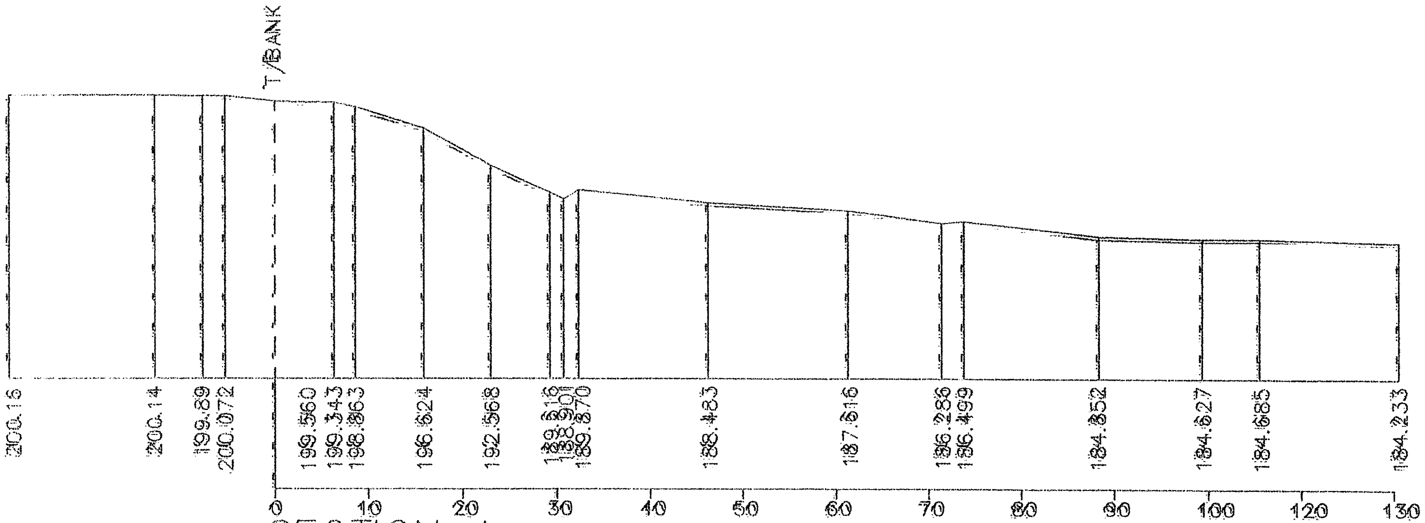
TEST PIT LOCATION PLAN
PROPOSED LYNN RIVER HEIGHTS
PHASE II RESIDENTIAL DEVELOPMENT

CHUNG & VANDER DOELEN ENGINEERING LTD.
280 Victoria St. North, Unit 8
Kitchener,ON,N2H 5E2
Phone:(519) 742-8979 Fax:(519) 742-7739
E-mail:cvd@bellnet.ca

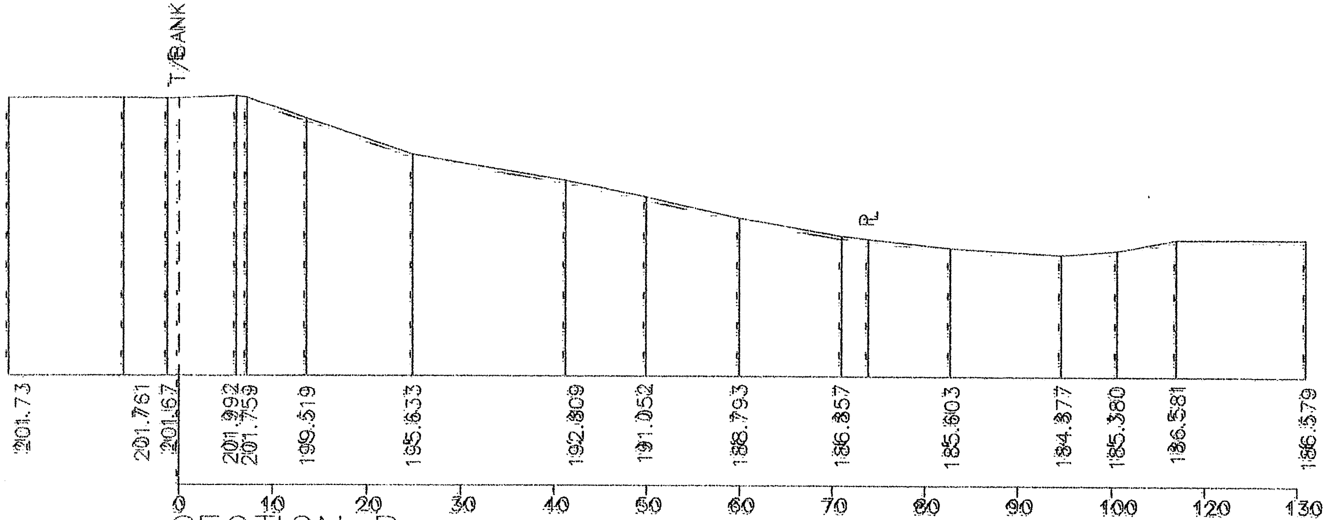
PART OF LOT 8, CONCESSION 2
NORFOLK COUNTY
TOWN OF PORT DOVER, ONTARIO

Drawn By: A H	Date: April , 2006	File No.: 05-11-K11
Checked By: EYC	Scale: NTS	DRAWING NO.: 1

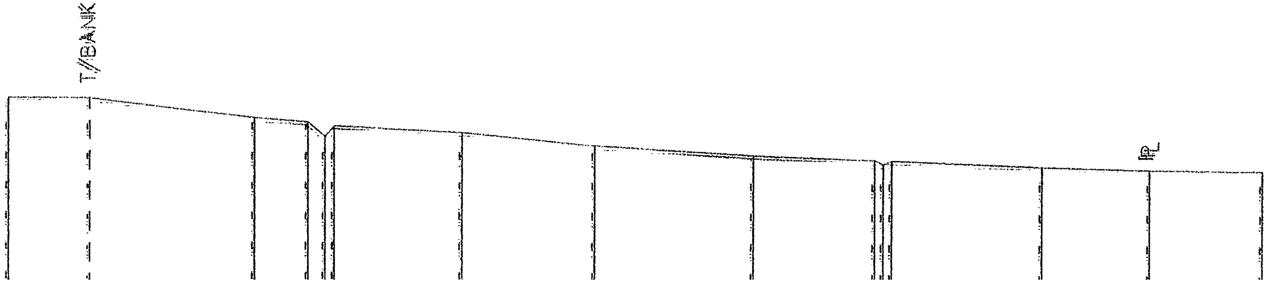

PART 1
PART 1
GEOGRAPHIC TOWNSHIP OF WOODHOUSE
BUSH
BUSH
BUSH
BANK
136.52
N 80° 04' 35" E
177.25
Ⓑ
Ⓐ
154.35±
N 14° 56' 50" W
152.68
LOT 8
LOT 9
PART 1 37R-9012
GEOGRAPHIC TOWNSHIP OF WOODHOUSE
LOT 9
LOT 9
FORMER CANADIAN NATIONAL RAILWAY RIGHT



SECTION A



SECTION B



LYNN RIVER HEIGHTS
PORT DOVER

TRAFFIC IMPACT STUDY

F.R. Berry & Associates
December, 2006

LYNN RIVER HEIGHTS
PORT DOVER

TRAFFIC IMPACT STUDY

1. INTRODUCTION AND BACKGROUND

Boban Developments National Limited has proposed the development of a 484 lot residential subdivision on the north side of Norfolk County Road 6 west of the existing urban area of Port Dover. The proposed development is immediately west of a previous phase of development containing 143 lots, which has already received draft plan approval. **Figure 1** shows the location of the site.

As a condition of approval, the County of Norfolk has requested a study of the traffic impact of the proposed development. The purpose of this report is to satisfy the County's request.

2. EXISTING CONDITIONS

County Road 6, formerly King's Highway No. 6, is a two-lane rural arterial in the vicinity of the site. It forms the major road link between Simcoe and Port Dover. The posted speed limit at the proposed access is 60km/h.

To the east of the proposed development, County Road 6 intersects Lynn Park Avenue and Thompson Drive. For the purposes of this study, an eight hour traffic count was made at this intersection on Tuesday, November 7, 2006. Peak hour turning movements derived from this count are shown in **Figure 2.**

3. PROPOSED DEVELOPMENT

The proposed development consists of 484 single family lots. The draft plan is shown in **Figure 3**. Access to the site is proposed via a new street connection to County Road 6, Street A, and via connections to Willowdale Crescent and Cardinal Lane to the east. Willowdale Crescent connects to Lynn Park Avenue which provides alternative access to County Road 6.

Phase 1 of the development, which already has draft plan approval, is connected to County Road 6 via Pheasant Trail.

3.1 Vehicle Trip Generation

Vehicle trip generation for the proposed development was estimated using rates contained in the Institute of Transportation Engineers Trip Generation Manual, Seventh Edition. Estimated vehicle trip generation for the complete development is shown in **Table 1**.

Table 1 also shows the estimated trip generation for Phase 1 of the development. For the purposes of this study, it was assumed that no lots in Phase 1 have been occupied. The total impact on County Road 6 will include traffic generated by both phases of the development.

3.2 Vehicle Trip Distribution and Assignment

Based on the traffic count at the intersection of County Road 6 and Lynn Park Avenue, it was estimated that approximately 30 percent of the peak hour trips would be oriented to and from the west.

All of the peak hour trips generated by the proposed development (Phase 2) which would have an origin or destination to the west were assigned to Street A. Those peak hour trips with an origin or destination to the east were assigned to one of Street A, Pheasant Trail or Lynn Park Avenue depending on the most convenient point of access. On this basis, it was estimated that approximately 60 percent of these trips would use Street A, 20 percent would use Pheasant Trail and 25 percent would use Lynn Park Avenue.

A similar approach was used for peak hour trips generated by Phase 1 of the development. All trips with an origin or destination to the west were assigned to Pheasant Trail. Those peak hour trips with an origin or destination to the east were split approximately equally between Pheasant Trail and Lynn Park Avenue.

Figure 4 shows the assignment of peak hour trips from both phases of the development.

4. ANALYSIS

4.1 Projected Traffic

A planning horizon of ten years was selected for this development. Depending on the rate of house construction, it is likely that the development will be close to full development by 2016.

Future background traffic was estimated by projecting existing peak hour turning movements from **Figure 2** to 2016 by using factors based on an annual growth rate of two percent. Projected background turning volumes are shown in **Figure 5**.

Figure 6 shows total projected peak hour traffic. The turning movements shown in **Figure 6** were obtained by adding development traffic from **Figure 4** to background traffic from **Figure 5**.

4.2 Traffic Signal Warrants

The justification for traffic signal warrants was assessed for existing conditions at the intersection of County Road 6 and Lynn Park Avenue for existing conditions and for all three intersections in the study area for projected conditions.

Analysis worksheets are contained in Appendix A. For existing conditions, the standard approach using the eight highest hours was adopted. For projected conditions, a simplified methodology based on peak hour conditions was used. In this approach, the aggregate of morning and afternoon peak hour volumes is divided by four and the result compared with standard warrant values. Because of the approximations used in the projections, MTO policy is to require a ratio of 120 percent between projected traffic and warrant values before considering traffic signals justified.

A traffic signal warrant analysis based on the traffic count made in November, 2006 indicates that signals are justified under existing conditions. While neither of the two traffic volumes meets the 100 percent criterion, both exceed 80 percent, thus meeting the warrant. It is suggested that further traffic counts be made in the spring of 2007 to confirm the need for traffic signals.

The analyses show that traffic signals would not be warranted under full built-out conditions at the intersections of County Road 6 with Street A and Pheasant Trail. At the intersection of County Road 6 and Lynn Park Avenue, under projected conditions, warrant values are exceeded for each of the two major warrants. Since the ratio does not meet the 120 percent criterion the need for signals cannot be confirmed using this approach. Clearly, however, since warrant values appear to be met under existing conditions, traffic signals will likely be required within the ten year planning horizon. Turning movements at the intersection of County Road 6 and Lynn Park Avenue should be monitored on a regular basis to determine when traffic signals are warranted.

4.3 Turning Lanes

MTO methodology was utilized to determine the need for turning lanes at each of the intersections in the study area. A design speed of 80km/h, equivalent to the posted speed limit of 60km/h, was used in the analysis.

Results of the turning lane analysis are summarized in **Table 2.** Analysis worksheets and copies of the appropriate MTO charts are contained in Appendix B.

The analysis indicates that, under existing conditions, a left turn lane with a storage length of 15 metres is warranted on County Road 6 at Thompson Drive (Lynn Park Avenue).

For the ten-year projection, under full build-out conditions, left turn lanes would be warranted at both Street A and Pheasant Trail, and in both directions at Lynn Park Avenue (Thompson Drive). A 25 metres storage length would be required at Street A and a 30 metre storage length in the westbound direction at Thompson Drive.

For a design speed of 80km/h, MTO standards call for an additional parallel lane length of 50 metres and a taper of 130 metres.

MTO criteria suggest that eastbound right turn lanes would be justified at Street A and Lynn Park Avenue where the peak hour turning volumes exceed 100 vehicles. For a design speed of 80km/h, the right turn lane should have a parallel lane length of 60 metres and a taper of 70 metres.

4.4 Level of Service

Each of the intersections in the study area was analyzed for level of service and delay using the Synchro 6 program. The results of the analyses are summarized in **Table 3**. Analysis worksheets are contained in Appendix C.

The intersection of County Road 6 with Lynn Park Avenue and Thompson Drive was analyzed for existing and background conditions as well as for projected total build-out conditions. For the existing and background conditions, the intersection would operate at a good level of service with stop control on the minor street approaches. The background condition assumed left turn lanes in both directions on County Road 6.

For the unsignalized condition, the addition of development traffic would reduce the level of service on the northbound and southbound approaches to levels E and F respectively in the afternoon peak hour. This confirms the conclusions reached in the analysis of signal warrants (Section 4.2) that traffic signals will be warranted by 2016.

The intersections of County Road 6 with Street A and Pheasant Trail would operate at good levels of service under full build-out conditions. Left turn lanes on County Road 6 were assumed for both intersections.

5. CONCLUSIONS

Development of Phase 2 of the Lynn River Heights will have an impact on the operation of traffic at the intersections of County Road 6 with Lynn Park Avenue (Thompson Drive) and Pheasant Trail and at the proposed intersection of County Road 6 and Street A.

A westbound left turn lane is currently justified at the intersection of County Road 6 and Lynn Park Avenue (Thompson Drive).

At full-build-out conditions, left turn lanes will be required on County Road 6 at Street A, Pheasant Trail and Lynn Park Avenue (Thompson Drive).

At full build-out conditions, traffic signals would not be warranted at the intersections of County Road 6 with Street A and Pheasant Trail. Within the ten year planning horizon, traffic signals will be justified at the intersection of County Road 6 and Lynn Park Avenue (Thompson Drive).

Without signalization, the intersections of County Road 6 with Street A and Pheasant Trail would operate at a good level of service under full build-out conditions. At the intersection of County Road 6 and Lynn Park Avenue (Thompson Drive), lengthy delays can be expected on the northbound and southbound approaches in the peak hour with existing stop control.

F.R. BERRY
Jan 17/07

Land Use	Ave. Daily Traffic	AM Peak Hour			PM Peak Hour		
		in	out	total	in	out	total
Phase 1 143 single family	1450	30	80	110	95	55	150
Phase 2 484 single family	4440	90	260	350	280	165	445

Table 1

Vehicle Trip Generation

Intersection	Left Turn Lane Required	Storage Length
Projected		
Street A		
AM Peak Hour	No	-
PM Peak Hour	Yes	25m
Pheasant Trail		
AM Peak Hour	No	-
PM Peak Hour	Yes	15m
Lynn Park Avenue		
Eastbound		
AM Peak Hour	Yes	15m
PM Peak Hour	Yes	15m
Westbound		
AM Peak Hour	No	-
PM Peak Hour	Yes	30m
Existing		
Lynn Park Avenue		
Eastbound		
AM Peak Hour	No	-
PM Peak Hour	No	-
Westbound		
AM Peak Hour	No	-
PM Peak Hour	Yes	15m

Table 2

Left Turn Lane Requirements

Intersection	Eastbound		Westbound		Northbound		Southbound		Intersection	
	Del	L of S	Del	L of S	Del	L of S	Del	L of S	ICU	L of S
AM Peak Hour										
Lynn Park Ave.										
- existing	1.0	A	0.6	A	14.7	B	13.5	B	30.1%	A
- background	8.1	A(l)	7.7	A(l)	17.0	C	16.4	C	35.0%	A
- total	8.3	A(l)	8.1	A(l)	26.3	D	45.1	E	39.2%	A
Pheasant Trail										
- total	8.2	A(l)	0	-	-	-	16.5	C	32.5%	A
Street A										
- total	8.2	A(l)	0	-	-	-	18.6	C	39.0%	A
PM Peak Hour										
Lynn Park Ave.										
- existing	0.5	A	2.6	A	15.5	C	16.9	C	45.6%	A
- background	7.9	A(l)	8.1	A(l)	19.7	C	22.1	C	38.5%	A
- total	8.7	A(l)	8.5	A(l)	37.6	E	114.0	F	53.0%	A
Pheasant Trail										
- total	8.5	A(l)	0	-	-	-	18.6	C	35.5%	A
Street A										
- total	8.6	A(l)	0	-	-	-	21.2	C	45.3%	A

Note:

Del - ave. delay (secs)

Lof S - level of service

ICU - Intersection capacity utilization

(l) - left turn movement

Table 3

Level of Service

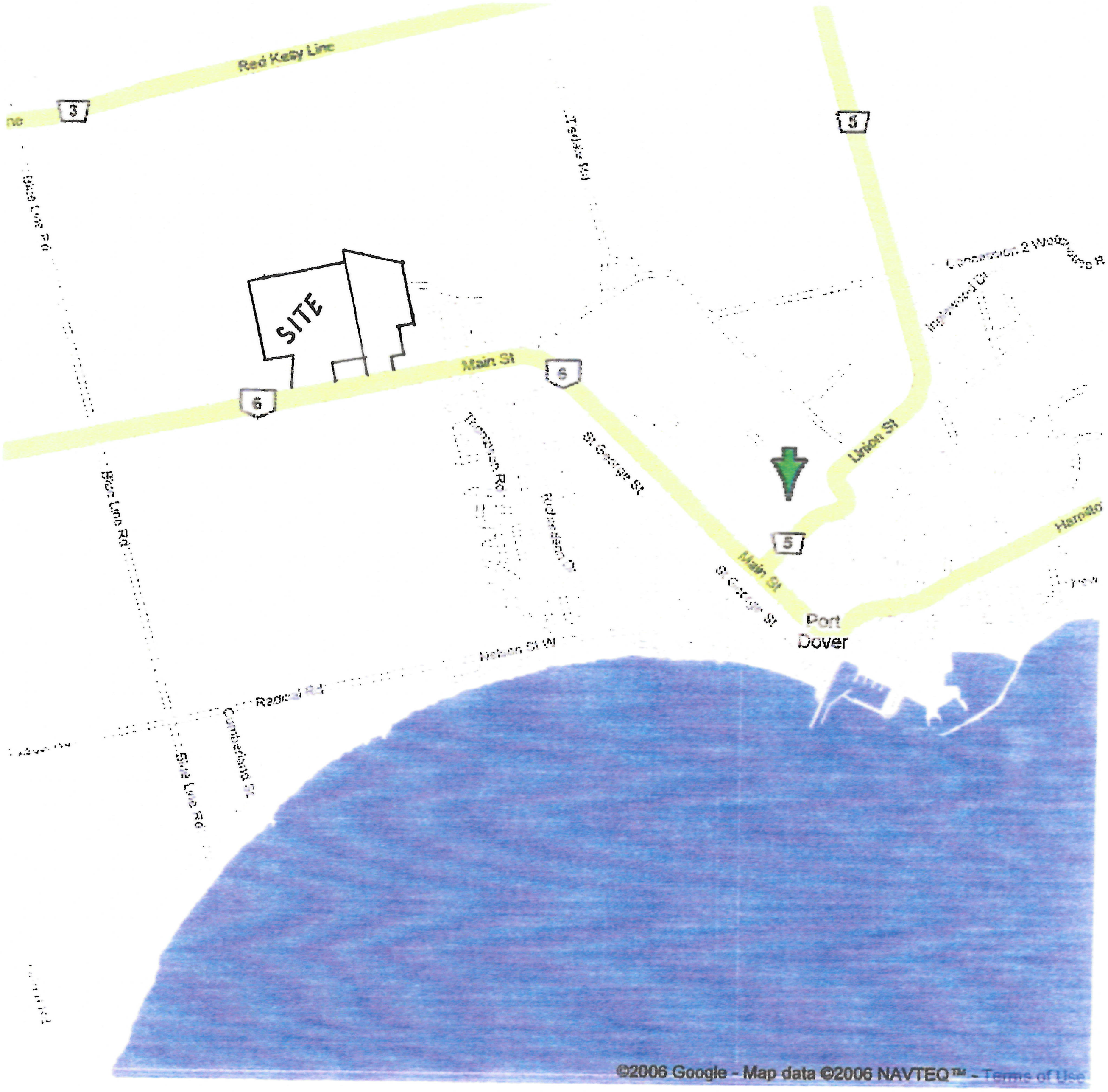
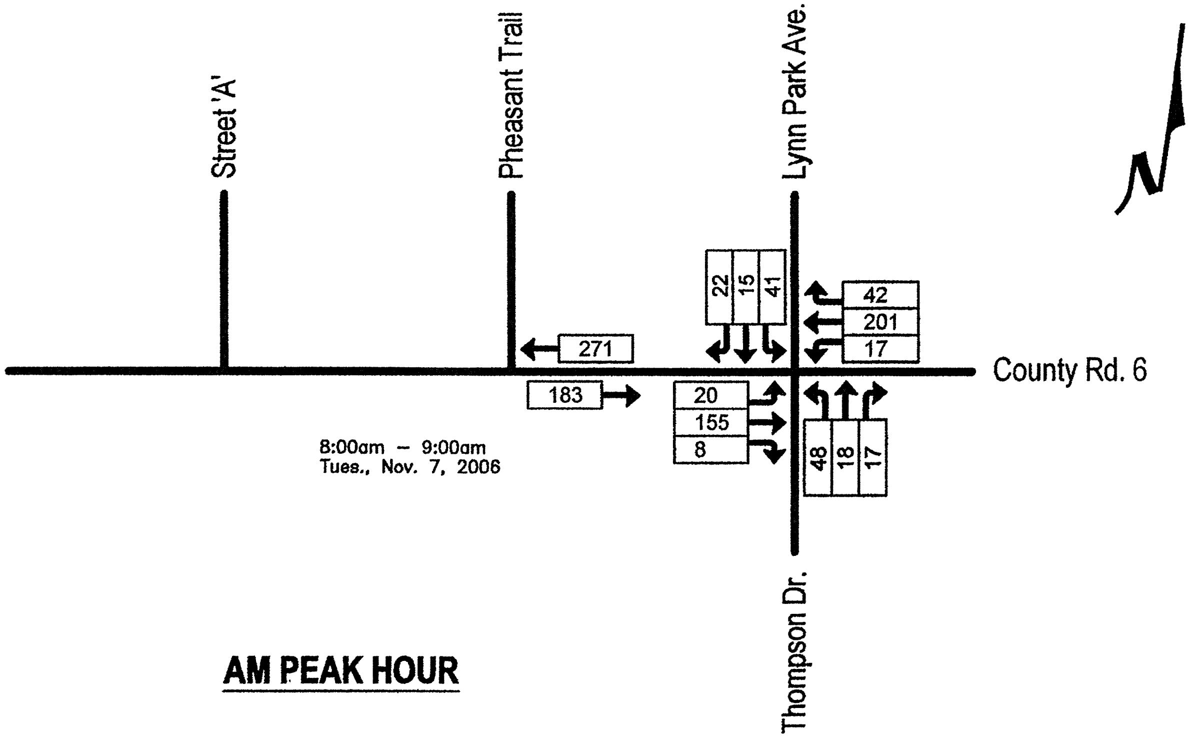


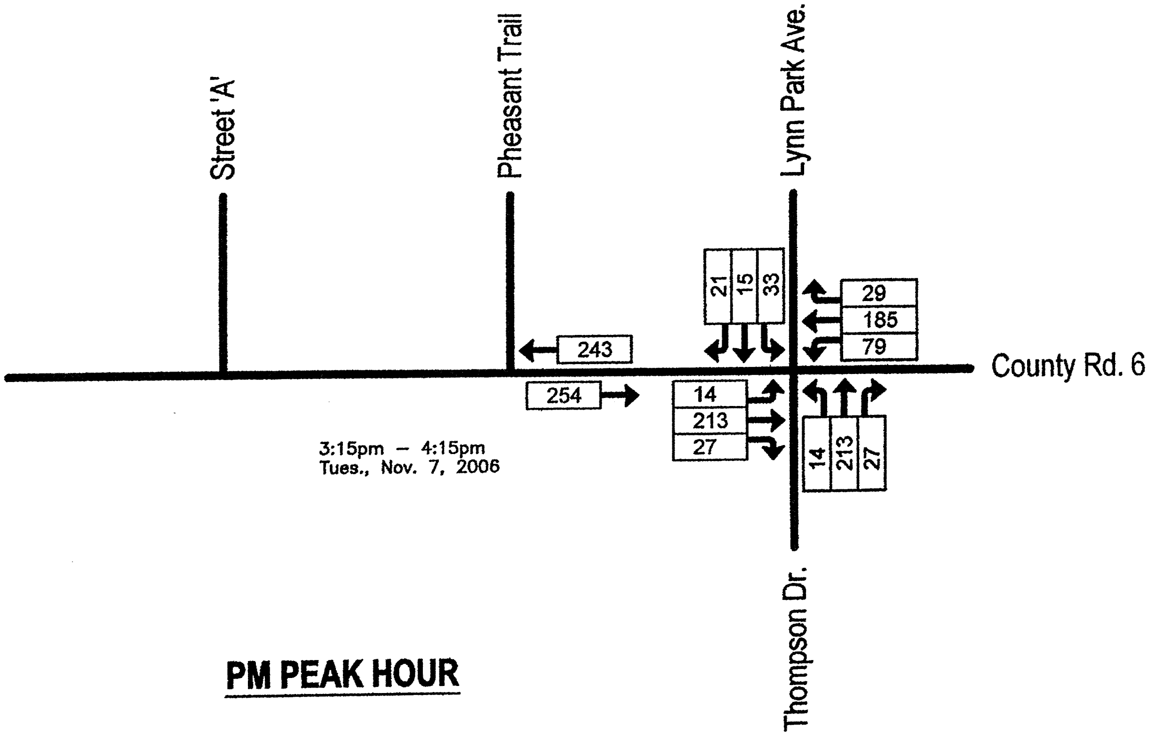
Figure 1

Area Plan



8:00am – 9:00am
Tues., Nov. 7, 2006

AM PEAK HOUR



3:15pm – 4:15pm
Tues., Nov. 7, 2006

PM PEAK HOUR

Existing Traffic

FIGURE 2

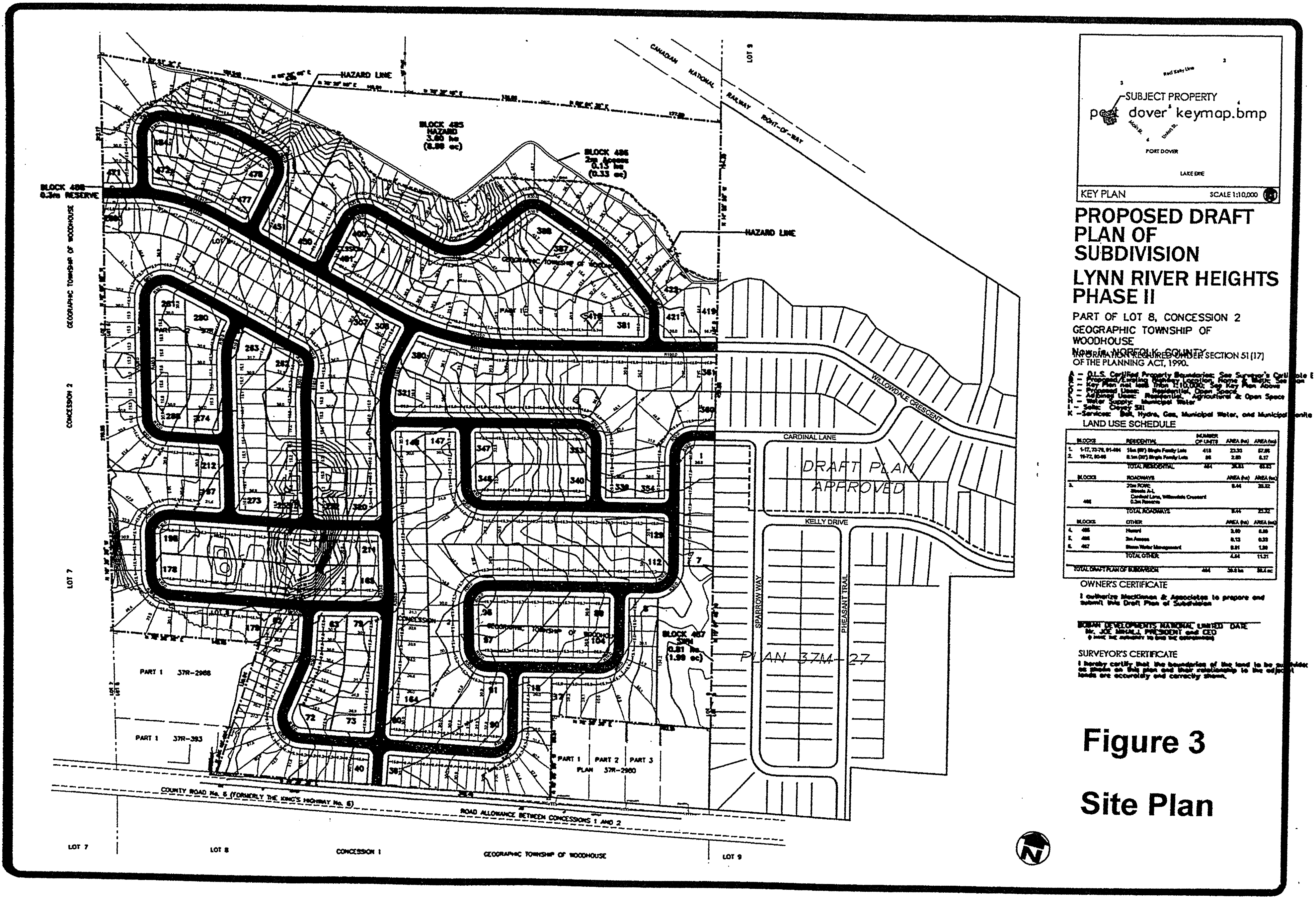
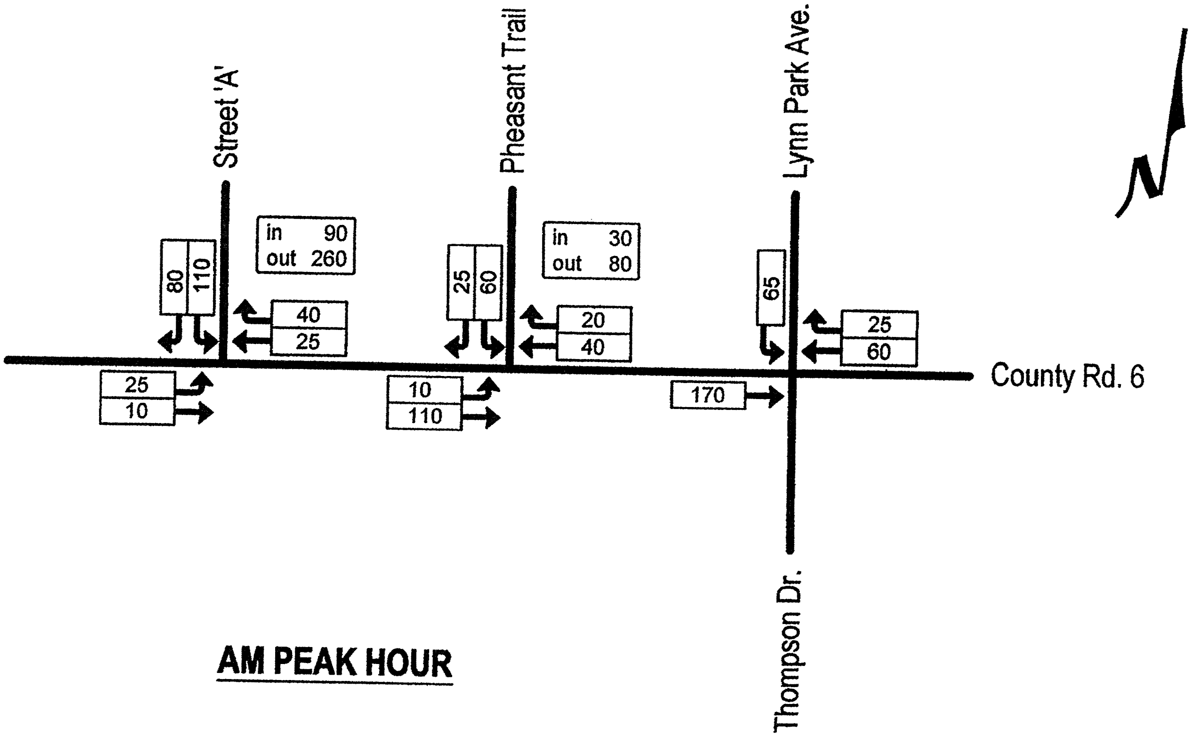
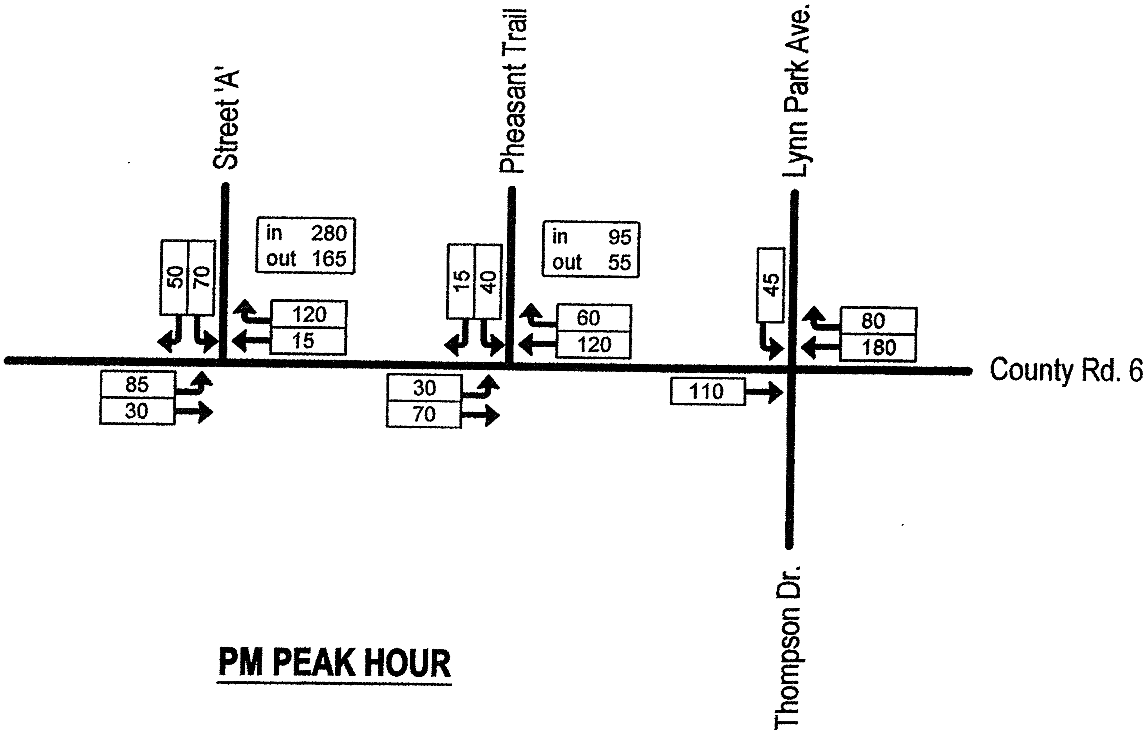


Figure 3

Site Plan



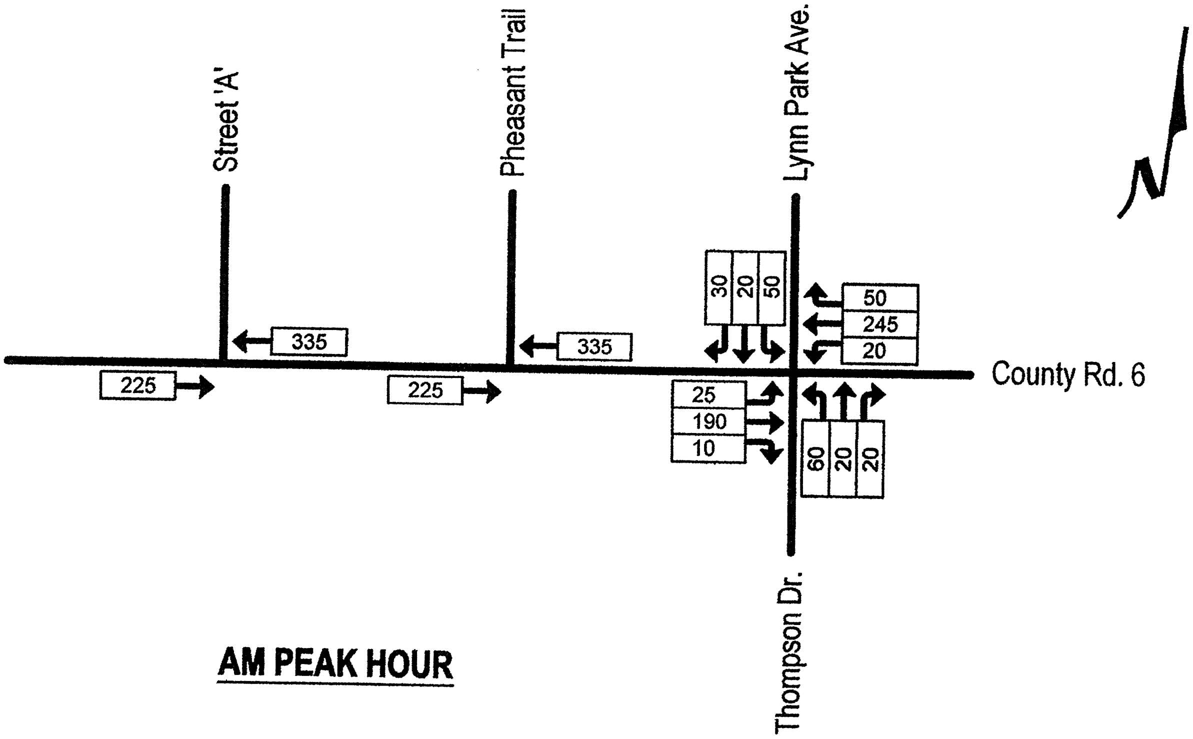
AM PEAK HOUR



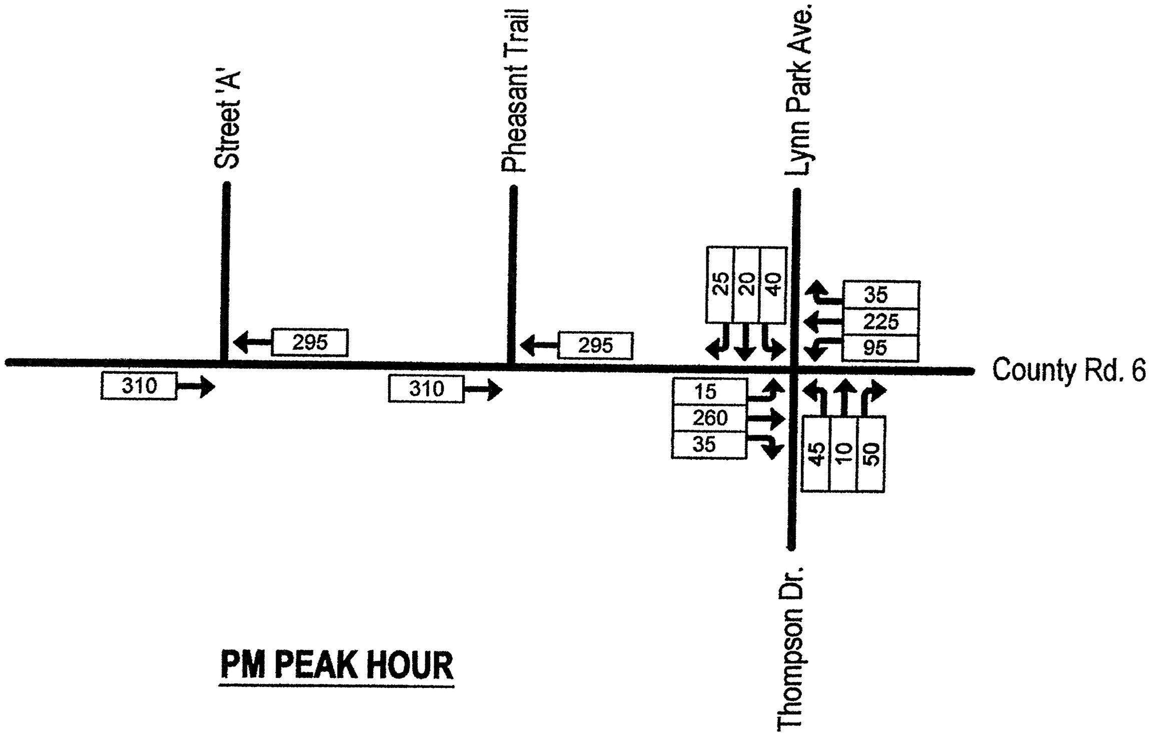
PM PEAK HOUR

Development Traffic

FIGURE 4



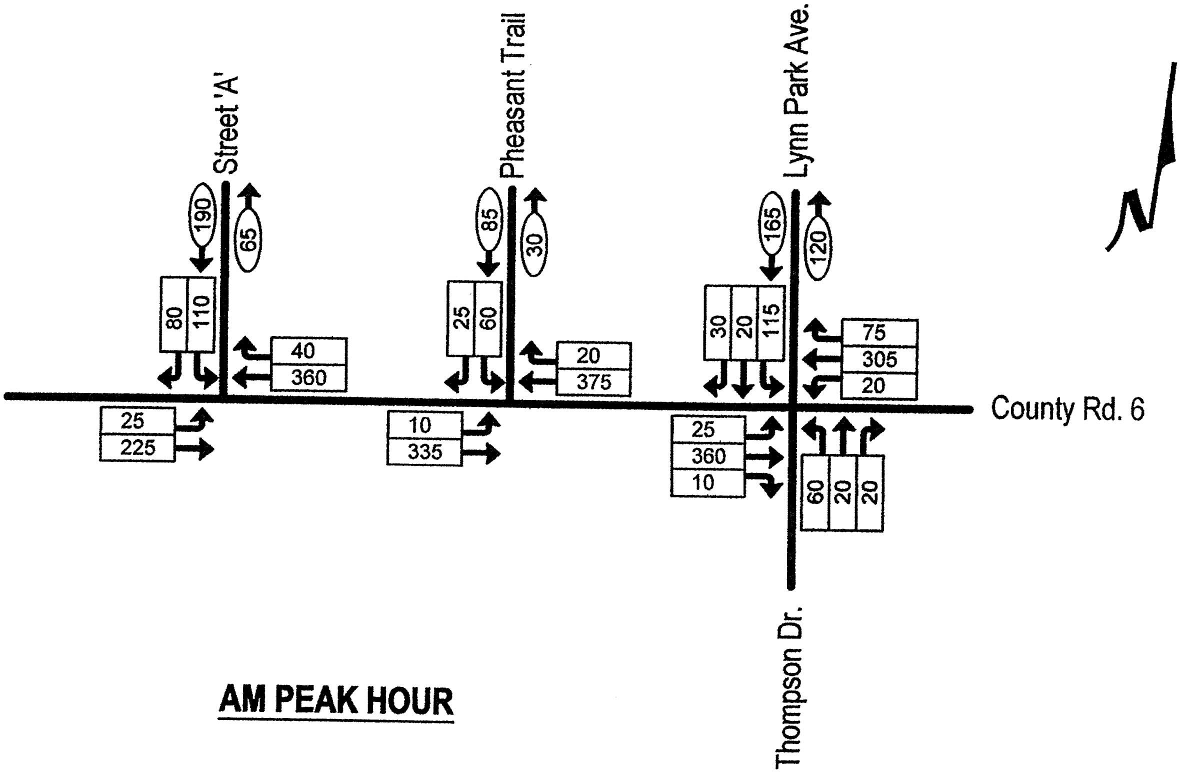
AM PEAK HOUR



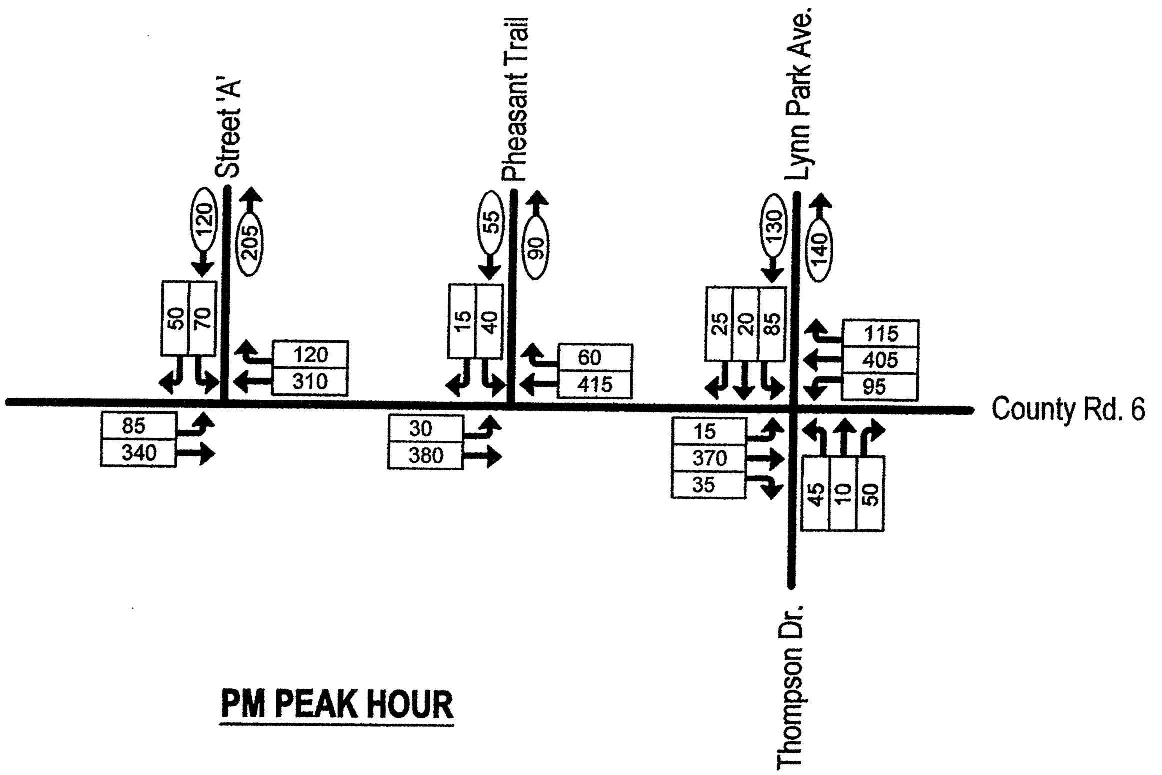
PM PEAK HOUR

Background Traffic 2016

FIGURE 5



AM PEAK HOUR



PM PEAK HOUR

Total Traffic 2016

FIGURE 6

APPENDIX A

SIGNAL WARRANT ANALYSIS

B.2.03.08 TRAFFIC SIGNAL WARRANT ANALYSIS FORM FOR INTERSECTION CONTROL.

Minimum warrants for installation of traffic signals for roadways with two or more lanes.

Major street. County Road 6 ....

Minor street. Lynn Park Ave ...

No. of lanes ...2.........

FREE FLOW CONDITIONS (RURAL) ☑

RESTRICTED FLOW CONDITIONS (URBAN) ☐

WARRANT 1 – MINIMUM VEHICULAR VOLUME

100 % SATISFIED - YES ☐ NO ☐

80 % SATISFIED - YES ☑ NO ☐

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)				PERCENTAGE WARRANT									
APPROACH LANES	1		2 or MORE		HOUR ENDING									
FLOW CONDITION	FREE FLOW ☑	RESTR FLOW ☐	FREE FLOW ☐	RESTR FLOW ☐	0800	0900	1200	1300	1400	1600	1700	1800	TOTAL ACROSS	
A. ALL APPROACHES	480 (385)	720 (575)	600 (480)	900 (720)	283	604	492	524	541	688	685	524		
	100% FULFILLED					✓	✓	✓	✓	✓	✓	✓	700	
	80% FULFILLED													SECTIONAL PERCENT
	ACTUAL % IF BELOW 80% VALUE				59								59	
													TOTAL DOWN 759	÷8= 95
B. MINOR STREET BOTH APPROACHES	120* (95)*	170* (135)*	120* (95)*	170* (135)*	71	161	85	100	96	154	120	74	TOTAL ACROSS	
	100% FULFILLED					✓				✓	✓		300	
	80% FULFILLED							✓	✓				160	SECTIONAL PERCENT
	ACTUAL % IF BELOW 80% VALUE				59		71					62	192	
													TOTAL DOWN 652	÷8= 81.5

*FOR 'T' INTERSECTIONS THESE VALUES SHOULD BE INCREASED BY 50%

WARRANT 2 - DELAY TO CROSS TRAFFIC

100 % SATISFIED - YES ☐ NO ☐

80 % SATISFIED - YES ☑ NO ☐

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)				PERCENTAGE WARRANT									
APPROACH LANES	1		2 or MORE		HOUR ENDING									
FLOW CONDITION	FREE FLOW ☑	RESTR FLOW ☐	FREE FLOW ☐	RESTR FLOW ☐	0800	0900	1200	1300	1400	1600	1700	1800	TOTAL ACROSS	
A MAJOR STREET BOTH APPROACHES	480 (385)	720 (575)	600 (480)	900 (720)	212	443	407	424	445	534	565	450		
	100% FULFILLED									✓	✓		200	
	80% FULFILLED					✓	✓	✓	✓			✓	400	SECTIONAL PERCENT
	ACTUAL % IF BELOW 80% VALUE				44								44	
													TOTAL DOWN 644	÷8= 80.5
B. TRAFFIC CROSSING MAJOR STREET	50 (40)	75 (60)	50 (40)	75 (60)	52	106	45	65	49	88	53	27	TOTAL ACROSS	
	100% FULFILLED				✓	✓		✓		✓	✓		500	
	80% FULFILLED						✓		✓				160	SECTIONAL PERCENT
	ACTUAL % IF BELOW 80% VALUE											54	54	
													TOTAL DOWN 714	÷8= 89

B2.03.07

MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNALS FOR TWO LANE ROADWAYS

LOCATION County Road 6 AT Lynn Park Ave.

MUNICIPALITY Norfolk (Pt. Dover) DATE OF SURVEY November 7 2006

WARRANT		DESCRIPTION	MINIMUM REQUIREMENT FOR TWO-LANE ROADWAYS		COMPLIANCE	
			FREE FLOW	RESTRICTED FLOW		
			OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	③ ENTIRE %
INTERSECTION	1. MINIMUM VEHICULAR VOLUME	①A Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	[✓ 480]	720	95	81.5
		④B Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	[✓ 120]	170	81.5	
	2. DELAY TO CROSS TRAFFIC	①A Vehicle Volume, Along Major Street for Each of the Heaviest 8 Hours of an Average Day, and	[✓ 480]	720	80.5	80.5
		②B Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours	[✓ 50]	75	89	
	3. ACCIDENT HAZARD	A Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged Over a 36 Month Period, and	5		N/A	
		B Adequate Trial of Less Restrictive Remedies, Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Accidents, and	YES ☐ NO ☐		N/A	
		C Fulfillment of Either of the Above Warrants (Minimum Vehicular Volume or Delay to Cross Traffic) to the Extent of 80% or More.	YES ☑ NO ☐			
	4. COMBINATION WARRANT	Two or More of the Above Warrants (1, 2 or 3) Satisfied to the Extent of 80% or More.	YES ☑ NO ☐			✓
MID-BLOCK	5. MINIMUM PEDESTRIAN VOLUME	A Pedestrian Volume Crossing the Major Street Average per Hour for the Heaviest 8 Hours of an Average Day, and	120	240		
		①B Vehicle Volume Along Major Street Average Per Hour for the Same 8 Hours.	290	575		

NOTES:

① Vehicle Volume Warrants (1A), (2A) and (5B) for Roadways Having Two or More Moving Lanes in one Direction Should Be 25% Higher Than Values Given Above.

② For Definition of Crossing Volume Refer to Note ④ on the Signal Warrant Analysis Form B2.03.08

③ The Lowest Sectional Percentage Governs the Entire Warrant.

④ For "T" Intersections the Values for Warrant (1B) Should Be Increased by 50%

B2.03.07

MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNALS FOR TWO LANE ROADWAYS

LOCATION County Road 6 AT Lynn Park Ave.

MUNICIPALITY Norfolk (Pt Dover) DATE OF SURVEY

2016 Peak Hours (Fig 6)

	WARRANT		DESCRIPTION	MINIMUM REQUIREMENT FOR TWO-LANE ROADWAYS		COMPLIANCE	
				FREE FLOW	RESTRICTED FLOW		
				OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	③ ENTIRE %
INTERSECTION	1. MINIMUM VEHICULAR VOLUME	①A	Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	[✓ 480]	720	126.5	104
		④B	Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	[✓ 120]	170	104	
	2. DELAY TO CROSS TRAFFIC	①A	Vehicle Volume, Along Major Street for Each of the Heaviest 8 Hours of an Average Day, and	[✓ 480]	720	100	100
		②B	Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours	[✓ 50]	75	172.5	
	3. ACCIDENT HAZARD	A	Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged Over a 36 Month Period, and	5			
		B	Adequate Trial of Less Restrictive Remedies, Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Accidents, and	YES ☐ NO ☐			
		C	Fulfillment of Either of the Above Warrants (Minimum Vehicular Volume or Delay to Cross Traffic) to the Extent of 80% or More.	YES ☐ NO ☐			
	4. COMBINATION WARRANT		Two or More of the Above Warrants (1, 2 or 3) Satisfied to the Extent of 80% or More.	YES ☐ NO ☐			
MID-BLOCK	5. MINIMUM PEDESTRIAN VOLUME	A	Pedestrian Volume Crossing the Major Street Average per Hour for the Heaviest 8 Hours of an Average Day, and	120	240		
		①B	Vehicle Volume Along Major Street Average Per Hour for the Same 8 Hours.	290	575		

2430/4 -> 607.5

500/4 -> 125

1930/4 -> 482.5

345/4 -> 86.25

NOTES:

① Vehicle Volume Warrants (1A), (2A) and (5B) for Roadways Having Two or More Moving Lanes in one Direction Should Be 25% Higher Than Values Given Above.

② For Definition of Crossing Volume Refer to Note ④ on the Signal Warrant Analysis Form B2.03.08

③ The Lowest Sectional Percentage Governs the Entire Warrant.

④ For "T" Intersections the Values for Warrant (1B) Should Be Increased by 50%

B 2.03.07

MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNALS FOR TWO LANE ROADWAYS

LOCATION County Road 6 AT Street F7

MUNICIPALITY Norfolk (Pt. Dover) DATE OF SURVEY

2016 Peak Hours (Fig 6)

WARRANT			DESCRIPTION	MINIMUM REQUIREMENT FOR TWO-LANE ROADWAYS: FREE FLOW OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	MINIMUM REQUIREMENT FOR TWO-LANE ROADWAYS: RESTRICTED FLOW OPERATING SPEED LESS THAN 70 km/h	COMPLIANCE: SECTIONAL %	COMPLIANCE: ③ ENTIRE %	
INTERSECTION	1. MINIMUM VEHICULAR VOLUME	①A	Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	480	720	94.5	43	1815/4 → 453.75
		④B	Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	180 ~~120~~	170	43		310/4 → 77.5
	2. DELAY TO CROSS TRAFFIC	①A	Vehicle Volume, Along Major Street for Each of the Heaviest 8 Hours of an Average Day, and	480	720	78	78	1505/4 → 376.25
		②B	Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours	50	75	90		180/4 → 45
	3. ACCIDENT HAZARD	A	Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged Over a 36 Month Period, and	5				
		B	Adequate Trial of Less Restrictive Remedies, Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Accidents, and	YES ☐ NO ☐				
		C	Fulfillment of Either of the Above Warrants (Minimum Vehicular Volume or Delay to Cross Traffic) to the Extent of 80% or More.	YES ☐ NO ☐				
	4. COMBINATION WARRANT		Two or More of the Above Warrants (1, 2 or 3) Satisfied to the Extent of 80% or More.	YES ☐ NO ☐				
MID-BLOCK	5. MINIMUM PEDESTRIAN VOLUME	A	Pedestrian Volume Crossing the Major Street Average per Hour for the Heaviest 8 Hours of an Average Day, and	120	240			
		①B	Vehicle Volume Along Major Street Average Per Hour for the Same 8 Hours.	290	575			

NOTES:

① Vehicle Volume Warrants (1A), (2A) and (5B) for Roadways Having Two or More Moving Lanes in one Direction Should Be 25% Higher Than Values Given Above.

② For Definition of Crossing Volume Refer to Note ④ on the Signal Warrant Analysis Form B2.03.08

③ The Lowest Sectional Percentage Governs the Entire Warrant.

④ For "T" Intersections the Values for Warrant (1B) Should Be Increased by 50%

B2.03.07

MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNALS FOR TWO LANE ROADWAYS

LOCATION County Road 6 AT Pheasant Trail

MUNICIPALITY Norfolk (Pt. Dover) DATE OF SURVEY

2016 Peak Hours (Fig 6)

WARRANT		DESCRIPTION	MINIMUM REQUIREMENT FOR TWO-LANE ROADWAYS		COMPLIANCE	
			FREE FLOW	RESTRICTED FLOW		
			OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	③ ENTIRE %
INTERSECTION	1. MINIMUM VEHICULAR VOLUME	①A Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	480	720	92	21
		④B Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	180 ~~120~~	170	21	
	2. DELAY TO CROSS TRAFFIC	①A Vehicle Volume, Along Major Street for Each of the Heaviest 8 Hours of an Average Day, and	480	720	85	50
		②B Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours	50	75	50	
	3. ACCIDENT HAZARD	A Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged Over a 36 Month Period, and	5			
		B Adequate Trial of Less Restrictive Remedies, Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Accidents, and	YES ☐ NO ☐			
		C Fulfillment of Either of the Above Warrants (Minimum Vehicular Volume or Delay to Cross Traffic) to the Extent of 80% or More.	YES ☐ NO ☐			
	4. COMBINATION WARRANT	Two or More of the Above Warrants (1, 2 or 3) Satisfied to the Extent of 80% or More.	YES ☐ NO ☐			
MID-BLOCK	5. MINIMUM PEDESTRIAN VOLUME	A Pedestrian Volume Crossing the Major Street Average per Hour for the Heaviest 8 Hours of an Average Day, and	120	240		
		①B Vehicle Volume Along Major Street Average Per Hour for the Same 8 Hours.	290	575		

1775/4 → 443.75

150/4 → 37.5

1625/4 → 406.25

100/4 → 25

NOTES:

① Vehicle Volume Warrants (1A), (2A) and (5B) for Roadways Having Two or More Moving Lanes in one Direction Should Be 25% Higher Than Values Given Above.

② For Definition of Crossing Volume Refer to Note ④ on the Signal Warrant Analysis Form B2.03.08

③ The Lowest Sectional Percentage Governs the Entire Warrant.

④ For "T" Intersections the Values for Warrant (1B) Should Be Increased by 50%

APPENDIX B

LEFT TURN LANE REQUIREMENTS

LEFT TURN LANE REQUIREMENTS (cont'd)

County Road 6 at Street A

Design Speed 80km/h

Future (2016)

Eastbound

AM Peak Hour

Percent left 25/250 - 10.0% - use 10 percent
Va - 250vph Vo - 400vph S - 0

PM Peak Hour

Percent left 85/425 - 20.0% - use 20 percent
Va - 425vph Vo - 430vph S - 25m

County Road 6 at Pheasant Trail

Design Speed 80km/h

Future (2016)

Eastbound

AM Peak Hour

Percent left 10/345 - 2.9% - use 5 percent
Va - 345vph Vo - 395vph S - 0

PM Peak Hour

Percent left 30/410 - 7.3% - use 10 percent
Va - 410vph Vo - 475vph S - 15m

LEFT TURN LANE REQUIREMENTS

County Road 6 at Lynn Park Avenue

Design Speed 80km/h

Existing (November, 2006)

Eastbound

AM Peak Hour

Percent left 20/183 - 10.9% - use 10 percent
Va - 183vph Vo - 260vph S - 0

PM Peak Hour

Percent left 14/254 - 5.5% - use 5 percent
Va - 254vph Vo - 293vph S - 0

Westbound

AM Peak Hour

Percent left 17/260 - 6.5% - use 10 percent
Va - 260vph Vo - 183vph S - 0

PM Peak Hour

Percent left 79/293 - 26.9% - use 30 percent
Va - 293vph Vo - 254vph S - 15m

Future (2016)

Eastbound

AM Peak Hour

Percent left 25/395 - 6.3% - use 10 percent
Va - 395vph Vo - 400vph S - 15m

PM Peak Hour

Percent left 15/420 - 3.6% - use 5 percent
Va - 420vph Vo - 615vph S - 15m

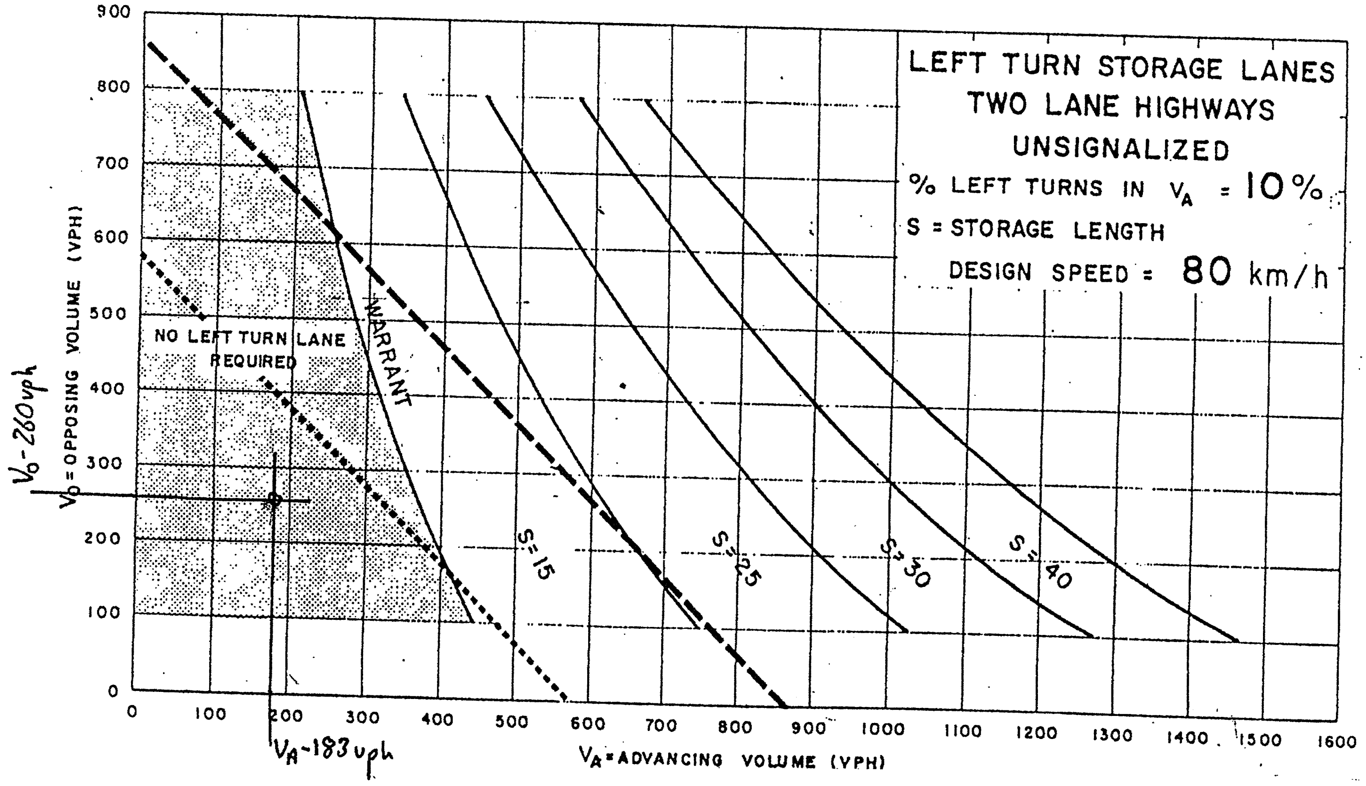
Westbound

AM Peak Hour

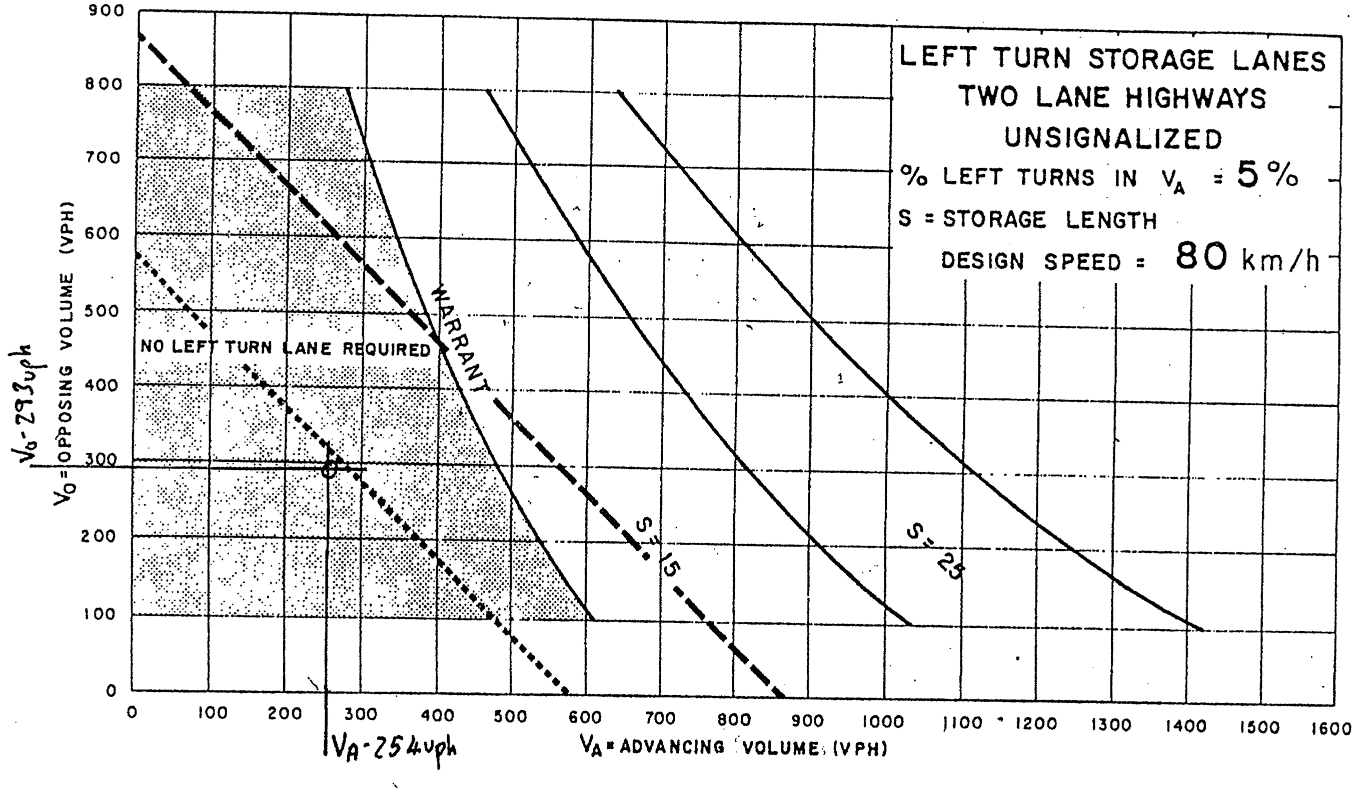
Percent left 20/400 - 5.0% - use 5 percent
Va - 400vph Vo - 395vph S - 0

PM Peak Hour

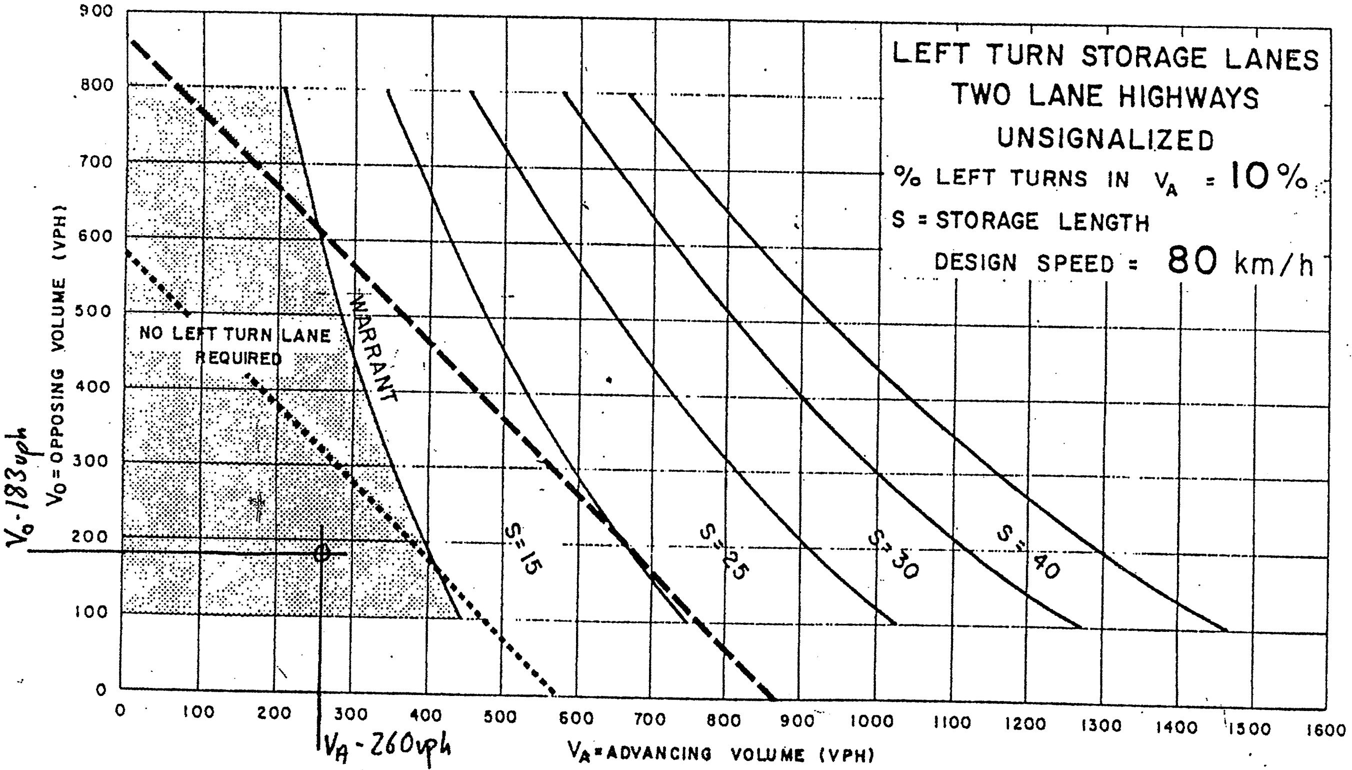
Percent left 95/615 - 15.4% - use 15 percent
Va - 615vph Vo - 420vph S - 30m



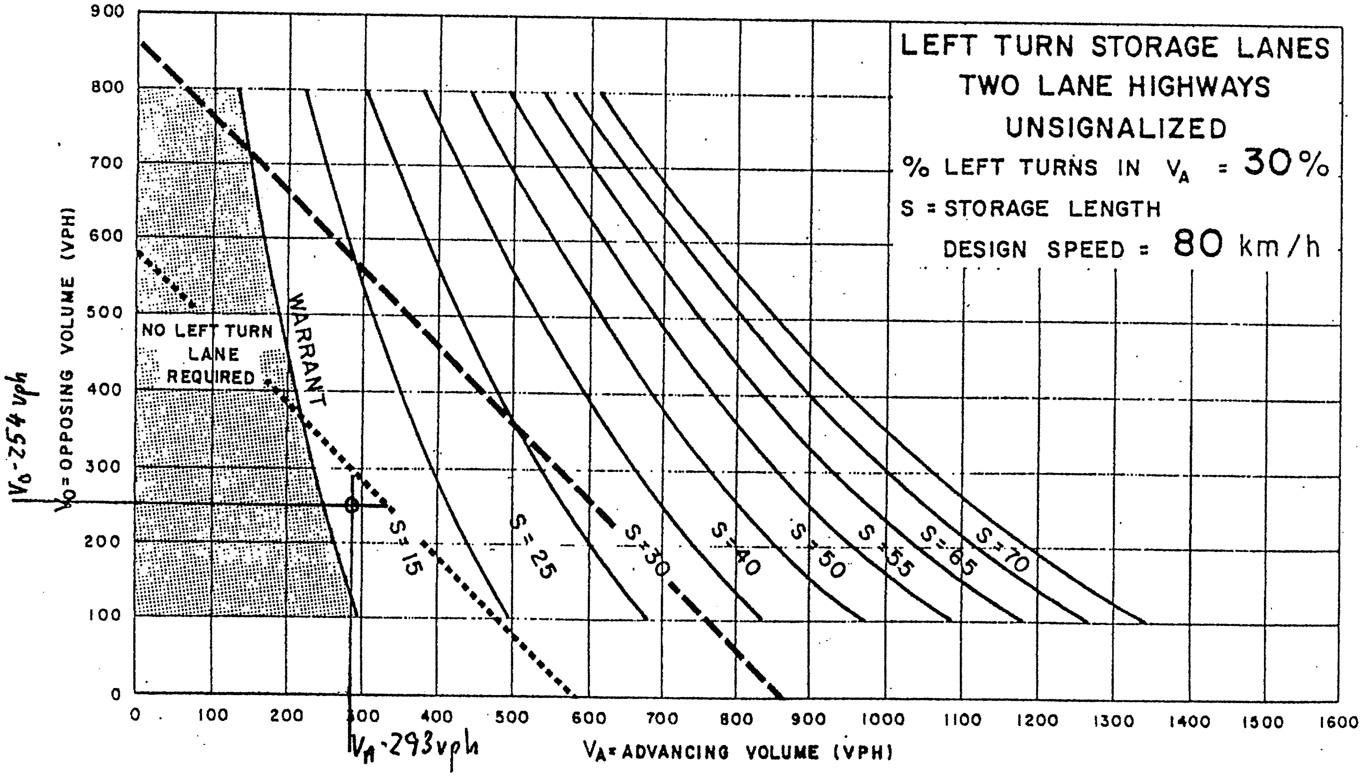
County Road 6 at Lynn Park Ave.
Eastbound
2006 AM Peak Hour



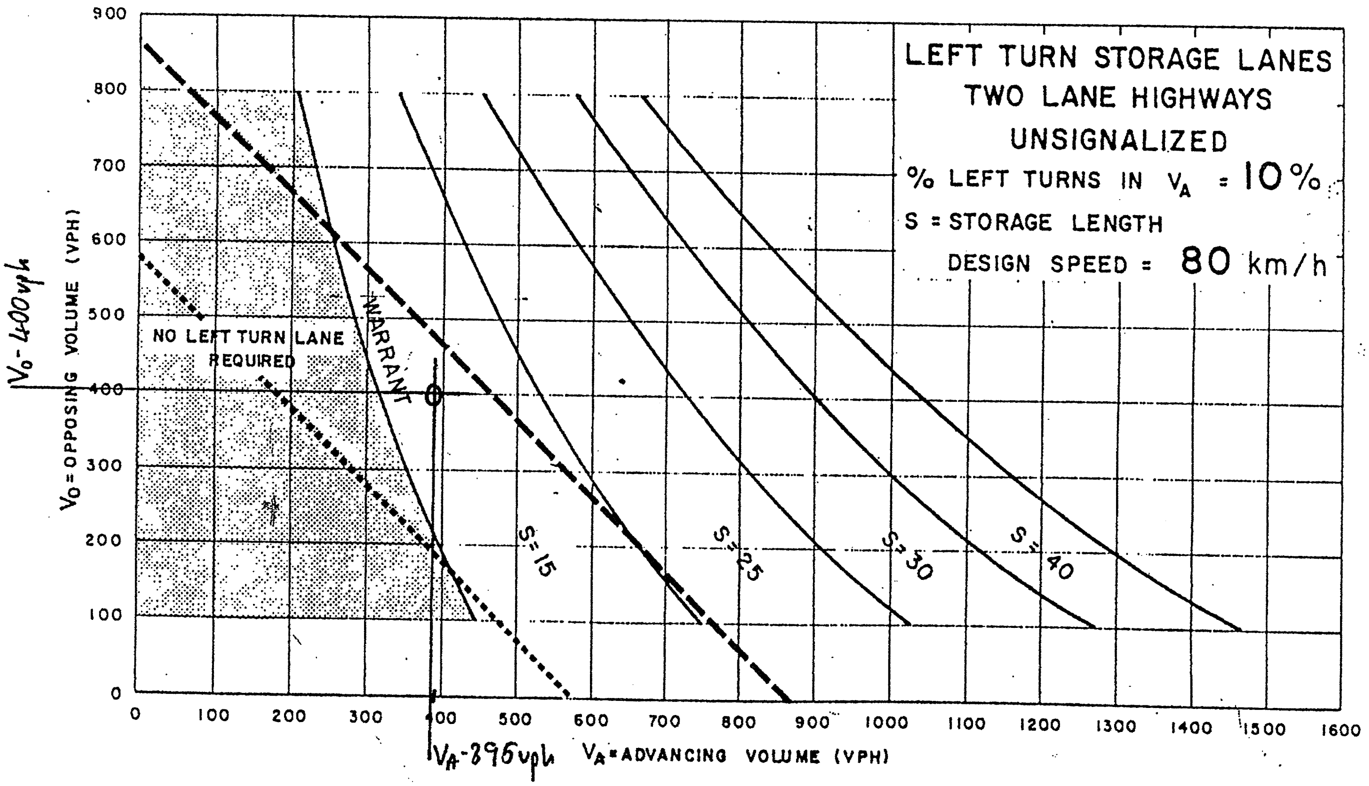
County Road 6 at Lynn Park Ave.
Eastbound
2006 PM Peak Hour



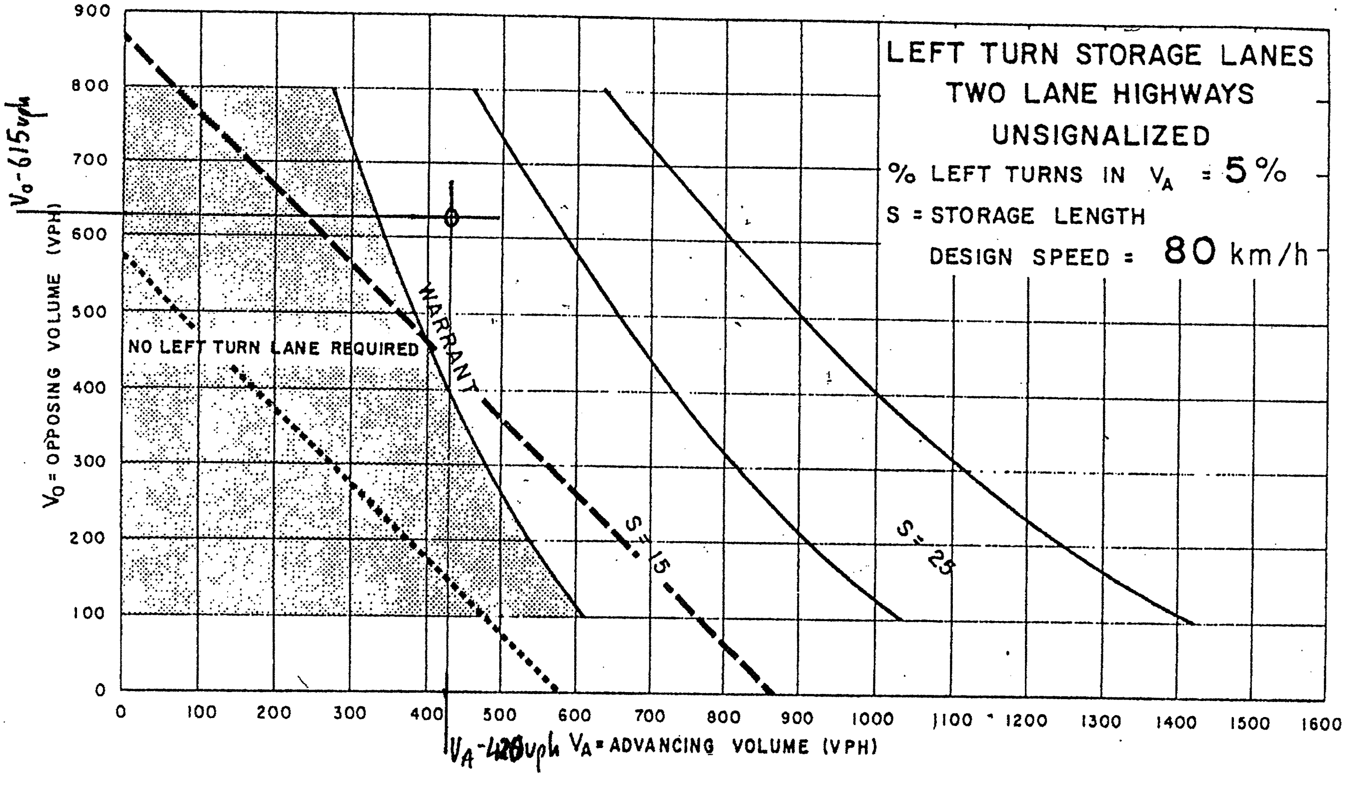
County Road 6 at Lynn Park Ave.
Westbound
2006 AM Peak Hour



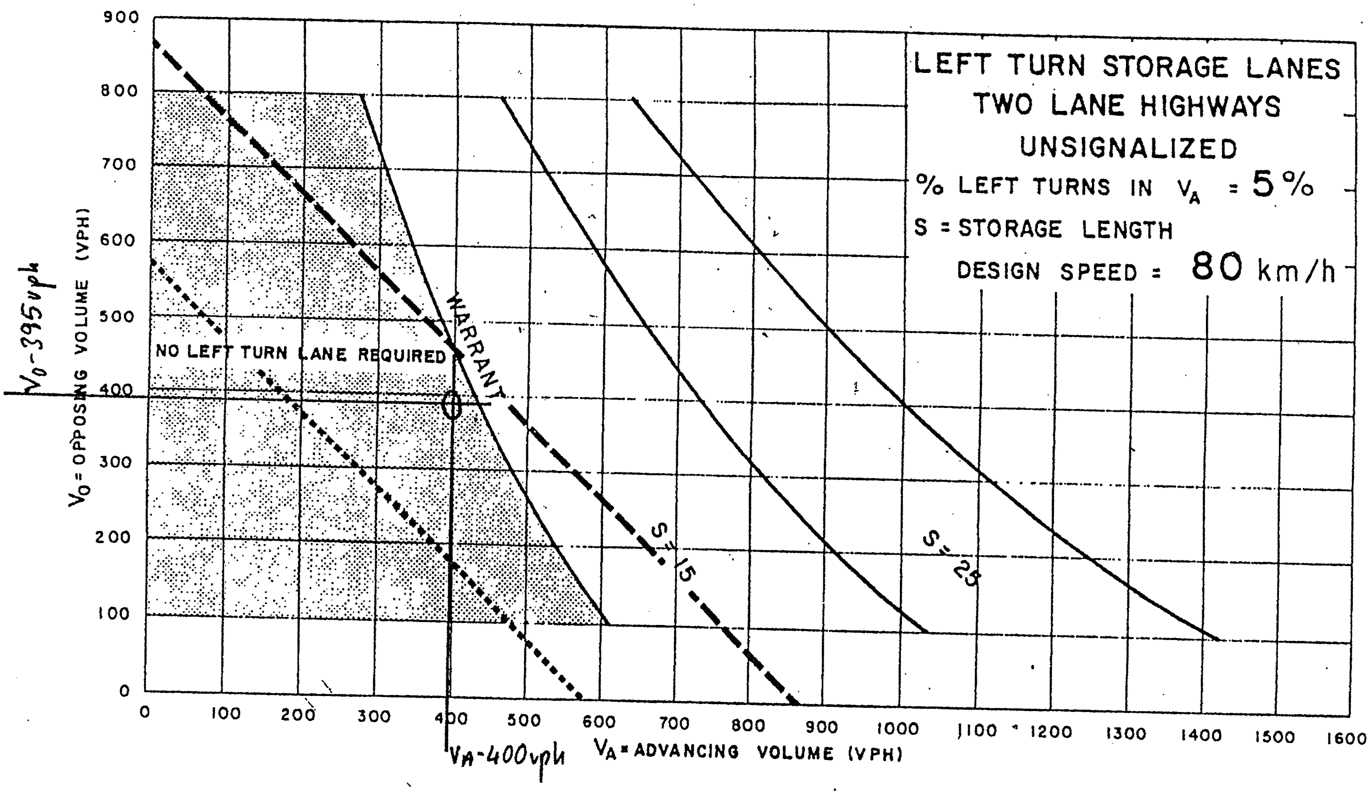
County Road 6 at Lynn Park Ave.
Westbound
2006 PM Peak Hour



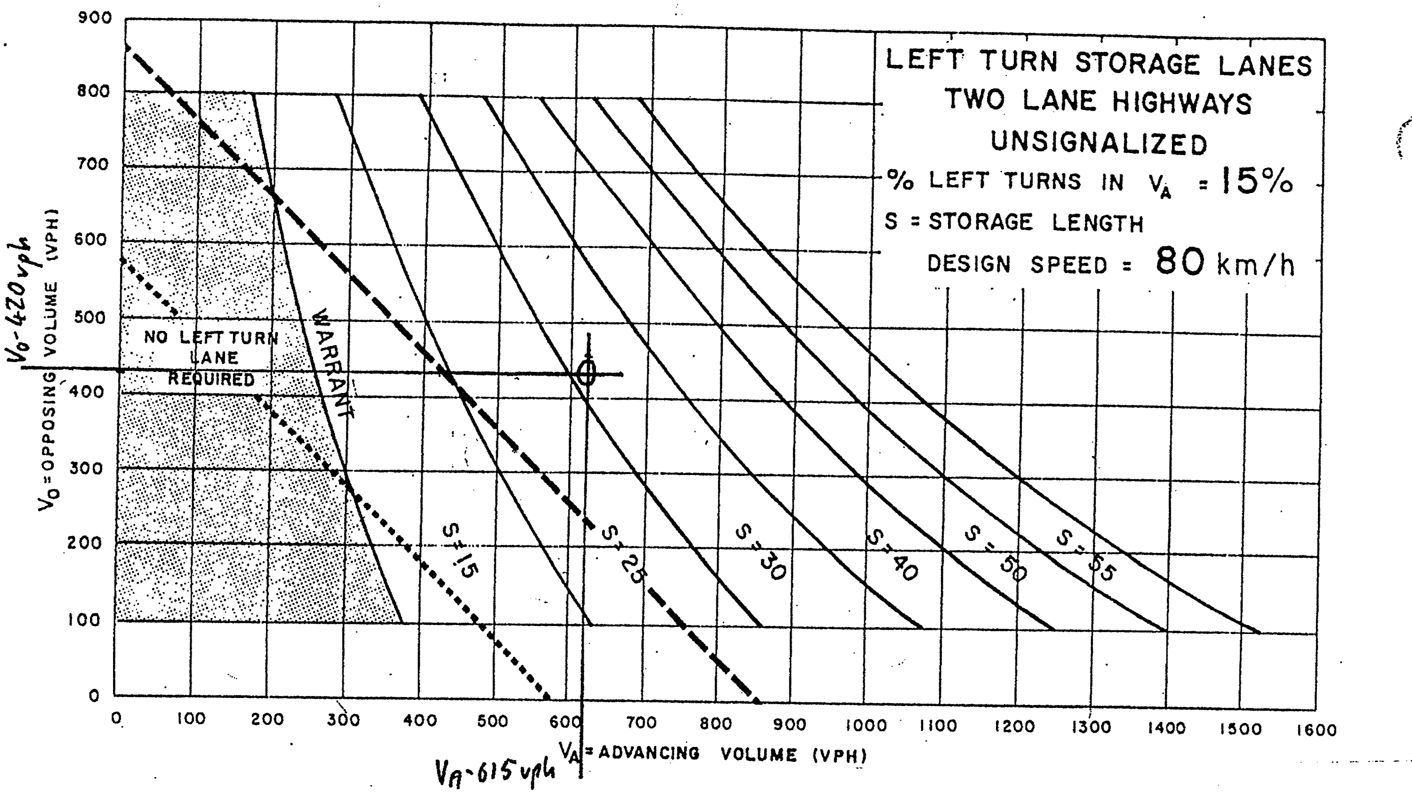
County Road 6 at Lynn Park Ave.
Eastbound
2016 AM Peak Hour



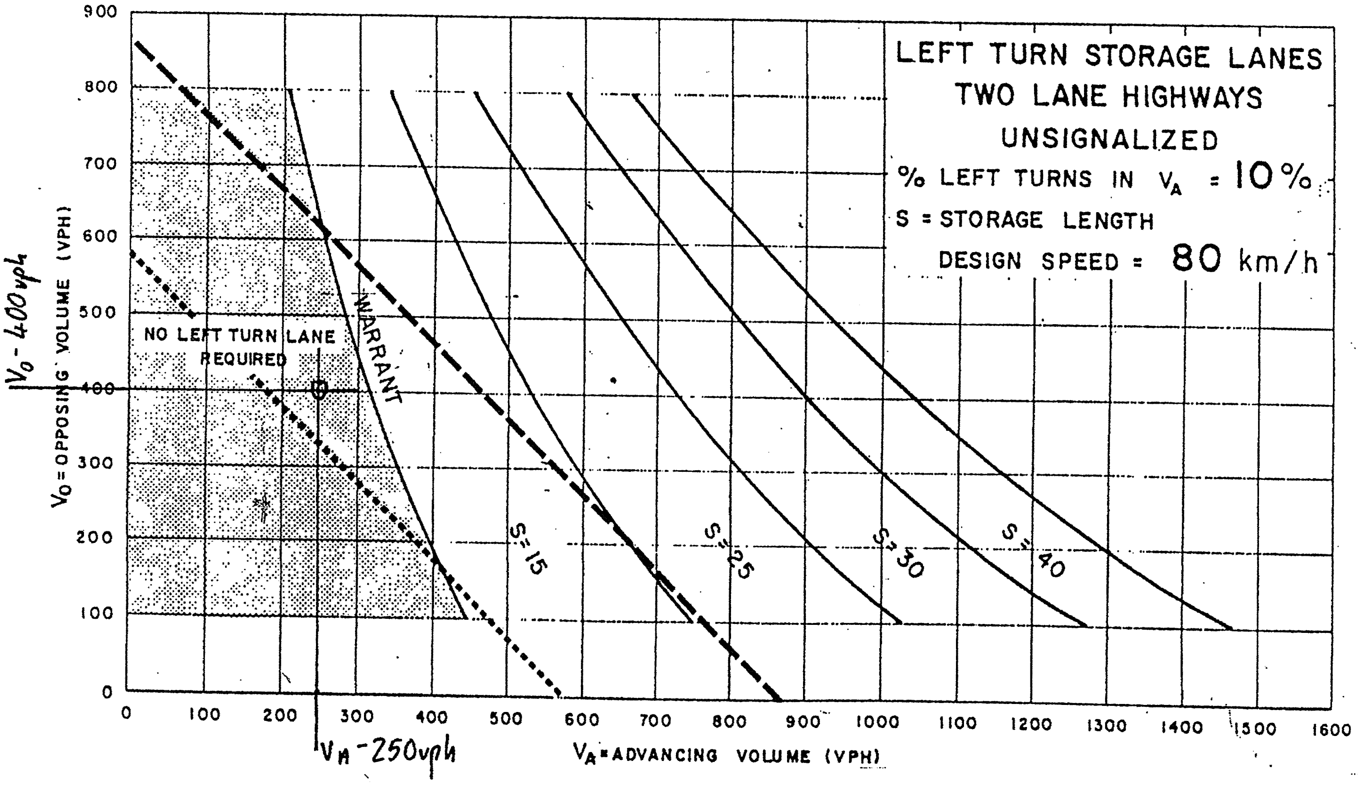
County Road 6 at Lynn Park Ave.
Eastbound
2016 PM Peak Hour



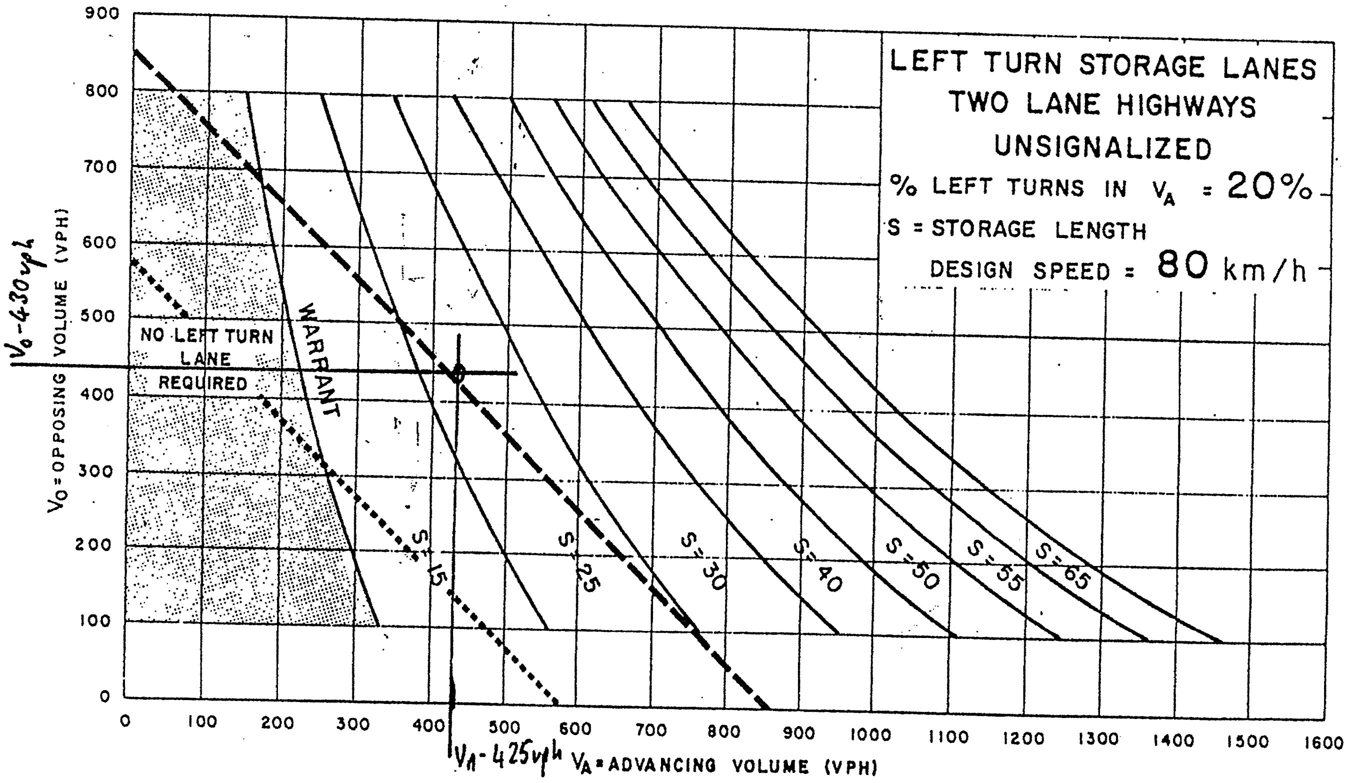
County Road 6 at Lynn Park Ave.
Westbound
2016 AM Peak Hour



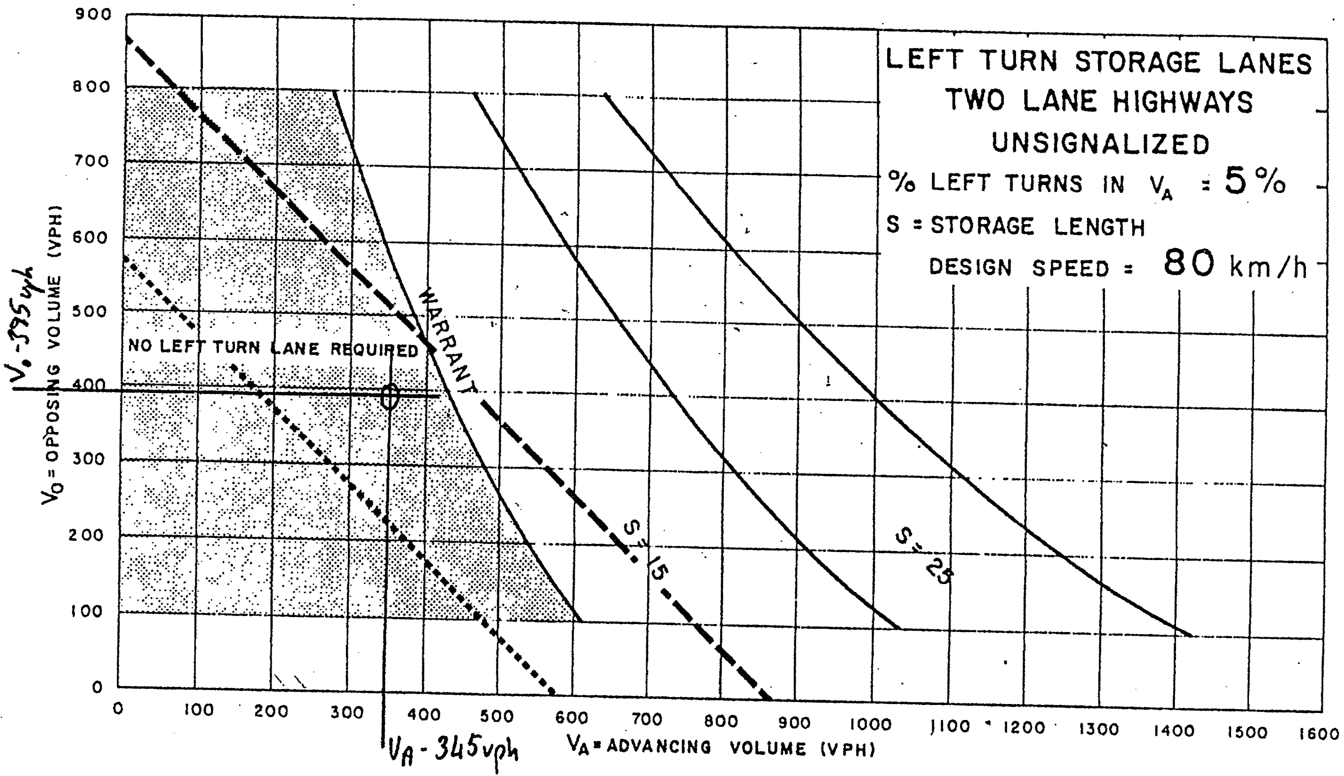
County Road 6 at Lynn Park Ave.
Westbound
2016 PM Peak Hour



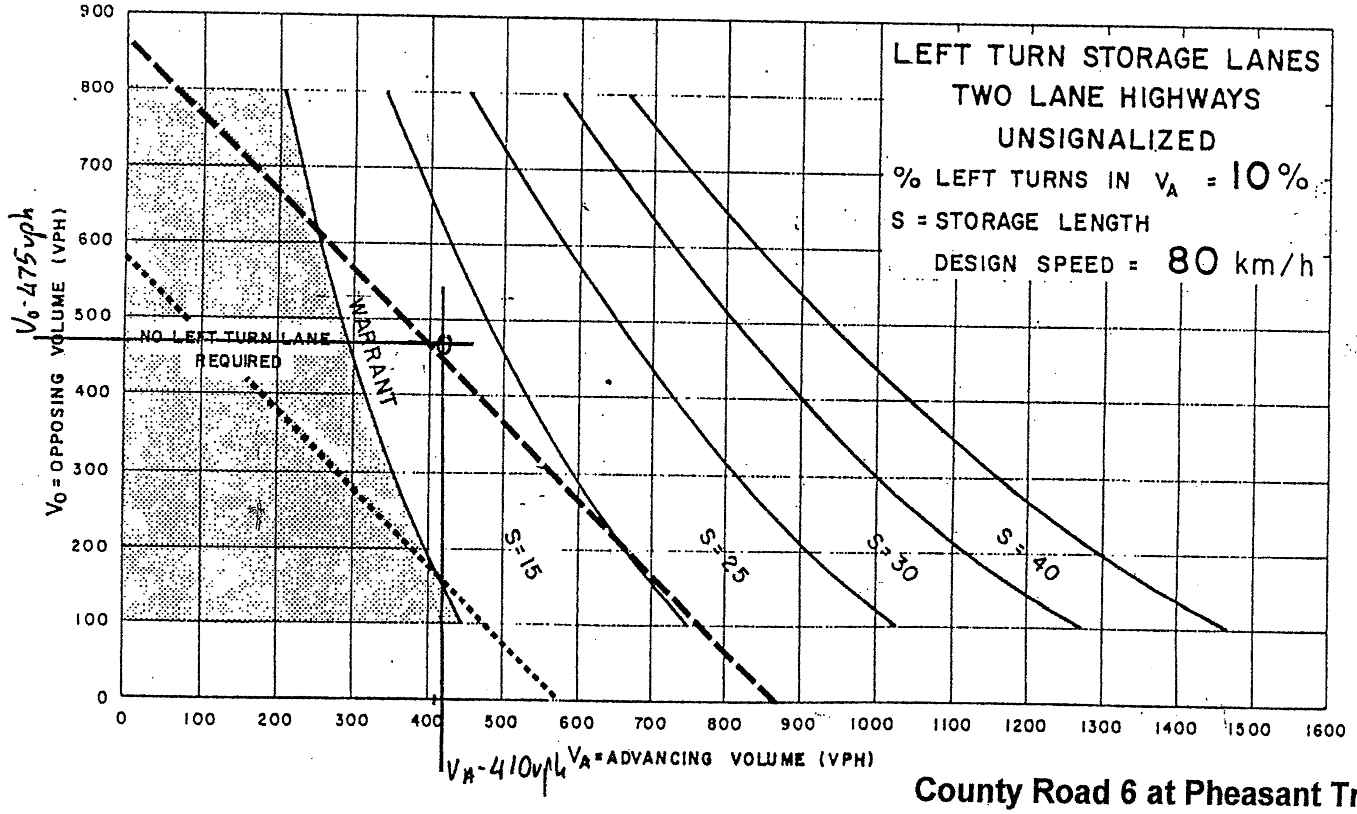
County Road 6 at Street A
Eastbound
2016 AM Peak Hour



County Road 6 at Street A
Eastbound
2016 PM Peak Hour



County Road 6 at Pheasant Trail
Eastbound
2016 AM Peak Hour



County Road 6 at Pheasant Trail
Eastbound
2016 PM Peak Hour

APPENDIX C

LEVEL OF SERVICE ANALYSIS

County Road 6 and Lynn Park Ave.
AM Peak Hour Existing

0653LynnRiverHts
12/8/2006

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	20	155	8	17	201	42	48	18	17	41	15	41
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	168	9	18	218	46	52	20	18	45	16	45
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	264			177			547	517	173	523	499	241
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	264			177			547	517	173	523	499	241
tC, single (s)	4.2			4.1			7.1	6.6	6.3	7.2	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.1	3.4	3.6	4.0	3.4
p0 queue free %	98			99			87	96	98	89	96	94
cM capacity (veh/h)	1255			1411			404	437	850	418	462	778

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	199	283	90	105
Volume Left	22	18	52	45
Volume Right	9	46	18	45
cSH	1255	1411	461	529
Volume to Capacity	0.02	0.01	0.20	0.20
Queue Length 95th (m)	0.4	0.3	5.5	5.6
Control Delay (s)	1.0	0.6	14.7	13.5
Lane LOS	A	A	B	B
Approach Delay (s)	1.0	0.6	14.7	13.5
Approach LOS			B	B

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	30.1%	ICU Level of Service	A
Analysis Period (min)	15		

County Road 6 and Lynn Park Ave.
AM Peak Hour Background 2016

0653LynnRiverHts
12/8/2006

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**
Lane Configurations	↰	↱		↰	↱			✥			✥	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	25	190	10	20	245	50	60	20	20	50	20	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	207	11	22	266	54	65	22	22	54	22	33
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	321			217			620	630	212	630	609	293
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	321			217			620	630	212	630	609	293
tC, single (s)	4.2			4.1			7.1	6.6	6.3	7.2	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.1	3.4	3.6	4.0	3.4
p0 queue free %	98			98			82	94	97	84	95	96
cM capacity (veh/h)	1195			1364			359	373	808	346	397	727

Direction, Lane #	**EB 1**	**EB 2**	**WB 1**	**WB 2**	**NB 1**	**SB 1**
Volume Total	27	217	22	321	109	109
Volume Left	27	0	22	0	65	54
Volume Right	0	11	0	54	22	33
cSH	1195	1700	1364	1700	407	423
Volume to Capacity	0.02	0.13	0.02	0.19	0.27	0.26
Queue Length 95th (m)	0.5	0.0	0.4	0.0	8.1	7.7
Control Delay (s)	8.1	0.0	7.7	0.0	17.0	16.4
Lane LOS	A		A		C	C
Approach Delay (s)	0.9		0.5		17.0	16.4
Approach LOS					C	C

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	35.0%	ICU Level of Service	A
Analysis Period (min)	15		

County Road 6 and Lynn Park Ave.
AM Peak Hour Total 2016

0653LynnRiverHts
12/8/2006

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**
Lane Configurations	↰	↱		↰	↱			✣			✣	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	25	360	10	20	305	75	60	20	20	115	20	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	391	11	22	332	82	65	22	22	125	22	33
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	413			402			870	908	397	894	872	372
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	413			402			870	908	397	894	872	372
tC, single (s)	4.2			4.1			7.1	6.6	6.3	7.2	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.1	3.4	3.6	4.0	3.4
p0 queue free %	98			98			73	91	97	44	92	95
cM capacity (veh/h)	1104			1167			237	256	636	222	279	656

Direction, Lane #	**EB 1**	**EB 2**	**WB 1**	**WB 2**	**NB 1**	**SB 1**
Volume Total	27	402	22	413	109	179
Volume Left	27	0	22	0	65	125
Volume Right	0	11	0	82	22	33
cSH	1104	1700	1167	1700	276	259
Volume to Capacity	0.02	0.24	0.02	0.24	0.39	0.69
Queue Length 95th (m)	0.6	0.0	0.4	0.0	13.7	35.0
Control Delay (s)	8.3	0.0	8.1	0.0	26.3	45.1
Lane LOS	A		A		D	E
Approach Delay (s)	0.5		0.4		26.3	45.1
Approach LOS					D	E

Intersection Summary			
Average Delay	9.9		
Intersection Capacity Utilization	39.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↱		Y	
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	10	335	375	20	60	25
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	364	408	22	65	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	429				804	418
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	429				804	418
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				81	96
cM capacity (veh/h)	1141				351	639

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	11	364	429	92
Volume Left	11	0	0	65
Volume Right	0	0	22	27
cSH	1141	1700	1700	405
Volume to Capacity	0.01	0.21	0.25	0.23
Queue Length 95th (m)	0.2	0.0	0.0	6.6
Control Delay (s)	8.2	0.0	0.0	16.5
Lane LOS	A			C
Approach Delay (s)	0.2		0.0	16.5
Approach LOS				C

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	32.5%	ICU Level of Service	A
Analysis Period (min)	15		

County Road 6 and Street A
AM Peak Hour Total 2016

	↗	→	←	↖	↘	↙
Movement	**EBL**	**EBT**	**WBT**	**WBR**	**SBL**	**SBR**
Lane Configurations	↰	↑	↱		⅄	
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	25	225	360	40	110	80
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	245	391	43	120	87
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	435				712	413
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	435				712	413
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				70	86
cM capacity (veh/h)	1136				392	643

Direction, Lane #	**EB 1**	**EB 2**	**WB 1**	**SB 1**
Volume Total	27	245	435	207
Volume Left	27	0	0	120
Volume Right	0	0	43	87
cSH	1136	1700	1700	470
Volume to Capacity	0.02	0.14	0.26	0.44
Queue Length 95th (m)	0.6	0.0	0.0	16.8
Control Delay (s)	8.2	0.0	0.0	18.6
Lane LOS	A			C
Approach Delay (s)	0.8		0.0	18.6
Approach LOS				C

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	39.0%	ICU Level of Service	A
Analysis Period (min)	15		

County Road 6 and Lynn Park Ave.
PM Peak Hour Existing

0653LynnRiverHts
12/8/2006

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Configurations		✥			✥			✥			✥	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	14	213	27	79	185	29	37	9	41	33	15	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	232	29	86	201	32	40	10	45	36	16	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)												
pX, platoon unblocked												
vC, conflicting volume	233			261			696	681	246	715	680	217
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	233			261			696	681	246	715	680	217
tC, single (s)	4.2			4.1			7.2	6.6	6.2	7.2	6.6	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.6	4.1	3.3	3.6	4.1	3.3
p0 queue free %	99			93			87	97	94	88	95	97
cM capacity (veh/h)	1306			1315			305	335	797	292	336	828

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	276	318	95	75
Volume Left	15	86	40	36
Volume Right	29	32	45	23
cSH	1306	1315	436	377
Volume to Capacity	0.01	0.07	0.22	0.20
Queue Length 95th (m)	0.3	1.6	6.2	5.6
Control Delay (s)	0.5	2.6	15.5	16.9
Lane LOS	A	A	C	C
Approach Delay (s)	0.5	2.6	15.5	16.9
Approach LOS			C	C

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		

County Road 6 and Lynn Park Ave.
PM Peak Hour Background 2016

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**
Lane Configurations	↰	↱		↰	↱			✥			✥	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	15	260	35	95	225	35	45	10	50	40	20	25
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	283	38	103	245	38	49	11	54	43	22	27
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	283			321			823	823	302	845	823	264
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	283			321			823	823	302	845	823	264
tC, single (s)	4.2			4.1			7.2	6.6	6.2	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.6	4.1	3.3	3.6	4.1	3.4
p0 queue free %	99			92			79	96	93	81	92	96
cM capacity (veh/h)	1252			1251			238	271	743	228	271	756

Direction, Lane #	**EB 1**	**EB 2**	**WB 1**	**WB 2**	**NB 1**	**SB 1**
Volume Total	16	321	103	283	114	92
Volume Left	16	0	103	0	49	43
Volume Right	0	38	0	38	54	27
cSH	1252	1700	1251	1700	358	301
Volume to Capacity	0.01	0.19	0.08	0.17	0.32	0.31
Queue Length 95th (m)	0.3	0.0	2.0	0.0	10.2	9.6
Control Delay (s)	7.9	0.0	8.1	0.0	19.7	22.1
Lane LOS	A		A		C	C
Approach Delay (s)	0.4		2.2		19.7	22.1
Approach LOS					C	C

Intersection Summary

Average Delay	5.7		
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)	15		

County Road 6 and Lynn Park Ave.
PM Peak Hour Total 2016

0653LynnRiverHts
12/8/2006

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**
Lane Configurations	↰	↱		↰	↱			✥			✥	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	15	370	35	95	405	115	45	10	50	85	20	25
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	402	38	103	440	125	49	11	54	92	22	27
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	565			440			1139	1226	421	1204	1182	503
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	565			440			1139	1226	421	1204	1182	503
tC, single (s)	4.2			4.1			7.2	6.6	6.2	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.6	4.1	3.3	3.6	4.1	3.4
p0 queue free %	98			91			64	93	91	25	87	95
cM capacity (veh/h)	982			1130			135	154	637	123	164	553

Direction, Lane #	**EB 1**	**EB 2**	**WB 1**	**WB 2**	**NB 1**	**SB 1**
Volume Total	16	440	103	565	114	141
Volume Left	16	0	103	0	49	92
Volume Right	0	38	0	125	54	27
cSH	982	1700	1130	1700	221	152
Volume to Capacity	0.02	0.26	0.09	0.33	0.52	0.93
Queue Length 95th (m)	0.4	0.0	2.3	0.0	20.4	50.6
Control Delay (s)	8.7	0.0	8.5	0.0	37.6	114.0
Lane LOS	A		A		E	F
Approach Delay (s)	0.3		1.3		37.6	114.0
Approach LOS					E	F

Intersection Summary

Average Delay	15.5		
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		

County Road 6 and Pheasant Trail
PM Peak Hour Total 2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↱		Y	
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	30	380	415	60	40	15
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	413	451	65	43	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	516				962	484
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	516				962	484
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				84	97
cM capacity (veh/h)	1060				278	587

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	33	413	516	60
Volume Left	33	0	0	43
Volume Right	0	0	65	16
cSH	1060	1700	1700	324
Volume to Capacity	0.03	0.24	0.30	0.18
Queue Length 95th (m)	0.7	0.0	0.0	5.1
Control Delay (s)	8.5	0.0	0.0	18.6
Lane LOS	A			C
Approach Delay (s)	0.6		0.0	18.6
Approach LOS				C

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	35.5%	ICU Level of Service	A
Analysis Period (min)	15		

County Road 6 and Street A
PM Peak Hour Total 2016

0653LynnRiverHts
12/8/2006

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↱		Y	
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	85	340	310	120	70	50
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	92	370	337	130	76	54
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	467				957	402
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	467				957	402
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				71	92
cM capacity (veh/h)	1105				264	652

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	92	370	467	130
Volume Left	92	0	0	76
Volume Right	0	0	130	54
cSH	1105	1700	1700	351
Volume to Capacity	0.08	0.22	0.27	0.37
Queue Length 95th (m)	2.1	0.0	0.0	12.7
Control Delay (s)	8.6	0.0	0.0	21.2
Lane LOS	A			C
Approach Delay (s)	1.7		0.0	21.2
Approach LOS				C

Intersection Summary

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	45.3%	ICU Level of Service	A
Analysis Period (min)	15		

1.0 STUDY BACKGROUND

Thompson Environmental Planning & Design Ltd. was retained to inventory and assess the potential natural environment impacts of the proposed Lynn River Heights Inc. Subdivision (Phase 2); which includes Part of Lot 8, Concession 2, on the western edge of the Town of Port Dover, County of Norfolk, Ontario (Figure 1).

An initial assessment of the lands to the east of this property (Boban Developments Lynn River Heights Phase I) were submitted in January 2002 with a Revised Environmental Inventory and Assessment prepared to address the changes in the storm water management approach in January 2005. This report has been prepared to assess Boban Developments Lynn River Heights Phase 2. This report includes additional biological inventory of the study area including each of the natural heritage features, the Lynn River Wetland Complex, the riparian habitat along the Lynn River and the associated valley slopes. This development proposal together with the Stormwater Management Report prepared by L.A.Girard Engineering (Ontario) Ltd (May 2007) and the Geotechnical Investigation prepared by Chung & Vander Doelen Engineering Ltd. (April 24, 2006) were reviewed and our assessment of the potential for negative environmental impact have been provided.

1.1 Background Data Collection

This study consisted of a review of relevant documents, background reports and references such as:

- Silver Lake Wetland, component of the Lynn River Wetland Complex (Desktop Update, March 8, 2001) Wetland Evaluation (Jacobson, 2001).
- Geotechnical Investigation Proposed Residential Development Part of Lot 8, Concession II, Town of Port Dover, (Chung & Vander Doelen Engineering Ltd., 2006);
- Stormwater Management Report for Boban Developments National Limited Subdivision of Part of Lot 8, Concession 2, Town of Port Dover, County of Norfolk (L.A. Girard Engineering Ltd., May 2007).

1.2 Biotic Environment

Our environmental investigation focused on the Study Area (Figure 1), which was defined by the property limits with an additional 50 m beyond the property along the northern, western and eastern margins (e.g. Wetland). These areas outside of the property were considered important due to the potential for indirect impacts, which may result from a development such as this (e.g. increased stormwater quantity). Our site visit occurred on November 23, 2001, June 11, 2003 and May 18, 2006 for the purpose of completing a biological and physical inventory.

1.3 Vegetation

Plant communities were initially mapped on 2000 aerial photography. A vegetation inventory was then conducted during our three site visits to the study area for the purpose of describing these plant communities in more detail and to refine the initial mapping. The Ecological Land Classification for Southern Ontario (Lee, et.al. 1998) was used to determine the technical name of each vegetation community unit.

During the vegetation inventory the following information was recorded for each of the Vegetation Units.

A. a list of plant species observed;
B. Overstorey composition and abundance (including an estimate of diameter at breast height for each species);
C. Understorey shrubs, vines and emergent saplings composition and abundance;
D. Dominant herbaceous species;
E. Overstorey closure;
F. Relative age and overstorey;
G. Health and level of relative disturbance;
H. Soils/drainage/topography;

1.4 Relative Disturbance

During the preparation of the vegetation community descriptions, each community was rated as to their level of relative disturbance and number of disturbance types present. Examples of disturbance included evidence of tree cutting, presence of trash and dominance of non-native and invasive species. These disturbances typically indicate that a disruption to the native community has occurred or that the natural progression of succession had been interrupted.

The vegetation community disturbance index applied during this investigation included the following disturbance indicators:

1. Presence of human disturbances;
2. Presence of a well developed woodlot edge;
3. Time lapse since active agriculture was practiced, and;
4. Percent cover of non-native species.

1.5 Fisheries Potential

The potential for fish habitat was investigated. The background information was reviewed and during the site visit migratory fish habitat and resident fish were searched for. The potential for direct and indirect impacts on fish habitat where assessed during our field inventory (e.g. increased volume of stormwater and decreased stormwater quality)

1.6 Description of the Development Proposal

The development proposal is to create 460single-family residential lots on approximately 40 hectare site (See Figure 1). The valley slope, wetland and the Lynn River are located beyond the northern boundary of the property and would be outside of this proposed development. There is a portion of the valley slope that is along the northern edge of the property and would be retained as open space (approximately 1 hectare). The Stormwater Management Block will receive approximately 72% of the run-off from the site. The remaining 28% of the stormwater will be infiltrated or fall on the slope areas. The stormwater management pond within Phase I of Lynn River Heights Residential Development will receive 100% of the runoff from all hard surfaces within this development. This 0.83 hectare stormwater management parcel contains a large forbay (8 m x 60 m) with a 0.2 hectare wet pond basin, with restrictor outlets that will control the 100 year post-development storm event to below the 2 year pre-development peak flow. This proposed development within Phase 2 will provide Level 2 Environmental Habitat Protection (Normal). No lot level controls are proposed as the soil percolation rates are low and a perched groundwater limits infiltration techniques.

It should be noted that only backyard runoff from the lots adjacent to the slope will be directed to the slope from the proposed development area. All other stormwater from the development will be contained by the proposed stormwater management pond (L.A. Girard Engineering Ltd., 2007).

2.0 POLICY FRAMEWORK

This section identifies the significant features and any relevant environmental policy areas or legislation, which may apply to lands within and around the property.

2.1 Provincially Significant Wetland

The Haldimand – Norfolk Official Plan and the City of Naticoke Official Plan has the goal of achieving no loss of Provincially Significant Wetlands. Section 26, of the Haldimand – Norfolk Official Plan and Section 0.2 the City of Naticoke Official Plan indicates that development will not be permitted within the boundaries of Provincially Significant Wetlands. Section 30 and Section 0.2.4 respectively requires that an Environmental Impact Study is required to determine if the proposed development within 120 meters of a wetland boundary does not result in potential negative impacts and to determine the most appropriate buffer width for protecting the wetland form and functions.

Silver Lake Wetland evaluation indicates that this component of the Lynn River Wetland Complex is not considered Provincially Significant on its own. Through discussions with Mr. David Richards, Long Point Area Biologist with the Ontario Ministry of Natural Resources, Silver Lake Wetland is a component of the larger Lynn River Wetland Complex, which is a Provincially Significant Wetland.

The Silver Lake Wetland is a 15 hectare lacustrine marsh located along the Lynn River. Based on the evaluation this wetland is of local significance for waterfowl and supports warmwater sport fish habitat. A more detailed description of this wetland is found within the wetland evaluation (Appendix A).

Fish habitat protection is set out in Section 36 of the Haldimand Norfolk Official Plan as well as Section 0.3 of the City of Naticoke Official Plan. Only the Haldimand Norfolk OP indicates that a vegetative buffer may be required adjacent to fish habitat as a component of a development proposal.

3.0 STUDY AREA DETAILS

3.1 Topography and Soils

The topography on the property is generally flat with the highest elevation (approximately 209 meters asl) located in the north-west corner and gradually sloping toward the south-east to approximately 196 m asl adjacent to Highway 6. The valley slope provides the greatest change in elevation with a 16 meter drop to the toe of slope and wetland boundary (approximately 188 m asl) with a 3:1 slope for the first 9 meters and a 6:1 slope to the toe. It is important to note that the floodline for the Lynn River is generally located along the 185 m asl contour, which is considered the base of the slope. This floodline and toe of slope generally varies between 20 and 70 meters from the Lynn River.

It is important to note that the trees or the vegetation along the slope do not indicate any past or present slope instability. Seepages on the slope are generally located at the 190 m above sea level (asl) elevation (Figure 1). Borehole 2 (Chung & Vander Doelen Engineering Ltd., 2006) confirms the groundwater level with a depth of 10.5 m (elevation 188.6 m) (April, 2006).

The source of this groundwater is considered to be the result of infiltration off site. The subsurface materials are generally a clayey silt (approximately 1.5 m in thickness) and a silty clay (approximately 9 m in thickness). Both of these clay materials have been characterised as dense and non-porous (Chung & Vander Doelen Engineering, 2006).

There are several surface drainage locations that are directed from the agricultural fields north along the top of slope leading to the Lynn River valley below. These discharge points are likely caused by historic storm events and have resulted in erosion gullies (1 m to 3 m deep) cut into the slope face by the surface runoff.

There is a small constructed pond located central to the property that is fed by groundwater.

The wetland along the northern margin of the property at the bottom of the valley slope is characterised as imperfectly drained silty clay. Within the study area this wetland boundary is generally located along the northern edge of the property at the 188 to 190 m asl discharge zone and below. Several groundwater seepages are located along the slopes within the Study Area (Figure 1) contributing to and sustaining this wetland vegetation.

3.2 Surface Drainage

The lands generally form a relatively flat table with a steep slope along the northern edge of the property, which slopes toward the wetland. There are three ravines on the slope, which transport drainage from the top of slope to the wetland. These erosion gullies or ravines are 1 m to3 m deep and 2 m to 4 m wide in some locations. These features are considered localised points of discharge with a limited surface area being directed to these locations along the slope. It is likely that these ravines would only direct water during extreme storm events and each of them has a seepage located at approximately the 188 m elevation.

It is important to note that there where no signs of slumping, mass wasting, leaning trees or toppled trees along this slope.

3.3 Terrestrial Environment

Vegetation

The vegetation in the study area is a mixture of woodland, marsh and swamp communities. As a result of our field investigations, four vegetation units were identified within the Study Area. The descriptions of these vegetation units are based on the Ecological Land Classification for Southern Ontario (Lee et.al. 1998)(Figure 1). A complete list of the vegetation species recorded during our biological inventory is located in Appendix B.

Vegetation Unit 1
Dry –Fresh Sugar Maple– Hemlock Mixed Forest

This woodland is characterised by sugar maple (*Acer saccharum*) (60%) with an average dbh of 44 cm. Hemlock (Tsuga canadensis) (20%) with a dbh of 45 cm, red oak (Quercus rubra) (15%) with a 36 cm dbh and American beech *(Fagus grandifolia)* with a 42 cm dbh. The overstorey closure is estimated to be 80%. The understorey is sparse with green ash (10 m), common elderberry (2 m) and hemlock (3 m) as the dominant species. Along the vegetation unit edge wild red raspberry dominates forming a thicket.

The herbaceous layer is sparse forming dense scattered pockets. The dominant species include Pennsylvania sedge (*Carex pennsylvanica*) and white bear sedge (*Carex albursina*).

The soils are a well drained sandy silt loam on steep topography. The level of disturbance is low as the community is relatively mature and well intact with few introduced species.

Vegetation Unit 2
Green Ash Mineral Deciduous Swamp

The overstorey is dominated by green ash (30%) with a 34 cm dbh, red maple *(Acer rubra)* (30%) with a 36 cm dbh, American elm *(Ulmus americana)* (20%) with a 22 cm dbh, blue beech

(*Carpinus caroliniana*) (10%) with a 10 cm dbh and eastern white cedar (10%) with a 44 cm dbh. The estimated overstorey closure is 75%.

The shrub layer is considered moderated to dense, dominated by red-osier dogwood, eastern white cedar, alternate-leaved dogwood (*Cornus alternifolia*) and basswood each with an average of 2 to 3 meters in height.

The herbaceous layer is sparse and located in scattered pockets. The dominant species include sensitive fern (*Onoclea sensibilis*), awl-fruited sedge (*Carex stipata*), wool grass (*Scirpus cyperinus*) and ostrich fern (*Matteuccia struthiopteris*).

Soils consist of saturated clay. Snags and rotting logs are a component of this vegetation community representing approximately 5%. The topography is relatively flat. The level of disturbance is low due to the relatively mature condition and limited presence of introduced species.

Vegetation Unit 3

Fresh-Moist White Cedar – Hardwood Mixed Forest

This successional woodland community is dominated by white cedar (*Thuja occidentalis*) (40%) with a 36 cm dbh, large-toothed aspen (*Populus grandidentata*) (40%) with a 34 cm dbh, basswood (*Tilia americana*) (10%) with 44 cm dbh and green ash (*Fraxinus pennsylvanica*) with a 36 cm dbh. The estimated overstorey closure is 80%.

Shrubs and saplings are dense with staghorn sumac (*Rhus typhina*) with an average height of 8 meters. Other species include red-osier dogwood (*Cornus stolonifera*), Manitoba maple (*Acer ne*gundo) and common buckthorn (*Rhamnus cathartica*) all with an average height of 2 to 4 m.

The herbaceous layer is moderate with garlic mustard (*Allaria officinalis*), tall goldenrod, Canada goldenrod, Canada bluegrass (*Poa compressa*) and Kentucky bluegrass (*Poa pratensis*) as the dominant species.

Soils consist of well drained clay loam. Disturbance is considered high due to the early successional stage of development and the presence of agricultural weed species.

Vegetation Unit 4

Fresh - Moist Hemlock - Hardwood Mixed Forest

This woodland is characterised by hemlock (40%) with an average dbh of 56 cm, sugar maple (25%) with an average dbh of 36 cm, black cherry (*Prunus serotina*) (15%) with a dbh of 40 cm, green ash (15%) with a 44 cm dbh and red oak with a 36 cm dbh. The overstorey closure is estimated to be 85%.

The understorey is moderate with green ash (2 m), running strawberry bush (*Euonymus obovatus*) (<1 m) and back cherry (3 m) as the dominant species. Along the southern edge of this vegetation unit, wild red raspberry (Rubus strigosus) and staghorn sumac (Rhus typhina) dominates forming a thicket.

The herbaceous layer is sparse and forms pockets with garlic mustard as the dominant species. Lady fern (Athyrium filix-femina), spinulose wood fern (Dryopteris carthusiana) and Pennsylvania sedge are also present within the herbaceous layer.

The soils are a well drained sandy loam on rolling topography. The level of disturbance is moderate due to the relatively mature condition and dominant presence of introduced species.

Vegetation Community Summary

These vegetation communities along the slope are largely undisturbed and mature. The riparian and wetland communities however, have experienced some previous impacts due to the proximity of the rail corridor. The species identified in the study area are considered common within wetland and forested communities within the Port Dover area. There were no provincially or nationally significant species located within the study area (Oldham 1993). A complete plant species list is located in Appendix B.

3.4 Animal Life

Animal species observed during our field surveys included a breeding bird survey, incidental records of reptiles and amphibians as well as mammals. The breeding bird survey is located in Appendix C of this report. Racoon (*Procyon lotor*) tracks, eastern cottontail (Sylvilagus floridanus), red fox (Vulpes vulpes) and white tailed deer (*Odocoileus virginianus*) were also observed. These species are commonly found along riparian and hedgerow communities within the region. There were no regionally or provincially significant species observed (Austen, Cadman and James, 1994 and Dobbyn, 1994).

3.5 Fisheries and Fish Habitat

The potential for fish habitat is considered to be locally significant in the wetland ponds and a warm water sport fish population is located in the Lynn River. The wetland is described as a lacustrine marsh bisected by the Lynn River. The potential for this proposed development to have a direct or indirect impact on fish habitat was considered during our site investigations.

3.6 Travel Corridors

It is recognized that existing wildlife travel corridors or linkages as referred to in Section 45 of the Haldimand Norfolk Official Plan and Section 0.5 of the City of Naticoke Official Plan are limited in the Study Area with the exception of the valley slopes, wetland and riparian corridor along the Lynn River. The abutting lands (to the south, west and east) of the Study Area are characterized as residential and agricultural with the wetland and forested slopes to the north providing the best opportunity for wildlife to travel within a moderate amount of vegetative cover. The combination of wetland, upland forest and riparian vegetation provides a substantial amount of habitat for birds, mammals and amphibian/reptile species. There is essentially a 100 meter wide corridor, which links valley lands to the northwest with the wetlands along the shoreline of Lake Erie. This results in a large, diverse, connected and complex habitat for sustaining wildlife populations into the future. It is recognized that a corridor width equal to or greater than 100 meters in width is considered ideal for providing a variety of wildlife functions to the landscape (Riley and Mohr, 1994).

4.0 MITIGATION AND MANAGEMENT

4.1 Proposed Development Design

The proposed development design (111 Draft Plan Approved) allows for a total of 460 single family lots. Due to the generally flat topography within the proposed development area there will be limited earth grading and excavation for servicing. The subdivision will have full municipal services.

The previous Geotechnical Investigation (Chung & Vander Doelen Engineering Ltd., 2001) On the Lynn River Heights Phase I development determined that "the existing slope is stable with sufficient factor of safety (over 1.5) against slope failure. The most recent Geotechnical Investigation (Chung & Vander Doelen Engineering Ltd., 2006) prepared for this development Lynn River Heights Phase II also determined that "the existing slope is stable with a sufficient factor of safety (over 1.5) against slope failure.

The Geotechnical Investigation concluded that the proposed residential construction would not negatively affect the existing stability of the valley slope." The report recommends the following setback considerations be applied during site development:

- "The minimum 6 m Erosion Access Allowance should be applied to the top of the slope and any structures should be constructed at least 6 m from the defined top of slope line." (see Figure 1)
- "No vegetation at the top of slope and on the slope face is to be removed or damaged due to construction activities. The top of the slope is to be cordoned off to prevent any accidental damage to the vegetation"
- "All reconstructed slope surfaces should be topsoiled and seeded/sodded to prevent surface erosion."
- "Surface water runoff should be directed to the front of the lots, and the roof waters should all be emptied to the street or the storm water system."
- "No concentrated flows are to be emptied onto the slope face. Any storm outlet that may drain down the slope must be done in a lined ditch or culvert. Failure to do so will result in erosion, removal of vegetation and an over-steeping of the slope, all of which will reduce the stability of the slope."

This report also supports these recommendations made within the Geotechnical Investigation (Chung & Vander Doelen Engineering Ltd., 2006).

4.1.1 Stormwater Management

The stormwater management facility will be a wet pond located near Highway 6. A large forebay will provide the initial water quality treatment and the proposed 0.3 hectare facility will provide quantity control for the 100 year storm event. It is anticipated that a Level 2 water quality control is required for this development. The stormwater management plan has been sensitive to both the potential for erosion along the valley slopes and protection of both the Silver Creek Wetland and Lynn River. As a result both quality and quantity of groundwater will be maintained at pre-development levels.

4.1.2 Protection of Significant Natural Heritage Features

The proposed Draft Plan design will avoid any potential for direct impacts to the Silver Lake Wetland (Lynn River Wetland Complex), the vegetated slopes along the Lynn River Valley and the Lynn River. Each of these features is either on or adjacent to the property to the north and based on definitions within the Provincial Policy Plan are considered Significant Natural Heritage Features (Figure 2).

4.1.3 Tree Management

It should be noted that the proposed development design would protect all of the existing vegetation on site and abutting the property. This protection includes the trees located along the top of slope.

Those trees and associated vegetation along the top of slope at the north end of the property will be protected through the installation of paige wire and silt fence installed 1 meter beyond the drip of the trees or at the top of slope which ever is greater.

It is recommended that silt fence and construction fence be installed just beyond the dripline of those trees located along the top of slope to prevent grading, silt deposition, storage of materials and compaction of tree roots within the dripline of these trees.

4.1.4 Buffers

Wetland buffers are considered to be an acceptable management practice when providing for the conservation and protection of provincially significant wetlands and watercourses. A naturally vegetated buffer between 15 - 30 m in width is regularly recommended by the planning agencies (Riley and Mohr 1994). There is an extensive list of literature and scientific research which indicates that a natural buffer of vegetation protects water quality by filtering out and using excess sediments and nutrients. Vegetated filter-strips are particularly effective in the attenuation of the effects of surface sheet flow drainage on water quality, particularly the effects of phosphorus and suspended solids (Hilditch 1992). Forested filter-strips; however, remove more pollutants than grassed ones due to the greater uptake and long-term retention of nutrients (Brinson et al. 1981).

Haupt and Kidd (1965) found that an undisturbed forested filter-strip 9 m in width prevented sediment from entering a stream while a study in West Virginia reported that a forested strip 10-20 m wide along a stream protected it from sedimentation, erosion and excessive increases in water temperature caused by adjacent development.

According to the literature a 15 m minimum buffer is generally considered appropriate along streams, lakes and wetlands while a wider setback may be more appropriate in areas of sensitive soils and coldwater fish habitat (Budd et al. 1987, Cohen et al. 1987, OMNR 1987). Other factors which should be considered with respect to determining the width of a vegetated buffers are the quality of vegetation, buffer functions performed and the sensitivity of the resource to be protected.

4.1.5 Proposed Buffer Design

Based on the proposed development design for the Boban Developments National Ltd. a vegetated wetland buffer width of 30 m will be provided from the top of slope north to the wetland boundary. This results in a total of 0.94 hectare of the property dedicated to the wetland buffer. It should be noted that a 6 meter wide structural setback has also been provided from the top of slope south to the rear lot line. A minimum of 80 meters distance separation has been provided between the rear lots along the top of slope to Lynn River (See Figure 2). Currently both the setback to the river and the wetland buffer does exist between the agricultural activity and this wetland. This development formally establishes both the buffer and the setback and dedicates the entire area of almost 4.8 hectares as Open Space.

The purpose of this 30 m buffer is to provide the wetland with protection from intrusion, erosion and contaminants following development. This buffer, once established, will be able to perform several buffer functions. These functions would include the following:

- protection from exposure to the full force of wind as well as the potential drying effects could protect the existing vegetation from unnecessary changes and encourage greater wildlife diverse through maintenance of small areas of microclimate.
- maintains a diverse and species rich edge.
- provide a vegetated filter-strip to intercept and assimilate nutrients and sediment before entering along the wetland.
- will maintain the link between the wetland and upland communities and provide for the wildlife corridor along Lynn River.
- will provide wildlife food source through maintenance of sugar maple, beech, oaks, elderberry and wildflowers.

These five separate buffer functions listed above will be achieved through the maintenance of this slope and distance separation of 30 m. There will be no structures or grade changes located within this wetland buffer. In addition a 6 m wide structural setback has been recommended by the Geotechnical Investigation (Chung & Vander Doelen Engineering, 2006) for continued access, referred to as the Erosion Access Allowance. This additional setback will allow large equipment to access the slope if there is a need to rectify any damage to the slope in the future. The form and function of this buffer area is considered excellent as it currently contributes to the protection of the wetland and there is no need to plant the buffer as is typically necessary with other development proposals.

4.1.7 Design Summary

This development design avoids any direct impacts on the wetland, valley slope or Lynn River and the indirect impacts of the proposed Lynn River Heights Phase II residential subdivision have been mitigated through the proposed protection measures and proposed buffer. The benefits of our proposed development design include:

- No direct impacts to the wetland feature;
- Stormwater Management Area has been located in area, which is sensitive to the protection of the wetland feature. This plan provides quality and quantity control for the 100 year storm event;
- A 30 meter buffer has been proposed for the wetland boundary. This buffer is referred to as a "no touch" zone will be provided and respected along the entire length of this wetland boundary.
- Protection of valley slope vegetation with a 6 meter wide setback from the top of slope to the lot line and not intrusion onto the slope, and;
- Directing stormwater from hard surfaces away from the top of slope to avoid further erosion.

5.0 POTENTIAL INDIRECT IMPACTS

It is anticipated that any potential impacts will be indirect impacts as a result of siltation during construction or through the potential impacts of stormwater runoff. The following discussion has been structured to address those potential indirect impacts to the slope and wetland area and their function.

1. During Construction: Typically there is the potential for siltation and erosion of soils and subsoils within the development area during construction. Protection and mitigation measures proposed are as follows:

    1. All Paige wire fence and silt fence must be installed prior to site clearing or top soil stripping (See Figure 2);
    2. Silt fence, construction fence and must be installed to define the construction and work areas in an effort to limit traffic and afford protection to the trees (Figure 2);
    3. Slopes greater than 3:1 must be stabilized using suitable geotextile material and seeded or sodded as soon as possible (i.e. stormwater management pond);
    4. As soon as final grades have been achieved a dense cover of grass and legumes will be seeded;
    5. A stormwater management pond will be constructed initially as a sediment control pond during construction. The final stormwater management pond will then be completed and landscaped appropriately after construction is complete.

Final details for erosion control and slope protection will be provided at a later time during final engineering design.

2. Stormwater Runoff and Maintenance and Hydrological Regime: Construction of a residential development within the property typically creates a barrier to groundwater movement thus disrupting the pre-construction hydrologic regime. Based on the Geotechnical Investigation

(Chung & Vander Doelen Engineering, 2006) this site does not contribute to the groundwater discharging to the wetland (i.e. seepages). Based on this assessment there is no potential groundwater quality or quantity impacts to the wetland or the Lynn River as a result of this proposed residential development.

3. Change in Surface Water Flow: Currently there are two shallow, surface water flow channels within the property located at the southern end and 3 erosion gullies at the north end. The predevelopment drainage areas will remain virtually the same following development however, all the road surfaces, foundation drains and roof drainage will be directed to the stormwater management pond. The drainage area at the north end of the property which is directed to the erosion gullies will be reduced (approximately 1 hectare from the existing 4 to 5 hectares). This reduction is drainage area is considered to be a net benefit as this surface water is not essential to maintaining the wetland or vegetation on the slope face. The stormwater within these gullies result in further erosion and is considered a long-term threat to the stability of the vegetation and the slope. Only the back half of Lots along the top of slope will direct surface water to the top of bank. It is recommended that all foundation sump pumps and roof gutters for these lots are directed to the front of these lots and the street using appropriate grades.

6.0 Haldimand Norfolk and City of Nanticoke Official Plan Policies

Based on the biophysical inventory and assessment conducted for this report the following conclusions can be made with regard to the Provincially Significant Wetland, valley slope and Lynn River. This report demonstrates that:

- There will be no loss of wetland area or function;
- This proposal does not provide for subsequent demand for future development which will adversely affect wetland functions;
- This proposed development does not conflict with existing site specific wetland management practices;
- This proposed development maintains and protects the existing natural wildlife corridor and trail along the Lynn River;
- Fish habitat within the wetland and the Lynn River will be protected as a result of this proposed development design, as well as the proposed protection and mitigation measures;

7.0 Conclusions

The proposed residential development design and recommended protection and mitigation measures will not result in adverse environmental impacts to the significant Natural Heritage Features outlined in this report. Based on our inventory and assess this document supports the Official Plan Amendment and Zoning application on be half of Boban Developments National Ltd for Lynn River Heights Phase II. This conclusion is based on the following:

- Area to be development has already been impacted through agricultural practices;
- There were no significant wildlife species located on the property;

- The key Natural Heritage Features, a Provincially Significant Wetland, a valley slope and a warm water sport fishery identified on or adjacent to the property will be protected;

- Our proposed site design will not impact fish or fish habitat;

- Our proposed site design demonstrates no loss of wetland area or wetland function;

- The 30 m (approximate) wide wetland buffer along the wetland boundary will maintain a total of 0.94 hectares of upland ecosystem to perform as a buffer;

- The linear wildlife corridor and rail trail along the Lynn River will be protected and designated as Open Space, and;

- Groundwater as well as surface water quality and quantity will be maintained at pre-development levels.

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RE: Report on the 2005 Stage 1-3 Archaeological Assessment of the Proposed Lynn River Heights Subdivision Phase 2, Part of Lot 8, Concession 2 (former Township of Woodhouse) Town of Port Dover, County of Norfolk P038-149

Report on the Stage 4 Archaeological Mitigative Excavations of the Lynn River Site (AeHb-31) within the Proposed River Heights Subdivision Phase 2, Part of Lot 8 Concession 2 (Formerly Township of Woodhouse) Town of Port Dover, County of Norfolk P038-216-2006

Please be advised that the reports referenced above and produced by AMICK Consultants Limited, submitted and accepted by the Ministry are still valid to this day as far as our office is concerned.

Sincerely,

Marilyn Cornies

AMICK Consultants Limited
Managing Partner

Michael Henry and Marilyn Cornies
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Ministry of Culture **Ministère de la Culture**
Heritage & Libraries Branch
Southwest Archaeological Field Office
900 Highbury Avenue
London, Ontario N5Y 1A4

Ontario

(519) 675-7742; Fax: 675-7777

September 6, 2005

To: James Hill, Manager
Community and Strategic Planning
County of Oxford, Box 397, Court House
Woodstock, Ontario N4S 7Y3

RE: Recommendation of Archaeological Clearance, Draft Plan of Subdivision 32T-88011, Norwich on the Pines Development Ltd., Part Lot 537, Plan No. 745 (Village of Norwich), Township of Norwich, Oxford County

This office of the Ministry of Culture has reviewed a Stage 1 and 2 archaeological assessment report prepared by AMICK Consultants (Licence/CIF # P038-095) for the lands noted above. The report documents that nothing of archaeological significance was discovered as a result of the Stage 2 assessment. Consequently, the report recommends that further archaeological investigations are not warranted. This Ministry concurs with this recommendation.

Given the above, cultural heritage resource concerns have been addressed and as per Condition 25, Condition 15 of the conditions of draft plan approval has been fulfilled to the satisfaction of this Ministry for the above-noted application.

If deeply buried cultural remains (including human remains) are uncovered during construction activities, this Ministry should be contacted immediately

I trust that this information is of assistance. Should you wish to discuss this further, please do not hesitate to contact me.

Sincerely,

John MacDonald
Heritage Planner/ Archaeologist
Southwestern Ontario Region

c. AMICK Consulting
MCL Licensing Co-ordinator

Ministry of Culture **Ministère de la Culture**
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June 22, 2006

To: Ms. Marilyn Cornies
AMICK Consultants Limited
760 Walker Street
London, Ontario N5Z 2J4

Re: Concurrence with Report Titled, "Report on the 2005 Stage 1-3 Archaeological Assessment of the Proposed Lynn River Heights Subdivision Phase 2, Part of Lot 8, Concession 2, (former Township of Woodhouse) Town of Port Dover, County of Norfolk", December 2005 (Licence/PIF # P038-149)

This office has had the opportunity to review the above-mentioned report on the archaeological activities conducted under Licence P038.The report indicates that as a result of the Stage 2 assessment, three pre-contact artifact locations were discovered. Due to the relative isolated nature of two of these finds, the report recommends that no further archaeological investigations are warranted for Locations 1 and 2. The third location was subjected to Stage 3 investigations and is recommended for Stage 4 mitigative excavation. This Ministry concurs with these recommendations.

Prior to waiving the archaeological condition on the remainder of the property, this office will need to receive a copy of the approved draft plan of subdivision and a copy of the conditions of draft plan approval for this development application.

I trust that this is of assistance. Should you wish to discuss this further, please do not hesitate to contact me.

Sincerely,

John MacDonald
Archaeologist/Heritage Planner
Southwestern Ontario Region

c. MCL Licensing Co-ordinator

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Ontario

June 23, 2008

Ms. Marilyn Cornies
AMICK Consultants Limited
760 Walker Street
London, Ontario
N5Z 1J4

RE: Review and Acceptance of Report Entitled, "Report on the Stage 4 Archaeological Mitigative Excavations of the Lynn River Site (AeHb-31) within the Proposed Lynn River Heights Subdivision Phase 2, Part of Lot 8, Concession 2 (formerly Township of Woodhouse), Town of Port Dover, County of Norfolk", Licence/PIF # P038-216-2006, MCL File 28SB003

Dear Ms. Cornies:

This office has reviewed the above-noted report and the additional information prepared under your licence. The report details the Stage 4 mitigation of the Lynn River site (AeHb-31) and notes that the site has been mitigated through excavation. Consequently, it is recommended that concerns for archaeological resources be considered addressed for the subject property.

However, if deeply buried cultural remains (including human remains) are discovered during construction activities, this office should be notified immediately.

If you have any questions regarding the above, please do not hesitate to contact me.

Sincerely,

Shari Prowse
Archaeology Review Officer
Culture Programs Unit

cc. MCL Archaeology Licence Administrator
LA Girard Engineering (Ontario) Limited

Len Girard.

JUN 12 2006

Report on the 2006 Stage 4 Archaeological Mitigative Excavations of the Lynn River Site (AeHb-31) within the Proposed Lynn River Heights Subdivision Phase 2, Part of Lot 8, Concession 2, (former Township of Woodhouse) Town of Port Dover, County of Norfolk.

Submitted to

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Prepared by

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Archaeological Consulting License # PO38
Project # PO38-216-2006
Corporate Project #26674-L

May 2006

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Project Personnel

Consulting Archaeologist	Marilyn E. Cornies
Project Archaeologist	Marilyn Cornies Jim Esler
Field Assistants	Michael B. Henry Phil Rice
Report Preparation	Michael B. Henry Marilyn E. Cornies
Draughting/Photography	Michael B. Henry Jim Esler Phil Rice

Executive Summary

This report describes the conduct of the Stage 4 Archaeological Mitigative Excavations of the Lynn River site (AeHb-31) within the Proposed Lynn River Heights Subdivision Phase 2 located on Part of Lot 8, Concession 2, former Township of Woodhouse, now in the Town of Port Dover, Norfolk County conducted by AMICK Consultants Limited on behalf of LA Girard Engineering (Ontario) Ltd. The present study was conducted under Archaeological Consulting License #PO-038 issued by the Minister of Culture for the Province of Ontario. All work was conducted in conformity with the Archaeological Assessment Technical Guidelines (OMCzCR 1993) and the Ontario Heritage Act (RSO 1980).

AMICK Consultants Limited was engaged on behalf of the proponent to undertake the Stage 1-3 assessment, and to enter the property and remove applicable archaeological data if necessary on May 25, 2005. As a result of the Stage 2 physical assessment of the property, two isolated finds and the Lynn River site (AeHb-231), a small aceramic lithic scatter, consisting of 8 pieces were encountered. No additional work was recommended for the isolated finds, while Stage 3 Limited Test Excavations were recommended for the lithic scatter. Stage 3 Limited Test Excavations were conducted in late 2005. The Stage 3 Test Excavations resulted in the recovery of an additional 15 pieces. A total of 23 artifacts were recovered from the Stage 2-3 assessment of the lithic scatter: projectile point n=1, projectile point fragment n=1, scraper n=1, knife n=1, utilized flake n=2, core n=3, and chipping detritus n=14. Normally, the majority of the collection gathered from lithic scatters is comprised of chipping detritus, generally in excess of 85%. Although the Stage 3 assemblage was small, only 60% of the artifacts recovered are chipping detritus. Given this anomaly, Stage 4 Mitigative Excavations in the form 1 x 1 metre squares were recommended in those areas where the diagnostic material had been recovered to ensure that all possible cultural information is garnered.

Permission to enter the property and remove artifacts was granted on February 10, 2006. The Stage 4 work was undertaken between April 29-May 13, 2006. A total of 33 1x1 metre squares were excavated resulting in an additional 61 artifacts. Oddly, the Stage 4 Mitigative Excavations failed to produce any diagnostic material whatsoever or subsurface features. As a result, no further work is recommended for the Lynn River site.

1.0 INTRODUCTION

This Archaeological License Report details the conduct and findings of a Stage 4 Archaeological Mitigative Excavations of the Lynn River site (AeHb-31) located within the Proposed Lynn River Heights Subdivision Phase 2, located on Part of Lot 8, Concession 2, (former Township of Woodhouse) in the Town of Port Dover, County of Norfolk. The entire subject property consists of approximately 100 acres.

This research was carried out on behalf of the proponent by AMICK Consultants Limited to address approval conditions. All work was conducted in accordance with the terms and conditions of the Ontario Heritage Act (RSO 1980) under Archaeological Consulting License #PO-038 issued to Marilyn Cornies by the Minister of Culture for the Province of Ontario. All pertinent materials, notes and artifacts are maintained at the offices of AMICK Consultants Limited.

2.0 LOCATION AND DESCRIPTION

As illustrated in Figure 1, the subject property is situated in the western portion of the Town of Port Dover. The property is approximately 100 acres of rectangular shaped undulating lands. County Road #6 lies to the north, existing residential to the east and agricultural lands to the west. The Lynn River forms the northern limits of the subject property. The Lynn River site (AeHb-31)is situated in the northeastern portion of the property on a knoll approximately 100 metres south of the slope to the Lynn River.

The subject property is situated within the Norfolk Sand Plain physiographic region which includes the western half of the Regional Municipality of Haldimand – Norfolk (previously Norfolk County), the eastern end of Elgin County, southern Brant and a small amount of Oxford. The sands and silts of this region were deposited as a delta in glacial Lakes Whittlesey and Warren. A great discharge of meltwater from the Grand River area entered the lakes between the ice front and the moraines to the northwest, building the delta from east to west of the Galt moraine. This and other moraines to the west are partly buried by sand. The drainage is through small rivers flowing directly to Lake Erie (Chapman and Putnam 1984: 153-155).

3.0 BACKGROUND RESEARCH

As part of the Stage 1-2 study, background research was conducted in order to determine if any archaeological resources had been formerly documented within or in close proximity to the subject property and if these same resources might be subject to impacts from the proposed undertaking. This data was also collected in order to assist in the assessment of the archaeological potential of the subject property and in order to establish the significance of any resources which might be encountered during the conduct of the present study. The requisite data was collected from the Archaeology

Unit, Heritage Branch, Ontario Ministry of Culture and the corporate research library of AMICK Consultants Limited.

Native Occupation:

Information regarding Native settlement and land use in the vicinity of the subject property was obtained through the registered Archaeological Sites Database which is collected by the Province of Ontario through the Ministry of Culture. It was determined that one archaeological site had been documented in close proximity to the subject property. The Gurr site (AeHb-19) is an Archaic/Woodland site.

Euro-Canadian Settlement:

The Illustrated Historical Atlas of Bruce County (H.R. Page 1875) shows that at the time that the Atlas was compiled a homestead owned by Jason Stamp was present on Lot 8, Woodhouse Township, Norfolk County.

Summary:

Background research indicated that the subject property exhibited a low potential for significant archaeological resources of First Nation origins. However, this is more likely a reflection of a lack of assessments having been conducted in the vicinity. Background research indicates that the subject property exhibits a high potential for significant archaeological resources of Euro- Canadian origins. The presence of the Lynn River to the north suggested a high potential for the possible discovery of sites of First Nation origins Consequently the property was considered to have a high potential for sites of both First Nation and Euro-Canadian origins.

4.0 PREVIOUS INVESTIGATIONS

The property had been subjected to a Stage 2 physical assessment consisting of pedestrian transect and test pit methodologies in the spring of 2005. As a result of the archaeological survey of the subject property, two isolated finds and a small aceramic lithic scatter were encountered. Isolated Find #1 is a crude biface of Onondaga chert. Isolated Find #2 is a large biface of Haldimand chert which may have been intended as a projectile point.

A total of 8 artifacts were recovered in an area approximately 15 x 15 metres. The site was named the Lynn River site and was registered with the Ministry of Culture and assigned the Borden number AeHb-231. The material recovered as a result of the surface collection consisted of one projectile point fragment, one scraper, one utilized flake and five pieces of chipping detritus. With the exception of the projectile point fragment all the pieces were of Onondaga chert. The projectile point fragment is of an unknown chert. The projectile point is missing the tip, however, the base suggests the point fragment is a Brewerton side notched point dating to the Archaic period of First Nations occupation in Southern Ontario. Given the number of finds in a small condensed area and the presence of the projectile point fragment, Stage 3 test excavations were recommended.

The Stage 3 Limited Test Excavations of the Lynn River Heights site (AeHb-231) were conducted from December 11-13, 2005. The site area was reexamined at a 1 metre interval between transects. The Stage 3 surface examinations failed to produce additional material. A total 16 one metre by one metre squares were excavated over the surface of the site area spaced at a fixed interval of five metres between individual squares. The placement of individual squares within each of the site areas was determined according to artifact locations found during the surface collection. As much as was reasonably possible, squares were placed to run through artifact densities and on top of individual surface finds. The grid system functioned using an X/Y coordinates wherein eastings functioned to provide X axis coordinates and northings provided the Y axis coordinates. Individual squares were designated based upon the location of the southwest corner of the unit within the X/Y coordinate system with eastings (X coordinates) given first. All squares were excavated to sterile subsoil and all excavated soil was screened through ¼ inch (6 mm) wire mesh to ensure that any artifacts contained within the soil matrix were recovered. All artifacts recovered during the test excavations were bagged and labeled according to this system.

The Stage 3 test units resulted in the recovery of an additional 15 artifacts; projectile point n=1, knife n=1, utilized flake n=1, core n=3 and chipping detritus n=9. Nine of the test units were sterile. The majority of the artifacts were concentrated in a small approximately 10 x 10 metre area. The following artifact table represents the artifacts recovered from the Stage 2 and 3 physical assessments.

The projectile point recovered from the Stage 3 assessment was manufactured of Onondaga chert and dates to the Archaic period. The knife is also manufactured of Onondaga chert but appears to have been a point which had been reworked into a knife. The utilized flake was crafted from Onondaga chert. The three cores and the 8 pieces of chipping detritus were all of Onondaga chert. One of the pieces of chipping detritus exhibited evidence of heat treatment. No subsurface cultural features were observed.

5.0 STAGE 4 MITIGATIVE EXCAVATIONS

5.1 Methodology

Stage 4 Mitigative Excavations were undertaken as a result of the unique assemblage discovered during the Stage 2-3 investigations. Although the number of artifacts recovered was small, the ratio of non chipping detritus (n=9, 40%) to chipping detritus (n=14, 60%) was not in keeping with the usual ratio of in excess of 85% chipping detritus.

Additional 1x1 metre squares were excavated, being undertaken in those areas in which the highest concentration of non chipping detritus artifacts was located. An additional 35 squares were excavated following the same grid system established during the Stage 3 Test Excavations. The grid system functioned using an X/Y coordinates wherein eastings functioned to provide X axis coordinates and northings provided the Y axis coordinates. Individual squares were designated based upon the location of the southwest corner of the unit within the X/Y coordinate system with eastings (X coordinates) given first. All squares were excavated to sterile subsoil and all excavated soil was screened through ¼ inch (6 mm) wire mesh to ensure that any artifacts contained within the soil matrix were recovered. All artifacts recovered during the test excavations were bagged and labeled according to this system.

5.2 Results

An additional 35 one x one metre squares were excavated in the course of the Stage 4 excavations. Of these, 6 squares were sterile. Non-sterile artifact yields varied from 1-6 artifacts per unit, however, only 3 of the units contained five or more artifacts. The squares were primarily focused in the centre of the Stage 3 east-west line which also contained the largest variety and quantity of artifacts discovered the Stage 1 & 2 investigations. Figure 4 illustrates the location of the units in relation to the Stage 2 & 3 results and the artifact frequencies.

An additional 69 artifacts were recovered as a result of the Stage 4 Excavations. The Stage 4 assemblage included 3 utilized flakes, 1 core and 65 pieces of chipping detritus. Nine of the pieces exhibited evidence of heat treatment. Of note is the absence of formal tools such projectile points, scraper, and a knife which were located during the Stage 2-3 assessments. No subsurface features were encountered. Table 1 illustrates the findings of the Stage 2-4 investigations.

Table 1: Artifact Catalogue of the Lynn River site (AeHb-31)

Cat.#	Surface Find #	Square	Stage	Description	Frequency
1	1			Chipping Detritus	1
2	2			Chipping Detritus	1
3	3			Utilized Flake	1
4	4			Scraper	1
5	5			Projectile Point Fragment	1
6	6			Chipping Detritus	1
7	7			Chipping Detritus	1
8	8			Chipping Detritus	1
9		500E-200N	3	Utilized Flake	1

10	500E-205N	3	Chipping Detritus	1
11	500E-205N	3	Core	1
12	505E-200N	3	Chipping Detritus	2
13	505E-205N	3	Knife	1
14	505E-205N	3	Chipping Detritus	4
15	510E-205N	3	Core	1
16	510E-205N	3	Projectile Point	1
17	510E-210N	3	Core	1
18	515E-200N	3	Chipping Detritus	1
19	515E-205N	3	Chipping Detritus	1
20	501E-205N	4	Chipping Detritus	5
21	502E-205N	4	Chipping Detritus	1
22	502E-205N	4	Core	1
23	503E-205N	4	Chipping Detritus	1
24	504E-205N	4	Chipping Detritus	2
25	506E-205N	4	Chipping Detritus	4
26	507E-205N	4	Chipping Detritus	2
27	508E-205N	4	Chipping Detritus	6
28	509E-205N	4	Utilized Flake	1
29	509E-205N	4	Chipping Detritus	1
30	511E-205N	4	Chipping Detritus	3
31	512E-205N	4	Chipping Detritus	2
32	513E-205N	4	Chipping Detritus	4
33	514E-205N	4	Chipping Detritus	5
34	504E-204N	4	Chipping Detritus	3
35	505E-204N	4	Chipping Detritus	1
36	506E-204N	4	Utilized Flake	1
37	506E-204N	4	Chipping Detritus	1
38	508E-204N	4	Chipping Detritus	2
39	509E-204N	4	Chipping Detritus	1
40	510E-204N	4	Chipping Detritus	4
41	511E-204N	4	Chipping Detritus	2
42	514E-204N	4	Chipping Detritus	1
	515E-204N	4	Sterile	0
43	504E-206N	4	Chipping Detritus	4
	505E-206N	4	Sterile	0
44	506E-206N	4	Chipping Detritus	2
45	508E-206N	4	Chipping Detritus	4
	509E-206N	4	Sterile	0
46	510E-206N	4	Chipping Detritus	1
47	511E-206N	4	Chipping Detritus	2
	514E-206N	4	Sterile	0
48	515E-206N	4	Chipping Detritus	2
	510E-207N	4	Sterile	0
49	515E-207N	4	Utilized Flake	1

50	510E-208N	4	Chipping Detritus	2
	515E-208N	4	Sterile	0
51	510E-209N	4	Chipping Detritus	2

The Stage 2-4 archaeological investigations of the Lynn River site (AeHb-31) produced a total of 97 artifacts. Oddly, the Stage 4 artifact assemblage failed to yield additional cultural or temporal data. However, the findings are now more in keeping with the artifact assemblages generally associated with small Archaic campsites which were occupied for a short period of time. When the Stage 2-4 findings are combined (see Table 2), the percentage of chipping detritus is in excess of 85%. It is believed that given the small quantity of artifacts per unit, the excavation of additional squares will not yield new information.

Table 2 Artifact Frequencies and Percentages

Artifact Description	Frequency	Percentage
Chipping Detritus	84	86.59
Projectile Points	1	1.03
Projectile Point Fragments	1	1.03
Scraper	1	1.03
Knife	1	1.03
Core	4	4.12
Utilized Flake	5	5.15
Total	97	99.98

6.0 CONCLUSIONS & RECOMMENDATIONS

As a result of the Stage 2 physical assessment of the property, two isolated finds and one small lithic scatter were encountered. No additional work is recommended for the isolated finds.

The Lynn River site (AeHb-31) was subjected to Stage 3 Limited Test Excavations and Stage 4 Mitigative Excavations. The Stage 4 yielded few artifacts and failed to produce additional diagnostic material or evidence of subsurface features. It is believed that the site has yielded all possible data and no further work is recommended. It is recommended that conditions respecting archaeological resources be considered addressed and that no further archaeological investigations are recommended for the subject property.

However, it must be noted at this time that no archaeological survey, regardless of its intensity, can entirely negate the possibility of deeply buried cultural material, notably human interments. In consequence, it is further recommended that should any such remains be encountered during construction activities, the Regulatory Operations Group, OMC and/or the Cemeteries Regulation Branch of the Ontario Ministry of Consumer and Commercial Relations be contacted immediately.

7.0 REFERENCES CITED

Chapman, L.J. & D.F. Putnam
1984 The Physiography of Southern Ontario (Third Edition). Ontario Geological Survey, Special Report #2. Ontario Ministry of Natural Resources, Toronto.

Government of Ontario
1980 The Heritage Act, RSO 1980. Queen's Printer, Toronto.

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1993 Archaeological Assessment Technical Guidelines, Stages 1-3 and Reporting Format. OMCzCR, Cultural Programs Branch, Archaeology and Heritage Planning, Toronto.

Page, H.R.
1875 Illustrated Historical Atlas of the County of Norfolk, Ontario. Toronto.

TABLE 3 Cultural Chronology for South-Central Ontario

PERIOD	GROUP	DATE RANGE	TRAITS
Palaeo- Indian			
	Fluted Point	9500-8500 B.C.	Big Game hunters
	Hi-Lo	8500-7500 B.C.	small nomadic groups
Archaic			
Early		8000-6000 B.C.	hunter-gatherers
Middle	Laurentian	6000-2000 B.C.	territorial divisions arise
Late	Lamoka	2500-1700 B.C.	ground stone tools appear
	Broadpoint	1800-1400 B.C.	
	Crawford Knoll	1500-500 B.C.	
	Glacial Kame	c.a. 1000 B.C.	elaborate burial practices
Woodland			
Early	Meadowood	1000-400 B.C.	introduction of pottery
	Red Ochre	1000-500 B.C.	
Middle	Point Peninsula	400 B.C.-500 A.D.	long distance trade
	Princess Point	500-800 A.D.	horticulture
Late	Pickering	800-1300 A.D.	villages & agriculture
	Uren	1300-1350 A.D.	larger villages
	Middleport	1300-1400 A.D.	
	Huron	1400-1650 A.D.	warfare
Historic			
Early	Odawa, Ojibwa	1700-1875 A.D.	social displacement
Late	Euro-Canadian	1785 A.D. +	European settlement

Figure 1 **Location of Subject Property**

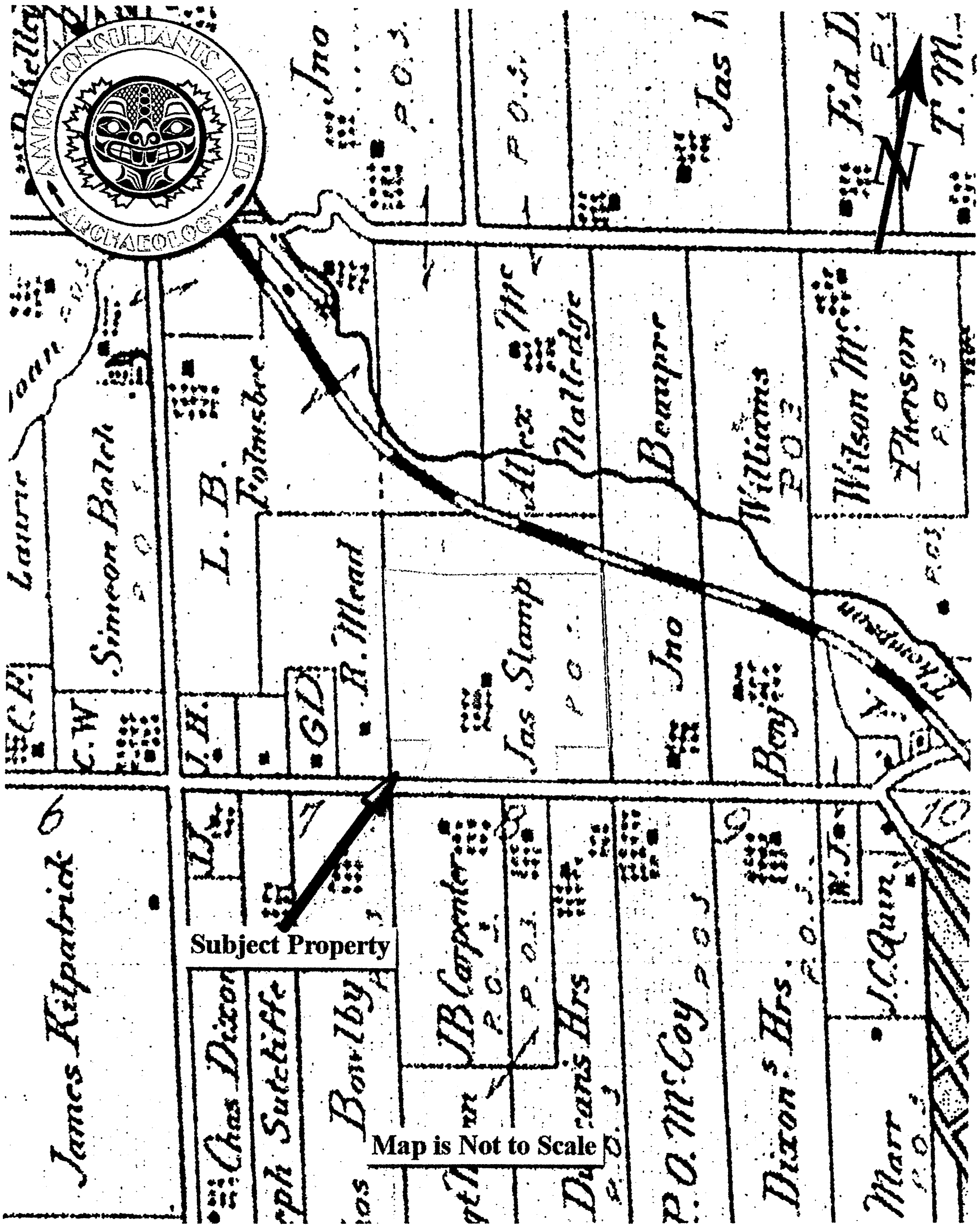

Figure 2 Segment of Historic Atlas Map

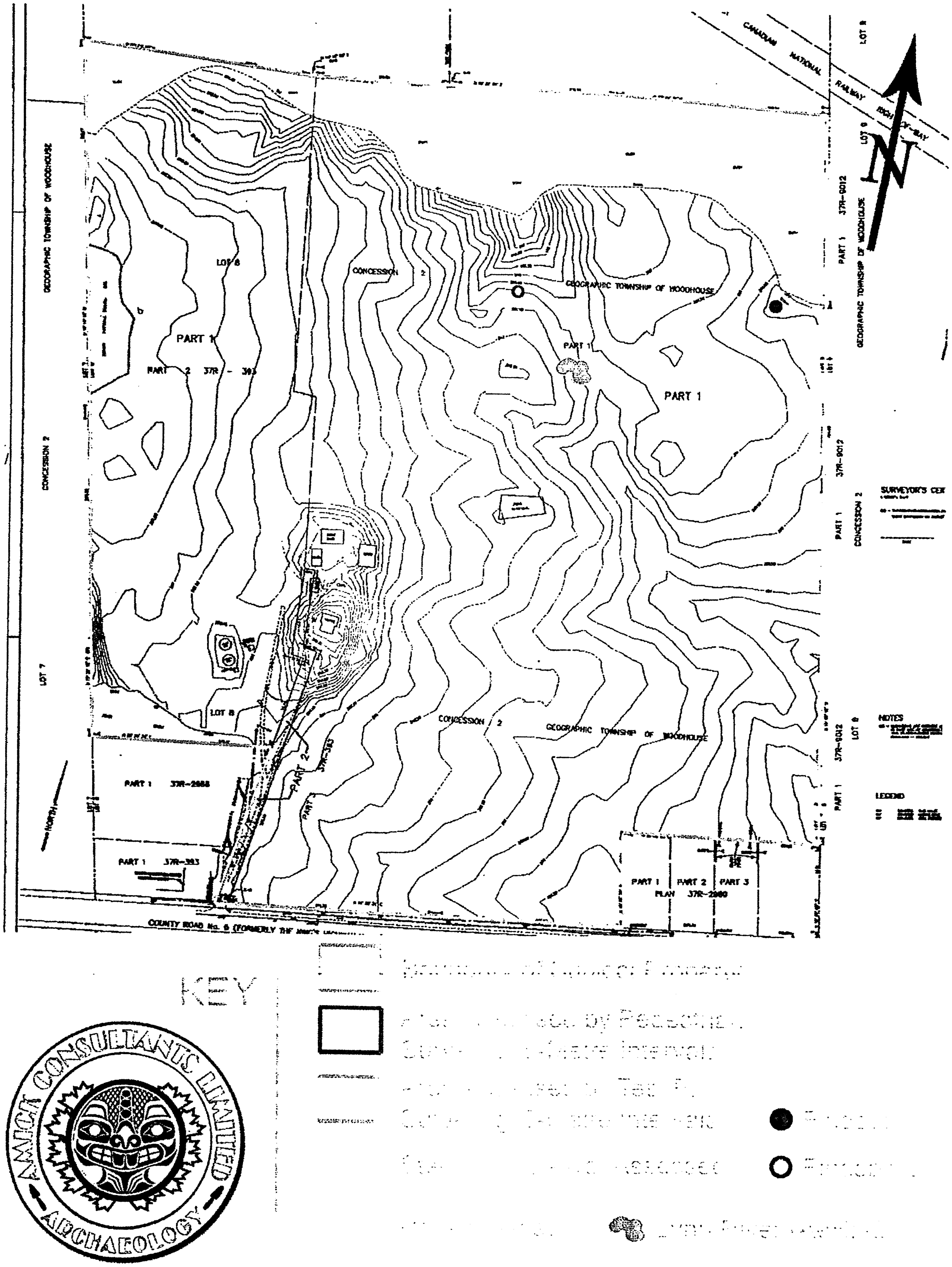

Figure 3 **Detailed Plan of Archaeological Assessment**

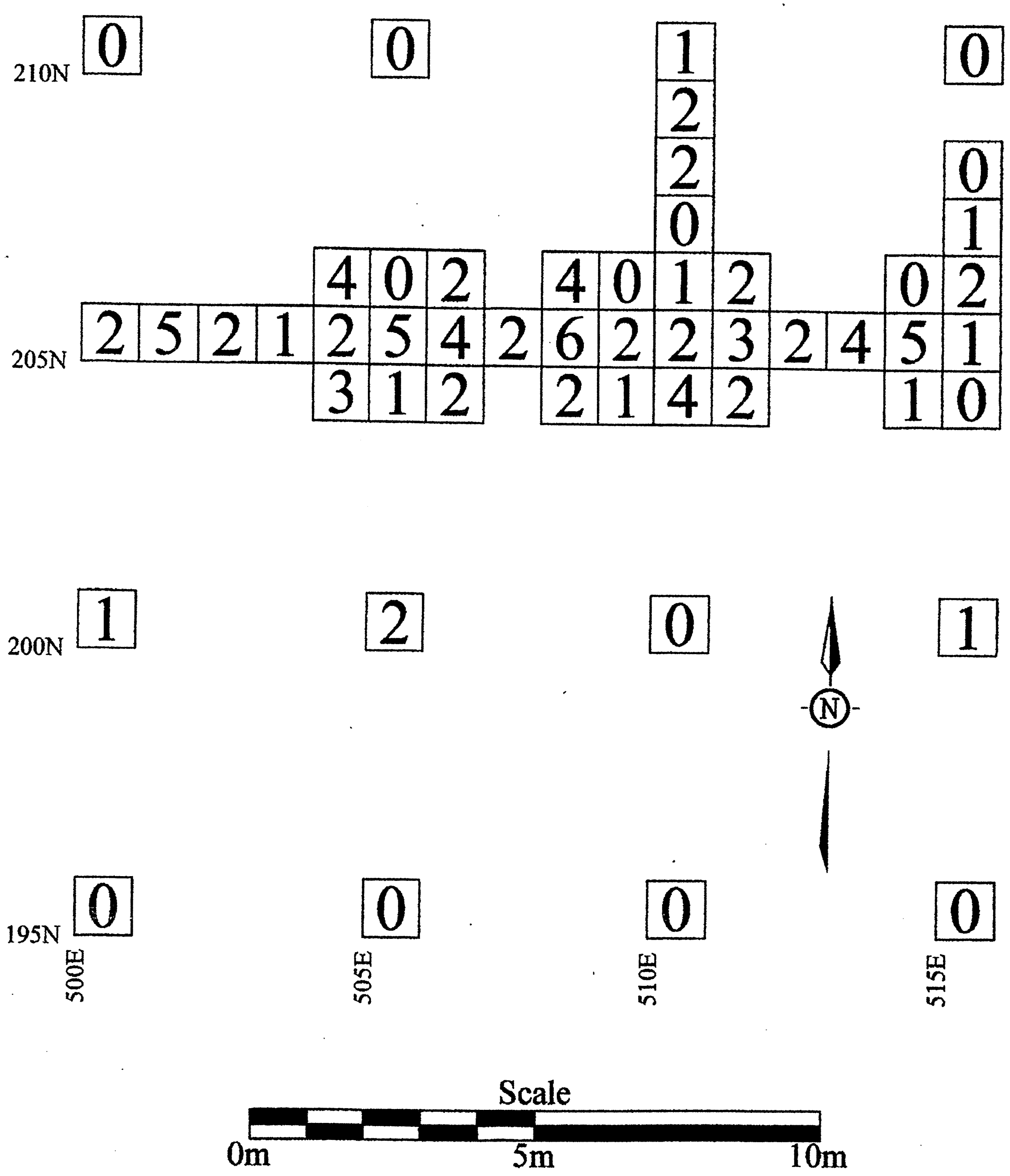

Figure 4 Detailed Plan of the Lynn River Site (AeHb-31)

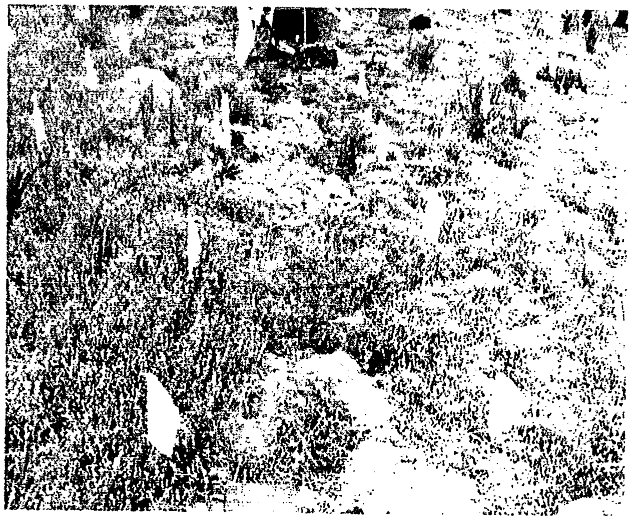

Plate 1 Field Conditions (facing west)

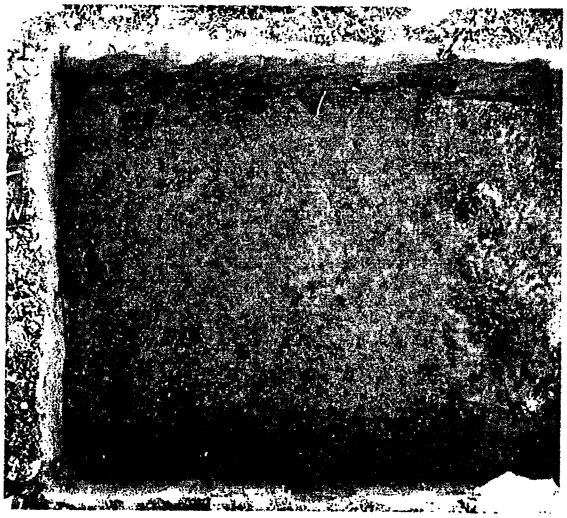

Plate 2 Square 510E-209N

Plate 3 Square 504E-204N

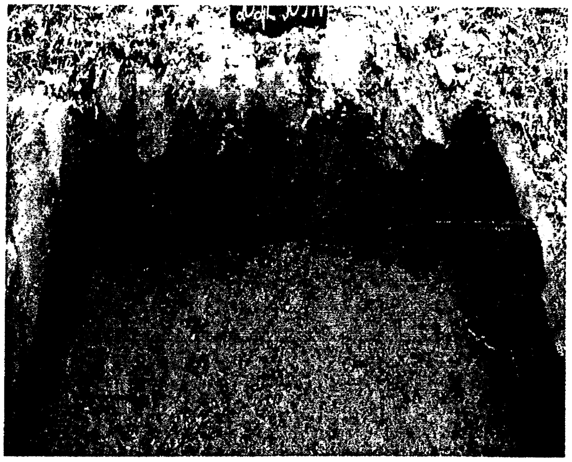

Plate 4 Square 509E-206

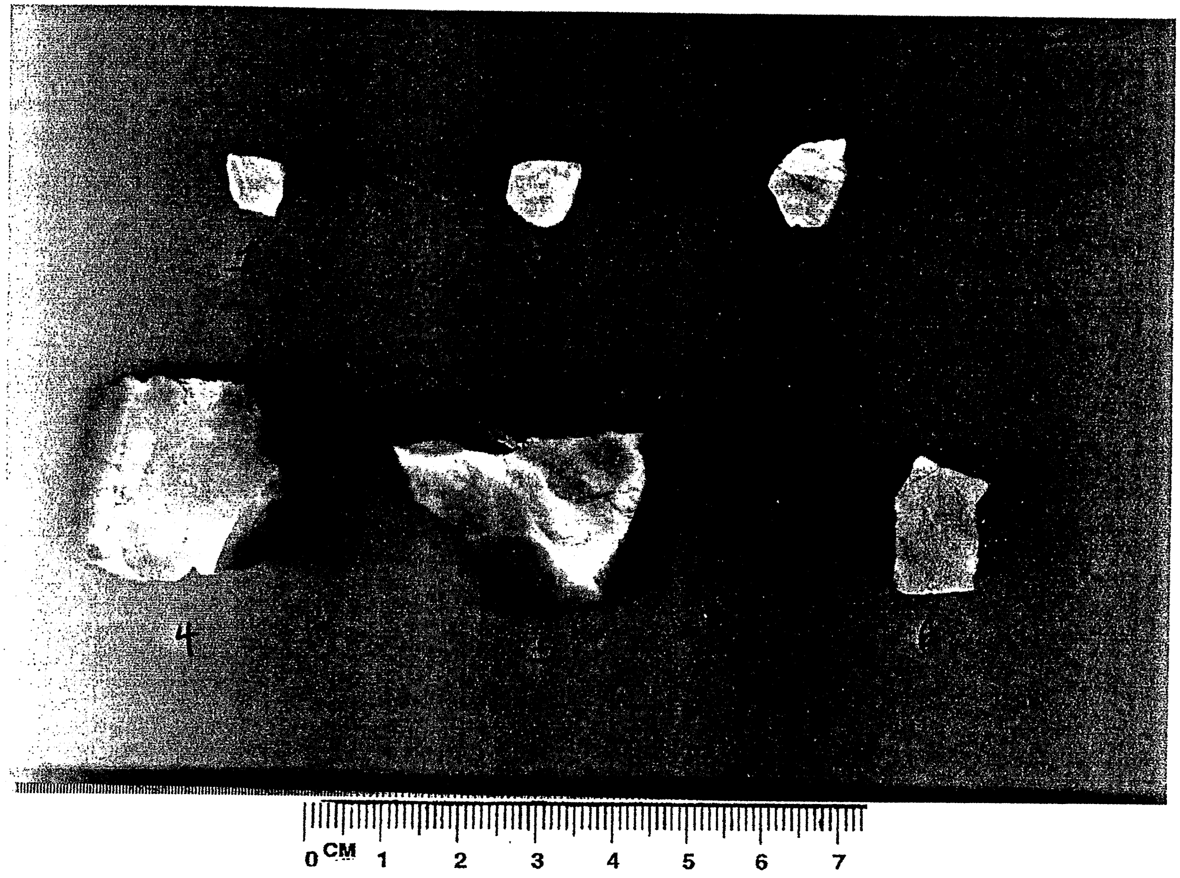

Plate 5 **Selected Artifacts from the Lynn River site (AeHb-231)**

1:AeHb-31:47- Chipping Detritus, 2: AeHb-31:32– Chipping Detritus
3: AeHb-31:36-Utilized Flake, 4: AeHb-31:28- Utilized Flake,
5: AeHb-31:22-Core, 6: AeHb-31:49- Utilized Flake.

CHUNG & VANDER DOELEN
ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1
519-742-8979

May 18, 2017
File No.: 05-11-K11

Community Planning, Development & Cultural Services,
County of Norfolk
185 Robinson Street, Suite 200
Simcoe, Ontario N3Y 5L6

Attention: Ms. Shannon Van Dalen, Senior Planner

Re: **Geotechnical Investigation Report (April 24, 2006)**
Proposed Lynn River Heights
Phase II Residential Development
Part of Lot 8, Concession 2, Norfolk County
Town of Port Dover

As requested, we hereby confirm that, notwithstanding any statement made in the Report that County of Norfolk may rely on the Report (including, without limitation, the findings and opinions expressed therein) which was prepared by CHUNG & VANDER DOELEN ENGINEERING LTD., as if it were an original addressee/recipient of the Report.

It is noted that this Report is still applicable provided that the geotechnical recommendations stated in the Report are followed in the design of the subdivision.

Yours truly,
CHUNG & VANDER DOELEN ENGINEERING LTD.

Chung

Eric Y. Chung, M.Eng., P.Eng.
Principal Engineer

GEOTECHNICAL / CONSTRUCTION INSPECTION / **MATERIALS** TESTING
ENVIRONMENTAL SERVICES / **WASTEWATER** ENGINEERING / **HYDROGEOLOGY**

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ENGINEERING LTD.

Geotechnical Engineering, Construction Inspecting
& Testing, Environmental Services

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GEOTECHNICAL INVESTIGATION
PROPOSED LYNN RIVER HEIGHTS
PHASE II RESIDENTIAL DEVELOPMENT
PART OF LOT 8, CONCESSION 2
NORFOLK COUNTY
TOWN OF PORT DOVER

Submitted to:

Boban Developments National Ltd.
1201 Ratcliffe Drive
Cambridge, Ontario
N3C 2V3

Attention: Mr. Joe Mihalj, President

Submitted by:

CHUNG & VANDER DOELEN ENGINEERING LTD.
280 Victoria Street North, Unit # 8
Kitchener, Ontario
N2H 5E2

File No.: 05-11-K11
April 24, 2006

CHUNG & VANDER DOELEN ENGINEERING LTD.

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1201 Ratcliffe Drive
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**Re: GEOTECHNICAL INVESTIGATION
PROPOSED LYNN RIVER HEIGHTS
PHASE II RESIDENTIAL DEVELOPMENT
PART OF LOT 8, CONCESSION 2
NORFOLK COUNTY
TOWN OF PORT DOVER**

We take pleasure in enclosing four (4) copies of our Geotechnical Investigation Report carried out at the above-mentioned location and we will be glad to discuss any questions arising from this work.

Soil samples will be retained for a period of three (3) months and will thereafter be disposed of unless we are otherwise instructed.

We thank you for giving us this opportunity to be of service to you.

Yours truly,
CHUNG & VANDER DOELEN ENGINEERING LTD.

Eric Y. Chung, M.Eng., P.Eng.
Principal Engineer

TABLE OF CONTENTS

ENCLOSURES

1.0 INTRODUCTION

CHUNG & VANDER DOELEN ENGINEERING LTD. (CVD) has been retained by Boban Developments National Ltd. to carry out a geotechnical investigation for the proposed Lynn River Heights Phase II residential development, which is located on Part of Lot 8, Concession 2, Norfolk County on the west edge of the Town of Port Dover, Ontario. The proposed subdivision is located to the west of the Phase I development which is being serviced and new homes being constructed.

This ±40 ha site is bounded by the Phase I development to the east, Highway 6 to the south, farmland to the west and a treed slope to the north. The river valley slope is approximately 16 m high. The Lynn River is located approximately 70 m from the toe of the slope at the easterly limit of the proposed Phase II development and this distance increases towards the westerly limit of the site.

The proposed Phase II subdivision development will be serviced by municipal water, sanitary and storm sewers. Storm water management blocks are proposed along the southern limits of the site.

The purpose of this investigation has been to determine the subsurface conditions and relevant soil properties at the subject site, in order to provide recommendations for the geotechnical design and construction of the proposed roads, sewers, residential foundations and the storm water management areas. The stability of the river valley slope is also assessed in order to address the slope setback requirements for the residential development.

CVD conducted the geotechnical investigation for the Phase I development and presented the findings in our report File No.: 01-10-K7 dated December 7, 2001. During the servicing and road construction of the Phase I development, CVD was present to provide geotechnical inspection and testing services. The information obtained in the Phase I development will be used to supplement the present investigation.

2.0 FIELD WORK

A site reconnaissance was conducted by the project engineer on March 22, 2006 to examine the stability condition of the valley slope.

The field work for this project was carried out on March 30, 2006 and consisted of putting down twenty-four (24) test pits across the site. The test pit locations are shown on the Test Pit Location Plan, Drawing No. 1. The test pits were excavated with a large excavator to depths of 0.6 to 4.0 m below existing ground surface under the supervision of a field engineer from CVD who logged the soil stratigraphy, monitored the groundwater condition and secured soil samples for laboratory testing.

The locations of the test pits were established in the field by CVD personnel. Their ground surface elevations were extrapolated from a spot elevation plan supplied by L.A. Girard Engineering (Ontario) Ltd.

Limited laboratory testing was carried out to confirm field classification, as the soils are similar to those encountered in the Phase I development. One (1) grain size distribution analysis was carried out on the predominant clayey silt deposit, and the results are presented graphically in Enclosure 25.

3.0 SITE CONDITION

The site has an area of approximately 40 ha and is presently cultivated. The area surrounding the farmstead (located at the southwest corner of the site) is topographically high (near Elevation 210.0 m). From this area, surface grades slope down gently to the north, east and south (near Elevation 198± m adjacent to Highway 6). A small pond, understood to be fed by a well, is located at the center of the site. A network of surface drainage swales has been formed between the topographically high areas and conveys surface water to the north, over the valley slope to the Lynn River. It is understood that field tiles exist across the site for field drainage purposes.

An ariel photograph of the site is shown in provided in Appendix "B".

4.0 VALLEY SLOPE CONDITION

The existing valley slope is located at the northern development limit and is covered by mature trees and thick undergrowth. The slope is the westerly continuation of that of the Phase I development and is similar in vegetation cover, slope angles, drainage and seepage conditions. There are several noticeable erosion gullies (some 1 to 3 m deep) cut into the slope face by surface runoff.

Appendix "B" also presents five (5) cross-sections of the valley slope surveyed and supplied by the client, and photographs of it conditions.

The crest of the slope varies in elevations from 200 to 206 m, generally increasing in elevation towards the westerly property limit. Based on the cross-sections, the highest valley slope is 16 m. The steepest section is near the easterly limit of Phase II, where the upper 8 to 10 m section is standing at typical inclinations of ± 3 H to 1 V, while the lower 6 to 8 m section between 6 and 8 H to 1 V. In general, the trees are standing vertical. No signs of any past and present slope instability were observed.

Seepage zones were observed (during our March 22, 2006 site reconnaissance) on the slope surfaces near elevation ±190 m, at approximately 8 to 10 m below the top of the slope (i.e., at the base of the upper 3 H : 1 V section). Cedar trees and wetland related vegetation grow along the lower slope section.

It is noted that Borehole 2 of the previous investigation (located approximately 45 m east of the easterly limit of the site) recorded water level at 10.5 m depth (elevation 188.6 m) in November 2001. The measured water level typically reflects the underlying saturated silty sand to silt deposit.

A flood plain exists between the toe of the upper slope section and the Lynn River. The width of the flood plain is ±70 m from the toe of the upper slope section at the easterly limit of Phase II and this distance increases towards the westerly limit of the site.

5.0 SUBSURFACE SOIL CONDITION

The subsurface soil and ground water conditions encountered in the test pits are provided on Enclosures 1 to 24, inclusive. The Log of Test Pit sheets contain detailed soil descriptions, inferred soil stratigraphy and groundwater observations.

In general, the site is covered by a topsoil veneer underlain by silty sand, sandy silt to silt over the higher western third of the site (including the existing farmstead and the pond area) and then clayey silt to the maximum depths of the test pits.

5.1 TOPSOIL

Surficial topsoil was contacted at all test pit locations with measured thickness varying between 175 and 700 mm, typically between 200 and 350 mm. The thicker topsoil layers, 500 to 700 mm, were contacted at Test Pits 5, 15 and 21. At Test Pit 13, topsoil fill with wood extended to 500 mm depth.

5.2 SILTY SAND TO SILT

Below the topsoil layer over the western portion o f the site, Test Pits 4, 5, 6, 13, 14, 15, 16, 17, and 18, contacted fine granular soils consisting of silty sand, sandy silt and silt to depths of 0.5 to 2.1 m.

Based on manual probing and the excavation resistence, these fine granular soils were assessed to exhibit loose compactness condition. Natural moisture contents of these soils indicate typically damp to moist moisture condition.

5.3 CLAYEY SILT

The predominant clayey silt deposit was typically brown in colour, but changed grey some 3 m below the ground surface. In general, the upper stratum was in firm to stiff consistency and moist, becoming a very stiff to hard consistency and damp 1.5 to 3.0 m below existing ground surface.

A typical grain size distribution of the clayey silt is provided on Enclosure 25

6.0 GROUND WATER CONDITION

During the excavation of the test pits, the groundwater condition was monitored. Test Pits 1, 4, 5, 13 and 17 encountered seepage at depths between 0.6 and 1.05 m depths. The seepage emanated from the upper topsoil or the fine granular layers, and this observation is typical of the spring condition. The balance of the test pits remained dry and open at completion of excavation.

Seepage zones were observed on the slope surfaces near elevation ±190 m, at approximately 8 to 10 m below the top of the slope (i.e., at the base of the upper 3 H : 1 V section). Seepage zones were not observed over the higher western portion of the site where fine granular soils exist near the ground surface, nor around the existing pond.

Seasonal fluctuations of the ground water table should be expected.

7.0 DISCUSSION AND RECOMMENDATIONS

7.1 GENERAL

The proposed Phase II residential subdivision will have full municipal services including storm sewers, sanitary sewers and water main. The depths of the sewers are expected to be in the order of 3 to 4 m. It is understood that only minimal cut and fill are expected to achieve the design grades.

7.2 SITE GRADING

The preliminary grading concept for the site will involve cutting at the higher wester portion of the site and filling at the southern and southeastern portions of the site. It is noted that the site is transversed by many drainage swales for drainage of the surface water. Experience with the Phase I development indicates that soft and wet materials may be encountered within these swales.

7.2.1 Reuse of Cut Materials

It is expected that the predominant cut materials will be the sandy silt, silty sand and clayey silt soils. The cut materials can be reused for fill areas. However, it is advisable to carry out the site grading in the drier summer months as the silty to clayey soils will be difficult to handle when they are wet.

7.2.2 Site Grading Procedures

The fill materials should be suitably compacted in order to support future roadways, buildings and houses. The following procedures are recommended for the construction of the fill areas.

1. All topsoil, soft and wet soils and any deleterious fill materials are to be stripped from building and road areas.

2. The exposed subgrade surface should be proof-rolled with a heavy vibratory compactor and inspected by a qualified geotechnical inspector. Any soft spots encountered during the process should be excavated to the level of competent soil.

3. The required grades can then be achieved by placing approved fill soils in maximum 200 to 300mm thick lifts, compacted to 95% standard Proctor maximum dry density (SPMDD) in roadway areas and to 98% SPMDD under the future house lot and building foundations. The limit of the engineered fill to be placed to support future structural loads and foundations should extend horizontally a distance at least equal to the depth

of fill to be placed.

4. The on-site cut soils from the high areas of the site are suitable fill materials. Overly wet and organic materials should be placed in the backyard and in non-structural areas where 90% SPMDD is adequate.

5. All backfilling and compaction operations should be supervised by qualified geotechnical inspectors to approve material and ensure the specified degree of compaction has been obtained.

7.3 UNDER GROUND SERVICES

The invert depths of the proposed sewers and watermain have not been finalized, but are expected to be some 3 to 4 m below finished grades for most portions of the subdivision. The trench excavation will intersect native and/or re-compacted sandy silt, silty sand and clayey silt soils.

7.3.1 Excavation Conditions

The results of the field work indicate that trenching can be carried out using conventional open cut procedures. Excavation side slopes should comply with The Ontario Occupational Health and Safety Act. The native soils and re-compacted fill can be classified as Type 2 soils in which near vertical side slopes may be employed in the lower 1.2 m of the trench and then trimmed back to 1 horizontal to 1 vertical provided that ground water seepage is adequately controlled.

Where sand and silt soils are encountered, the side slopes should be cut to 1 horizontal to 1 vertical throughout. If seepage or ground water is encountered, they must be controlled by suitable means, or side slopes cut to stable angles of 2 horizontal to 1 vertical. The geotechnical engineer should be retained to examine and inspect cut slopes to ensure construction safety.

No major problems due to ground water are expected within the shallow 3 to 4 m deep excavations. Perched and surface runoff may be controlled by local sump pits and pumping when and where necessary.

7.3.2 Pipe Bedding

In general, no bearing problems are anticipated for flexible and rigid pipes founded in the native soil deposits or re-compacted on-site soils. Bedding should be in accordance with Ontario Provincial Standard Drawings OPSD - 802.010

It is recommended that bedding material be consisted of a minimum 150 mm thick layer of OPSS Granular "A" or well-graded 19 mm crushed stone. This thickness should be increased to ¼ of the pipe diameter for larger pipes, to a maximum of 300 mm.

The bedding material should be placed in thin lifts and compacted to at least 95% SPMDD. Particular attention should be given to ensure material placed beneath the haunches of the pipe is adequately compacted.

7.3.3 Trench Backfill

The natural moisture contents of the majority of the excavated soils are within 3% of the optimum moisture content and therefore suitable for backfilling the trench excavations.

The backfill around the pipe to a height of 300 mm above the obvert should be imported sand or Granular "A", similar to the bedding material.

All backfill should be placed into the trenches in 200 to 300 mm thick layers and compacted to a minimum 95% SPMDD. It is expected that some loss of moisture will take place during excavation, stockpiling and backfilling and this will facilitate backfilling and compaction. Overly wet materials can be mixed with the drier soils to achieve a more compactable soil mixture.

It has been our experience that the excavated clayey silt soils should be broken into smaller pieces (less than 150 mm diameter) before returning into the trench as backfill. This will eliminate "wedging" problems and reduce long term settlement. Particular attention must be made to backfilling the laterals where the trenches are narrow. Thinner lifts and additional compaction must be applied.

To minimize potential problems, backfilling operations should follow closely after excavation so that only a minimal length of trench slope is exposed at any one time. This will minimize wetting up of the subgrade and backfill material. Should construction extend into the winter season, particular attention should be given to make sure frozen material is not used as backfill.

Frequent inspection by experienced geotechnical personnel should be carried out to examine and approve backfill material, to carefully inspect placement, and to verify that the specified degree of compaction has been obtained by in situ density testing.

7.4 PAVEMENT DESIGN AND CONSTRUCTION

Based on the results of the field work, the predominant subgrade materials at the site will consist of native and re-compacted silt to clayey silt materials. The proposed subdivision roads will be designed as local residential streets.

The following flexible pavement structure is recommended based on the results of gradation analyses, assumed CBR values, ground water table, frost susceptibility of subgrade soils and traffic volume.

HL3 Surface Asphaltic Concrete	**40 mm**
HL8 Binder Asphaltic Concrete	**50 mm**
Granular "A" Base	**150 mm**
Granular "B" Sub-base **(Crushed quarry material)**	**300 mm**

The pavement design considers that road construction will be carried out during the drier time of the year and that the subgrade is stable, not heaving under construction equipment traffic. If the subgrade is wet or unstable, additional granular sub-base may be required.

Prior to placement of the granular base, the subgrade should be prepared in accordance with the recommendations outlined in Section 7.2, Site Grading, and the Section 7.3.3, Trench Backfill.

The base and sub-base materials should be produced in accordance with the current OPSS Specifications, and placed and uniformly compacted to at least 100% SPMDD. The placing and rolling of the asphalt mixture should conform to OPSS Form 310 or equivalent.

It should be noted that even well-compacted silt and clay trench backfill could settle for a period of time after construction. In this regard, the surface course of the asphaltic concrete should be placed at least one (1) year after trench backfill is completed so as to allow any minor settlements to occur within the trench backfill. The incomplete pavement structure may not be capable of supporting construction traffic. Consequently, minor repair of the sub-base, base and asphaltic concrete may be required prior to paving with the base course and/or the surface course asphaltic concrete.

7.5 FOUNDATIONS

7.5.1 Building Foundation

The native soils encountered at the site are competent to support building foundations. Building foundations can be founded on native competent soils or well-compacted engineered fill. The approved engineered fill constructed as per the procedures in Section 7.2 can be used to support footing foundations designed to a net soil bearing pressure of up to 120 kPa (2500 psf)

Footing subgrade inspections are recommended to verify the bearing capacity of the soil prior to placement of the forms and concrete for the building foundations.

7.5.2 Lateral Earth Pressure

The basement walls and any other soil retaining structures should be designed to resist the lateral earth pressure acting against these walls. The following formula may be used for these calculations.

$$P = K(\gamma H + q)$$

where: P =	lateral earth pressure	kPa
K =	at rest earth pressure coefficient (0.4 for free draining granular material)	
γ =	unit weight of granular backfill	22 kN/m^3
H =	unbalanced height of wall	m
q =	surcharge load at ground surface	kPa

The native silt and clayey silt deposits are not free-draining. In accordance with the OBC requirement, a drainage core layer should be installed against foundation walls. The basement wall should be damp-proofed. Sump pump installation and foundation weeping tile installation are also required.

7.6 STORM WATER MANAGEMENT

The storm water management (SWM) blocks are to be located at the southern portion of the site. This area is predominantly underlain by a clayey silt deposit. One (1) grain size distribution analysis was conducted on the native clayey silt and the results are graphically presented on Enclosure 25.

The clayey silt soils will have permeability of the order of 1 x 10^{-6} to 1 x 10^{-7} cm/sec and is considered to be relatively impervious soils. It should be noted that these permeabilities are given for native undisturbed soil deposits. Where the site will be filled, the soil materials will be mixed and compacted, and consequently the permeability will be decreased substantially.

7.7 SLOPE STABILITY CONSIDERATION

7.7.1 Stability Analysis

Reference is made to the geotechnical investigation for the Phase I development, File No.: 01-10-K7 dated December 7, 2001 and the five (5) cross-sections of the valley slope in Appendix "B".

Based on during our March 22, 2006 site reconnaissance, the valley slope being studied is the westerly continuation of that of the Phase I development and is similar in vegetation cover, slope angles, drainage and seepage conditions.

The top of the slope varies in elevations from 200 to 206 m, generally increasing in elevation towards the westerly property limit. Based on cross-sections, the highest valley slope is 16 m. The steepest section is near the easterly limit of Phase II, where the upper 8 to 10 m section is standing at typical inclinations of ± 3 H to 1 V, while the lower 6 to 8 m section between 6 and 8 H to 1 V. The subject valley slope is covered by mature trees and thick undergrowth. In general, the trees are standing vertical. No signs of any past and present slope instability were observed.

Seepage zones were observed on the slope surfaces near elevation ±190 m, at approximately 8 to 10 m below the crest of the slope (i.e., at the base of the upper 3 H : 1 V section). Cedar trees and wetland related vegetation grow along the lower slope section.

It is noted that Borehole 2 of the previous investigation is located approximately 45 m east of the easterly limit of the site. The results of the slope stability analyses of the previous investigation indicate that the overall lowest factor of safety is in the order of 1.44 to 1.65. The most critical failure surface occurs in the lower saturated silty sand to silt layers in the form of shallow slips. It is noted that the cedar trees and vegetation growing along the toe of the upper slope will add 10 to 20% to the safety factor due to the root structure holding the surficial soils. The upper cohesive clayey silt to silty clay deposit has a factor of safety well over 2.

To summarize, the existing slope is stable with a sufficient factor of safety (over 1.5) against slope failure. The proposed residential construction will not negatively affect the existing stability of the valley slope.

7.7.2 Setback Considerations for Site Development

The results of the slope stability assessment are applied to determine the setback requirements for constructing residential dwellings at the top of the slope. Reference is made to the Erosion Hazard Limit of the Natural Hazards Training Manual (Policy 3.1).

It is noted that there are three(3) setback allowances for developing adjacent to a natural slope, namely the Toe Erosion Allowance, Stable Slope Allowance and the Erosion Access Allowance.

A flood plain exists between the toe of the upper slope and the Lynn River. The width of the flood plain is ±70 m from the toe of the upper slope at the easterly limit of Phase II and this distance increases towards the westerly limit of the site. Therefore, Toe Erosion Allowance is not required.

The existing slope is assessed to be stable (with a factor of safety of over 1.5) and therefore no additional Stable Slope Allowance is required.

Consequently, it is recommended that the minimum 6 m Erosion Access Allowance should be applied to the top of the slope, and any structures should be constructed at least 6 m from the defined top of slope line.

7.7.3 Design Considerations for Site Development

The previous section provides an estimate of the slope stability. The condition will change if the slope is altered (i.e., if fill is placed on the slope, if water is drained down the slope or if the vegetation is removed from the slope).

Recommendations concerning design and construction of the proposed project are provided herein.

1. No vegetation at the top of slope and on the slope face is to be removed or damaged due to construction activities. The top of the slope should be cordoned off to prevent any accidental damage to the vegetation.
2. All reconstructed slope surfaces should be topsoiled and seeded/sodded to prevent surface erosion.
3. Surface water runoff should be directed to the front of the lots, and the roof waters should all be emptied to the street or the storm water system.
4. No concentrated flows are to be emptied onto the slope face. Any storm outlet that may drain down the slope must be done in a lined ditch or culvert. Failure to do so will result in erosion, removal of vegetation and an over-steepening of the slope, all of which will reduce the stability of the slope.

8.0 CLOSURE

The Limitations of this Report, as quoted in Appendix "A", is an integral part of this report.

We trust that the information presented in this report is complete within our terms of reference. If there are any further questions concerning this report, please do not hesitate to contact our office.

Yours truly,
CHUNG & VANDER DOELEN ENGINEERING LTD.

Eric Y. Chung, M.Eng., P.Eng.
Principal Engineer

LICENSED PROFESSIONAL ENGINEER
E.Y. CHUNG
8345506
April 24.06
PROVINCE OF ONTARIO

APPENDIX "A"

LIMITATIONS OF REPORT

The conclusions and recommendations given in this report are based on information determined at the testhole locations. Subsurface and groundwater conditions between and beyond the testholes may differ from those encountered at the testhole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Soils Engineer be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the testholes.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of testholes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusion as to how the subsurface conditions may affect their work.

The benchmark and elevations mentioned in this report were obtained strictly for use in the geotechnical design of the project and by this office only, and should not be used by any other parties for any other purposes.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. CHUNG & VANDER DOELEN ENGINEERING LIMITED accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

This report does not reflect the environmental issues or concerns unless otherwise stated in the report. The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, we recommend that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

Appendix "B"

Ariel Photograph, Cross-sections and Photographs

Ariel Photograph of Site

Photograph 1, Upper slope section at easterly limit of Phase II development

Photograph 2, Another view of the upper slope section

FILE No: 05-11-K11

TEST PIT No. 1

Enclosure No.: 1
Sheet 1 of 1

CHUNG & VANDER DOELEN
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ENGINEERING LTD.

Client: **Boban Developments National Ltd.**
Project: **Proposed Lynn River Heights Phase II**
Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA

Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

ELEV./ DEPTH (m)	SOIL LITHOLOGY: DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE: SAMPLE ID	TYPE	N-VALUE	SHEAR STRENGTH (kPa) FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200 PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80	WATER CONTENT (%) Wp W WL 10 20 30	WELL DATA	DEPTH (m)	REMARKS
	Ground Elevation: 375mm TOPSOIL										
0.38	Stiff brown mottled, fissured CLAYEY SILT trace gravel moist ------- damp very stiff to hard ----- grey	0.5 1.0 1.5 2.0 2.5 3.0							▼	0.5 1.0 1.5 2.0 2.5 3.0	Trace seepage from fissures at 0.6 m depth
3.35	End of Test Pit	3.5 4.0 4.5								3.5 4.0 4.5	

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FILE No: 05-11-K11

TEST PIT No. 2

Enclosure No.: 2
Sheet 1 of 1

Client: **Boban Developments National Ltd.**

Project: **Proposed Lynn River Heights Phase II**

Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA

Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY				SAMPLE							
ELEV./ DEPTH (m)	DESCRIPTION Ground Elevation:	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	SHEAR STRENGTH (kPa) FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200 PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80	WATER CONTENT (%) W_P W W_L 10 20 30	WELL DATA	DEPTH (m)	REMARKS
	200mm TOPSOIL										
0.20	Stiff brown mottled, fissured CLAYEY SILT trace gravel moist ------- damp very stiff to hard	0.5 1.0 1.5 2.0 2.5 3.0								0.5 1.0 1.5 2.0 2.5 3.0	Test Pit dry at completion
3.05	End of Test Pit	3.5 4.0 4.5								3.5 4.0 4.5	

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FILE No: 05-11-K11

TEST PIT No. 3

Enclosure No.: 3
Sheet 1 of 1

Client:	**Boban Developments National Ltd.**
Project:	**Proposed Lynn River Heights Phase II**
Location:	**Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA

Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY | SAMPLE | SHEAR STRENGTH (kPa) | WATER CONTENT (%)

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200
PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80
WATER CONTENT (%): W_P W W_L ; 10 20 30

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	SHEAR STRENGTH (kPa)	WATER CONTENT (%)	WELL DATA	DEPTH (m)	REMARKS
	Ground Elevation: 200mm TOPSOIL										
0.20	Stiff brown mottled, fissured CLAYEY SILT trace gravel moist ------- damp very stiff to hard	0.5		1	BS					0.5	
		1.0								1.0	
		1.5		2	BS					1.5	
		2.0								2.0	
		2.5								2.5	
3.05	End of Test Pit	3.0								3.0	Test Pit dry at completion
		3.5								3.5	
		4.0								4.0	
		4.5								4.5	

ENGINEER: **Eric Chung**

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FILE No: 05-11-K11

TEST PIT No. 4

Enclosure No.: 4
Sheet 1 of 1

Client: **Boban Developments National Ltd.**

Project: **Proposed Lynn River Heights Phase II**

Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA

Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa) FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200 PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80	WATER CONTENT (%) W_P W W_L 10 20 30	WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION Ground Elevation:	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE					
	250mm TOPSOIL										
0.25	Orangy brown SANDY SILT moist to wet										
0.50	Very stiff to hard brown, mottled fissured CLAYEY SILT trace gravel	0.5								0.5	
		1.0							▼	1.0	Trace seepage from fissures at 0.9 m depth
		1.5								1.5	
		2.0								2.0	
		2.5								2.5	
	damp										
		3.0								3.0	
3.05	End of Test Pit										
		3.5								3.5	
		4.0								4.0	
		4.5								4.5	

ENGINEER: **Eric Chung**

FILE No: 05-11-K11

TEST PIT No. 5

Enclosure No.: 5
Sheet 1 of 1

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Client: **Boban Developments National Ltd.**
Project: **Proposed Lynn River Heights Phase II**
Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA
Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY / SAMPLE / SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □; 50 100 150 200 / PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○; 20 40 60 80 / WATER CONTENT (%): W_P W W_L; 10 20 30 / WELL DATA / DEPTH (m) / REMARKS

Ground Elevation:

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WELL DATA	REMARKS
	600mm TOPSOIL					
0.60	Loose orangy brown SANDY SILT moist to wet	1	BS			
1.05	Very stiff to hard brown, mottled fissured CLAYEY SILT trace gravel damp				▼	Trace seepage at 1.05 m depth
3.05	End of Test Pit					

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FILE No: 05-11-K11

TEST PIT No. 6

Enclosure No.: 6
Sheet 1 of 1

CHUNG & VANDER DOELEN CVD ENGINEERING LTD.

Client: **Boban Developments National Ltd.**

Project: **Proposed Lynn River Heights Phase II**

Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA

Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY | SAMPLE | SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □; 50 100 150 200 | PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○; 20 40 60 80 | WATER CONTENT (%): W_P W W_L; 10 20 30 | WELL DATA | DEPTH (m) | REMARKS

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
	Ground Elevation: 200mm TOPSOIL				
0.20	Brown SILT trace to some sand moist	1	BS		
0.60	Very stiff to hard brown, mottled fissured CLAYEY SILT trace gravel damp	2	BS		
3.05	End of Test Pit				Test Pit dry at completion

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FILE No: 05-11-K11

TEST PIT No. 7

Enclosure No.: 7
Sheet 1 of 1

CHUNG & VANDER DOELEN CVD ENGINEERING LTD.

Client: **Boban Developments National Ltd.**

Project: **Proposed Lynn River Heights Phase II**

Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA

Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY | SAMPLE | SHEAR STRENGTH (kPa) | WATER CONTENT (%) | WELL DATA | REMARKS

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ✕ LAB TEST: Unc. ■ P.P. ☐ — 50 100 150 200
PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ — 20 40 60 80
WATER CONTENT (%): W_P W W_L — 10 20 30

Ground Elevation:

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	WELL DATA	DEPTH (m)	REMARKS
	350mm TOPSOIL								
0.35	Stiff brown mottled, fissured CLAYEY SILT trace gravel moist ------- damp very stiff to hard	0.5 1.0 1.5 2.0 2.5						0.5 1.0 1.5 2.0 2.5	
3.05	End of Test Pit	3.0 3.5 4.0 4.5						3.0 3.5 4.0 4.5	Test Pit dry at completion

ENGINEER: **Eric Chung**

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FILE No: 05-11-K11

TEST PIT No. 8

Enclosure No.: 8
Sheet 1 of 1

CHUNG & VANDER DOELEN CVD ENGINEERING LTD.

Client: **Boban Developments National Ltd.**
Project: **Proposed Lynn River Heights Phase II**
Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA
Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY | SAMPLE | SHEAR STRENGTH (kPa) | WATER CONTENT (%)

FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

W_P W W_L
10 20 30

ELEV./ DEPTH (m)	DESCRIPTION Ground Elevation:	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE	WELL DATA	REMARKS
	200mm TOPSOIL						
0.20	Stiff brown mottled, fissured CLAYEY SILT trace gravel moist ------- damp very stiff to hard	0.5	1	BS			
		1.0	2	BS			
		1.5					
		2.0					
		2.5					
	---- grey, slightly plastic	3.0	3	BS			
3.35	End of Test Pit	3.5					Test Pit dry at completion
		4.0					
		4.5					

ENGINEER: **Eric Chung**

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CVD TEST PIT 05-11-K11.GPJ CVD_ENG.GDT 4/23/06

FILE No: 05-11-K11

TEST PIT No. 9

Enclosure No.: 9
Sheet 1 of 1

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CVD
ENGINEERING LTD.

Client: **Boban Developments National Ltd.**
Project: **Proposed Lynn River Heights Phase II**
Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA
Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

ELEV./ DEPTH (m)	SOIL LITHOLOGY DESCRIPTION Ground Elevation:	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	SHEAR STRENGTH (kPa) FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200 PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80	WATER CONTENT (%) W_P W W_L 10 20 30	WELL DATA	DEPTH (m)	REMARKS
	200mm TOPSOIL										
0.20	Stiff brown mottled, fissured CLAYEY SILT trace gravel moist ------- damp very stiff to hard	0.5 1.0 1.5 2.0 2.5 3.0								0.5 1.0 1.5 2.0 2.5 3.0	
3.20	End of Test Pit	3.5 4.0 4.5								3.5 4.0 4.5	Test Pit dry at completion

ENGINEER: **Eric Chung**

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FILE No: 05-11-K11

TEST PIT No. 10

Enclosure No.: 10
Sheet 1 of 1

CHUNG & VANDER DOELEN ENGINEERING LTD.
CVD

Client: **Boban Developments National Ltd.**
Project: **Proposed Lynn River Heights Phase II**
Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA
Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY | SAMPLE | SHEAR STRENGTH (kPa) | WATER CONTENT (%)

FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

W_P W W_L
10 20 30

ELEV./ DEPTH (m)	DESCRIPTION Ground Elevation:	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	WELL DATA	DEPTH (m)	REMARKS
	200mm TOPSOIL								
0.20	Stiff brown mottled, fissured CLAYEY SILT trace gravel moist ------- damp very stiff to hard	0.5 1.0 1.5 2.0 2.5 3.0						0.5 1.0 1.5 2.0 2.5 3.0	Test Pit dry at completion
3.05	End of Test Pit	3.5 4.0 4.5						3.5 4.0 4.5	

ENGINEER: **Eric Chung**

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FILE No: 05-11-K11

TEST PIT No. 11

Enclosure No.: 11
Sheet 1 of 1

CHUNG & VANDER DOELEN CVD ENGINEERING LTD.

Client: **Boban Developments National Ltd.**
Project: **Proposed Lynn River Heights Phase II**
Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA
Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY | SAMPLE | SHEAR STRENGTH (kPa) | WATER CONTENT (%) | WELL DATA | DEPTH (m) | REMARKS

FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

W_P W W_L
10 20 30

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	REMARKS
	Ground Elevation: 200mm TOPSOIL						
0.20	Stiff brown mottled, fissured CLAYEY SILT trace gravel moist ------- damp very stiff to hard	0.5 1.0 1.5 2.0 2.5 3.0					
3.20	End of Test Pit	3.5 4.0 4.5					Test Pit dry at completion

CVD TEST PIT 05-11-K11.GPJ CVD_ENG.GDT 4/23/06

ENGINEER: **Eric Chung**

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FILE No: 05-11-K11

TEST PIT No. 12

Enclosure No.: 12
Sheet 1 of 1

CHUNG & VANDER DOELEN ENGINEERING LTD. CVD

Client: **Boban Developments National Ltd.**
Project: **Proposed Lynn River Heights Phase II**
Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA
Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY | SAMPLE | SHEAR STRENGTH (kPa) | WATER CONTENT (%) | WELL DATA | DEPTH (m) | REMARKS

FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

W_P W W_L
10 20 30

Ground Elevation:

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE	REMARKS
	250mm TOPSOIL					
0.25	Stiff brown mottled, fissured CLAYEY SILT trace gravel moist ------- damp very stiff to hard ---------- occ. silt pockets/lenses	0.5 1.0 1.5 2.0 2.5 3.0				
3.35	End of Test Pit	3.5 4.0 4.5				Test Pit dry at completion

ENGINEER: **Eric Chung**

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ENGINEERING LTD.
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FILE No: 05-11-K11

TEST PIT No. 13

Enclosure No.: 13
Sheet 1 of 1

CHUNG & VANDER DOELEN
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Client: **Boban Developments National Ltd.**

Project: **Proposed Lynn River Heights Phase II**

Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA

Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY | SAMPLE | SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □; 50 100 150 200 | PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○; 20 40 60 80 | WATER CONTENT (%): W_P W W_L; 10 20 30

Ground Elevation:

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	WELL DATA	DEPTH (m)	REMARKS
	100mm TOPSOIL then fine sand FILL some silt trace organics and wood						
0.50	Loose orangy brown Fine SAND some silt moist to saturated	1	BS		▼	1.0	Trace seepage at 1.05 m depth
1.20	Very stiff to hard brown, mottled fissured CLAYEY SILT trace gravel damp						
3.65	End of Test Pit						

ENGINEER: **Eric Chung**

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FILE No: 05-11-K11

TEST PIT No. 14

Enclosure No.: 14
Sheet 1 of 1

CHUNG & VANDER DOELEN
CVD
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Client: **Boban Developments National Ltd.**
Project: **Proposed Lynn River Heights Phase II**
Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA
Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY			SAMPLE			SHEAR STRENGTH (kPa)	WATER CONTENT (%)	WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION Ground Elevation:	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200 PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80	W_P W W_L 10 20 30			
	375mm TOPSOIL									
0.38	Loose orangy brown Fine SAND, some silt to SILTY SAND damp to moist	0.5							0.5	
		1.0	1	BS					1.0	
1.35	Compact brown SANDY SILT trace clay damp	1.5	2	BS					1.5	
2.10	Very stiff brown CLAYEY SILT trace sand and gravel damp	2.0 2.5 3.0 3.5							2.0 2.5 3.0 3.5	
4.00	End of Test Pit	4.0 4.5							4.0 4.5	Test Pit dry at completion

CVD TEST PIT 05-11-K11.GPJ CVD_ENG.GDT 4/23/06

ENGINEER: **Eric Chung**

CHUNG & VANDER DOELEN
ENGINEERING LTD.
280 Victoria Street North, Unit 8
Kitchener, Ontario N2H 5E2
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FILE No: 05-11-K11

TEST PIT No. 15

Enclosure No.: 15
Sheet 1 of 1

Client: **Boban Developments National Ltd.**
Project: **Proposed Lynn River Heights Phase II**
Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA
Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)	WATER CONTENT (%)			
ELEV./ DEPTH (m)	DESCRIPTION Ground Elevation:	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200 PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80	W_P W W_L 10 20 30	WELL DATA	DEPTH (m)	REMARKS
	700mm TOPSOIL										
0.70	Loose orangy brown Fine SAND, some silt to SILTY SAND damp to moist										
1.20	Firm brown CLAYEY SILT										
		1.5		1	BS					1.5	
	moist to very moist ---------------- damp stiff to very stiff										
3.65	End of Test Pit										Test Pit dry at completion

ENGINEER: **Eric Chung**

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FILE No: 05-11-K11

TEST PIT No. 16

Enclosure No.: 16
Sheet 1 of 1

CHUNG & VANDER DOELEN CVD ENGINEERING LTD.

Client: **Boban Developments National Ltd.**
Project: **Proposed Lynn River Heights Phase II**
Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA
Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

Ground Elevation:

ELEV./ DEPTH (m)	DESCRIPTION	SAMPLE ID	TYPE	N-VALUE	REMARKS
	350mm TOPSOIL				
0.35	Loose orangy brown SILTY SAND damp to moist	1	BS		
1.05	Stiff to very stiff brown CLAYEY SILT damp				
3.05	End of Test Pit				Test Pit dry at completion

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

ENGINEER: **Eric Chung**

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CVD TEST PIT 05-11-K11.GPJ CVD_ENG.GDT 4/23/06

FILE No: 05-11-K11

TEST PIT No. 17

Enclosure No.: 17
Sheet 1 of 1

CHUNG & VANDER DOELEN
CVD
ENGINEERING LTD.

Client: **Boban Developments National Ltd.**
Project: **Proposed Lynn River Heights Phase II**
Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA
Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY | SAMPLE | SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □; 50 100 150 200 | PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○; 20 40 60 80 | WATER CONTENT (%): W_P W W_L; 10 20 30 | WELL DATA | DEPTH (m) | REMARKS

Ground Elevation:

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE	WELL DATA	REMARKS
	375mm TOPSOIL						
0.38	Loose orangy brown SILTY SAND damp to wet	0.5					
1.05	Firm brown SILT moist to very moist ---------------- damp stiff	1.0				▼	Trace seepage at 1.05 m depth
3.35	End of Test Pit	3.5					

ENGINEER: **Eric Chung**

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ENGINEERING LTD.
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Kitchener, Ontario N2H 5E2
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CVD TEST PIT 05-11-K11.GPJ CVD_ENG.GDT 4/23/06

FILE No: 05-11-K11

TEST PIT No. 18

Enclosure No.: 18
Sheet 1 of 1

Client: **Boban Developments National Ltd.**

Project: **Proposed Lynn River Heights Phase II**

Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA

Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa) FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200 PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80	WATER CONTENT (%) W_P W W_L 10 20 30			
ELEV./ DEPTH (m)	DESCRIPTION Ground Elevation:	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE			WELL DATA	DEPTH (m)	REMARKS
	Loose orangy brown Fine SAND, some silt to SILTY SAND damp to moist										
1.00	Stiff brown CLAYEY SILT trace gravel ------------ occ. silt lenses damp to moist										
3.65	End of Test Pit										Test Pit dry at completion

ENGINEER: **Eric Chung**

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ENGINEERING LTD.
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Kitchener, Ontario N2H 5E2
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: 05-11-K11

TEST PIT No. 19

Enclosure No.: 19
Sheet 1 of 1

CHUNG & VANDER DOELEN ENGINEERING LTD.

Client: **Boban Developments National Ltd.**
Project: **Proposed Lynn River Heights Phase II**
Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA
Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY | SAMPLE | SHEAR STRENGTH (kPa) FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200 | PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80 | WATER CONTENT (%) W_P W W_L 10 20 30 | WELL DATA | REMARKS

ELEV./ DEPTH (m)	DESCRIPTION Ground Elevation:	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	DEPTH (m)	REMARKS
	175mm TOPSOIL							
0.18	Stiff brown mottled, fissured CLAYEY SILT trace gravel moist ------- damp very stiff to hard	0.5 1.0 1.5 2.0 2.5 3.0					0.5 1.0 1.5 2.0 2.5 3.0	Test Pit dry at completion
3.05	End of Test Pit	3.5 4.0 4.5					3.5 4.0 4.5	

ENGINEER: **Eric Chung**

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ENGINEERING LTD.
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FILE No: 05-11-K11

TEST PIT No. 20

Enclosure No.: 20
Sheet 1 of 1

CHUNG & VANDER DOELEN CVD ENGINEERING LTD.

Client: **Boban Developments National Ltd.**
Project: **Proposed Lynn River Heights Phase II**
Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA
Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)	WATER CONTENT (%)			
ELEV./ DEPTH (m)	DESCRIPTION Ground Elevation:	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200 PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80	W_P W W_L 10 20 30	WELL DATA	DEPTH (m)	REMARKS
	175mm TOPSOIL										
0.18	Stiff brown mottled, fissured CLAYEY SILT trace gravel moist ------- damp very stiff to hard	0.5 1.0 1.5 2.0 2.5 3.0								0.5 1.0 1.5 2.0 2.5 3.0	
3.20	End of Test Pit	3.5 4.0 4.5								3.5 4.0 4.5	Test Pit dry at completion

CVD TEST PIT 05-11-K11.GPJ CVD_ENG.GDT 4/23/06

ENGINEER: **Eric Chung**

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FILE No: 05-11-K11

TEST PIT No. 21

Enclosure No.: 21
Sheet 1 of 1

CHUNG & VANDER DOELEN
CVD
ENGINEERING LTD.

Client: **Boban Developments National Ltd.**

Project: **Proposed Lynn River Heights Phase II**

Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA

Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SHEAR STRENGTH (kPa): FIELD VANE: Peak ⊗ Rem. × ; LAB TEST: Unc. ■ P.P. □ ; 50 100 150 200

PENETRATION RESISTANCE: STANDARD ● DYN. CONE ○ ; 20 40 60 80

WATER CONTENT (%): W_P W W_L ; 10 20 30

SOIL LITHOLOGY		SAMPLE				
ELEV./ DEPTH (m)	DESCRIPTION Ground Elevation:	SAMPLE ID	TYPE	N-VALUE	WELL DATA	REMARKS
	600mm TOPSOIL					
0.60	Stiff brown CLAYEY SILT					
		1	BS			
	------ grey					
	damp to moist					
3.35	End of Test Pit					Test Pit dry at completion

CVD TEST PIT 05-11-K11.GPJ CVD_ENG.GDT 4/23/06

ENGINEER: **Eric Chung**

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ENGINEERING LTD.
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FILE No: 05-11-K11

TEST PIT No. 22

Enclosure No.: 22
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CHUNG & VANDER DOELEN ENGINEERING LTD.
CVD

Client: **Boban Developments National Ltd.**
Project: **Proposed Lynn River Heights Phase II**
Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA
Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa) FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200 PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80	WATER CONTENT (%) W_P W W_L 10 20 30	WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION Ground Elevation:	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE					
	350mm TOPSOIL										
0.35	Stiff brown mottled, fissured CLAYEY SILT trace gravel moist ------- damp very stiff to hard	0.5 1.0 1.5 2.0 2.5								0.5 1.0 1.5 2.0 2.5	
3.05	End of Test Pit	3.0 3.5 4.0 4.5								3.0 3.5 4.0 4.5	Test Pit dry at completion

ENGINEER: **Eric Chung**

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FILE No: 05-11-K11

TEST PIT No. 23

Enclosure No.: 23
Sheet 1 of 1

CHUNG & VANDER DOELEN
CVD
ENGINEERING LTD.

Client: **Boban Developments National Ltd.**
Project: **Proposed Lynn River Heights Phase II**
Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA
Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY | SAMPLE | SHEAR STRENGTH (kPa) FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200 | PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80 | WATER CONTENT (%) W_P W W_L 10 20 30

ELEV./ DEPTH (m)	DESCRIPTION Ground Elevation:	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	WELL DATA	DEPTH (m)	REMARKS
	175mm TOPSOIL								
0.18	Stiff brown mottled, fissured CLAYEY SILT trace gravel moist ------- damp very stiff to hard	0.5 1.0 1.5 2.0 2.5 3.0						0.5 1.0 1.5 2.0 2.5 3.0	
3.20	End of Test Pit	3.5 4.0 4.5						3.5 4.0 4.5	Test Pit dry at completion

ENGINEER: **Eric Chung**

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ENGINEERING LTD.
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Kitchener, Ontario N2H 5E2
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FILE No: 05-11-K11

TEST PIT No. 24

Enclosure No.: 24
Sheet 1 of 1

Client: **Boban Developments National Ltd.**
Project: **Proposed Lynn River Heights Phase II**
Location: **Part of Lot 8, Conc. 2, Norfolk County (Port Dover)**

EQUIPMENT DATA
Machine: **Excavator**
Method: **Excavator**
Size:
Date: **Mar 30 06** TO **Mar 30 06**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)	WATER CONTENT (%)	WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION Ground Elevation:	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200 PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80	W_P W W_L 10 20 30			
	300mm TOPSOIL										
0.30	Stiff brown CLAYEY SILT moist	0.5								0.5	Test Pit dry at completion
0.60	End of Test Pit	1.0								1.0	
		1.5								1.5	
		2.0								2.0	
		2.5								2.5	
		3.0								3.0	
		3.5								3.5	
		4.0								4.0	
		4.5								4.5	

ENGINEER: **Eric Chung**

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CVD TEST PIT 05-11-K11.GPJ CVD_ENG.GDT 4/23/06

CHUNG & VANDER DOELEN
ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1
519-742-8979

May 19, 2017
File No.: E16286

Community Planning, Development & Cultural Services,
County of Norfolk
185 Robinson Street, Suite 200
Simcoe, Ontario N3Y 5L6

Attention: Ms. Shannon Van Dalen, Senior Planner

Re: **Phase I ESA Report (August 4, 2016)**
Proposed Lynn River Heights
Phase II Residential Development
Part of Lot 8, Concession 2, Norfolk County
Town of Port Dover

As requested, we hereby confirm that, notwithstanding any statement made in the Report that County of Norfolk may rely on the Report (including, without limitation, the findings and opinions expressed therein) which was prepared by CHUNG & VANDER DOELEN ENGINEERING LTD., as if it were an original addressee/recipient of the Report.

Yours truly,
CHUNG & VANDER DOELEN ENGINEERING LTD.

Eric Y. Chung, M.Eng., P.Eng.
Principal Engineer

CHUNG & VANDER DOELEN ENGINEERING LTD.
Geotechnical Engineering, Construction Inspecting
& Testing, Environmental Services

280 Victoria Street North, Unit # 8
Kitchener, Ontario, N2H 5E2
Telephone: 519-742-8979
Facsimile: 519-742-7739
E-Mail: cvd@bellnet.ca

PHASE I ENVIRONMENTAL SITE ASSESSMENT
PART OF LOT 8, CONCESSION 2
NORFOLK COUNTY
TOWN OF PORT DOVER, ONTARIO

Submitted to:

Lynn River Heights Inc.
1201 Ratcliffe Drive
Cambridge, Ontario
N3E 1B3

Attention: Mr. Joe Mihalj

Submitted by:

CHUNG & VANDER DOELEN ENGINEERING LTD.
280 Victoria Street North - Unit 8
Kitchener, Ontario
N2H 5E2

File No.: 05-11-K11
May 12, 2006

CHUNG & VANDER DOELEN ENGINEERING LTD.

Geotechnical Engineering, Construction Inspecting & Testing, Environmental Services

280 Victoria Street North, Unit # 8
Kitchener, Ontario, N2H 5E2
Telephone: 519-742-8979
Facsimile: 519-742-7739
E-Mail: cvd@bellnet.ca

May 12, 2006
File No.: 05-11-K11

Lynn River Heights Inc.
1201 Ratcliffe Drive
Cambridge, Ontario
N3E 1B3

Attention: Mr. Joe Mihalj

Re: **PHASE I ENVIRONMENTAL SITE ASSESSMENT**
PART OF LOT 8, CONCESSION 2
NORFOLK COUNTY
TOWN OF PORT DOVER, ONTARIO

We take pleasure in enclosing four (4) copies of our Phase I ESA report conducted for the above-referenced property.

If you have any questions or clarifications are required, please contact the undersigned at your convenience.

We thank you for giving us this opportunity to be of service to you.

Yours truly,

CHUNG & VANDER DOELEN ENGINEERING LTD.

Michael J. Lefebvre, P.Geo.
Manager, Environmental Services

EXECUTIVE SUMMARY

CHUNG & VANDER DOELEN ENGINEERING LTD. (CVD) was retained by Mr. Joe Mihalj of Lynn River Heights Inc., to conduct a Phase I Environmental Site Assessment (ESA) of the proposed residential development at Part of Lot 8, Concession 2, Norfolk County, in the Town of Port Dover, Ontario (hereinafter referred to as the "Site").

The purpose of the Phase I ESA was to identify actual or potential sources of contamination associated with the subject property. It is CVD's understanding that this Phase I ESA is part of the due diligence requirements to support the future purchase and/or development of the Site.

The Site is located on the north side of County Road 6, just west of the newly developed residential subdivision situated on Part Lot 9, in an area of predominantly residential and agricultural land uses. The Site is approximately 100 acres in area. The property is improved with a 2-storey farmhouse, constructed circa 1890. A barn and three sheds are situated immediately north of the dwelling. Three grain bins and an accompanying shed are located southwest of the dwelling. The remainder of the Site is actively farmed agricultural land, with the exception of a narrow band of forest along the northern property boundary. The Site slopes generally downwards to the east. The forested northern portion, slopes downwards to the Lynn River, to the northeast. The farmhouse, located on a southwest portion of the Site, is situated at a significantly higher topographical elevation. A drainage pond is located northeast of the farmhouse and outbuildings.

According to available research sources, the Site has been farmed since at least the 1930's.

Based on the results of the Phase I ESA, no actual or potential sources of contamination were identified on the property located at Part of Lot 8, Concession 2, Norfolk County, in the Town of Port Dover, Ontario. It is CVD's professional opinion therefore that the potential for significant environmental liabilities associated with the Site under investigation is low, and that further environmental investigation activities are not required. This opinion is based on the following:

- The neighbouring properties adjacent to the Site are not expected to pose an environmental concern for the Site. Past activities on the neighbouring properties in these areas are not expected to pose an environmental concern for the Site.

- Mr. Peter Bach, the current owner, informed CVD that Roundup© (a pesticide) has been applied to the fields annually for at least the last three years. Mr. Bach informed CVD that he was advised by the seller as to the quantity to be applied, and that the pesticide was used according to manufacturers specifications. CVD has also confirmed that Roundup breaks down chemically, six months after application. CVD does not consider the historical application of pesticides to the agricultural portion of the Site to be a source of environmental liability at this time.

- A diesel above-ground storage tank (AST) was observed in a drive shed located north of the dwelling. The AST was observed to be empty. CVD was informed by Mr. Bach that the AST had been used at a different location, and was being stored at the Site, where it could be protected from the elements. CVD does not consider the presence of the AST to be a source of significant environmental liability to the Site at this time.

girard ENGINEERING

2478153 ONTARIO INC.
212 Main Street West, P.O. BOX 98
Otterville, Ontario N0J 1R0
Bus: 519-879-6875
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Email: info@girardengineering.ca

Lynn River Heights Subdivision Phase 2 Port Dover
Democrat Port Dover Limited
Functional Servicing Report

Sanitary Sewage Flow

A large portion of this developments sewage flow was designed to drain into existing sanitary sewers located on Willowdale Crescent (0.00541 cms) and Cardinal Lane (0.00615 cms) in Phase 1 of Lynn River Heights.
The remaining portion of the development will be served by an extension of the 250 mm trunk sewer on Highway 6. The cumulative population for this portion of the development is projected to be 1306 persons based on 3.5 persons per dwelling unit. The peak design sewage flow was calculated to be 0.02371 cms. This figure can be input to the County Sanitary Sewage Model for analysis
The proposed Stage 1 will include 112 dwelling units and produce approximately 0.008 cms of peak sewage flow.

Water Demand – Domestic and Fire Flow

Fire flow is determined from the formula F = 220CA^0.5 where C is taken as 1.25 for partial masonry covered walls and wood frame construction and A is the usable area of a typical home say 2500 SF (approx. 240 SM)
F = 220 x 1.25 x (240)^0.5 = 4260 L/min and we can assume F = 4000 L/min from Note 3. This equates to 67 L/sec

The design for water demand is the greater of max daily demand + fire flow or max hourly demand

Average daily demand per capita is 450 L/day
Max daily demand factor is 2.25 (based on Norfolk County data)
Max hourly demand factor for residential is 4.00

For 500 dwelling units with 3 persons per unit results in a design population of 1500 persons. Max daily domestic demand is 2.25 x 0.450 x 1500/24/60/60 = 0.01758 cms = 17.58 L/sec
Max daily demand + fire flow = 67 L/sec + 17.58 L/sec = 84.58 L/sec

- According to the owner, a fuel oil AST may have been present in the basement of the farmhouse in the 1960's. CVD did not observe visual or olfactory evidence of staining on the concrete floor in the vicinity of the former AST location. It is CVDs professional opinion that the potential for significant environmental liabilities associated with the former fuel oil AST in the basement of the farmhouse, is low at this time.

To address potential operational / management issues, CVD offers the following:

- Appropriate management plans should be prepared for potential ACMs, lead based paints and PCBs (in light ballasts) if repair, renovation or demolition activities are planned in the future.

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

1.1 Purpose

CHUNG & VANDER DOELEN ENGINEERING LTD. (CVD) was retained by Mr. Joe Mihalj of Lynn River Heights Inc., to conduct a Phase I Environmental Site Assessment (ESA) of the proposed residential development at Part of Lot 8, Concession 2, Norfolk County, in the Town of Port Dover, Ontario (hereinafter referred to as the "Site").

The purpose of the Phase I ESA was to identify actual or potential sources of contamination associated with the subject property. It is CVD's understanding that this Phase I ESA is part of the due diligence requirements to support the future purchase and/or development of the Site.

Appendix A shows the location of the Site. A Site Plan is available in Appendix B.

1.2 Objectives and Scope of Work

A Phase I Environmental Site Assessment is a thorough review of all activities that may have impacted the Site from an environmental standpoint.

CVD conducted this work according to its standard environmental assessment procedures, which generally reflect CSA Z768-01 (2001)[1] Phase I Environmental Site Assessment requirements. The above noted procedures set standards for review of information pertaining to the Site, development of detailed checklists or protocols, conducting the Site inspection, and preparation of the final report. This is not a compliance audit.

The scope of work for the Phase I ESA consisted of the following tasks:

- Review the historical occupancy of the Site, through the use of available archived municipal and business directories, fire insurance plans, and aerial photographs;
- Review the current use of the Site and the commercial/industrial practices that may have impacted its environmental condition;
- Review the current use of the surrounding properties and the commercial/industrial practices that may have impacted the environmental condition of the Site;
- Review available documents, pertaining to the environmental conditions of the Site;
- Conduct a Site visit to identify the presence of environmental contaminants and concerns;

---

[1] Canadian Standard Association (CSA), 2001, Phase I Environmental Site Assessment (CSA Z768-01), Toronto, Canada.

- Contact government agencies to request information for the Site, regarding environmental regulatory registration or non-compliance. Review any such information where available;

- Prepare a report of findings and conclusions.

CVD relies on information received from all parties as accurate, unless contradicted by field observations or written documentation.

2.0 RESEARCH METHODS AND RESOURCES

A representative of CVD conducted a Site inspection of the property on May 3, 2006. CVD was able to access the entire Site, and inspect all structures. Selected photographs, illustrating key features of the property and surrounding areas, are presented in Appendix D.

2.1 Records Review – Requests for Information

Requests for information on the Site were sent to the following authorities in an effort to gain information related to past Site activities, and to address potential environmental issues that may be present at, or in the vicinity of the Site:

Ontario Ministry of the Environment (MOE)

A written request was made to MOE, Freedom of Information Officer for a record search on the Site. A response will be forwarded upon receiving the review if it is environmentally significant and would alter the conclusions of this report.

Norfolk County

Mr. Terry Hall, Technical Assistant, Public Works & Environment Department, for Norfolk County, was contacted in request for any information regarding the environmental condition of the Site. A response will be forwarded upon receiving the review if it is environmentally significant and would alter the conclusions of this report.

The Technical Standards and Safety Authority (TSSA), Fuels Safety Division (FSD)

Mr. Prem Lal was contacted to determine if any aboveground or underground storage tanks (ASTs or USTs) were listed in its database for the subject property and nearby neighbouring properties. Mr. Prem Lal of the FSD indicated that there are no registered fuel tanks on the Site.

2.2 Historical Records Review

Aerial Photography

Aerial photography for 1978, located at the University of Waterloo Map & Design Library, in Waterloo, Ontario were reviewed (Appendix C).

Fire Insurance Plans (FIPs)

Historical Fire Insurance Plans (FIPs) for Port Dover were unavailable.

City Directory

Historical business directories for Port Dover were unavailable.

3.0 SITE DESCRIPTION

The Site is located on the north side of County Road 6, just west of the newly developed residential subdivision situated on Part Lot 9, in an area of predominantly residential and agricultural land uses. The Site is approximately 100 acres in area.

The property is improved with a 2-storey farmhouse, constructed circa 1890. The, brick clad post-and-beam farmhouse currently uses a wood stove (located on the main floor) for heating, in addition to natural gas (basement furnace). A septic system with leaching bed is situated west of the farmhouse. The Site is connected to the municipal water supply. Overhead Norfolk Power hydro lines convey electricity to the Site. The Site is supplied with natural gas from Union Gas.

A barn and three sheds are situated immediately north of the dwelling. Three grain bins and an accompanying shed are located southwest of the dwelling. A drainage pond is located northeast of the farmhouse and outbuildings. The remainder of the Site is actively farmed agricultural land, with the exception of a narrow band of forest along the northern property boundary.

The Site slopes generally downwards to the east. The forested northern portion, slopes downwards to the Lynn River, to the northeast. The farmhouse, situated on a southwest portion of the Site, is situated at a significantly higher topographical elevation.

A Site Plan is shown in Appendix B.

4.0 HISTORY OF THE SITE AND ADJACENT AREA

4.1 Site History

According to available research sources, the Site has been farmed since at least the 1930's, with a wooded area at the northern extent of the Site. A sand hill was historically present, proximal to the northwest corner of the Site; the sand was excavated and sold to a local contractor. A small wooden building was constructed immediately southeast of the farmhouse in 1986, to house offshore workers. The building was dismantled in 1990.

The aerial photograph from 1978 shows the farmhouse and two buildings (farm, shed) on-Site. Several orchards are visible to the west, south, and further to the northeast of the farmhouse

4.2 History of Areas Adjacent to the Site

According to available historical research resources, the areas surrounding the Site were wooded areas, as well as rural residential and agricultural/ pastureland land uses.

North (inferred downgradient):
A large forested corridor is located immediately north of the Site. The Lynn River and decommissioned Canadian National Railway line (now a walking trail) are located further to the north.

East (inferred slightly downgradient):
A residential subdivision is currently under developed, immediately east of the Site. Land use in areas further to the east are predominantly residential.

South (inferred slightly downgradient):
County Road 6 is located immediately south of the Site. Areas further to the south of the Site are mainly comprised of rural residential and agricultural land uses.

West (inferred transgradient):
Areas to the west of the Site are mainly comprised of rural residential and agricultural land uses.

4.3 Summary

None of the neighbouring properties are expected to pose an environmental concern for the Site. Past activities on the neighbouring properties are not expected to pose an environmental concern for the Site.

5.0 PHYSICAL SETTING

5.1 Site Physiography

The geology and hydrogeology of the area were determined by a review of the Ministry of Northern Development and Mines, Quaternary Geology of Southern Ontario, Cambridge Area Sheet, Map 2226, 1987.

Based on information contained in the above-mentioned map, the surface features of this region consist of an extensive area of hummocky topography in a transitional zone between sand and clay plains. The bedrock in the area is part of the Dundee Formation and consists of limestone, dolostone, and shale from the Phanerozoic Era.

The closest surficial body of water to the Site is the Lynn River, northeast of the Site.

The Site slopes generally downwards to the east. The forested northern portion, slopes downwards to the Lynn River, to the northeast. The farmhouse, situated on a southwest portion of the Site, is situated at a significantly higher topographical elevation. A drainage pond is located northeast of the farmhouse and outbuildings.

5.2 Waste Disposal Site Inventory

A review of the MOE document entitled "Waste Disposal Site Inventory", June 1991, indicates that there are no closed or active landfill sites located within 1 km of the Site.

5.3 Coal Gasification Plants

According to the MOE document entitled "Inventory of Industrial Sites Producing or Using Coal Tar and Related Tars in Ontario", dated November 1988, there is no coal tar sites located within 1 km of the Site.

5.4 PCB Storage Sites

A review of the MOE document entitled "Ontario Inventory of Approved PCB Storage Sites", September 1988, indicates that no PCB containing properties within 500 metres of the Site.

5.5 Radon and Methane Gas

Radon

Radon is a colourless, odourless gas that occurs naturally from the breakdown of uranium. Radon can be found in high concentrations where there are soils and rocks containing high levels of uranium, granite, shale or phosphate. In open air or in areas with high air circulation, radon is not considered a health problem. However, in confined spaces (such as basements), radon can concentrate and become a health hazard.

Bedrock and soil in the area are known for having low radon gas-generating potential. As such, CVD does not expect radon gas to be a significant environmental issue at the Site.

Methane Gas

CVD did not observe any indications of putrescible fill materials present at the Site. In addition, the Site is not located in close proximity (i.e., not within 500 m) to any known active or closed landfill sites. As such, CVD does not expect methane gas to be a significant environmental issue at the Site.

5.7 Soil Fill and Land Reclamation

Fill material composition and source location are considerations in determining whether environmental concerns are present. Based on observations made at the time of the Site visit, CVD does not expect a significant amount of fill material to be present on the Site.

6.0 BUILDING DESCRIPTION

6.1 Main Structures

The property is improved with a 2-storey farmhouse, constructed circa 1890. The, brick clad post-and-beam farmhouse currently uses a wood stove for heating, in addition to natural gas. A septic system with leaching bed is situated west of the farmhouse. The Site is connected to the municipal water supply. Overhead Norfolk Power hydro lines convey electricity to the Site. The Site is supplied with natural gas from Union Gas.

The farmhouse has plaster and drywall ceilings and walls. Floor surfaces are a mixture of hardwood, carpet and tile. A natural gas furnace is located in the basement.

The unheated, uninsulated barn and sheds, are constructed of wood, and are currently used for storage and automobile parking, as well as various farm operations. The grain bins are constructed of stainless steel.

6.2 Exterior Observations

The exterior of the Site is actively farmed agricultural land, with the exception of a narrow band of forest along the northern property boundary. The Site slopes generally downwards to the east. The forested northern portion, slopes downwards to the Lynn River, to the northeast. The farmhouse, situated on a southwest portion of the Site, is situated at a significantly higher topographical elevation. A drainage pond is located northeast of the farmhouse and outbuildings.

Site photographs are available in Appendix D.

6.3 Chemical Inventory, Storage, and Handling

CVD did not observe any obvious signs of significant chemical storage or handling practices during the Site visit.

Mr. Peter Bach, the current owner, informed CVD that Roundup© (a pesticide) has been applied to the fields annually for at least the last three years. Mr. Bach informed CVD that he was advised by the seller as to the quantity to be applied, and that the pesticide was used according to manufacturers specifications. CVD has also confirmed that Roundup breaks down chemically, six months after application. CVD does not consider the historical application of pesticides to the agricultural portion of the Site to be a source of environmental liability at this time.

6.4 Underground Storage Tanks (USTs) and Aboveground Storage Tanks (ASTs)

Fuel storage at commercial/industrial facilities in Ontario is regulated by the Gasoline Handling Act, Gasoline Handling Code ("GHC"), the Fuel Oil Code and, where Act and codes are not applicable, the Ontario Fire Code. In general, the GHC applies to storage tanks associated with vehicle fuels, and the Fuel Oil Code applies to storage tanks associated with stationary combustion equipment such as boilers and diesel generators. Numerous standards and codes exist for the construction of storage tanks and associated connections. According to discussions with the Technical Standards and Safety Authority (TSSA), only underground storage tanks (USTs) installed under the GHC require registration from the TSSA.

Site inspections and interviews were conducted to assess the presence/absence and condition (if present) of USTs and ASTs at the Site.

A diesel above-ground storage tank (AST) was observed in a drive shed located north of the dwelling. The AST was observed to be empty. CVD was informed by Mr. Bach that the AST had been used at a different location, and was being stored at the Site, where is could be protected from the elements. CVD does not consider the presence of the AST to be a source of significant environmental liability to the Site at this time.

According to the owner, a fuel oil AST may have been present in the basement of the farmhouse in the 1960's. CVD did not observe visual or olfactory evidence of staining on the concrete floor in the vicinity of the former AST location. It is CVDs professional opinion that the potential for significant environmental liabilities associated with the former fuel oil AST in the basement of the farmhouse, is low at this time.

CVD did not find any correspondence to support the historical presence of additional ASTs or USTs on the Site.

CVD contacted the TSSA, Fuels Safety Division (FSD), to determine if any registered fuel outlets were listed in its database in the area of the subject property. Mr. Prem Lal of the FSD indicated that there are no registered fuel tanks on the Site.

6.5 Solid and Liquid Waste Generation and Disposal

Solid non-hazardous wastes currently generated on-Site are comprised mainly of residential household wastes. Waste is removed from the Site on a regular basis by licensed waste haulers. According to available information, no other solid wastes are currently generated on-site.

Liquid effluent discharges from the residence are directed to the septic bed area at the side of the property. Liquid effluent from the Site is currently comprised of sanitary water discharges from the washrooms and kitchen.

6.6 Designated Substances

In Ontario, the Occupational Health and Safety Act places duties on employers to take reasonable precautions to ensure that the health and safety of workers is adequately protected. General guidelines and requirements are dictated for all hazardous materials. Since the early 1980's a list of nearly a dozen substances have been classified as "designated substances" largely in response to their harmful characteristics.

All substances or combinations of substances, whether biological, chemical or physical in nature, deemed to fall under the criteria of a "designated substance" are subject to special treatment by workplaces in accordance to a set of substance specific rules and regulations.

At present, specific regulations have been made to control workplace exposure to all of the following substances:

- Acrylonitrile (O. Reg. 835);
- Arsenic (O. Reg. 836);
- Asbestos (O. Reg. 278/05);
- Benzene (O. Reg. 839);
- Coke Oven Emissions (O. Reg. 840);
- Ethylene Oxide (O. Reg. 841);
- Isocyanates (O. Reg. 842);
- Lead (O. Reg. 843);
- Mercury (O. Reg. 844);

- Silica (O. Reg. 845); and,
- Vinyl Chloride (O. Reg. 846)

6.6.1 Asbestos Containing Materials (ACMs)

Asbestos is a group of naturally occurring minerals, formerly used for thermal and acoustic insulation, as well as fireproofing. The use of asbestos was common due to its strength and resistance to heat, and is often found in old ceiling tiles, pipe and vessel insulation, blown into structural beams and ceilings, in floor tile, linoleum, and mastic. The use of asbestos building materials was banned in Canada in the late 1970's.

Asbestos is not always an immediate hazard; though when asbestos containing materials are disturbed, microscopic fibres become airborne and may be inhaled by humans, where it may cause cancer and lung disease.

Based on the date of construction of the residence (pre 1900), ACMs may be present in materials used during the construction or subsequent renovations in the farmhouse. CVD did not observe probable asbestos-containing materials during the Site visit. Observations were made only in readily accessible areas of the building (i.e., not in concealed spaces such as behind walls, or above ceilings).

6.6.2 Lead

Lead is a highly toxic metal which, when present in the human body (in sufficient quantities), attacks the central nervous system and can result in numerous health problems. Lead-based paints have not been used since the late 1970's, when the U.S. Department of Housing and Urban Development (HUD) banned it for use in all homes and most other buildings.

Based on the age of the residence (pre 1900), lead based paint may be present in the farmhouse. Painted surfaces were observed to be in good condition, with no peeling or flaking.

6.6.3 Other Designated Substances

CVD did not observe any other designated or hazardous substances at the Site, and none are expected.

6.7 Polychlorinated Biphenyls (PCBs)

Polychlorinated biphenyls (PCBs) are a class of chemicals that have good electrical insulating properties. Most fluorescent light ballasts manufactured before 1979 (PCBs were banned in any building materials in 1979) contain about a teaspoon of concentrated PCBs sealed inside the capacitor. Normal ballast operation does not emit measurable amounts of PCBs, but when an old light ballast fails, the capacitor may rupture and leak PCBs.

Acute health effects of PCB exposure may be eye, nose, and throat irritation and liver damage, while prolonged exposure has been shown to lead to cancer, damage to the liver and central nervous system, and reproductive difficulty.

CVD did not observe ceiling mounted fluorescent light fixtures within the buildings.

6.8 Urea Formaldehyde Foam Insulation (UFFI)

Urea formaldehyde is a low-density foam approved for insulating wall cavities in wood-framed structures, until its ban in 1980. Potential health problems associated with the inhalation of formaldehyde particles include irritation of the eye, nose and throat, as wells as nausea, vomiting, and nosebleeds.

CVD did not observe any urea formaldehyde foam insulation at the Site. Observations were made only in readily accessible areas of the building (i.e., not in concealed spaces such as behind walls, or above ceilings).

CVD does not expect UFFI to be present on-Site.

6.9 Air Emissions Sources

CVD did not observe the presence of air emissions sources at the time of the Site visit that potentially could affect the environmental quality of the Site. According to available information, the only potential historical air emission sources are exhausts from heating equipment, general building ventilation, and washroom vents. Based on the nature of these emission sources at the Site, CVD does not expect any significant environmental issues regarding the air emissions at the Site.

6.10 Ozone Depleting Substances (ODSs)

The following substances are ozone-depleting substances (ODSs):

- Chlorofluorocarbons (CFCs) - widely used in refrigerants, aerosol repellents, and foam insulation;
- Halons - composed of brominated fluorocarbons, and have been used in fire extinguishing equipment;
- Other products - methyl chloroform and carbon tetrachloride have been used mainly in industry as degreasers and adhesives, and for chemical processing.

Due to the nature of ODSs and their potential impact to the environment, their use, transport, storage, and disposal is strictly enforced. Canada's current position on CFCs is complete elimination by 2020. Although there is no requirement to remove ODSs from active units, any servicing must be performed by contractors that have appropriate certification.

CVD did not observe HVAC units at the Site.

7.0 CONCLUSIONS

Based on the results of the Phase I ESA, no actual or potential sources of contamination were identified on the property located at Part of Lot 8, Concession 2, Norfolk County, in the Town of Port Dover, Ontario. It is CVD's professional opinion therefore that the potential for significant environmental liabilities associated with the Site under investigation is low, and that further environmental investigation activities are not required. This opinion is based on the following:

- The neighbouring properties adjacent to the Site are not expected to pose an environmental concern for the Site. Past activities on the neighbouring properties in these areas are not expected to pose an environmental concern for the Site.

- Mr. Peter Bach, the current owner, informed CVD that Roundup© (a pesticide) has been applied to the fields annually for at least the last three years. Mr. Bach informed CVD that he was advised by the seller as to the quantity to be applied, and that the pesticide was used according to manufacturers specifications. CVD has also confirmed that Roundup breaks down chemically, six months after application. CVD does not consider the historical application of pesticides to the agricultural portion of the Site to be a source of environmental liability at this time.

- A diesel above-ground storage tank (AST) was observed in a drive shed located north of the dwelling. The AST was observed to be empty. CVD was informed by Mr. Bach that the AST had been used at a different location, and was being stored at the Site, where it could be protected from the elements. CVD does not consider the presence of the AST to be a source of significant environmental liability to the Site at this time.

- According to the owner, a fuel oil AST may have been present in the basement of the farmhouse in the 1960's. CVD did not observe visual or olfactory evidence of staining on the concrete floor in the vicinity of the former AST location. It is CVDs professional opinion that the potential for significant environmental liabilities associated with the former fuel oil AST in the basement of the farmhouse, is low at this time.

To address potential operational / management issues, CVD offers the following:

- Appropriate management plans should be prepared for potential ACMs, lead based paints and PCBs (in light ballasts) if repair, renovation or demolition activities are planned in the future.

8.0 STUDY LIMITATIONS

CVD has prepared this report for the exclusive use of Mr. Joe Mihalj of Lynn River Heights Inc., in evaluating the environmental conditions of the Site at the time of CVD's Site visit. CVD will not be responsible for the use of this report by any additional party, or reliance on or any decision to be made based on it without the prior written consent of CVD. CVD accepts no responsibility for damages, if any, by any third party as a result of decisions or actions based on this report.

This report presents an overview of issues of environmental concern, reflecting CVD's best judgment using information reasonably available at the Site at the time of CVD's Site visit. CVD has prepared this report using information understood to be factual and correct and shall not be responsible for conditions arising from information or facts that were concealed or not fully disclosed to CVD at the time of the Site visit.

The American Society of Testing and Materials Standard of Practice notes that no environmental Site assessment can wholly eliminate uncertainty regarding the potential for recognized environmental conditions in connection with a property. Performance of a standardized environmental Site assessment protocol is intended to reduce, but not eliminate, uncertainty regarding the potential for recognized environmental conditions in connection with the property, given reasonable limits of time and cost.

This assessment was carried out using historical data and a Site walkover. Intrusive testing is not part of the scope of this assessment.

We trust that the above report is complete within our terms of reference. If there are any questions concerning this matter, please do not hesitate to contact our office.

Yours truly,

CHUNG & VANDER DOELEN ENGINEERING LTD.

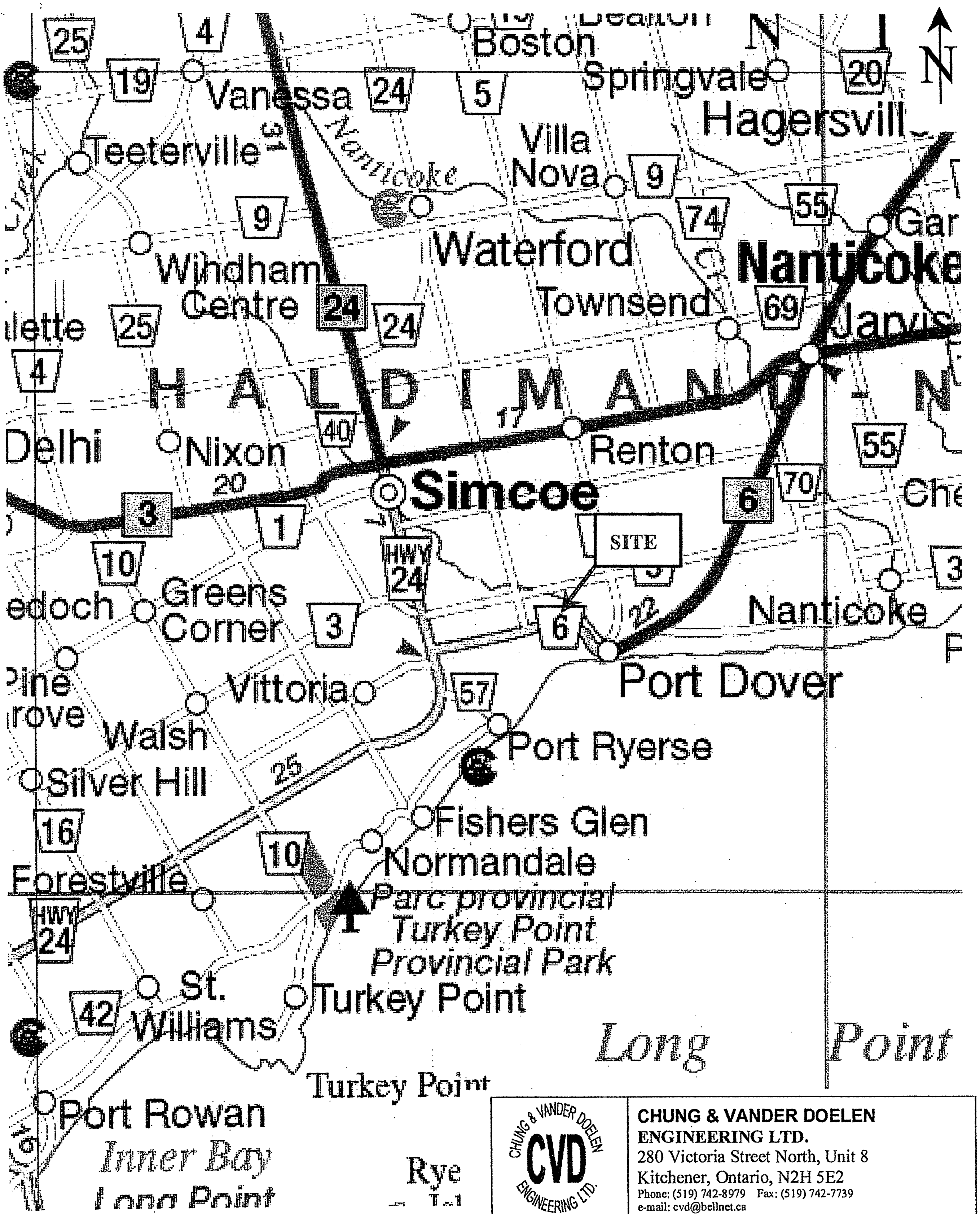
Gregory J. Zehr, B.E.S.
Environmental Scientist

Eric Y. Chung, M.Eng., P.Eng.
Principal Engineer

LICENSED PROFESSIONAL ENGINEER
E.Y. CHUNG
8345506
May 12.06
PROVINCE OF ONTARIO

APPENDIX A

KEY PLAN



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e-mail: cvd@bellnet.ca

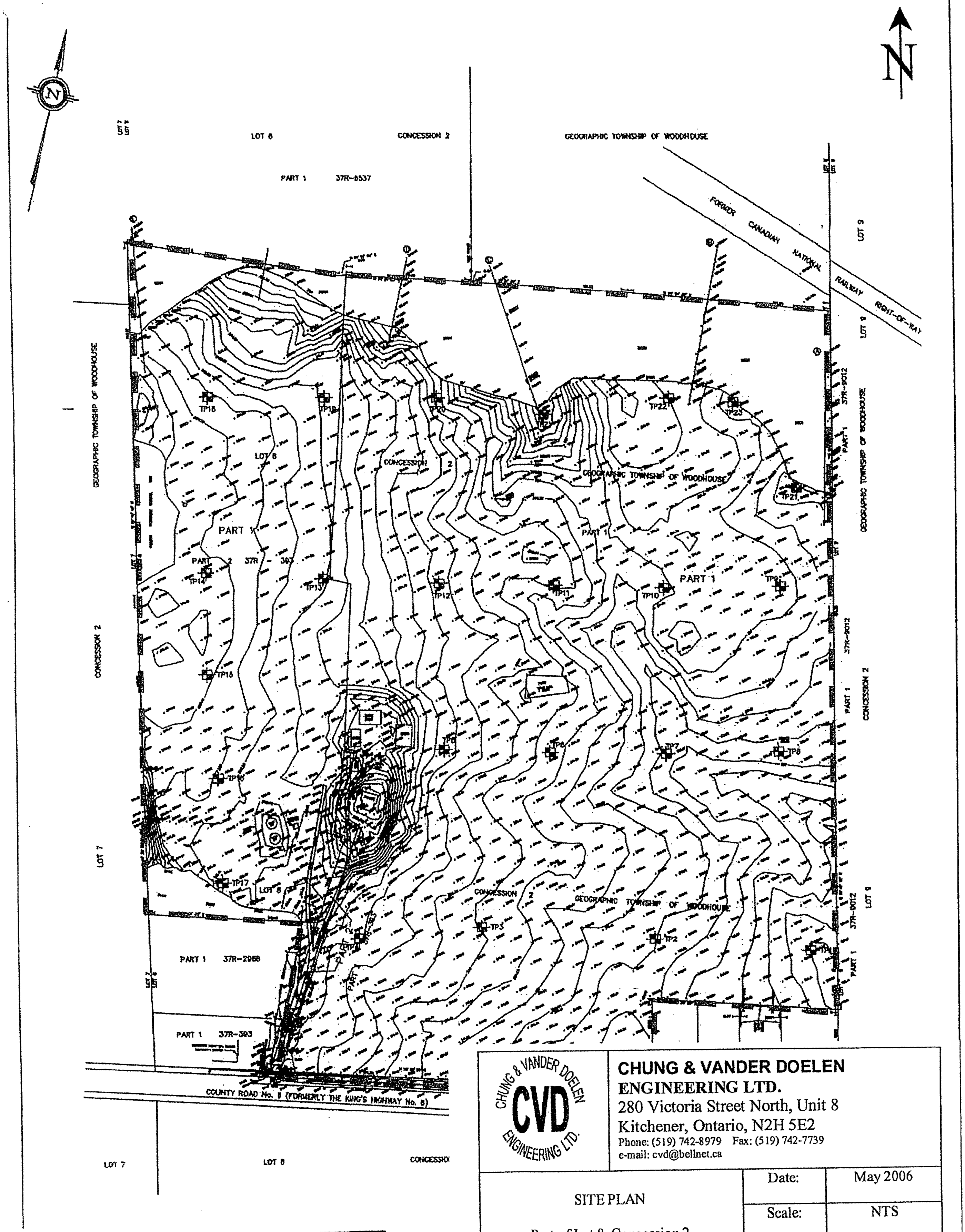
KEY PLAN

PORT DOVER, ONTARIO.

Date:	May 2006
Scale:	NTS
File No.:	05-11-K11
Appendix:	A

APPENDIX B

SITE PLAN



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SITE PLAN

Part of Lot 8, Concession 2
Norfolk County, Town of Port Dover
Ontario

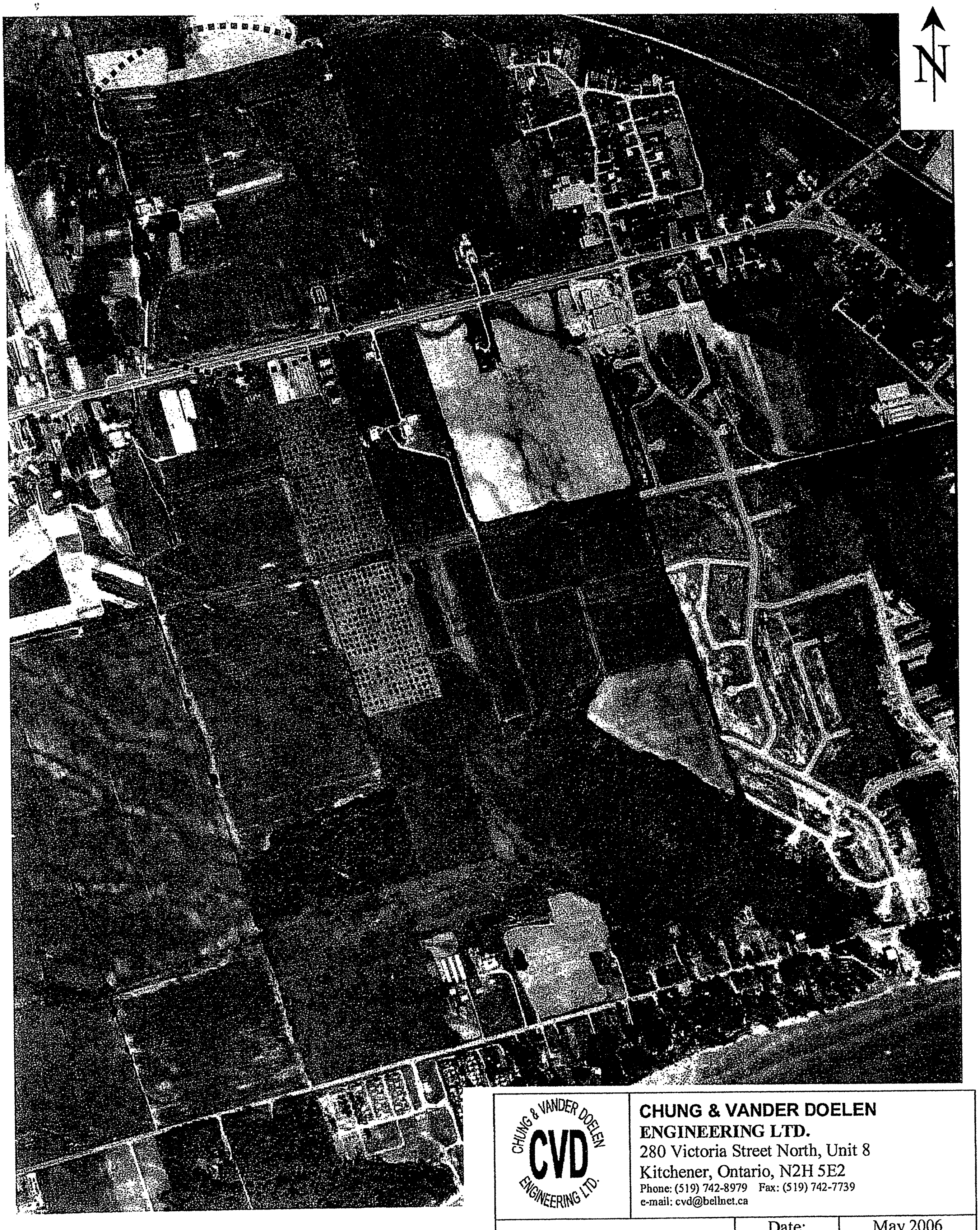
Date:	May 2006
Scale:	NTS
File No.:	05-11-K11
Appendix:	B

Legend:

▨ = Approximate Site Boundary

APPENDIX C

AERIAL PHOTOGRAPH



Legend:

⬭ = Approximate Site Location

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1978 AERIAL PHOTOGRAPH

PORT DOVER, ONTARIO

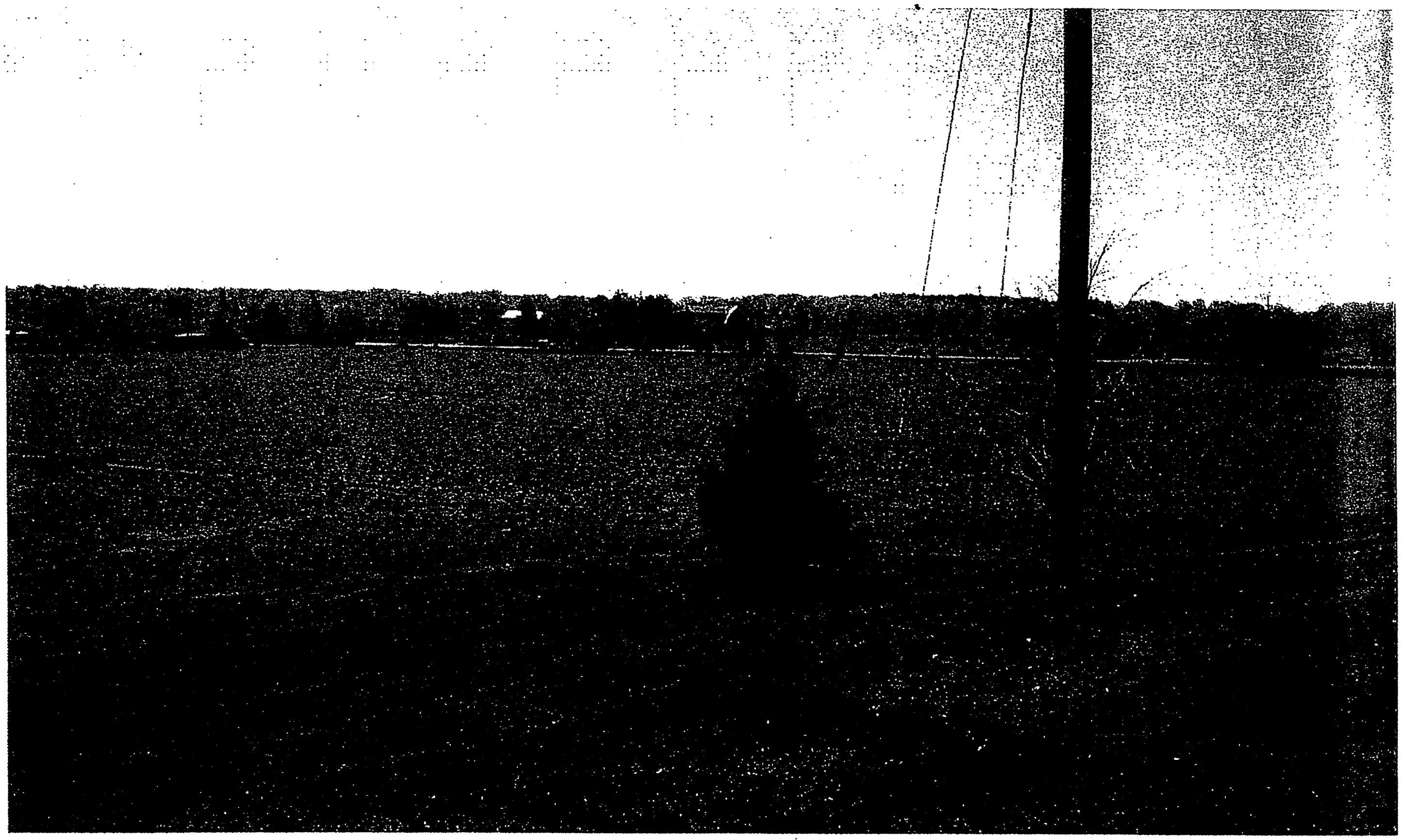
Date:	May 2006
Scale:	NTS
File No.:	05-11-K11
Appendix:	C

APPENDIX D

SITE PHOTOGRAPHS

Photograph 1 - View of farmhouse, facing north.

Photograph 2 - View of grain bins, facing west.



Photograph 3 - View of agricultural field from farmhouse lawn, facing southeast. Ongoing residential development is visble in the background.

Photograph 4 - View of agricultral land, facing north. The forested portion of the Site is visible in the background.

APPENDIX E

QUALIFICATIONS OF ASSESSOR

Gregory J. Zehr, B.E.S.

Environmental Site Assessor

Mr. Zehr has over 5 years of experience in environmental assessment and project management providing site investigation, and remediation services, for the industrial, commercial and municipal sectors.

Mr. Zehr has specialized in the development and implementation of environmental work plans and programs for a broad range of clients in the property management, insurance, automotive, chemical, manufacturing, and transportation sectors.

Education

Honours Bachelor of Environmental Studies, Biophysical and Information Systems Specialization, University of Waterloo, 2000

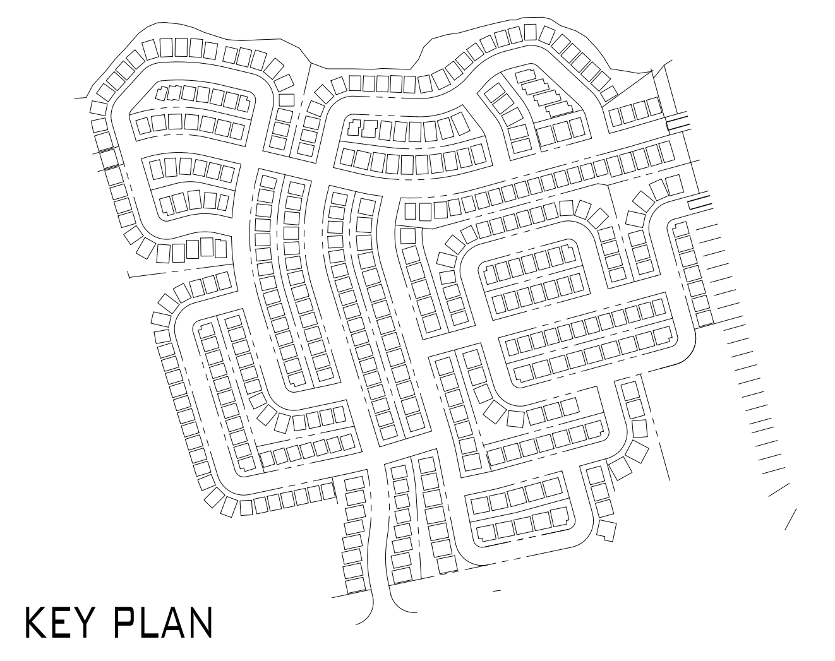
Project Experience

Mr. Zehr has conducted over 150 Phase I and Phase II Environmental Site Assessments for various commercial and industrial properties including service stations, shopping plazas, apartment buildings, and industrial manufacturing facilities.

Mr. Zehr has conducted several environmental decommissioning projects. His areas of expertise include regulatory liaison, industrial plant decommissioning, spill cleanup, reclamation, and site rehabilitation.

Mr. Zehr conducted *compliance audits* in various industrial settings over the past five years, and conducted numerous pre-acquisition environmental compliance audits throughout Ontario, for the insurance, property acquistion and banking industry.

Mr. Zehr has supervised over 50 underground storage tank removal projects, and provided direction for further remedial activities when required.



THE CONTRACTOR IS RESPONSIBLE FOR THE REVIEW OF THESE PLANS & TO EDUCATE THEMSELVES OF THE EXACT LOCATIONS OF UTILITIES AND UNDERGROUND SERVICES ON SITE PRIOR TO CONSTRUCTION. ALL UTILITIES ARE NOT SHOWN ON THESE PLANS. THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGES & REPAIRS TO ALL UTILITIES ON SITE.

No:	Revision:	By:	Date:
1	ISSUED FOR PRELIMINARY REVIEWS	TS	NOV. 21, 2017

DEMOCRAT HOMES LTD.
PORT DOVER, ONTARIO

DESIGNED BY:

girard ENGINEERING
2478153 ONTARIO INC.
OTTERVILLE EMBRO
TEL: 1-519-879-6875
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ENGINEERS SEAL OF APPROVAL:

LEN GIRARD
Mar. 22, 2019

NOTE: THESE DRAWINGS ARE THE PROPERTY OF THE ENGINEER AND ARE NOT VALID UNLESS SEALED IN RED INK. THESE DRAWINGS ARE NOT TO BE REPRODUCED UNLESS AUTHORIZED BY THE ENGINEER.

LYNN RIVER HEIGHTS
PORT DOVER, ONTARIO

MAJOR STORM
PLAN

SCALE: 1:1000
DATE: OCTOBER, 2017
DRAWING BY: T. SPRAGUE
DESIGNED BY: G. ADOM / L. GIRARD
CHECKED BY: L. GIRARD
PROJECT NO: 16-067
DRAWING NO: 200

DEC 1/17

SANITARY SEWER DESIGN CALCULATIONS

SUBDIVISIC LYNN RIVER HEIGHTS
PROJECT NO: 16-067
DESIGNED BY: GEORGE ADOM
CHECKED BY: LEN GIRARAD
DATE: NOVEMBER, 2017

SINGLE FAMILY HOMES: 3.5 PEOPLE/ LOT
LOW - MEDUIM TOWNHOUSES: 3.5 PEOPLE/ LOT
DESIGNED 'n' : 0.013
MINIMUM COVER: 2.4 m

$$Harmon\ peaking\ factor, M = 1 + \frac{14}{(4 + P^{0.5})}$$

$$Total\ sewage\ flow, Q = \frac{P\,q\,M}{86.4} + IA$$

$Average\ daily\ per\ capital\ domestic\ flow, q = 450\ L/p/d$

$Extraneous\ flow\ (infiltration\ allowance), I = 0.28\ L/s/ha$

P = Population density

A = Tributary area, ha

Area No	LOCATION			AREA			POPULATION					SEWAGE FLOWS				SEWER DESIGN				PROFILE					Invert Elevations		Cover (m)
	Street	From MH	To MH	Net or Gross (m²)	Delta ha	Cum ha	Per ha	Per Lot	No. Of Lots	Delta Pop.	Cum Pop.	Peaking Factor, M	Sewage/ Pop. Flow, Q (m³/s)	Peak Extraneous Flow, IA (m³/s)	Total Peak Design Flow (m³/s)	Pipe Size (mm)	Grade %	Capacity (m3/s)	Velocity m/s	Length (m)	Fall in Sewer (m)	Surf Elev. (m)	Headloss	Drop in MH	U/S	D/S	
0	1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
A27	STREET D	86	80	1880	0.188	0.188		3.5	2.0	7	7	4.43	0.00013	0.00003	0.00015	200	1.00	0.0328	1.043	[redacted]	0.406	[redacted]			205.330	204.924	2.791
A27A	STREET D	80	79	880	0.088	0.904		3.5	1.0	3.5	10.5	4.41	0.00019	0.00014	0.00032	200	0.80	0.0293	0.933	[redacted]	0.061	[redacted]		0.03	204.894	204.833	2.901
A28	STREET D	79	78	4070	0.407	1.311		3.5	5.0	17.5	28	4.36	0.00049	0.00020	0.00069	200	0.80	0.0293	0.933	[redacted]	0.421	[redacted]		0.03	204.803	204.382	2.921
A29	STREET D	78	77	5370	0.537	1.848		3.5	7.0	24.5	52.5	4.31	0.00092	0.00028	0.00119	200	0.80	0.0293	0.933	[redacted]	0.454	[redacted]		0.03	204.352	203.898	2.956
A30	STREET D	77	76	5180	0.518	2.366		3.5	7.0	24.5	77	4.27	0.00133	0.00035	0.00169	200	0.80	0.0293	0.933	[redacted]	0.454	[redacted]		0.03	203.868	203.414	2.927
A30A	STREET D	76	75	2450	0.245	2.611		3.5	2.0	7	84	4.26	0.00145	0.00039	0.00184	200	0.80	0.0293	0.933	[redacted]	0.113	[redacted]		0.03	203.384	203.271	3.025
A31	STREET D	75	74	3400	0.340	2.951		3.5	4.0	14	98	4.25	0.00169	0.00044	0.00213	200	0.80	0.0293	0.933	[redacted]	0.469	[redacted]		0.03	203.241	202.772	3.047
A32A	VILLOWDAL	86	85	1890	0.189	0.189		3.5	2.0	7	7	4.43	0.00013	0.00003	0.00015	200	1.50	0.0401	1.277	[redacted]	0.436	[redacted]		0.03	204.827	204.391	3.294
A32	VILLOWDAL	85	84	3540	0.354	0.543		3.5	5.0	17.5	24.5	4.37	0.00043	0.00008	0.00051	200	1.50	0.0401	1.277	[redacted]	0.604	[redacted]		0.03	204.361	203.757	3.241
A33	VILLOWDAL	84	74	4370	0.437	0.980		3.5	6.0	21	45.5	4.32	0.00080	0.00015	0.00094	200	1.50	0.0401	1.277	[redacted]	0.955	[redacted]		0.03	203.727	202.772	3.167
A41	STREET E	86	83	5020	0.502	0.502		3.5	6.0	21	21	4.38	0.00037	0.00008	0.00045	200	1.50	0.0401	1.277	[redacted]	1.167	[redacted]		0.03	204.847	203.680	3.274
A42	STREET E	83	82	2250	0.225	0.727		3.5	2.0	7	28	4.36	0.00049	0.00011	0.00060	200	1.50	0.0401	1.277	[redacted]	0.228	[redacted]		0.03	203.650	203.422	3.239
A44	STREET E	82	81	3920	0.392	1.119		3.5	5.0	17.5	45.5	4.32	0.00080	0.00017	0.00096	200	1.50	0.0401	1.277	[redacted]	0.642	[redacted]		0.03	203.392	202.750	3.250
A45	STREET E	81	72	3120	0.312	1.431		3.5	4.0	14	59.5	4.30	0.00104	0.00021	0.00125	200	1.00	0.0328	1.043	[redacted]	0.396	[redacted]		0.03	202.720	202.324	3.247
A53	STREET C	66	65	3870	0.387	0.387		3.5	4.0	14	14	4.40	0.00025	0.00006	0.00031	200	0.45	0.022	0.7	[redacted]	0.237	[redacted]		0.03	202.569	202.332	3.247
A54	STREET C	65	64	2760	0.276	0.663		3.5	2.0	7	21	4.38	0.00037	0.00010	0.00047	200	0.50	0.0232	0.737	[redacted]	0.106	[redacted]		0.03	202.302	202.196	3.321
A55	STREET C	64	63	7470	0.747	1.410		3.5	12.0	42	63	4.29	0.00110	0.00021	0.00131	200	0.50	0.0232	0.737	[redacted]	0.414	[redacted]		0.03	202.166	201.752	3.338
A56	STREET C	63	62	6920	0.692	2.102		3.5	11.0	38.5	101.5	4.24	0.00174	0.00032	0.00206	200	0.50	0.0232	0.737	[redacted]	0.409	[redacted]		0.03	201.722	201.313	3.760
A57	STREET C	62	61	2150	0.215	2.317		3.5	2.0	7	108.5	4.23	0.00186	0.00035	0.00221	200	0.50	0.0232	0.737	[redacted]	0.102	[redacted]		0.03	201.283	201.181	3.383
A58	STREET C	61	60	5690	0.569	2.886		3.5	9.0	31.5	140	4.20	0.00238	0.00043	0.00282	200	0.50	0.0232	0.737	[redacted]	0.346	[redacted]		0.03	201.151	200.805	3.402
A59	STREET C	60	40	3750	0.375	3.261		3.5	5.0	17.5	157.5	4.18	0.00267	0.00049	0.00316	200	0.50	0.0232	0.737	[redacted]	0.367	[redacted]		0.03	200.775	200.408	3.424
A46A	STREET D	74	73	860	0.086	4.017		3.5	1.0	3.5	147	4.19	0.00250	0.00060	0.00310	200	0.50	0.0232	0.737	[redacted]	0.193	[redacted]		0.03	202.742	202.549	3.857
A46	STREET D	73	72	2260	0.226	4.243		3.5	3.0	10.5	157.5	4.18	0.00267	0.00064	0.00331	200	0.50	0.0232	0.737	[redacted]	0.195	[redacted]		0.03	202.519	202.324	3.946
A47	STREET D	72	71	1650	0.165	4.408		3.5	2.0	7	164.5	4.18	0.00278	0.00066	0.00345	200	0.50	0.0232	0.737	[redacted]	0.177	[redacted]		0.03	202.294	202.117	3.950
A47 CONT	STREET D	71	70	1650	0.165	4.573		3.5	2.0	7	171.5	4.17	0.00290	0.00069	0.00358	200	0.50	0.0232	0.737	[redacted]	0.187	[redacted]		0.03	202.087	201.900	4.000
A48	STREET D	70	69	4480	0.448	5.021		3.5	7.0	24.5	196	4.15	0.00330	0.00075	0.00405	200	0.50	0.0232	0.737	[redacted]	0.277	[redacted]		0.03	201.870	201.593	3.995
A49	STREET D	69	68	3840	0.384	5.405		3.5	6.0	21	217	4.13	0.00363	0.00081	0.00445	200	0.50	0.0232	0.737	[redacted]	0.253	[redacted]		0.03	201.563	201.310	3.829
A50	STREET D	68	67	3470	0.347	5.752		3.5	4.0	14	231	4.12	0.00386	0.00086	0.00472	200	0.50	0.0232	0.737	[redacted]	0.098	[redacted]		0.03	201.280	201.182	3.674
A51	STREET D	67	41	2590	0.259	6.011		3.5	3.0	10.5	241.5	4.12	0.00403	0.00090	0.00493	200	0.50	0.0232	0.737	[redacted]	0.322	[redacted]		0.03	201.152	200.830	3.622
A35	STREET F	48	47	8600	0.860	6.871		3.5	12.0	42	283.5	4.09	0.00470	0.00103	0.00573	200	0.50	0.0232	0.737	[redacted]	0.452	[redacted]		0.03	202.993	202.541	1.865
A36	STREET F	47	46	3310	0.331	7.202		3.5	4.0	14	297.5	4.08	0.00492	0.00108	0.00600	200	0.50	0.0232	0.737	[redacted]	0.093	[redacted]		0.03	202.511	202.418	3.361
A35A	STREET F	46	45	2030	0.203	7.405		3.5	2.0	7	304.5	4.08	0.00503	0.00111	0.00614	200	0.50	0.0232	0.737	[redacted]	0.322	[redacted]		0.03	202.388	202.066	3.381

A37	STREET B	45	44	4280	0.428	7.833	3.5	6.0	21	325.5	4.06	0.00536	0.00117	0.00653	200	0.50	0.0232	0.737	42.76	0.214	205.640		0.03	202.036	201.822	3.404
A38	STREET B	44	43	3300	0.330	8.163	3.5	5.0	17.5	343	4.05	0.00563	0.00122	0.00686	200	0.50	0.0232	0.737	42.76	0.214	205.346		0.03	201.792	201.578	3.354
A39	STREET B	43	42	5160	0.516	8.679	3.5	8.0	28	371	4.04	0.00607	0.00130	0.00737	200	0.50	0.0232	0.737	68.85	0.344	205.126		0.03	201.548	201.204	3.378
A40	STREET B	42	41	5770	0.577	9.256	3.5	9.0	31.5	402.5	4.02	0.00656	0.00139	0.00794	200	0.50	0.0232	0.737	68.85	0.344	204.776		0.03	201.174	200.830	3.402
A52	STREET B	41	40	3430	0.343	15.610	3.5	4.0	14	658	3.91	0.01042	0.00234	0.01276	200	0.50	0.0232	0.737	78.36	0.392	204.422		0.03	200.800	200.408	3.422
A61A	STREET B	36	37	3330	0.333	0.333	3.5	4.0	14	14	4.40	0.00025	0.00005	0.00030	200	0.50	0.0232	0.737	30.85	0.154	203.794		0.03	201.187	201.033	2.407
A61	STREET B	37	38	2810	0.281	0.614	3.5	4.0	14	28	4.36	0.00049	0.00009	0.00059	200	0.50	0.0232	0.737	31.68	0.158	203.631		0.03	201.003	200.845	2.428
A60	STREET B	38	39	4400	0.440	1.054	3.5	6.0	21	49	4.32	0.00086	0.00016	0.00101	200	0.50	0.0232	0.737	46.00	0.230	203.465		0.03	200.815	200.585	2.450
A60A	STREET B	39	40	1790	0.179	1.233	3.5	2.0	7	56	4.30	0.00098	0.00018	0.00116	200	0.50	0.0232	0.737	29.35	0.147	203.228		0.03	200.555	200.408	2.473
A62	STREET C	40	24	1400	0.140	20.244	3.5	0.0	0	871.5	3.84	0.01355	0.00304	0.01659	200	1.00	0.0328	1.043	78.81	0.788	204.023		0.03	200.378	199.590	3.445
A63	STREET H	25	24	7160	0.716	0.716	3.5	18.0	63	63	4.29	0.00110	0.00011	0.00120	200	1.00	0.0328	1.043	98.19	0.982	204.119		0.03	200.572	199.590	3.347
A64	STREET H	24	22	3970	0.397	21.357	3.5	9.0	31.5	966	3.81	0.01491	0.00320	0.01811	200	1.00	0.0328	1.043	56.27	0.563	203.616		0.03	199.560	198.997	3.856
A65	STREET H	22	21	3560	0.356	21.713	3.5	7.0	24.5	990.5	3.80	0.01526	0.00326	0.01851	200	1.00	0.0328	1.043	62.19	0.622	203.332		0.03	198.967	198.345	4.165
A66	STREET H	21	20	2510	0.251	21.964	3.5	4.0	14	1005	3.80	0.01546	0.00329	0.01875	200	1.00	0.0328	1.043	21.42	0.214	203.019		0.03	198.315	198.101	4.504
A67	STREET H	20	19	4580	0.458	22.422	3.5	8.0	28	1033	3.79	0.01586	0.00336	0.01922	200	1.00	0.0328	1.043	97.08	0.971	202.896		0.03	198.071	197.100	4.625
A67A	STREET H	19	7	820	0.082	22.504	3.5	1.0	3.5	1036	3.79	0.01591	0.00338	0.01928	200	2.00	0.0463	1.475	14.36	0.287	202.403		0.03	197.070	196.783	5.133
A68	CARDINAL	26	34	2780	0.278	0.278	3.5	6.0	21	21	4.38	0.00037	0.00004	0.00041	200	0.50	0.0232	0.737	59.06	0.295	202.557			198.926	198.631	3.431
A69	CARDINAL	34	35	3630	0.363	0.641	3.5	4.0	14	35	4.34	0.00062	0.00010	0.00071	200	0.50	0.0232	0.737	17.90	0.090	202.073		0.030	198.601	198.511	3.272
A70	CARDINAL	35	12	6600	0.660	1.301	3.5	17.0	59.5	94.5	4.25	0.00163	0.00020	0.00182	200	0.50	0.0232	0.737	87.79	0.439	201.934		0.030	198.481	198.042	3.253
A71	CARDINAL	15	14	2730	0.273	0.273	3.5	3.0	10.5	10.5	4.41	0.00019	0.00004	0.00023	200	0.50	0.0232	0.737	66.47	0.332	201.500			198.875	198.543	2.425
A71 CONT	CARDINAL	14	13	360	0.036	0.309	3.5	0.0	0	10.5	4.41	0.00019	0.00005	0.00023	200	0.60	0.0254	0.808	15.45	0.093	200.795		0.030	198.513	198.420	2.082
A72	CARDINAL	13	12	4600	0.460	0.769	3.5	9.0	31.5	42	4.33	0.00074	0.00012	0.00085	200	0.40	0.0207	0.66	87.02	0.348	200.821		0.030	198.390	198.042	2.231
A73	STREET J	12	11	2920	0.292	2.362	3.5	5.0	4	140.5	4.20	0.00239	0.00035	0.00274	200	0.50	0.0232	0.737	62.46	0.312	201.253		0.030	198.012	197.700	3.041
A74	STREET J	11	10	3200	0.320	2.682	3.5	4.0	14	154.5	4.19	0.00262	0.00040	0.00302	200	0.50	0.0232	0.737	21.19	0.106	201.573		0.030	197.670	197.564	3.703
A75	STREET J	10	9	2980	0.298	2.980	3.5	6.0	21	175.5	4.17	0.00296	0.00045	0.00341	200	0.52	0.0236	0.752	44.21	0.230	201.690		0.030	197.534	197.304	3.956
A76A	STREET J	22	23	3460	0.346	0.346	3.5	7.0	24.5	24.5	4.37	0.00043	0.00005	0.00049	200	1.50	0.0401	1.277	63.53	0.953	203.332			199.239	198.286	3.893
A76	STREET J	23	9	4940	0.494	0.840	3.5	12.0	42	66.5	4.29	0.00116	0.00013	0.00128	200	1.50	0.0401	1.277	63.48	0.952	202.627		0.030	198.256	197.304	4.171
A77	STREET H	9	8	2750	0.275	4.095	3.5	5.0	17.5	259.5	4.10	0.00431	0.00061	0.00493	200	0.60	0.0254	0.808	62.58	0.375	201.919		0.030	197.274	196.899	4.445
A78	STREET H	8	7	1860	0.186	4.281	3.5	3.0	10.5	270	4.10	0.00448	0.00064	0.00512	200	0.60	0.0254	0.808	14.36	0.086	202.239		0.030	196.869	196.783	5.170
EASEMENT	PARK	7	2	0	0	26.785	3.5	0.0	0	1306	3.72	0.01969	0.00402	0.02371	250	1.90	0.0819	1.668	70.04	1.331	202.719		0.030	196.753	195.422	5.716
PROP PIPE	HIGHWAY 2	2	1	0	0	26.785	3.5	0.0	0	1306	3.72	0.01969	0.00402	0.02371	250	0.93	0.0573	1.167	86.74	0.807	199.000		0.030	195.392	194.585	3.358
EXISTING	HIGHWAY 3	1	EX 3A	0	0	26.785	3.5	0.0	0	1306	3.72	0.01969	0.00402	0.02371	250	2.08	0.0858	1.747	86.74	1.807	197.600		0.030	194.555	192.748	2.795

PHASE DESIGNED TO OUTLET INTO EX SEWER ON WILLOWDALE CRESCENT

A1	VILLOWDAL	45	55	3790	0.379	0.379	3.5	4.0	14	14	4.40	0.00025	0.00006	0.00031	200	1.00	0.0328	1.043	78.23	0.782	205.640			201.413	200.631	4.027
A2	VILLOWDAL	55	56	4550	0.455	0.834	3.5	6.0	21	35	4.34	0.00062	0.00013	0.00074	200	1.00	0.0328	1.043	58.96	0.590	205.037		0.030	200.601	200.011	4.236
A3	VILLOWDAL	56	57	4870	0.487	1.321	3.5	7.0	24.5	59.5	4.30	0.00104	0.00020	0.00123	200	0.50	0.0232	0.737	61.70	0.309	204.183		0.030	199.981	199.672	4.002
A4	STREET G	54	57	2130	0.213	0.213	3.5	2.0	7	7	4.43	0.00013	0.00003	0.00016	200	1.74	0.0432	1.376	47.64	0.829	203.569			200.501	199.672	2.868

A4A	VILLOWDAL	57	58	2860	0.286	1.820	3.5	4.0	14	80.5	4.27	0.00139	0.00027	0.00166	200	0.50	0.0232	0.737	55.10	0.276	203.323		0.030	199.642	199.366	3.481
A11	VILLOWDAL	58	59	4930	0.493	2.313	3.5	7.0	24.5	105	4.24	0.00180	0.00035	0.00215	200	0.50	0.0232	0.737	55.10	0.276	202.750		0.030	199.336	199.060	3.214
A6	STREET F	48	49	3060	0.306	0.306	3.5	3.0	10.5	10.5	4.41	0.00019	0.00005	0.00023	200	1.00	0.0328	1.043	36.45	0.365				200.645	200.280	4.198
A5	STREET G	54	49	2950	0.295	0.295	3.5	3.0	10.5	10.5	4.41	0.00019	0.00004	0.00023	200	0.45	0.022	0.7	49.35	0.222	203.519			200.502	200.280	2.817
A7	STREET F	49	50	3120	0.312	0.913	3.5	3.0	10.5	31.5	4.35	0.00056	0.00014	0.00069	200	0.50	0.0232	0.737	38.30	0.192			0.030	200.250	200.058	3.374
A8	STREET F	50	51	2411	0.2411	1.154	3.5	3.0	10.5	42	4.33	0.00074	0.00017	0.00091	200	0.50	0.0232	0.737	43.67	0.218	203.430		0.030	200.028	199.810	3.202
A9	STREET F	51	52	1510	0.151	1.305	3.5	2.0	7	49	4.32	0.00086	0.00020	0.00105	200	0.50	0.0232	0.737	12.29	0.061	202.972		0.030	199.780	199.719	2.992
A10	STREET F	52	53	8210	0.821	2.126	3.5	10.0	35	84	4.26	0.00145	0.00032	0.00177	200	0.50	0.0232	0.737	74.34	0.372	202.834		0.030	199.689	199.317	2.945
A10A	STREET F	53	59	770	0.077	2.203	3.5	0.0	0	84	4.26	0.00145	0.00033	0.00178	200	0.50	0.0232	0.737	43.87	0.219	202.422		0.030	199.287	199.060	2.935
A12	VILLOWDAL	59	EX 27	6680	0.668	5.184	3.5	9.0	31.5	220.5	4.13	0.00369	0.00078	0.00447	200	2.35	0.0502	1.599	71.83	1.688	201.931		0.030	199.030	197.340	2.701
EX 27	VILLOWDAL	EX 27	EX 26	10700	1.07	6.254	3.5	14.0	49	269.5	4.10	0.00447	0.00094	0.00541	200	0.96	0.0321	1.022	106.00	1.008	200.110		0.030	197.310	192.748	2.600

PHASE DESIGNED TO OUTLET INTO EX SEWER ON CARDINAL LANE

A13A	STREET H	55	55A	880	0.088	0.088	3.5	1.0	3.5	3.5	4.45	0.00006	0.00001	0.00008	200	1.00	0.0328	1.043	24.79	0.248	205.037			201.712	201.464	3.125
A13	STREET H	55A	55B	2080	0.208	0.296	3.5	5.0	17.5	21	4.38	0.00037	0.00004	0.00042	200	0.50	0.0232	0.737	27.11	0.136	204.913		0.030	201.434	201.298	3.279
A14A	STREET H	55B	55C	2080	0.208	0.504	3.5	5.0	17.5	38.5	4.34	0.00068	0.00008	0.00075	200	0.50	0.0232	0.737	27.11	0.136	204.769		0.030	201.268	201.132	3.301
A14	STREET H	55C	25	7260	0.726	1.230	3.5	20.0	70	108.5	4.23	0.00186	0.00018	0.00205	200	0.80	0.0293	0.933	99.87	0.799	204.626		0.030	201.102	200.303	3.324
A15	STREET I	25	26	1400	0.14	1.370	3.5	0.0	0	108.5	4.23	0.00186	0.00021	0.00207	200	1.00	0.0328	1.043	78.53	0.785	204.119		0.030	200.273	199.488	3.646
A20	CARDINAL	30	29	2920	0.292	0.292	3.5	3.0	10.5	10.5	4.41	0.00019	0.00004	0.00023	200	0.45	0.022	0.7	16.51	0.074	202.908		0.393	199.910	199.836	2.798
A16	CARDINAL	29	26	3400	0.34	0.632	3.5	4.0	14	24.5	4.37	0.00043	0.00009	0.00053	200	0.45	0.022	0.7	70.60	0.318	202.918		0.030	199.806	199.488	2.912
A17	STREET I	26	27	5360	0.536	2.538	3.5	8.0	28	161	4.18	0.00273	0.00038	0.00311	200	0.45	0.022	0.7	69.98	0.315			0.030	199.458	199.143	2.899
A19	STREET I	27	28	4570	0.457	2.995	3.5	7.0	24.5	185.5	4.16	0.00313	0.00045	0.00358	200	0.45	0.022	0.7	66.48	0.299			0.030	199.113	198.814	2.885
A21	CARDINAL	30	31	4510	0.451	0.451	3.5	7.0	24.5	24.5	4.37	0.00043	0.00007	0.00050	200	0.45	0.022	0.7	52.57	0.237	202.908			199.785	199.548	2.923
A21A	CARDINAL	31	32	4630	0.463	0.914	3.5	7.0	24.5	49	4.32	0.00086	0.00014	0.00099	200	0.50	0.0232	0.737	52.57	0.263	202.630		0.030	199.518	199.255	2.912
A22	CARDINAL	32	33	2150	0.215	1.129	3.5	2.0	7	56	4.30	0.00098	0.00017	0.00115	200	0.45	0.022	0.7	13.81	0.062	202.357		0.030	199.225	199.163	2.932
A23	CARDINAL	33	28	3440	0.344	1.473	3.5	4.0	14	70	4.28	0.00121	0.00022	0.00144	200	0.45	0.022	0.7	70.85	0.319	202.269		0.030	199.133	198.814	2.936
A24	STREET I	28	15	3350	0.335	4.803	3.5	4.0	14	269.5	4.10	0.00447	0.00072	0.00519	200	0.50	0.0232	0.737	78.50	0.393	201.900		0.030	198.784	198.391	2.916
A25	CARDINAL	15	16	4950	0.495	5.298	3.5	7.0	24.5	294	4.08	0.00486	0.00079	0.00566	200	2.37	0.0504	1.606	53.41	1.266			0.030	198.361	197.094	2.939
A25A	CARDINAL	16	17	1150	0.115	5.413	3.5	1.0	3.5	297.5	4.08	0.00492	0.00081	0.00573	200	0.50	0.0232	0.737	13.80	0.069	201.938		0.030	197.064	196.995	4.674
A26	CARDINAL	17	18	2440	0.244	5.657	3.5	2.0	7	304.5	4.08	0.00503	0.00085	0.00588	200	0.50	0.0232	0.737	13.80	0.069	201.509		0.030	196.965	196.896	4.344
A26A	CARDINAL	18	EX 14	980	0.098	5.755	3.5	1.0	3.5	308	4.07	0.00508	0.00086	0.00595	200	0.50	0.0232	0.737	19.26	0.096	200.888		0.030	196.866	196.770	3.822
EX A8	CARDINAL	EX 14	EX 13	2400	0.24	5.995	3.5	3.0	10.5	318.5	4.07	0.00525	0.00090	0.00615	200	0.97	0.0323	1.027	45.00	0.437			0.030	196.740	192.748	2.448

DEC 1/17

STORM SEWER DESIGN CALCULATIONS

SUBDIVISION: LRH SUBDIVISION
PROJECT NO: 16-091
DESIGNED BY: GEORGE ADOM
CHECKED BY: LEN GIRARD
DRAWN BY: TOM SPRAGUE

DATE: NOVEMBER, 2017

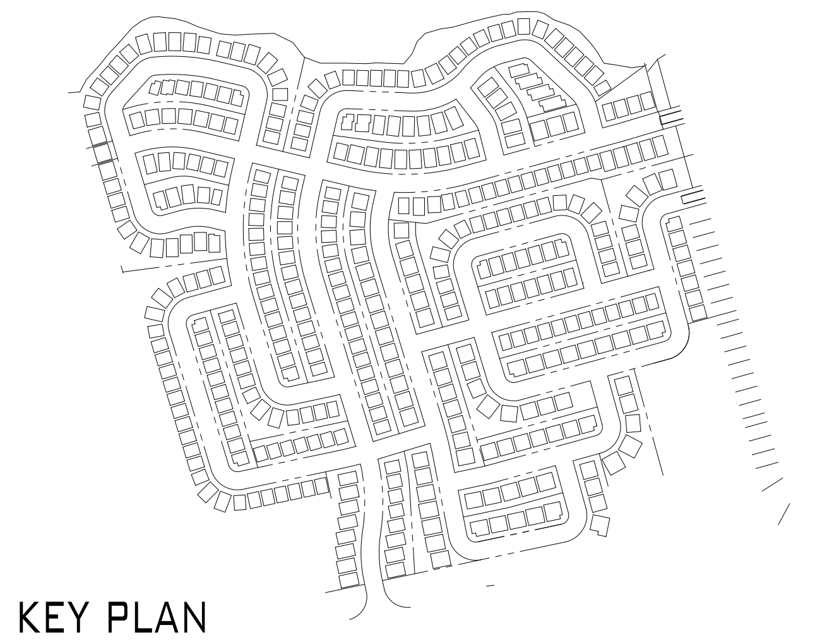
DESIGN FREQUENCY: 5 YEARS
RAINFALL STATION: TILLSONBURG, ON
DESIGNED 'n' : 0.013
MINIMUM COVER: 1.5 m

Enter lowest TC	15
Enter highest Tc	30
Enter New Tc	15.241

	LOCATION			DRAINAGE AREA				RUNOFF			PIPE SELECTION							PROFILE					
Drainage Area	Street	FROM CBMH No.	TO CBMH No.	A ha	C	A×C	Cum. A×C	Cum. Tc (min)	i mm/h	Q m^3/s	Pipe L (m)	Pipe Grade (%)	Pipe D (mm)	Actual Capacity (full) m^3/s	Velocity (full) m/s	Time of Flow (min)	Minor Losses m	Fall in Sewer m	[redacted]	Drop in MH	U/S Inv. Elev. m	D/S Inv. Elev. m	Cover (Depth to Obvert of Pipe) m
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19			21	22	23
A58	STREET D	80	76	0.266	0.45	0.120	0.120	15.000	76.402	0.0254	42.44	0.60	300	0.0748	1.0588	0.668		0.255	208.271		205.407	205.152	2.564
A51A	STREET D	76	75	0.088	0.45	0.040	0.159	15.668	75.191	0.0333	6.35	0.50	300	0.0683	0.9665	0.110		0.032	207.943	0.020	205.132	205.100	2.511
A51	STREET D	75	74	0.307	0.45	0.138	0.297	15.778	74.991	0.0620	50.79	0.50	375	0.1239	1.1216	0.755		0.254	207.894	0.020	205.080	204.826	2.439
A50	STREET D	74	73	0.525	0.45	0.236	0.534	16.532	73.624	0.1092	55.40	0.50	375	0.1239	1.1216	0.823		0.277	207.502	0.020	204.806	204.529	2.321
A49	STREET D	73	72	0.428	0.45	0.000	0.534	17.355	72.131	0.1069	55.40	0.50	375	0.1239	1.1216	0.823		0.277	207.075	0.020	204.509	204.232	2.191
A48A	STREET D	72	71	0.182	0.45	0.082	0.616	18.179	70.637	0.1208	12.07	0.55	375	0.1299	1.1764	0.171		0.066	206.648	0.020	204.212	204.146	2.061
A48	STREET D	71	68	0.346	0.45	0.156	0.771	18.350	70.327	0.1507	55.22	0.50	450	0.2015	1.2667	0.727		0.276	206.555	0.020	204.126	203.850	1.979
A56A	WILLOWDALE	80	70	0.183	0.45	0.082	0.082	15.000	76.402	0.0175	26.16	0.80	300	0.0864	1.2226	0.357		0.209	208.271		205.407	205.198	2.564
A56	WILLOWDALE	70	69	0.355	0.45	0.160	0.242	15.357	75.755	0.0509	39.62	1.10	300	0.1013	1.4336	0.461		0.436	207.752	0.020	205.178	204.742	2.274
A55	WILLOWDALE	69	68	0.435	0.45	0.196	0.438	15.817	74.920	0.0911	60.83	1.18	300	0.1050	1.4848	0.683		0.718	207.044	0.024	204.718	204.000	2.026
A54	STREET E	80	79	0.430	0.45	0.194	0.194	15.000	76.402	0.0411	76.91	0.70	300	0.0808	1.1436	1.121		0.538	208.271		205.407	204.869	2.564
A54A	STREET E	79	78	0.139	0.45	0.063	0.256	16.121	74.369	0.0529	13.24	1.20	300	0.1059	1.4973	0.147		0.159	207.039	0.020	204.849	204.690	1.890
A53	STREET E	78	77	0.478	0.45	0.215	0.471	16.268	74.103	0.0970	42.45	1.40	300	0.1143	1.6173	0.437		0.594	206.792	0.020	204.670	204.076	1.822
A52	STREET E	77	66	0.310	0.45	0.140	0.611	16.706	73.308	0.1244	36.9	1.88	300	0.1325	1.8741	0.328		0.694	206.117	0.021	204.055	203.361	1.762
																			[redacted]				
A46A	STREET D	68	67	0.119	0.45	0.054	1.263	19.076	69.010	0.2421	36.1	0.80	450	0.2549	1.6022	0.376		0.289	206.796	0.020	203.830	203.541	2.516
A46	STREET D	67	66	0.226	0.45	0.102	1.364	19.452	68.328	0.2590	36.39	0.85	450	0.2627	1.6515	0.367		0.309	206.616	0.020	203.521	203.212	2.645
A45	STREET D	66	65	0.170	0.45	0.077	2.052	19.819	67.663	0.3856	36.64	0.46	600	0.4162	1.4719	0.415		0.169	206.394	0.171	203.041	202.872	2.753
A45A	STREET D	65	57	0.166	0.45	0.075	2.126	20.234	66.910	0.3952	35.34	0.50	600	0.4340	1.5346	0.384		0.177	206.201	0.020	202.852	202.675	2.749
A44	STREET D	57	56	0.455	0.45	0.205	2.331	20.618	66.214	0.4288	60.6	0.80	600	0.5489	1.9411	0.520		0.485	206.036	0.020	202.655	202.170	2.781
A43	STREET D	56	55	0.431	0.45	0.194	2.525	21.138	65.271	0.4578	48.9	0.75	600	0.5315	1.8795	0.434		0.367	205.519	0.020	202.150	201.783	2.769
A43A	STREET D	55	54	0.213	0.45	0.096	2.621	21.572	64.484	0.4695	21.63	0.80	600	0.5489	1.9411	0.186		0.173	205.104	0.020	201.763	201.590	2.741
A42	STREET D	54	41	0.320	0.45	0.144	2.765	21.757	64.148	0.4927	63.07	0.90	600	0.5822	2.0589	0.511		0.568	204.924	0.020	201.570	201.002	2.754
																			[redacted]				
A41	STREET C	57	58	0.384	0.45	0.173	0.173	15.000	76.402	0.0367	60.88	0.40	300	0.0611	0.8645	1.174		0.244	206.036		202.734	202.490	3.002
A41A	STREET C	58	59	0.275	0.45	0.124	0.297	16.174	74.273	0.0612	23.23	0.45	300	0.0648	0.9169	0.422		0.105	205.773	0.020	202.470	202.365	3.003
AEXT1/2	EASEMENT	CBMH59A	59	1.157	0.45	0.521	0.521	15.000	76.402	0.1105	43.56	1.58	300	0.1215	1.7187	0.422		0.689	[redacted]		203.054	202.365	1.750
A40	STREET C	59	60	0.748	0.45	0.337	1.154	16.596	73.508	0.2356	83.13	0.40	525	0.2718	1.2556	1.103		0.333	205.654	0.240	202.125	201.792	3.004
A39	STREET C	60	61	0.692	0.45	0.311	1.465	17.699	71.507	0.2911	83.46	0.48	525	0.2978	1.3755	1.011		0.401	205.632	0.020	201.772	201.371	3.335
A38	STREET C	61	61A	0.216	0.45	0.097	1.562	18.711	69.672	0.3024	22.04	0.51	525	0.3070	1.4178	0.259		0.112	204.816	0.020	201.351	201.239	2.940
A37	STREET C	61	62	0.513	0.45	0.231	1.793	18.970	69.203	0.3447	66.34	0.50	525	0.3039	1.4038	0.788		0.332	204.703	0.020	201.219	200.887	2.959
A36	STREET C	62	40	0.429	0.45	0.193	1.986	19.757	67.775	0.3740	74.94	0.50	525	0.3039	1.4038	0.890		0.375	204.365	0.020	200.867	200.492	2.973

BLK 492	STREET B	36A	36	0.140	0.25	0.315	0.315	15.000	76.402	0.0669	27.52	0.40	375	0.1108	1.0032	0.457	0.110	[redacted]		201.332	201.222	2.175
A12	STREET B	36	37	0.320	0.45	0.144	0.459	15.457	75.573	0.0964	31.37	0.40	375	0.1108	1.0032	0.521	0.125	[redacted]	0.020	201.202	201.077	2.167
A12A	STREET B	37	38	0.295	0.45	0.133	0.592	15.978	74.628	0.1227	31.82	0.40	450	0.1802	1.1329	0.468	0.127	203.581	0.090	200.987	200.860	2.144
A13	STREET B	38	39	0.427	0.45	0.192	0.784	16.446	73.780	0.1607	45.62	0.45	450	0.1911	1.2017	0.633	0.205	203.415	0.020	200.840	200.635	2.125
A13A	STREET B	39	40	0.187	0.45	0.084	0.868	17.079	72.632	0.1751	26.38	0.47	450	0.1943	1.2215	0.360	0.123	203.178	0.020	200.615	200.492	2.113
A31	STREET B	45	44	0.425	0.45	0.191	0.191	15.000	76.402	0.0406	55.22	0.60	300	0.0748	1.0588	0.869	0.331	205.609		202.692	202.361	2.617
A32	STREET B	44	43	0.331	0.45	0.149	0.340	15.869	74.826	0.0707	44.41	0.80	300	0.0864	1.2226	0.605	0.355	205.296	0.020	202.341	201.986	2.655
A33	STREET B	43	42	0.515	0.45	0.232	0.572	16.475	73.727	0.1171	68.1	0.50	450	0.2015	1.2667	0.896	0.341	205.066	0.050	201.936	201.606	2.680
A34	STREET B	42	41	0.581	0.45	0.261	0.833	17.371	72.102	0.1669	70.42	0.62	450	0.2236	1.4059	0.835	0.434	204.716	0.020	201.586	201.002	2.680
A35	STREET B	41	40	0.344	0.45	0.155	3.753	22.268	63.222	0.6591	78.52	0.65	675	0.6774	1.8927	0.691	0.510	204.362	0.170	200.832	200.472	2.855
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
A47	WILLOWDALE	68	45	0.140	0.45	0.063	0.063	15.000	76.402	0.0134	78.55	1.50	300	0.1183	1.6740	0.782	1.178	206.796		203.860	202.662	2.636
A63	STREET F	47A	47	0.372	0.45	0.167	0.230	15.000	76.402	0.0489	49.42	0.52	300	0.0697	0.9857	0.836	0.257	206.339		203.392	203.135	2.647
A30	STREET F	47	46	0.062	0.45	0.028	0.258	15.836	74.886	0.0537	20.34	0.45	300	0.0648	0.9169	0.370	0.092	206.022	0.090	203.045	202.953	2.677
A30A	STREET F	46	45	0.335	0.45	0.151	0.409	16.205	74.217	0.0843	67.75	0.40	375	0.1108	1.0032	1.126	0.271	205.919	0.020	202.933	202.662	2.611
A59	WILLOWDALE	45	32	0.381	0.45	0.171	0.644	17.331	72.175	0.1290	78.22	0.60	375	0.1357	1.2287	1.061	0.469	205.609	0.020	202.642	202.173	2.592
A29	STREET H	32	31	0.085	0.6	0.051	0.695	18.392	70.251	0.1355	21.7	0.81	375	0.1577	1.4276	0.253	0.176	204.987	0.020	202.153	201.977	2.459
A29A	STREET H	31	30	0.208	0.6	0.125	0.819	18.645	69.792	0.1588	27.6	0.33	450	0.1637	1.0290	0.447	0.091	204.863	0.090	201.887	201.796	2.526
A28	STREET H	30	29	0.208	0.6	0.125	0.944	19.092	68.981	0.1809	27.6	0.45	450	0.1911	1.2017	0.383	0.124	204.719	0.020	201.776	201.652	2.493
A28A	STREET H	29	28	0.454	0.6	0.272	1.217	19.475	68.287	0.2308	50.52	0.80	450	0.2549	1.6022	0.526	0.404	204.576	0.020	201.632	201.228	2.494
A27	STREET H	28	18	0.335	0.6	0.201	1.418	20.001	67.333	0.2651	50.52	1.00	450	0.2849	1.7913	0.470	0.505	204.317	0.020	201.208	200.703	2.659
A26	STREET H	18	17	0.750	0.6	0.450	0.450	15.000	76.402	0.0955	98.18	0.60	300	0.0748	1.0588	1.546	0.589	204.056	-0.030	200.733	200.446	3.023
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	203.986	[redacted]	[redacted]	[redacted]	[redacted]
A15	STREET H	17	15	0.399	0.6	0.239	7.360	23.674	60.672	1.2405	56.12	0.48	900	1.2538	1.9705	0.475	0.269	203.554	0.020	199.880	199.611	2.774
A16	STREET J	15	16	0.348	0.6	0.209	7.569	24.149	59.811	1.2576	66.12	0.33	975	1.2869	1.7235	0.639	0.218	203.268	0.090	199.521	199.303	2.772
A16A	STREET J	16	10	0.497	0.6	0.298	7.867	24.788	58.652	1.2818	66.06	0.35	975	1.3254	1.7749	0.620	0.231	202.577	0.020	199.283	199.052	2.319
A11	STREET H	15	14	0.322	0.6	0.193	0.193	15.000	76.402	0.0410	60.65	0.40	375	0.1108	1.0032	1.008	0.243	203.268	-0.660	200.271	200.028	2.622
A10	STREET H	14	13	0.189	0.6	0.113	0.307	16.008	74.574	0.0635	23.52	0.40	375	0.1108	1.0032	0.391	0.094	202.969	0.020	200.008	199.914	2.586
A9	STREET H	13	12	0.566	0.6	0.340	0.646	16.398	73.867	0.1326	109.89	0.40	450	0.1802	1.1329	1.617	0.440	202.846	0.090	199.824	199.384	2.572
A9A	STREET H	PCB	12	0.674	0.25	0.169	0.169	15.000	76.402	0.0358	15.00	0.40	300	0.0611	0.8645	0.289	0.060	[redacted]		199.464	199.404	1.086
A8A	STREET H	12	11	0.098	0.6	0.059	0.874	18.015	70.934	0.1721	15.13	0.45	450	0.1911	1.2017	0.210	0.068	[redacted]	0.020	199.364	199.296	2.445
A8	STREET H	11	10	0.372	0.6	0.223	1.097	18.225	70.554	0.2150	71.85	0.40	525	0.2718	1.2556	0.954	0.287	[redacted]	0.090	199.206	198.919	2.463
A7A	STREET J	10	9	0.618	0.6	0.371	9.335	25.409	57.526	1.4918	42.71	0.32	1050	1.5442	1.7832	0.399	0.137	201.857	0.090	198.962	198.825	1.845
A7	STREET J	9	8	0.618	0.6	0.371	9.706	25.808	56.802	1.5315	23.26	0.33	1050	1.5682	1.8108	0.214	0.077	201.640	0.020	198.805	198.728	1.785
A6	STREET J	8	19A	0.294	0.6	0.176	9.882	26.022	56.414	1.5487	66.03	0.33	1050	1.5682	1.8108	0.608	0.218	201.493	0.020	198.708	198.490	1.735
A19	STREET I	18	21	0.145	0.45	0.065	1.483	20.471	66.481	0.2738	83.48	0.45	525	0.2883	1.3318	1.045	0.376	204.056	0.090	200.613	200.237	2.918
A20	CARDINAL	25	24	0.225	0.45	0.101	0.101	15.000	76.402	0.0215	14.39	0.30	450	0.1561	0.9812	0.244	0.043	202.858		200.524	200.481	1.884
A20A	CARDINAL	24	21	0.343	0.45	0.154	0.256	15.244	75.960	0.0539	72.12	0.31	450	0.1586	0.9974	1.205	0.224	202.868	0.020	200.461	200.237	1.957
A18	CARDINAL	21	20	0.325	0.6	0.195	0.195	15.000	76.402	0.0414	61.94	1.00	325	0.1196	1.4418	0.716	0.619	202.489	-0.020	200.257	199.638	1.907

A18A	CARDINAL	20	19	0.212	0.6	0.127	0.322	15.716	75.104	0.0672	15.11	1.06	325	0.1232	1.4844	0.170		0.160	202.023	0.021	199.617	199.457	2.081
A17	CARDINAL	19	19A	0.795	0.6	0.477	0.799	15.886	74.795	0.1661	95.73	0.93	375	0.1690	1.5297	1.043		0.890	201.884	0.077	199.380	198.490	2.129
A2	CARDINAL	19A	1	0.302	0.6	0.181	10.862	26.630	55.311	1.6690	64.22	0.38	1050	1.6828	1.9432	0.551		0.244	201.186	0.020	198.470	198.226	1.666
A21	CARDINAL	25	26	0.984	0.45	0.443	0.443	15.000	76.402	0.0940	104.55	0.51	350	0.1041	1.0818	1.611		0.533	202.858		200.524	199.991	1.984
A21A	CARDINAL	26	27	0.215	0.45	0.097	0.540	16.611	73.481	0.1101	14.29	0.35	450	0.1686	1.0598	0.225		0.050	202.307	0.120	199.871	199.821	1.986
A22	CARDINAL	27	23	0.342	0.45	0.154	0.693	16.835	73.074	0.1408	72.31	0.35	450	0.1686	1.0598	1.137		0.253	202.219	0.020	199.801	199.548	1.968
A23	STREET I	21	22	0.532	0.45	0.239	1.722	21.515	64.587	0.3090	66.20	0.56	525	0.3217	1.4857	0.743		0.371	202.489	0.020	200.217	199.846	1.747
A24	STREET I	22	23	0.455	0.45	0.205	1.927	22.258	63.240	0.3385	57.11	0.40	600	0.3881	1.3726	0.693		0.228	202.153	0.090	199.756	199.528	1.797
A25	STREET I	23	3	0.335	0.45	0.151	2.771	22.952	61.981	0.4771	78.52	0.45	650	0.5097	1.5357	0.852		0.353	201.862	0.070	199.458	199.105	1.754
A5	CARDINAL	6	5	0.237	0.45	0.107	0.107	15.000	76.402	0.0226	15.34	0.40	300	0.0611	0.8645	0.296		0.061	200.888		199.543	199.482	1.045
A4A	CARDINAL	5	4	0.118	0.45	0.053	0.160	15.296	75.865	0.0337	15.34	0.40	300	0.0611	0.8645	0.296		0.061	201.459	0.020	199.462	199.401	1.697
A4	CARDINAL	4	3	0.499	0.45	0.225	0.384	15.591	75.330	0.0804	56.41	0.40	350	0.0922	0.9581	0.981		0.226	201.838	0.070	199.331	199.105	2.157
A3	CARDINAL	3	2	0.272	0.45	0.122	3.278	23.804	60.436	0.5503	62.94	0.45	675	0.5636	1.5748	0.666		0.283	201.425	0.040	199.065	198.782	1.685
A3A	CARDINAL	2	1A	0.037	0.8	0.030	3.307	24.470	59.228	0.5442	13.38	0.46	675	0.5699	1.5922	0.140		0.062	201.064	0.020	198.762	198.700	1.627
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]	200.984	[redacted]	[redacted]	[redacted]	[redacted]
A1	POND	1	OUTLET	1.360	0.25	0.340	14.604	27.180	54.314	2.2035	30.00	0.33	1200	2.2390	1.9795	0.253		0.099	200.857	0.170	198.056	197.957	1.601
				PHASE DESIGNED TO OUTLET INTO EXISTING SEWER ON WILLOWDALE																			
A59A	WILLOWDALE	32	33	0.463	0.45	0.208	0.208	15.000	76.402	0.0442	62.49	1.20	300	0.1059	1.4973	0.696		0.750	204.987	-0.020	202.193	201.443	2.494
A60	WILLOWDALE	33	34	0.483	0.45	0.217	0.426	16.611	73.481	0.0869	59.46	1.50	300	0.1183	1.6740	0.592		0.892	204.133	0.020	201.423	200.532	2.410
A61	STREET G	53	34	0.223	0.45	0.100	0.100	15.000	76.402	0.0213	49.65	1.80	300	0.1296	1.8338	0.451		0.894	[redacted]		201.425	200.5316	2.347
A61A	WILLOWDALE	34	34A	0.412	0.45	0.185	0.711	17.203	72.407	0.1431	58.39	1.15	375	0.1879	1.7010	0.572		0.671	203.323	0.096	200.436	199.764	2.512
A62	WILLOWDALE	34A	35	0.365	0.45	0.164	0.876	17.775	71.370	0.1736	56.92	1.36	375	0.2043	1.8498	0.513		0.774	202.700	0.020	199.744	198.970	2.581
A64A	STREET F	47A	48	0.311	0.45	0.140	0.140	15.000	76.402	0.0297	39.65	2.92	300	0.1651	2.3357	0.283		1.158	206.339		203.392	202.234	2.647
A64	STREET F	48	49	0.243	0.45	0.109	0.249	15.283	75.889	0.0526	32.77	2.41	300	0.1500	2.1219	0.257		0.790	[redacted]	0.220	202.014	201.224	2.679
A65A	STREET G	53	49	0.178	0.45	0.080	0.080	15.000	76.402	0.0170	51.87	0.40	300	0.0611	0.8645	1.000		0.207	[redacted]		201.432	201.224	2.340
A65	STREET F	49	50	0.401	0.45	0.180	0.510	15.540	75.423	0.1068	41.07	0.90	375	0.1662	1.5048	0.455		0.370	204.047	0.095	201.129	200.760	2.543
A66	STREET F	50	51	0.256	0.45	0.115	0.625	15.995	74.598	0.1295	44.95	1.00	375	0.1752	1.5862	0.472		0.450	203.380	0.020	200.740	200.290	2.265
A67	STREET F	51	52	0.131	0.45	0.059	0.684	16.467	73.742	0.1401	13.70	0.80	375	0.1567	1.4188	0.161		0.110	202.922	0.020	200.270	200.161	2.277
A68	STREET F	52	52A	0.734	0.45	0.330	1.014	16.628	73.450	0.2070	75.68	0.80	450	0.2549	1.6022	0.787		0.605	202.784	0.095	200.066	199.460	2.268
A69	STREET F	36	35	0.082	0.45	0.037	1.051	17.416	72.021	0.2103	47.01	1.00	450	0.2849	1.7913	0.437		0.470	202.372	0.020	199.440	198.970	2.482
A70	WILLOWDALE	35	EX27	0.659	0.45	0.297	2.223	18.288	70.439	0.4351	69.28	0.70	600	0.5135	1.8158	0.636		0.485	201.831	0.170	198.800	198.315	2.431
EX. A17	WILLOWDALE	EX27	EX26	0.770	0.5	0.385	2.608	18.924	69.286	0.5021	104.00	0.99	600	0.6106	2.1594	0.803		1.030	200.090	0.020	198.295		1.195
				PHASE DESIGNED TO OUTLET INTO EXISTING SEWER ON CARDINAL																			
A5A	CARDINAL	6	EX15	0.104	0.45	0.047	0.047	15.000	76.402	0.0099	19.75	2.00	300	0.1367	1.9330	0.170		0.395	200.888		198.440	198.045	2.148
EX. A24	CARDINAL	EX15	EX14	0.320	0.5	0.160	0.207	15.170	75.965	0.0436	42.54	1.10	300	0.1013	1.4336	0.495		0.468	199.420	0.020	198.025		1.095



THE CONTRACTOR IS RESPONSIBLE FOR THE REVIEW OF THESE PLANS & TO EDUCATE THEMSELVES OF THE EXACT LOCATIONS OF UTILITIES AND UNDERGROUND SERVICES ON SITE PRIOR TO CONSTRUCTION. ALL UTILITIES ARE NOT SHOWN ON THESE PLANS. THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGES & REPAIRS TO ALL UTILITIES ON SITE.

No:	Revision:	By:	Date:
1	ISSUED FOR PRELIMINARY REVIEWS	TS	NOV. 21, 2017

DEMOCRAT HOMES LTD.
PORT DOVER, ONTARIO

DESIGNED BY:

girard ENGINEERING

2478153 ONTARIO INC.
OTTERVILLE EMBRO
TEL: 1-519-879-6875
FAX: 1-519-879-6536
EMAIL: INFO@GIRARDENGINEERING.CA

ENGINEERS SEAL OF APPROVAL:

Len Girard
LEN GIRARD
Mar. 22, 2019

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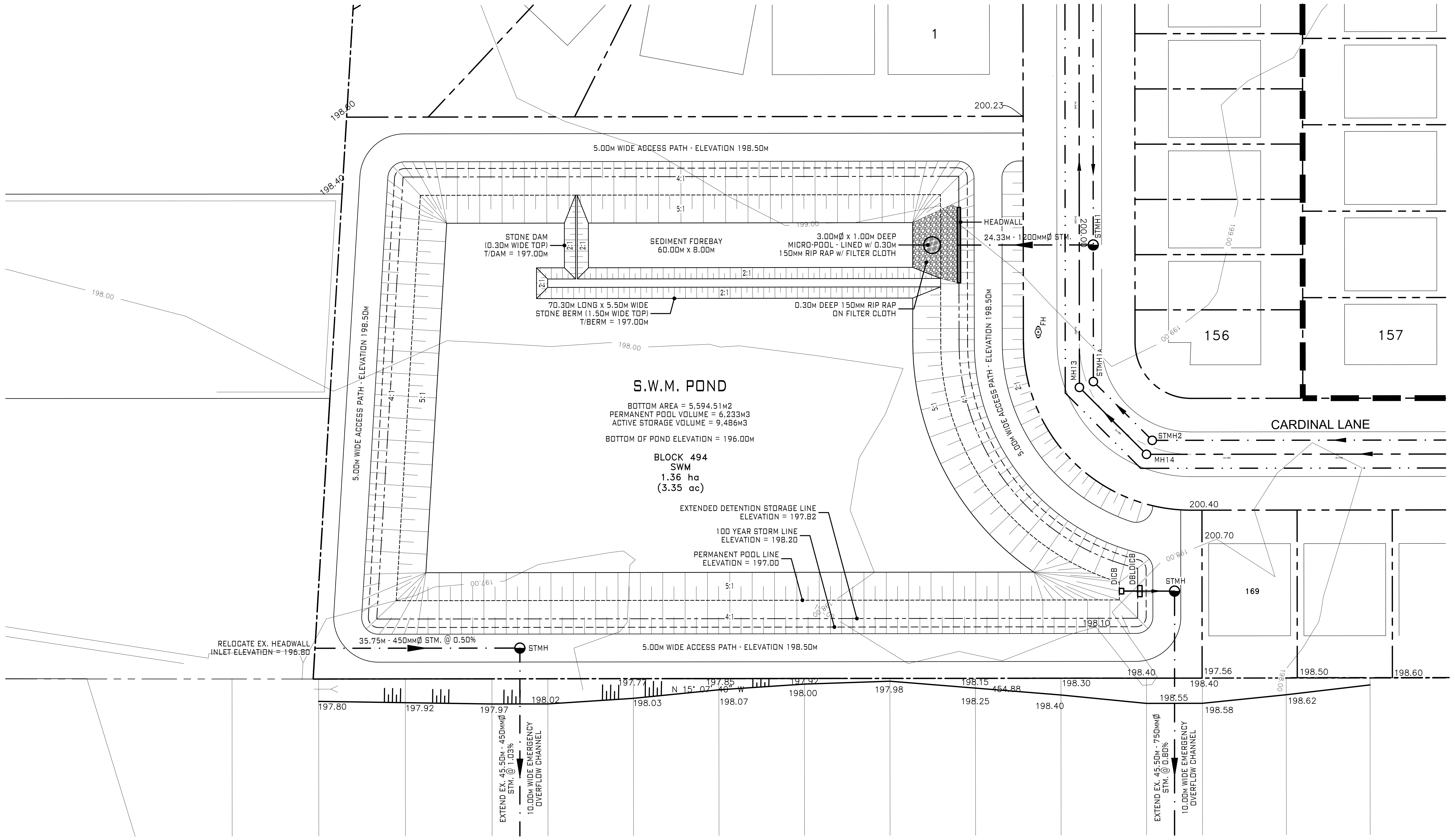
LYNN RIVER HEIGHTS
PORT DOVER, ONTARIO

MAJOR STORM PLAN

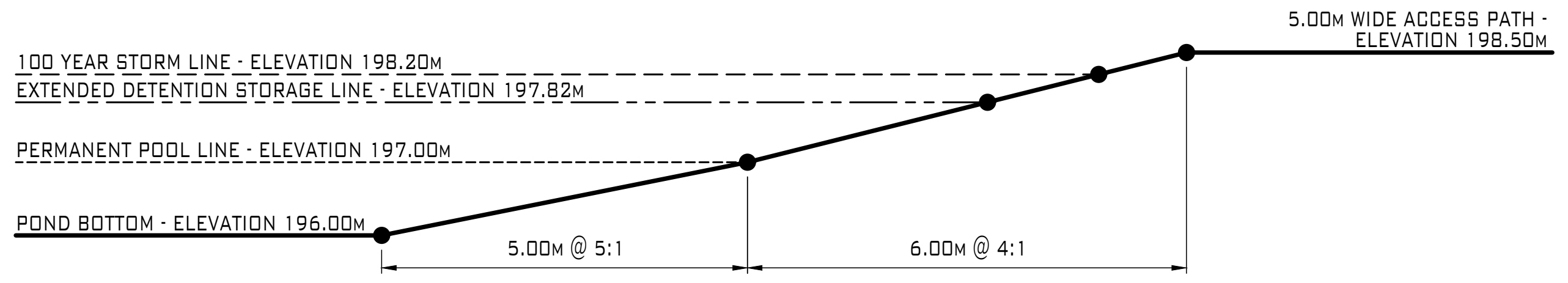
SCALE:	1:1000
DATE:	OCTOBER, 2017
DRAWING BY:	T. SPRAGUE
DESIGNED BY:	G. ADOM / L. GIRARD
CHECKED BY:	L. GIRARD
PROJECT NO:	16-067

DRAWING NO:
200



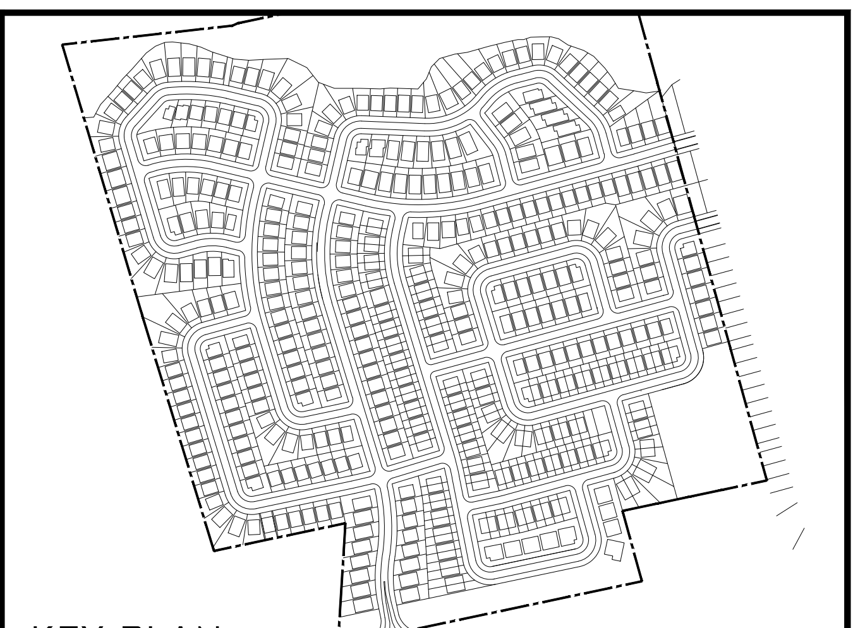
STORM WATER MANAGEMENT POND PLAN

SCALE: 1:500



PARTIAL POND SECTION

SCALE: 1:100



KEY PLAN

LEGEND:

- MH59 - DENOTES PROPOSED SANITARY SEWER, DIRECTION OF FLOW & MANHOLE
- STMH35 - DENOTES PROPOSED STORM SEWER, DIRECTION OF FLOW & MANHOLE
- DENOTES PROPOSED WATERMAIN
- FH - DENOTES PROPOSED FIRE HYDRANT LOCATION
- DENOTES PROPOSED PHASE LINE

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No:	Revision:	By:	Date:
1	ISSUED FOR PRELIMINARY REVIEWS	TS	DEC. 5, 2017

DEMOCRAT HOMES LTD.
PORT DOVER, ONTARIO

DESIGNED BY:

girard ENGINEERING

2478153 ONTARIO INC.
OTTERVILLE EMBRO
TEL: 1-519-879-6875
FAX: 1-519-879-6536
EMAIL: INFO@GIRARDENGINEERING.CA

ENGINEERS SEAL OF APPROVAL:

REGISTERED PROFESSIONAL ENGINEER
Len Girard
LEN GIRARD
Mar. 22, 2019
PROVINCE OF ONTARIO

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LYNN RIVER HEIGHTS
PORT DOVER, ONTARIO

STORM WATER
MANAGEMENT POND PLAN

SCALE:	1:500	
DATE:	MARCH 2019	DRAWING NO:
DRAWING BY:	D. FALLOWFIELD	400
DESIGNED BY:	L. GIRARD	
CHECKED BY:	L. GIRARD	
PROJECT NO:	16-067	

SKETCH
ILLUSTRATING TOPOGRAPHIC INFORMATION
PART OF LOT 8
CONCESSION 2
GEOGRAPHIC TOWNSHIP OF WOODHOUSE
NOW IN
NORFOLK COUNTY

SCALE – 1: 1500 0 30 60 90 METRES

METRIC DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

KIM HUSTED SURVEYING LTD.

SURVEYOR'S CERTIFICATE

I CERTIFY THAT

(1) – TOPOGRAPHIC INFORMATION SHOWN HEREON WAS GENERATED FROM FIELD WORK COMPLETED ON AUGUST 24, 2004

AUGUST 26, 2004
DATE

KIM S. HUSTED
ONTARIO LAND SURVEYOR

NOTES

(1) – ELEVATIONS ARE GEODETIC AND ARE REFERRED TO TABLET (No. 724316) IN EAST SIDE OF CONCRETE FOUNDATION 39 CETIMETRES BELOW BRICK WORK AND 24 CENTIMETRES NORTH OF SOUTH EAST CORNER OF BUILDING ELEVATION = 208.596

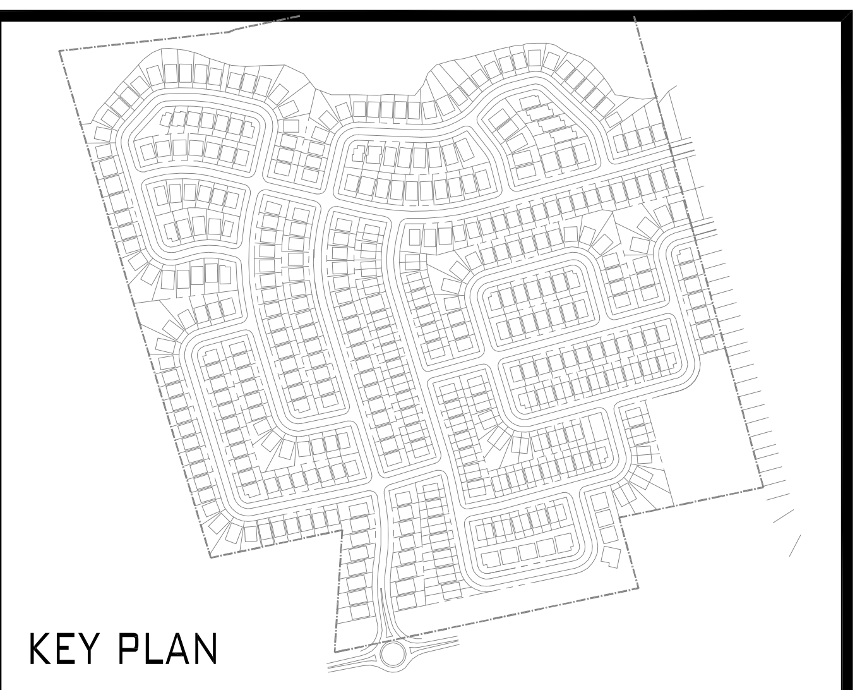
(2) – THIS SKETCH WAS UPDATED ON JUNE 28, 2017 TO ILLUSTRATE THE LOCATION OF THE EDGE OF CULTIVATION, THE EDGE OF THE TREE LINE AND THE LOCATION OF THE TOP OF BACK.

LEGEND

GV	DENOTES	GAS VALVE
UP	DENOTES	HYDRO POLE
BP	DENOTES	BELL PEDESTAL

KIM HUSTED SURVEYING LTD.
ONTARIO LAND SURVEYOR
30 HARVEY STREET, TILLSONBURG ONTARIO, N4G 3J8
PHONE: 519–842–3638 FAX: 519–842–3639

PROJECT: 04–6820TOB REFERENCE: HF 1 DISK No. 566



KEY PLAN

LEGEND:

THE CONTRACTOR IS RESPONSIBLE FOR THE REVIEW OF THESE PLANS & TO EDUCATE THEMSELVES OF THE EXACT LOCATIONS OF UTILITIES AND UNDERGROUND SERVICES ON SITE PRIOR TO CONSTRUCTION. ALL UTILITIES ARE NOT SHOWN ON THESE PLANS. THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGES & REPAIRS TO ALL UTILITIES ON SITE.

No:	Revision:	By:	Date:
1	ISSUED FOR PRELIMINARY REVIEWS	TS	DEC. 5, 2017

DEMOCRAT HOMES LTD.
PORT DOVER, ONTARIO

DESIGNED BY:
girard ENGINEERING
2478153 ONTARIO INC.
OTTERVILLE EMBRO
TEL: 1-519-879-6875
FAX: 1-519-879-6536
EMAIL: INFO@GIRARDENGINEERING.CA

ENGINEERS SEAL OF APPROVAL:

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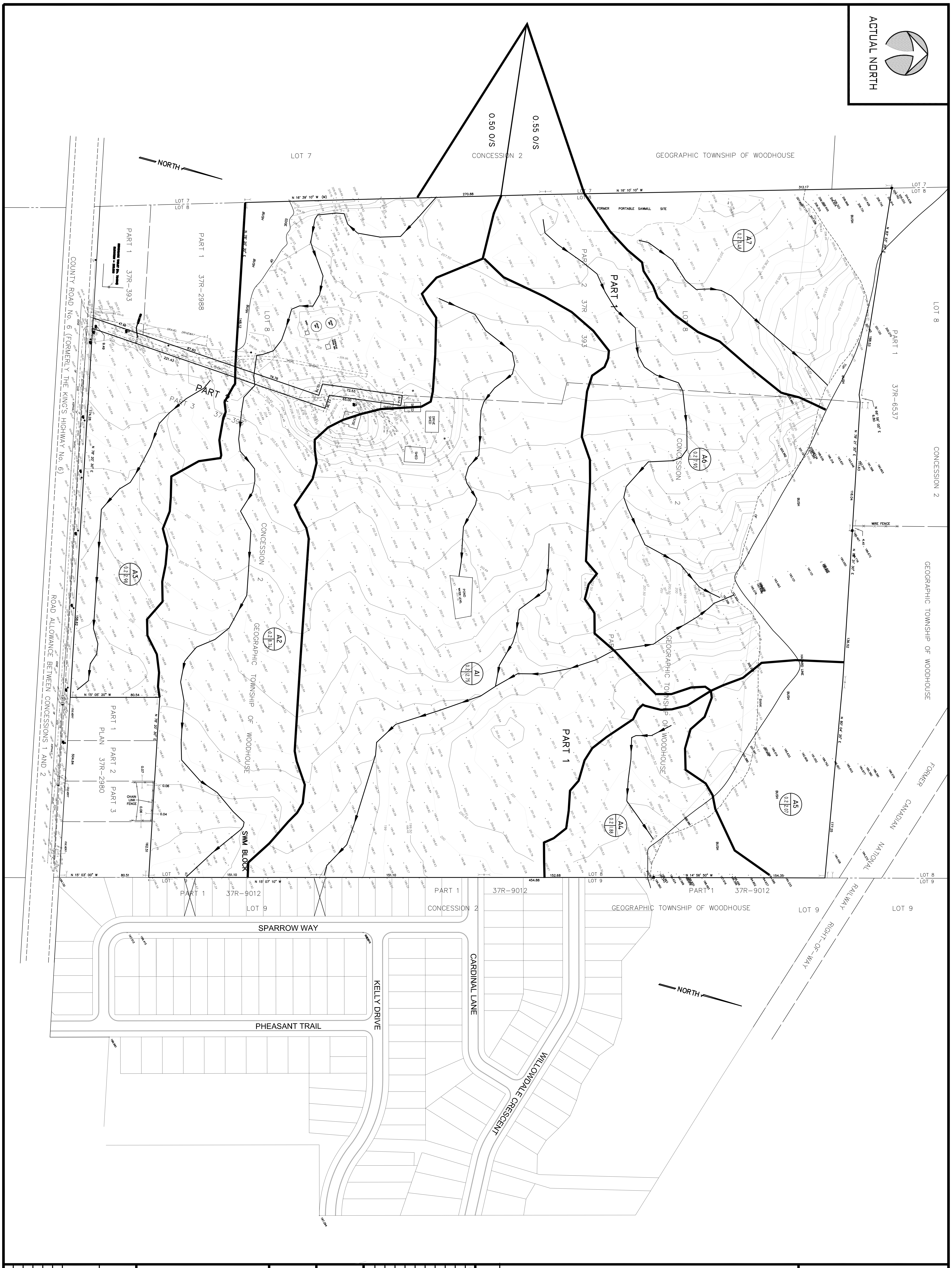
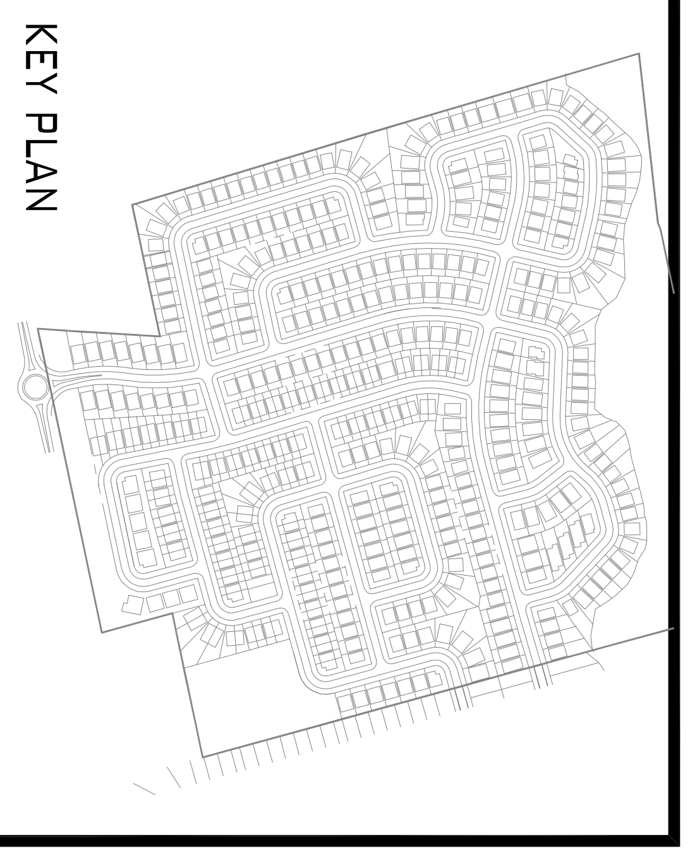
LYNN RIVER HEIGHTS
PORT DOVER, ONTARIO

CONTOUR PLAN

SCALE: 1:1000
DATE: OCTOBER, 2017
DRAWING BY: T. SPRAGUE
DESIGNED BY: G. ADOM / L. GIRARD
CHECKED BY: L. GIRARD
PROJECT NO: 16-067
DRAWING NO: 301



KEY PLAN



LEGEND:

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NO:	REVISION:	BY:	DATE:
1	ISSUED FOR REVIEW	TH	JULY 24, 2007
2	ISSUED FOR 2ND SUBMISSION	TH	FEB. 21, 2008
3	REVISED AS PER COUNTY'S REVIEW - 3RD SUBMISSION	TH	APRIL 2, 2008
4	REVISED TO NEW LAYOUT - ISSUED FOR REVIEW	TS	DEC. 5, 2017

DEMOCRAT HOMES LTD.
PORT DOVER, ONTARIO

DESIGNED BY:

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ENGINEERING

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OTTERVILLE
EMBRO
TEL: 1-519-879-6875
FAX: 1-519-879-6536
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ENGINEERS SEAL OF APPROVAL:

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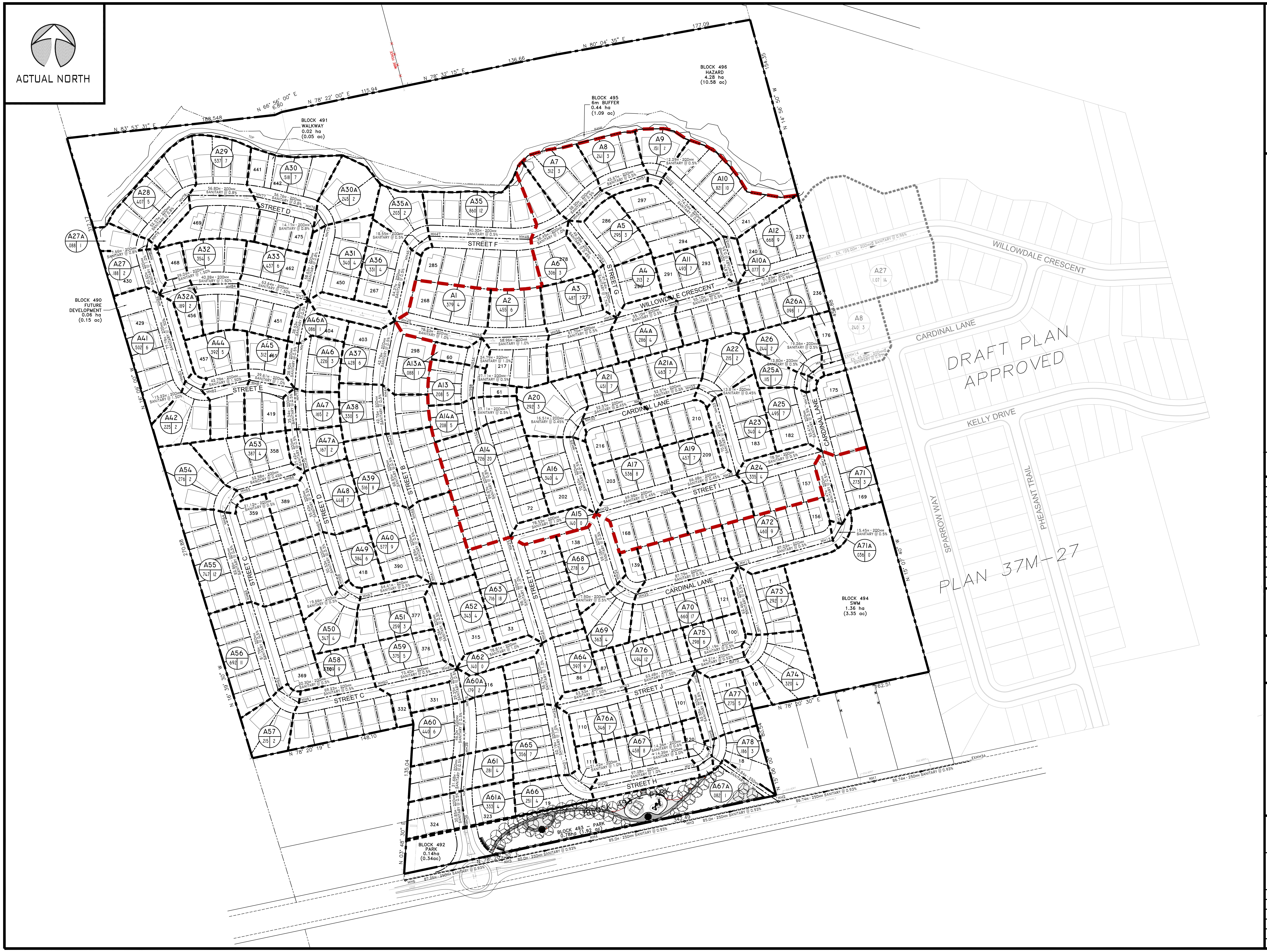
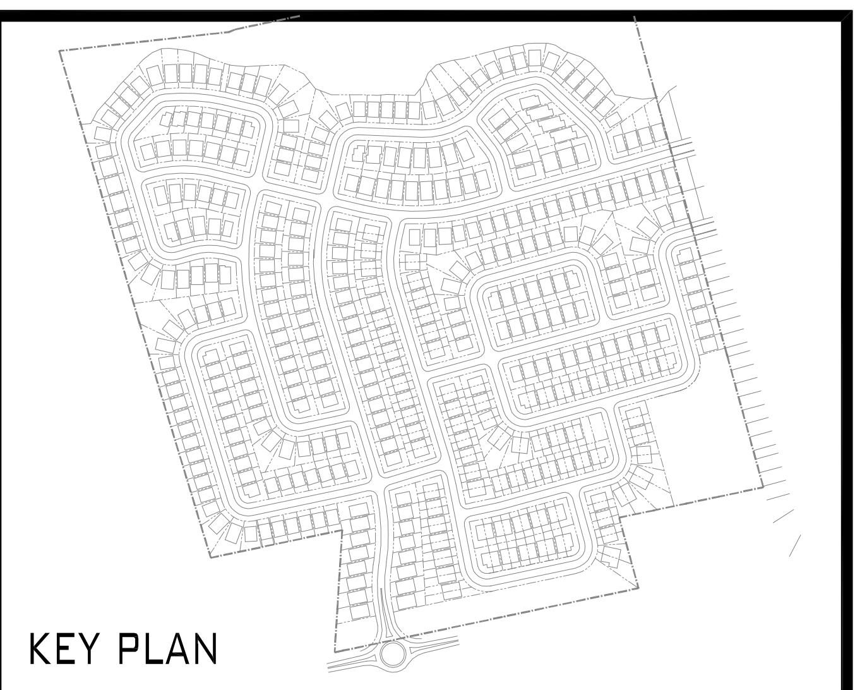
LYNN RIVER HEIGHTS
PORT DOVER, ONTARIO

PRE-DEVELOPMENT PLAN

SCALE: 1:1500
DATE: OCTOBER, 2017
DRAWING BY: T. SPRAGUE
DESIGNED BY: G. ADOM / L. GIRARD
CHECKED BY: L. GIRARD
PROJECT NO: 16-067
DRAWING NO: 300



KEY PLAN



LEGEND:

- DENOTES PROPOSED SANITARY SEWER
- DENOTES PROPOSED SANITARY MANHOLE
- AREA DESIGNATOR
- NUMBER OF LOTS SERVICED
- AREA (HA)

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No:	Revision:	By:	Date:
1	ISSUED FOR PRELIMINARY REVIEWS	TS	DEC. 5, 2017

DEMOCRAT HOMES LTD.
PORT DOVER, ONTARIO

DESIGNED BY

girard ENGINEERING
2478153 ONTARIO INC.
OTTERVILLE EMBRO
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FAX: 1-519-879-6536
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ENGINEERS SEAL OF APPROVAL

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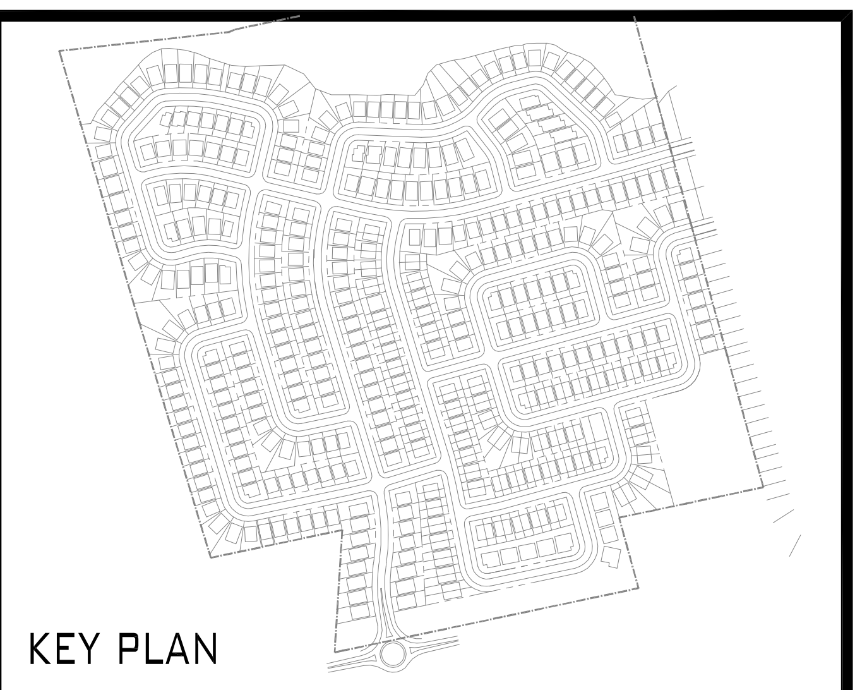
LYNN RIVER HEIGHTS
PORT DOVER, ONTARIO

SANITARY SEWER DRAINAGE PLAN

SCALE:	1:1000	
DATE:	OCTOBER, 2017	DRAWING NO:
DRAWING BY:	T. SPRAGUE	302
DESIGNED BY:	G. ADOM / L. GIRARD	
CHECKED BY:	L. GIRARD	
PROJECT NO:	16-067	

KEY PLAN



LEGEND:

- DENOTES PROPOSED STORM SEWER
- DENOTES PROPOSED STORM MANHOLE
- AREA DESIGNATOR
- NUMBER OF LOTS SERVICED
- AREA (HA)

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NO:	REVISION:	BY:	DATE:
1	ISSUED FOR PRELIMINARY REVIEWS	TS	DEC. 5, 2017

DEMOCRAT HOMES LTD.
PORT DOVER, ONTARIO

DESIGNED BY:

girard ENGINEERING

2478153 ONTARIO INC.
OTTERVILLE EMBRO
TEL: 1-519-879-6875
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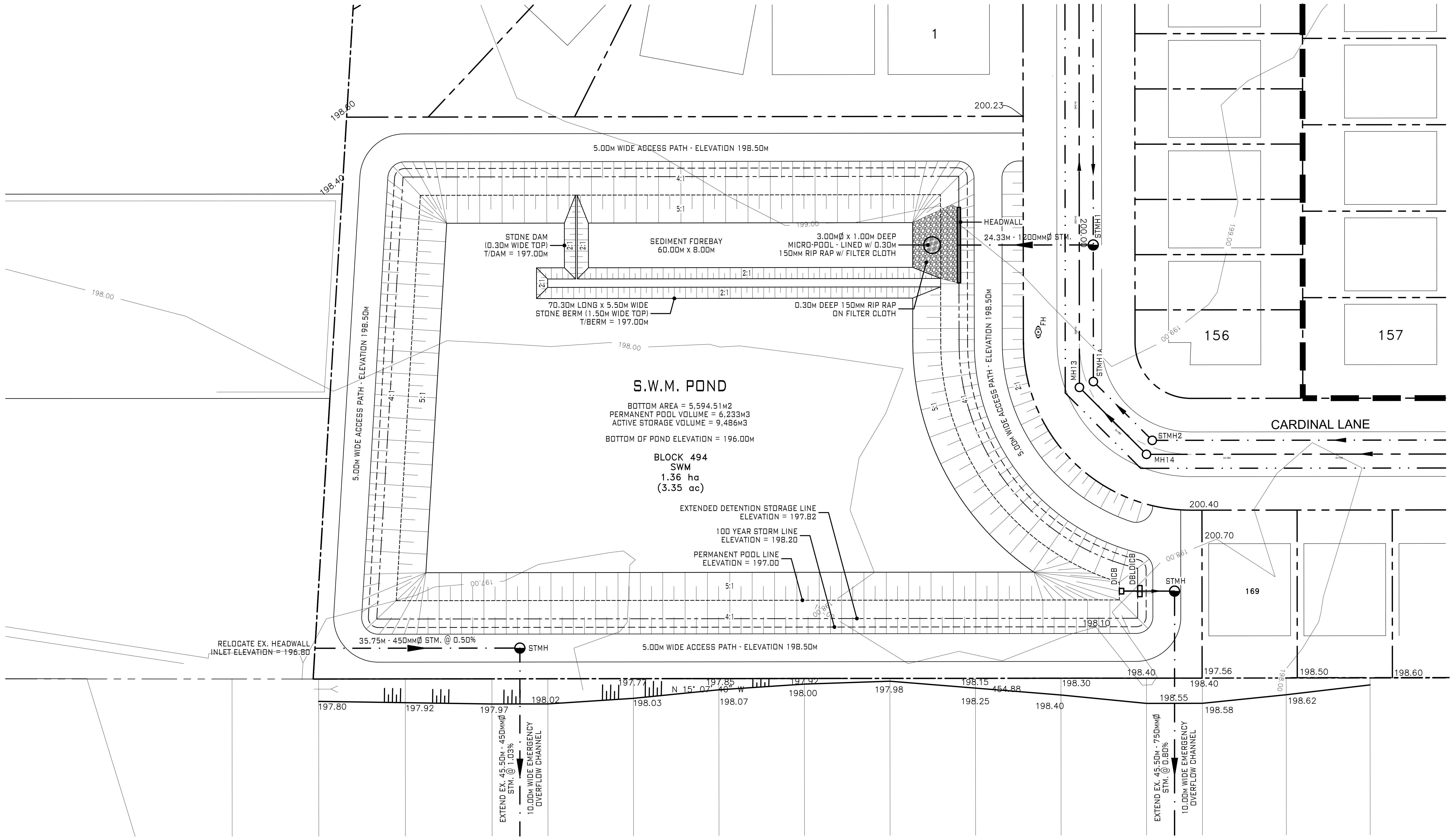
LYNN RIVER HEIGHTS
PORT DOVER, ONTARIO

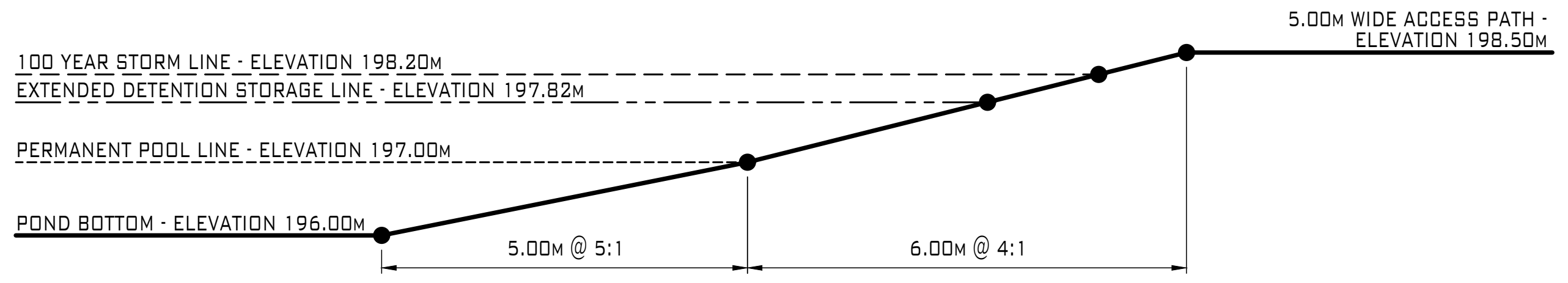
STORM SEWER DRAINAGE PLAN

SCALE: 1:1000
DATE: OCTOBER, 2017
DRAWING BY: T. SPRAGUE
DESIGNED BY: G. ADOM / L. GIRARD
CHECKED BY: L. GIRARD
PROJECT NO: 16-067
DRAWING NO: 303



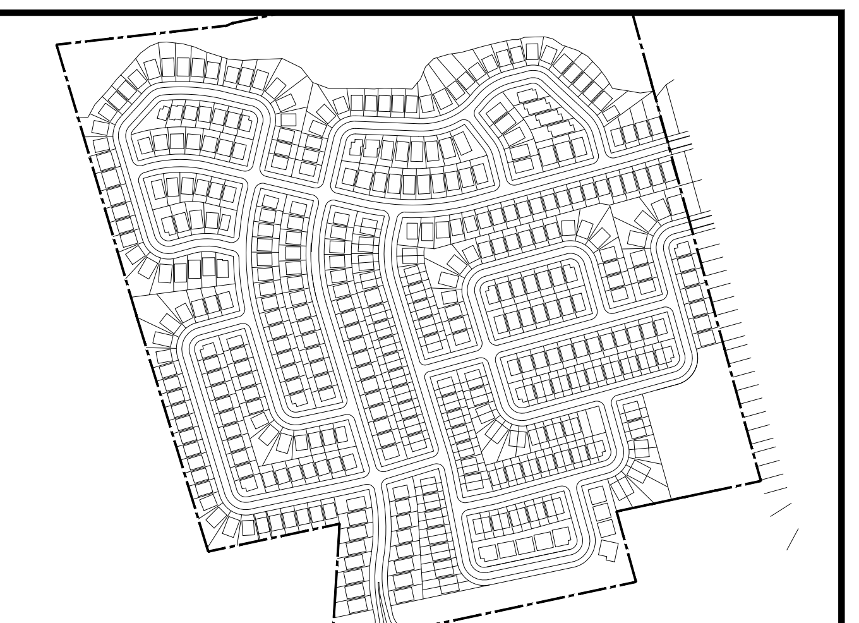
STORM WATER MANAGEMENT POND PLAN

SCALE: 1:500



PARTIAL POND SECTION

SCALE: 1:100



KEY PLAN

LEGEND:

MH59 - DENOTES PROPOSED SANITARY SEWER, DIRECTION OF FLOW & MANHOLE

STMH35 - DENOTES PROPOSED STORM SEWER, DIRECTION OF FLOW & MANHOLE

- DENOTES PROPOSED WATERMAIN

FH - DENOTES PROPOSED FIRE HYDRANT LOCATION

- DENOTES PROPOSED PHASE LINE

THE CONTRACTOR IS RESPONSIBLE FOR THE REVIEW OF THESE PLANS & TO EDUCATE THEMSELVES OF THE EXACT LOCATIONS OF UTILITIES AND UNDERGROUND SERVICES ON SITE PRIOR TO CONSTRUCTION. ALL UTILITIES ARE NOT SHOWN ON THESE PLANS. THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGES & REPAIRS TO ALL UTILITIES ON SITE.

No:	Revision:	By:	Date:
1	ISSUED FOR PRELIMINARY REVIEWS	TS	DEC. 5, 2017

DEMOCRAT HOMES LTD.
PORT DOVER, ONTARIO

DESIGNED BY:

girard ENGINEERING

2478153 ONTARIO INC.
OTTERVILLE EMBRO
TEL: 1-519-879-6875
FAX: 1-519-879-6536
EMAIL: INFO@GIRARDENGINEERING.CA

ENGINEERS SEAL OF APPROVAL:

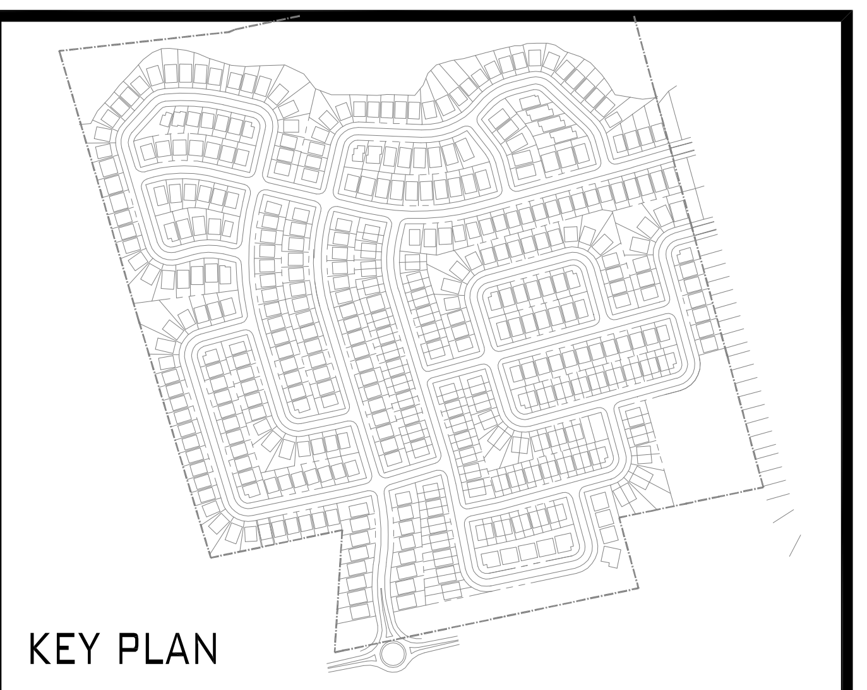
LEN GIRARD
Len Girard
Mar. 22, 2019

NOTE: THESE DRAWINGS ARE THE PROPERTY OF THE ENGINEER AND ARE NOT VALID UNLESS SEALED IN RED INK. THESE DRAWINGS ARE NOT TO BE REPRODUCED UNLESS AUTHORIZED BY THE ENGINEER.

LYNN RIVER HEIGHTS
PORT DOVER, ONTARIO

STORM WATER
MANAGEMENT POND PLAN

SCALE: 1:500
DATE: MARCH 2019
DRAWING BY: D. FALLOWFIELD
DESIGNED BY: L. GIRARD
CHECKED BY: L. GIRARD
PROJECT NO: 16-067
DRAWING NO: 400


KEY PLAN

LEGEND:

—·—·— - DENOTES PROPOSED WATERMAIN

FH - DENOTES PROPOSED FIRE HYDRANT

THE CONTRACTOR IS RESPONSIBLE FOR THE REVIEW OF THESE PLANS & TO EDUCATE THEMSELVES OF THE EXACT LOCATIONS OF UTILITIES AND UNDERGROUND SERVICES ON SITE PRIOR TO CONSTRUCTION. ALL UTILITIES ARE NOT SHOWN ON THESE PLANS. THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGES & REPAIRS TO ALL UTILITIES ON SITE.

NO:	REVISION:	BY:	DATE:
1	ISSUED FOR PRELIMINARY REVIEWS	TS	DEC. 5, 2017

DEMOCRAT HOMES LTD.
PORT DOVER, ONTARIO

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2478153 ONTARIO INC.
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TEL: 1-519-879-6875
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ENGINEERS SEAL OF APPROVAL:

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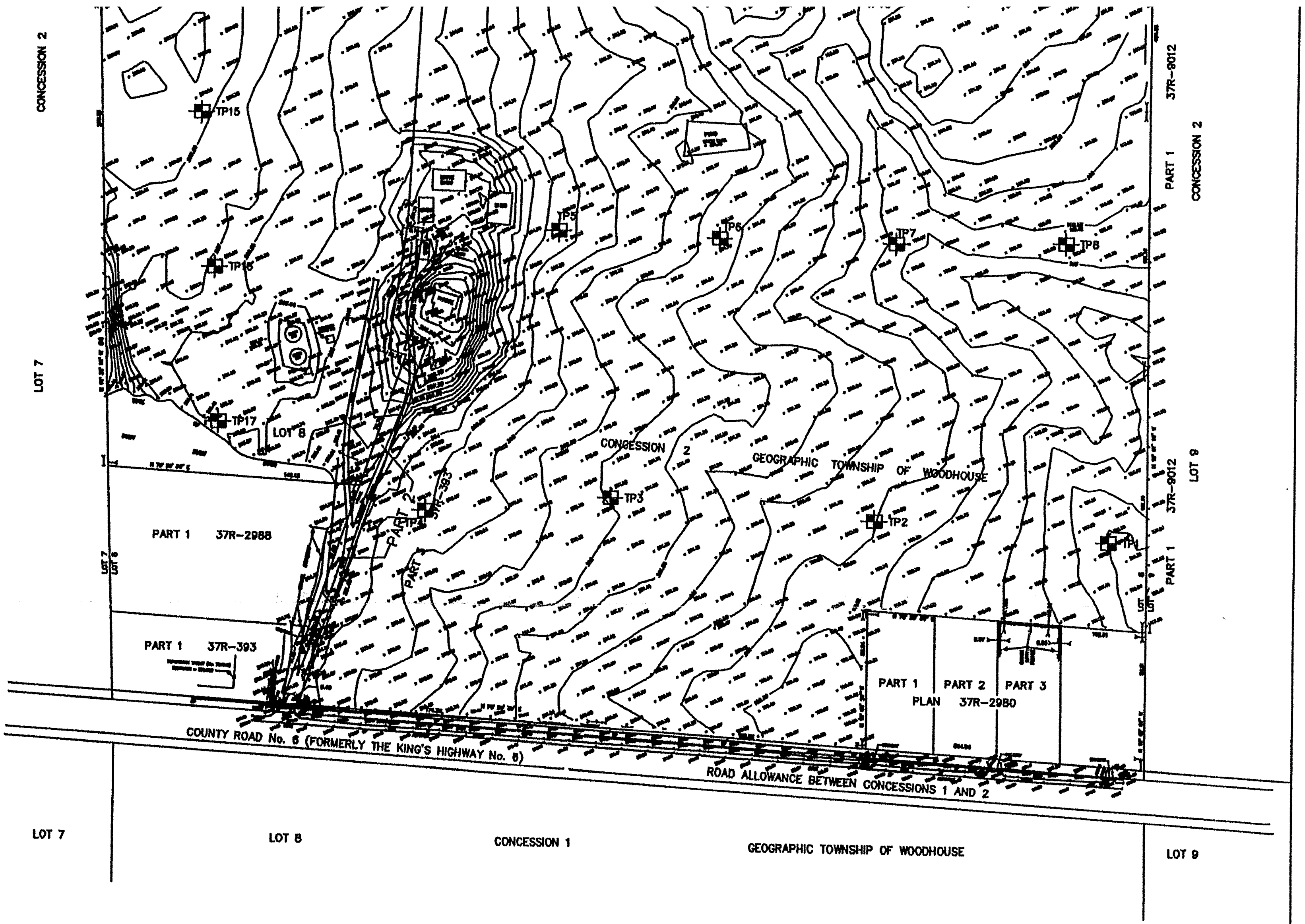
LYNN RIVER HEIGHTS
PORT DOVER, ONTARIO

WATER DISTRIBUTION PLAN

SCALE: 1:1000
DATE: OCTOBER, 2017
DRAWING BY: T. SPRAGUE
DESIGNED BY: G. ADOM / L. GIRARD
CHECKED BY: L. GIRARD
PROJECT NO: 16-067
DRAWING NO: 304A



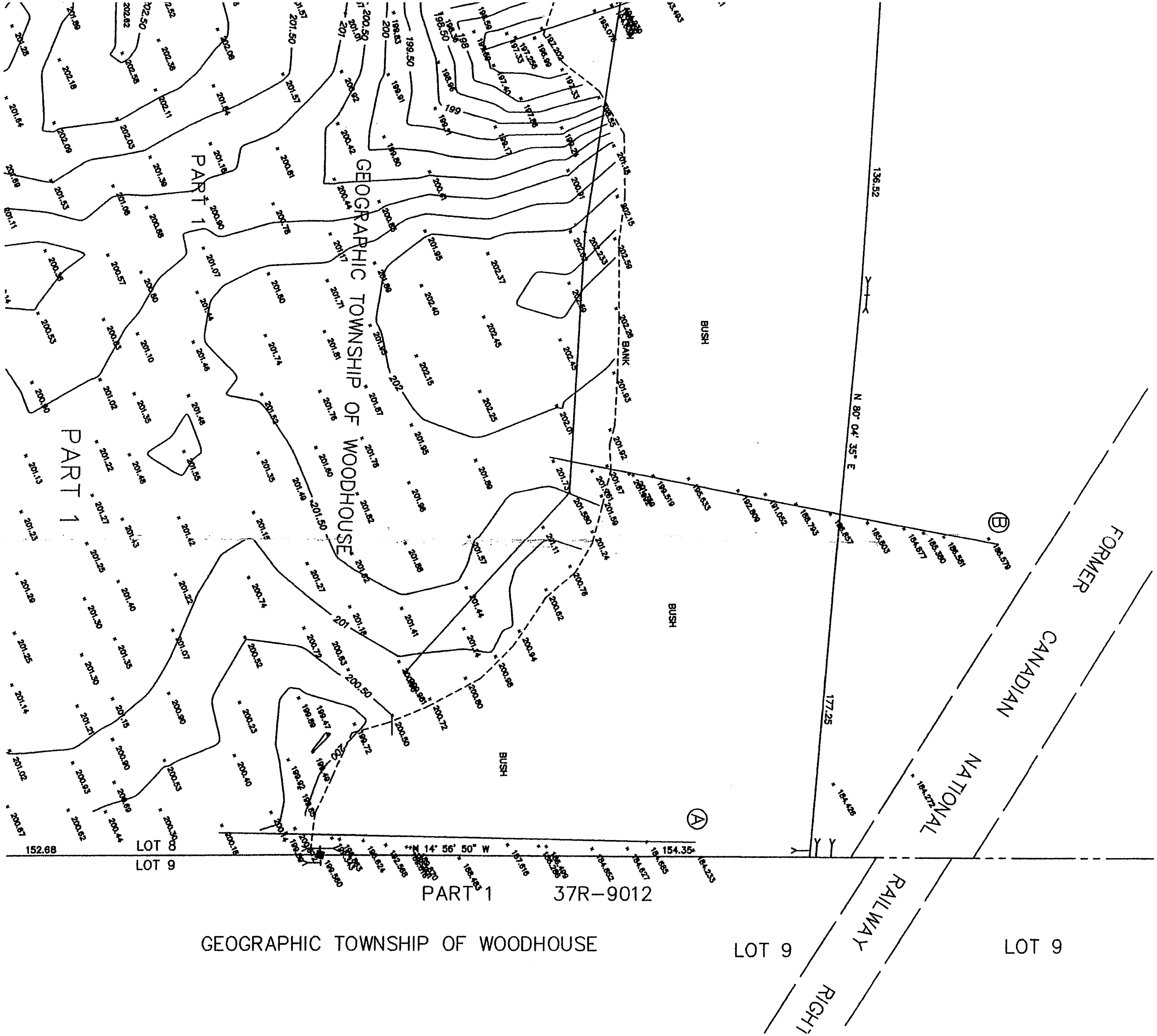
TEST PIT LOCATION PLAN
PROPOSED LYNN RIVER HEIGHTS
PHASE II RESIDENTIAL DEVELOPMENT

PART OF LOT 8, CONCESSION 2
NORFOLK COUNTY
TOWN OF PORT DOVER, ONTARIO

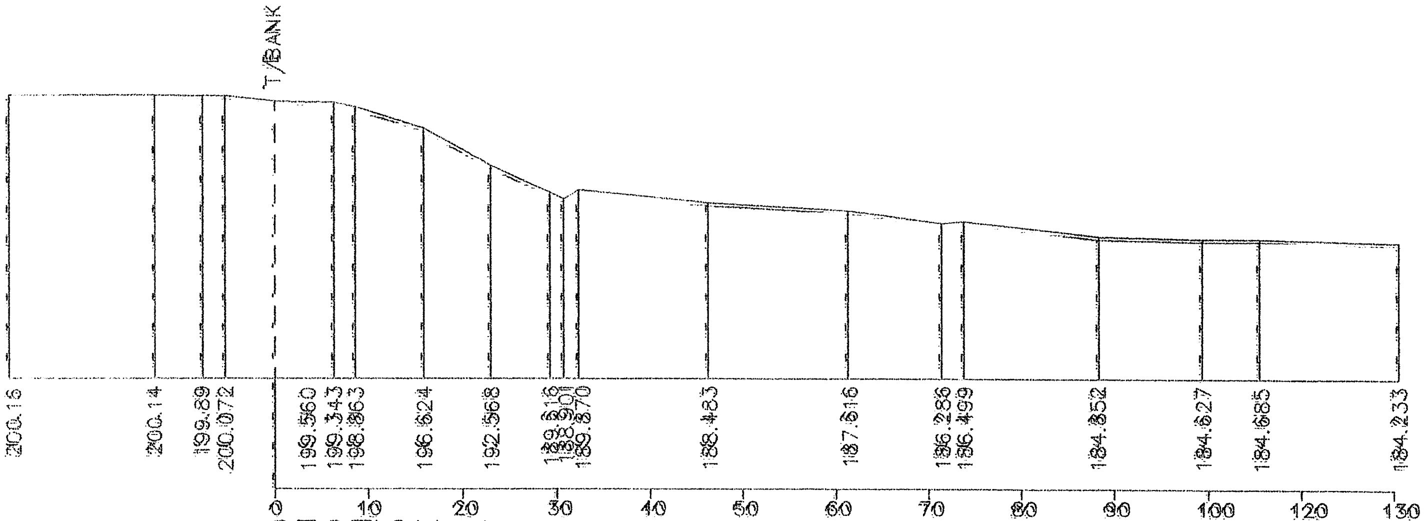
CHUNG & VANDER DOELEN ENGINEERING LTD.
CVD

CHUNG & VANDER DOELEN
ENGINEERING LTD.
280 Victoria St. North, Unit 8
Kitchener,ON,N2H 5E2
Phone:(519) 742-8979 Fax:(519) 742-7739
E-mail:cvd@bellnet.ca

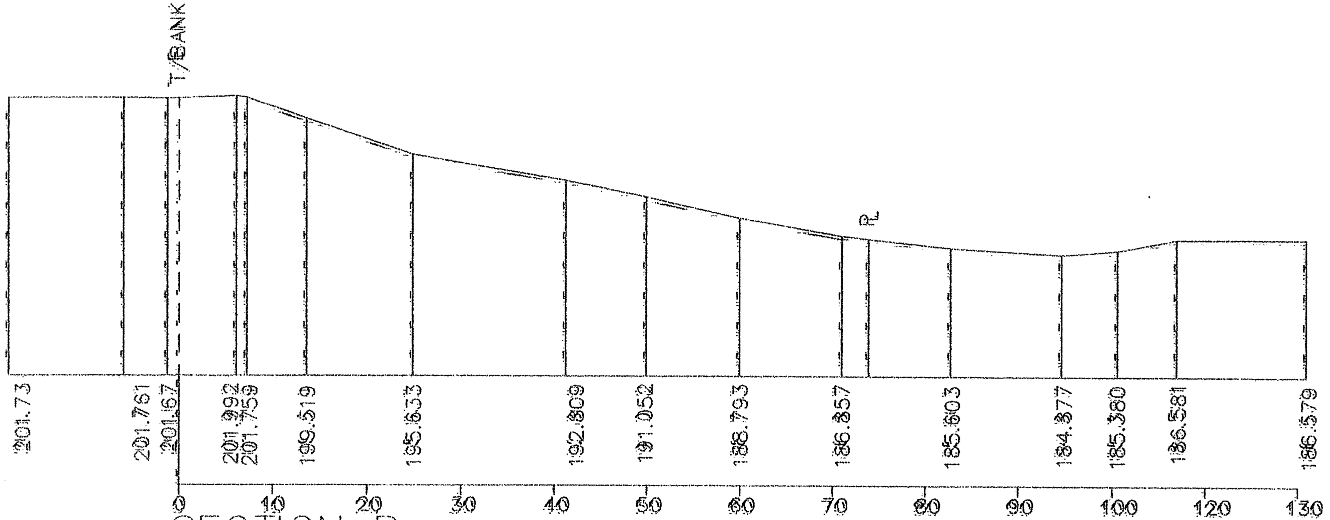
Drawn By:	Date:	File No.:
A H	April , 2006	05-11-K11
Checked By:	Scale:	DRAWING NO.:
EYC	NTS	1



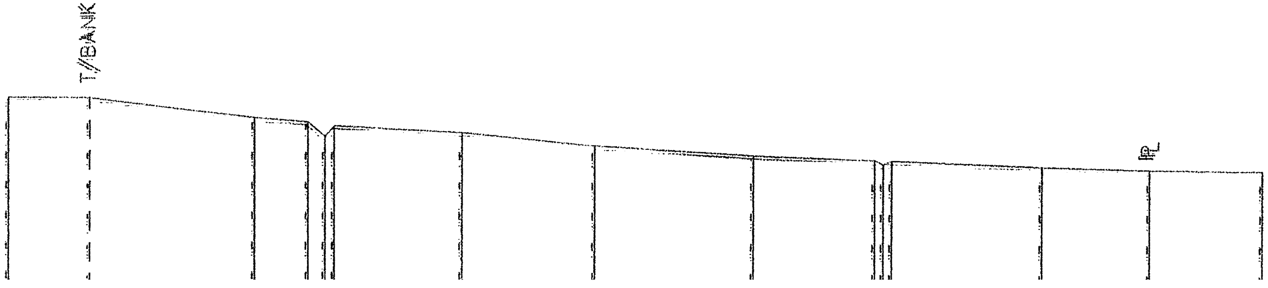
PART 1
PART 1
PART 1
GEOGRAPHIC TOWNSHIP OF WOODHOUSE
BUSH
BUSH
BUSH
BANK
Ⓐ
Ⓑ
152.68
LOT 8
LOT 9
N 14° 56' 50" W
154.35
177.25
136.52
N 80° 04' 35" E
PART 1
37R-9012
GEOGRAPHIC TOWNSHIP OF WOODHOUSE
LOT 9
LOT 9
FORMER CANADIAN NATIONAL RAILWAY RIGHT



SECTION A



SECTION B



APPENDIX A

TRAFFIC COUNTS

Highway 6 @ Pheasant Trail

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

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

Municipality: Port Dover
Site #: 0000000002
Intersection: Hwy 6 & Pheasant Trail
TFR File #: 3
Count date: 16-Jun-2016

Weather conditions:
Clear/Dry am, Rain mid+pm

Person(s) who counted:
Matt

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

Major Road: Hwy 6 runs W/E

North Leg Total: 45
North Entering: 31
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	18	2	11	31
Totals	18	2	11	

Heavys	0
Trucks	1
Cars	13
Totals	14

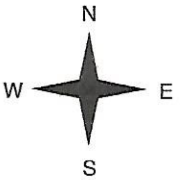
East Leg Total: 475
East Entering: 272
East Peds: 1
Peds Cross: ⧗

Pheasant Trail

Heavys	Trucks	Cars	Totals
18	4	301	323

Cars	Trucks	Heavys	Totals
9	0	0	9
234	4	18	256
7	0	0	7
250	4	18	

Hwy 6



Hwy 6

Heavys	Trucks	Cars	Totals
0	0	4	4
10	8	161	179
0	1	15	16
10	9	180	

Cars	Trucks	Heavys	Totals
185	8	10	203

Blue Lake Ave

Peds Cross: ⧗
West Peds: 0
West Entering: 199
West Leg Total: 522

Cars	24
Trucks	1
Heavys	0
Totals	25

Cars	49	0	13	62
Trucks	0	1	0	1
Heavys	0	0	0	0
Totals	49	1	13	

Peds Cross: ⋈
South Peds: 2
South Entering: 63
South Leg Total: 88

Comments

Highway 6 @ Pheasant Trail

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 13:00:00
To: 14:00:00

Municipality: Port Dover
Site #: 0000000002
Intersection: Hwy 6 & Pheasant Trail
TFR File #: 3
Count date: 16-Jun-2016

Weather conditions:
Clear/Dry am, Rain mid+pm

Person(s) who counted:
Matt

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

Major Road: Hwy 6 runs W/E

North Leg Total: 55
North Entering: 31
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	18	2	11	31
Totals	18	2	11	

Heavys	0
Trucks	0
Cars	24
Totals	24

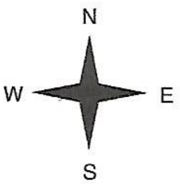
East Leg Total: 516
East Entering: 257
East Peds: 1
Peds Cross: ⧗

Pheasant Trail

Heavys	Trucks	Cars	Totals
4	3	260	267

Cars	Trucks	Heavys	Totals
11	0	0	11
224	3	4	231
15	0	0	15
250	3	4	

Hwy 6



Heavys	Trucks	Cars	Totals
0	0	11	11
0	5	232	237
0	0	9	9
0	5	252	

Hwy 6

Cars	Trucks	Heavys	Totals
254	5	0	259

Blue Lake Ave

Peds Cross: ⧗
West Peds: 0
West Entering: 257
West Leg Total: 524

Cars	26
Trucks	0
Heavys	0
Totals	26

Cars	18	2	11	31
Trucks	0	0	0	0
Heavys	0	0	0	0
Totals	18	2	11	

Peds Cross: ⋈
South Peds: 0
South Entering: 31
South Leg Total: 57

Comments

Highway 6 @ Pheasant Trail

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 15:15:00
To: 16:15:00

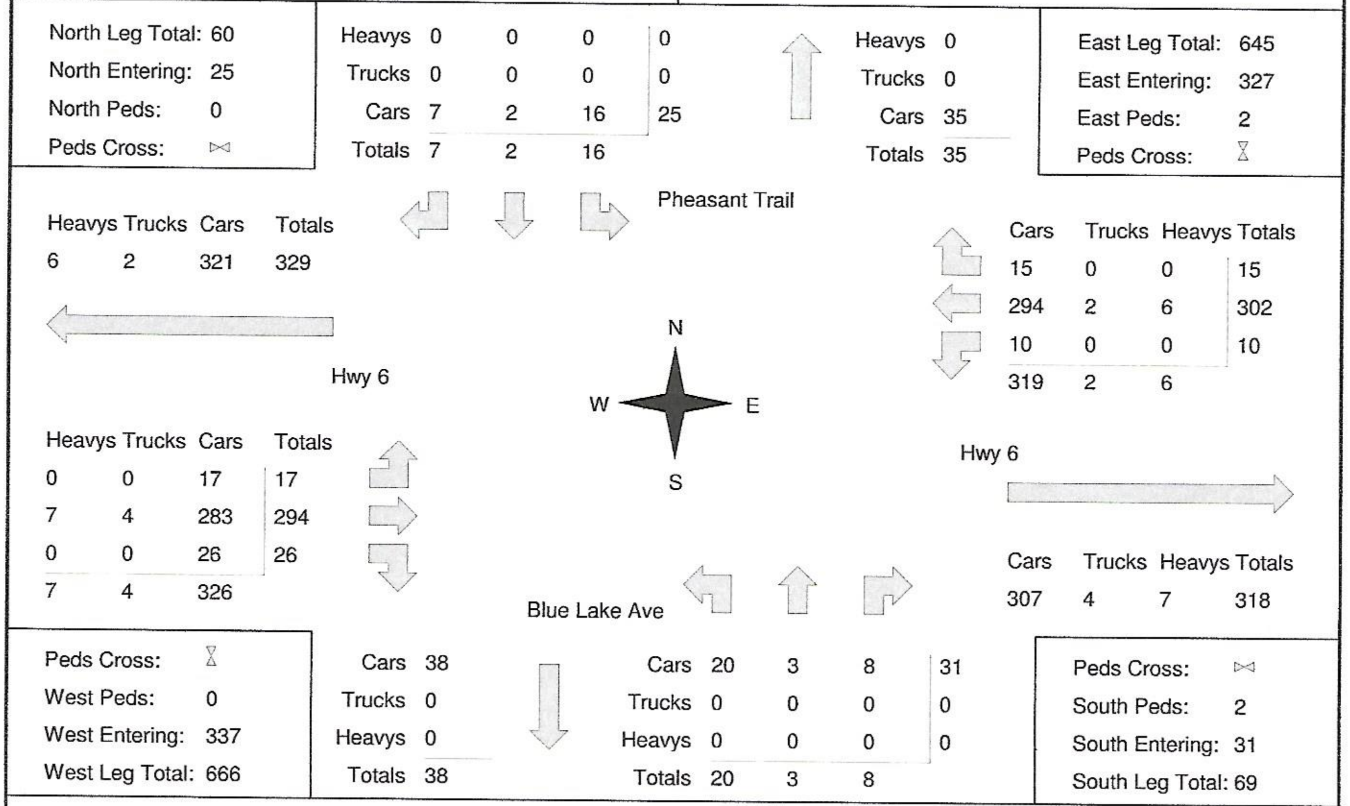
Municipality: Port Dover
Site #: 0000000002
Intersection: Hwy 6 & Pheasant Trail
TFR File #: 3
Count date: 16-Jun-2016

Weather conditions:
Clear/Dry am, Rain mid+pm

Person(s) who counted:
Matt

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

Major Road: Hwy 6 runs W/E



North Leg Total: 60
North Entering: 25
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	7	2	16	25
Totals	7	2	16	

Heavys	0
Trucks	0
Cars	35
Totals	35

East Leg Total: 645
East Entering: 327
East Peds: 2
Peds Cross: ⧖

Heavys	Trucks	Cars	Totals
6	2	321	329

Cars	Trucks	Heavys	Totals
15	0	0	15
294	2	6	302
10	0	0	10
319	2	6	

Heavys	Trucks	Cars	Totals
0	0	17	17
7	4	283	294
0	0	26	26
7	4	326	

Cars	Trucks	Heavys	Totals
307	4	7	318

Peds Cross: ⧖
West Peds: 0
West Entering: 337
West Leg Total: 666

Cars	38
Trucks	0
Heavys	0
Totals	38

Cars	20	3	8	31
Trucks	0	0	0	0
Heavys	0	0	0	0
Totals	20	3	8	

Peds Cross: ⋈
South Peds: 2
South Entering: 31
South Leg Total: 69

Comments

Highway 6 @ Pheasant Trail

Total Count Diagram

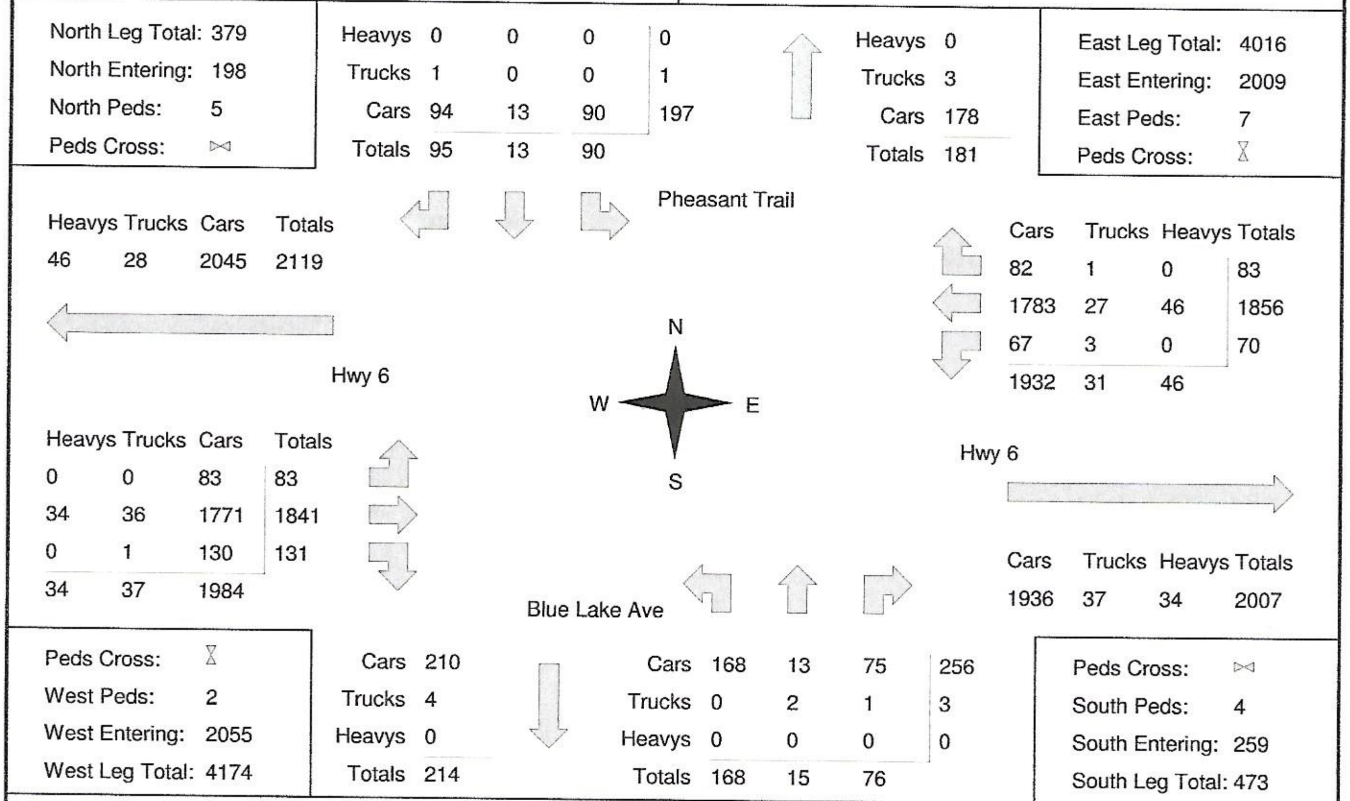
Municipality: Port Dover
Site #: 0000000002
Intersection: Hwy 6 & Pheasant Trail
TFR File #: 3
Count date: 16-Jun-2016

Weather conditions:
Clear/Dry am, Rain mid+pm

Person(s) who counted:
Matt

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

Major Road: Hwy 6 runs W/E



North Leg Total: 379
North Entering: 198
North Peds: 5
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	1	0	0	1
Cars	94	13	90	197
Totals	95	13	90	

Heavys	0
Trucks	3
Cars	178
Totals	181

East Leg Total: 4016
East Entering: 2009
East Peds: 7
Peds Cross: ⧗

Heavys	Trucks	Cars	Totals
46	28	2045	2119

Cars	Trucks	Heavys	Totals
82	1	0	83
1783	27	46	1856
67	3	0	70
1932	31	46	

Heavys	Trucks	Cars	Totals
0	0	83	83
34	36	1771	1841
0	1	130	131
34	37	1984	

Cars	Trucks	Heavys	Totals
1936	37	34	2007

Peds Cross: ⧗
West Peds: 2
West Entering: 2055
West Leg Total: 4174

Cars	210
Trucks	4
Heavys	0
Totals	214

Cars	168	13	75	256
Trucks	0	2	1	3
Heavys	0	0	0	0
Totals	168	15	76	

Peds Cross: ⋈
South Peds: 4
South Entering: 259
South Leg Total: 473

Comments

Highway 6 @ Pheasant Trail

Municipality: Port Dover
Major Road: Hwy 6
Minor Road: Pheasant Trail

Date: Jun 16, 2016

Major Road Runs: East/West
Weather Conditions: Clear/Dry am, Rain mid+pm
Person No. 1 Matt
Person No. 2

Period Ending	North Approach							East Approach							South Approach							West Approach							Veh. Summary	
	Cars			Trucks			Ped.	Cars			Trucks			Ped.	Cars			Trucks			Ped.	Cars			Trucks			Ped.		
	Left	Thru	Right	Left	Thru	Right	Cross.	Left	Thru	Right	Left	Thru	Right	Cross.	Left	Thru	Right	Left	Thru	Right	Cross.	Left	Thru	Right	Left	Thru	Right	Cross.	15	60
7:15	0	1	2	0	0	0	0	1	31	1	0	0	0	0	3	2	3	0	0	0	0	1	12	1	0	1	0	0	59	
7:30	0	1	0	0	0	0	0	2	31	0	0	1	0	0	2	0	1	0	0	0	0	0	20	4	0	2	0	0	64	
7:45	5	0	4	0	0	0	1	1	46	0	0	4	0	0	7	1	3	0	0	0	0	1	15	2	0	3	0	0	92	
8:00	2	0	4	0	0	0	0	0	45	3	0	4	0	0	9	0	4	0	0	0	0	1	38	1	0	1	0	0	112	327
8:15	3	1	2	0	0	0	0	4	43	4	0	3	0	0	12	0	2	0	0	0	0	0	33	1	0	3	0	0	111	379
8:30	5	0	2	0	0	0	0	1	50	2	0	10	0	0	15	0	4	0	1	0	1	0	36	4	0	3	1	0	134	449
8:45	2	0	9	0	0	0	0	0	73	1	0	6	0	0	13	0	3	0	0	0	0	0	38	6	0	5	0	0	156	513
9:00	1	1	5	0	0	0	0	2	68	2	0	3	0	1	9	0	4	0	0	0	1	4	54	4	0	7	0	0	164	565
11:15	7	0	2	0	0	0	0	1	48	2	0	2	0	0	10	0	1	0	0	0	0	2	58	4	0	3	0	0	140	
11:30	2	0	2	0	0	0	0	0	38	3	1	1	0	0	2	0	0	0	0	0	0	2	57	2	0	0	0	0	110	
11:45	2	0	2	0	0	0	0	1	40	1	0	4	0	0	2	0	2	0	0	1	0	3	46	2	0	2	0	0	108	
12:00	4	0	3	0	0	0	0	3	65	4	1	1	0	0	3	0	1	0	0	0	0	2	47	3	0	3	0	0	140	498
12:15	5	0	2	0	0	0	0	2	47	3	0	3	0	0	3	0	1	0	1	0	0	1	59	4	0	0	0	0	131	489
12:30	4	1	2	0	0	0	0	1	61	5	0	0	0	0	4	0	3	0	0	0	0	1	46	4	0	3	0	0	135	514
12:45	2	2	2	0	0	1	0	2	48	4	0	4	0	0	5	0	1	0	0	0	0	1	49	5	0	1	0	0	127	533
13:00	2	0	5	0	0	0	0	0	73	1	0	0	0	0	4	0	1	0	0	0	0	0	48	3	0	3	0	0	140	533
13:15	6	0	3	0	0	0	0	5	55	3	0	2	0	0	8	0	2	0	0	0	0	3	55	3	0	3	0	0	148	550
13:30	0	0	5	0	0	0	0	5	54	4	0	2	0	0	3	0	4	0	0	0	0	1	53	2	0	1	0	0	134	549
13:45	2	1	5	0	0	0	0	3	61	3	0	3	0	0	2	1	1	0	0	0	0	4	55	3	0	0	0	0	144	566
14:00	3	1	5	0	0	0	0	2	54	1	0	0	0	1	5	1	4	0	0	0	0	3	69	1	0	1	0	0	150	576
15:15	0	1	1	0	0	0	1	1	67	4	1	3	0	0	4	0	5	0	0	0	0	0	56	6	0	5	0	0	154	
15:30	4	0	2	0	0	0	0	3	54	5	0	0	0	0	5	1	1	0	0	0	2	5	59	5	0	6	0	0	150	
15:45	2	1	2	0	0	0	0	1	78	5	0	3	0	2	10	1	1	0	0	0	0	3	76	9	0	3	0	0	195	
16:00	7	0	1	0	0	0	0	3	67	4	0	3	0	0	1	0	1	0	0	0	0	6	75	6	0	0	0	0	174	673
16:15	3	1	2	0	0	0	0	3	95	1	0	2	0	0	4	1	5	0	0	0	0	3	73	6	0	2	0	0	201	720
16:30	3	0	3	0	0	0	1	1	55	2	0	3	0	0	3	1	1	0	0	0	0	6	58	2	0	1	0	0	139	709
16:45	1	0	3	0	0	0	0	8	64	2	0	1	0	0	2	0	2	0	0	0	0	5	84	3	0	3	0	0	178	692
17:00	5	1	5	0	0	0	0	2	50	5	0	1	0	1	5	2	3	0	0	0	0	5	81	7	0	0	0	0	172	690
17:15	4	0	2	0	0	0	0	3	67	3	0	1	0	0	5	0	2	0	0	0	0	3	64	6	0	2	0	0	162	651
17:30	3	0	1	0	0	0	0	3	57	2	0	0	0	0	2	0	3	0	0	0	0	7	86	6	0	1	0	0	171	683
17:45	1	0	2	0	0	0	2	2	58	1	0	2	0	2	3	1	1	0	0	0	0	9	81	10	0	2	0	2	173	678
18:00	0	0	4	0	0	0	0	1	40	1	0	1	1	0	3	1	5	0	0	0	0	1	90	5	0	0	0	0	153	659

Highway 6 @ Lynn Park Ave

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

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

Municipality: Port Dover
Site #: 0000000001
Intersection: Hwy 6 & Lynn Park Ave
TFR File #: 2
Count date: 16-Jun-2016

Weather conditions:
Clear/Dry am, Rain mid+pm

Person(s) who counted:
Diane

**** Signalized Intersection ****

Major Road: Hwy 6 runs W/E

North Leg Total: 144
North Entering: 81
North Peds: 1
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	3	0	3	6
Cars	25	12	38	75
Totals	28	12	41	

Heavys	0
Trucks	5
Cars	58
Totals	63

East Leg Total: 460
East Entering: 247
East Peds: 0
Peds Cross: ⧗

Lynn Park Ave

Heavys	Trucks	Cars	Totals
6	18	245	269

Cars	Trucks	Heavys	Totals
28	0	0	28
173	13	5	191
27	1	0	28
228	14	5	

Hwy 6

N
W
E
S

Heavys	Trucks	Cars	Totals
0	2	19	21
4	13	128	145
1	1	11	13
5	16	158	

Hwy 6

Cars	Trucks	Heavys	Totals
191	17	5	213

Thompson Rd

Peds Cross: ⧗
West Peds: 23
West Entering: 179
West Leg Total: 448

Cars	50
Trucks	2
Heavys	1
Totals	53

Cars	47	11	25	83
Trucks	2	3	1	6
Heavys	1	0	1	2
Totals	50	14	27	

Peds Cross: ⋈
South Peds: 9
South Entering: 91
South Leg Total: 144

Comments

Highway 6 @ Lynn Park Ave

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 13:00:00
To: 14:00:00

Municipality: Port Dover
Site #: 0000000001
Intersection: Hwy 6 & Lynn Park Ave
TFR File #: 2
Count date: 16-Jun-2016

Weather conditions:
Clear/Dry am, Rain mid+pm

Person(s) who counted:
Diane

**** Signalized Intersection ****

Major Road: Hwy 6 runs W/E

North Leg Total: 79
North Entering: 46
North Peds: 4
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	16	4	26	46
Totals	16	4	26	

Heavys	0
Trucks	2
Cars	31
Totals	33

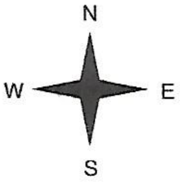
East Leg Total: 583
East Entering: 291
East Peds: 1
Peds Cross: ⧗

Lynn Park Ave

Heavys	Trucks	Cars	Totals
3	6	246	255

Cars	Trucks	Heavys	Totals
18	0	0	18
206	5	3	214
59	0	0	59
283	5	3	

Hwy 6



Hwy 6

Heavys	Trucks	Cars	Totals
0	2	7	9
0	4	207	211
0	0	25	25
0	6	239	

Cars	Trucks	Heavys	Totals
287	5	0	292

Thompson Rd

Peds Cross: ⧗
West Peds: 2
West Entering: 245
West Leg Total: 500

Cars	88
Trucks	0
Heavys	0
Totals	88

Cars	24	6	54	84
Trucks	1	0	1	2
Heavys	0	0	0	0
Totals	25	6	55	

Peds Cross: ⋈
South Peds: 3
South Entering: 86
South Leg Total: 174

Comments

Highway 6 @ Lynn Park Ave

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 15:15:00
To: 16:15:00

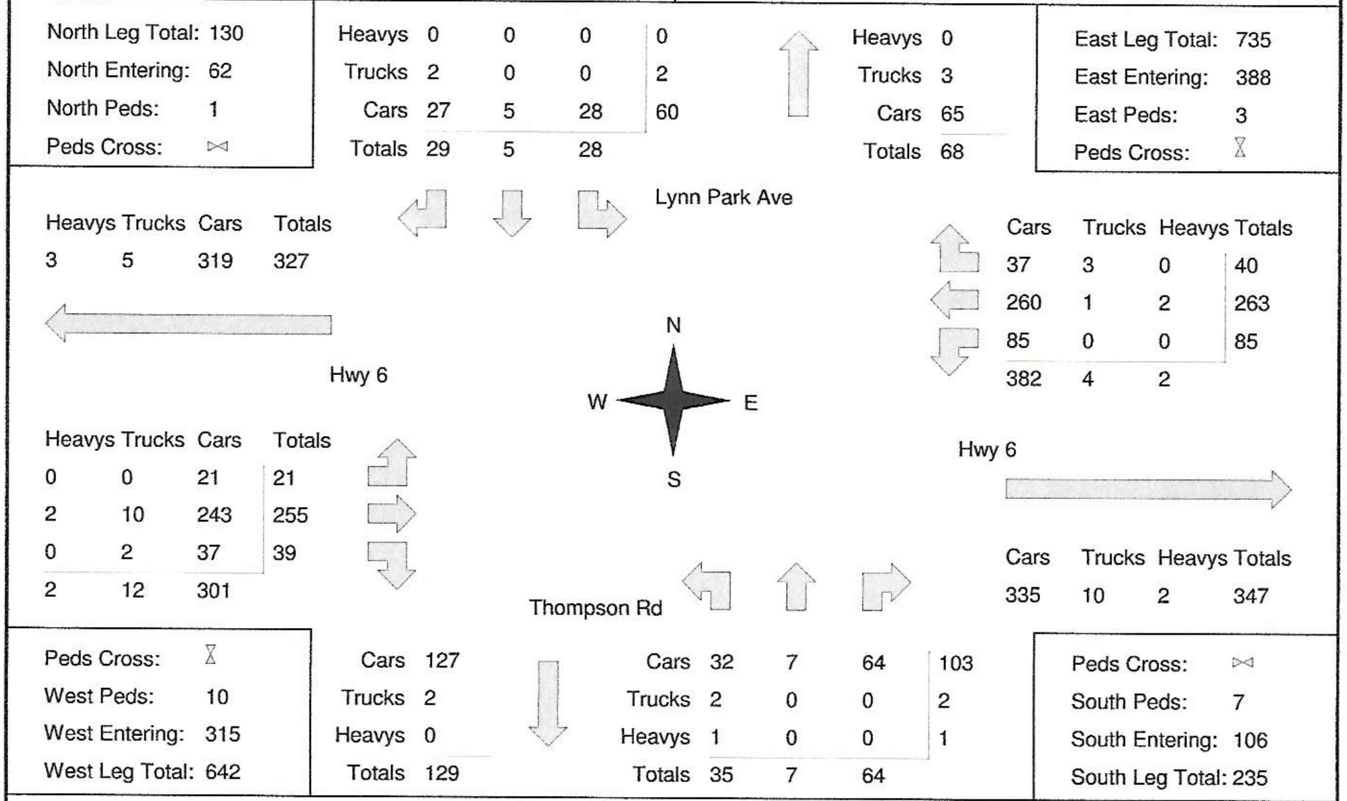
Municipality: Port Dover
Site #: 0000000001
Intersection: Hwy 6 & Lynn Park Ave
TFR File #: 2
Count date: 16-Jun-2016

Weather conditions:
Clear/Dry am, Rain mid+pm

Person(s) who counted:
Diane

**** Signalized Intersection ****

Major Road: Hwy 6 runs W/E



North Leg Total: 130
North Entering: 62
North Peds: 1
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	2	0	0	2
Cars	27	5	28	60
Totals	29	5	28	

Heavys	0
Trucks	3
Cars	65
Totals	68

East Leg Total: 735
East Entering: 388
East Peds: 3
Peds Cross: ⧖

Lynn Park Ave

Heavys	Trucks	Cars	Totals
3	5	319	327

Cars	Trucks	Heavys	Totals
37	3	0	40
260	1	2	263
85	0	0	85
382	4	2	

Hwy 6

Heavys	Trucks	Cars	Totals
0	0	21	21
2	10	243	255
0	2	37	39
2	12	301	

Hwy 6

Cars	Trucks	Heavys	Totals
335	10	2	347

Thompson Rd

Peds Cross: ⧖
West Peds: 10
West Entering: 315
West Leg Total: 642

Cars	127
Trucks	2
Heavys	0
Totals	129

Cars	32	7	64	103
Trucks	2	0	0	2
Heavys	1	0	0	1
Totals	35	7	64	

Peds Cross: ⋈
South Peds: 7
South Entering: 106
South Leg Total: 235

Comments

Highway 6 @ Lynn Park Ave

Total Count Diagram

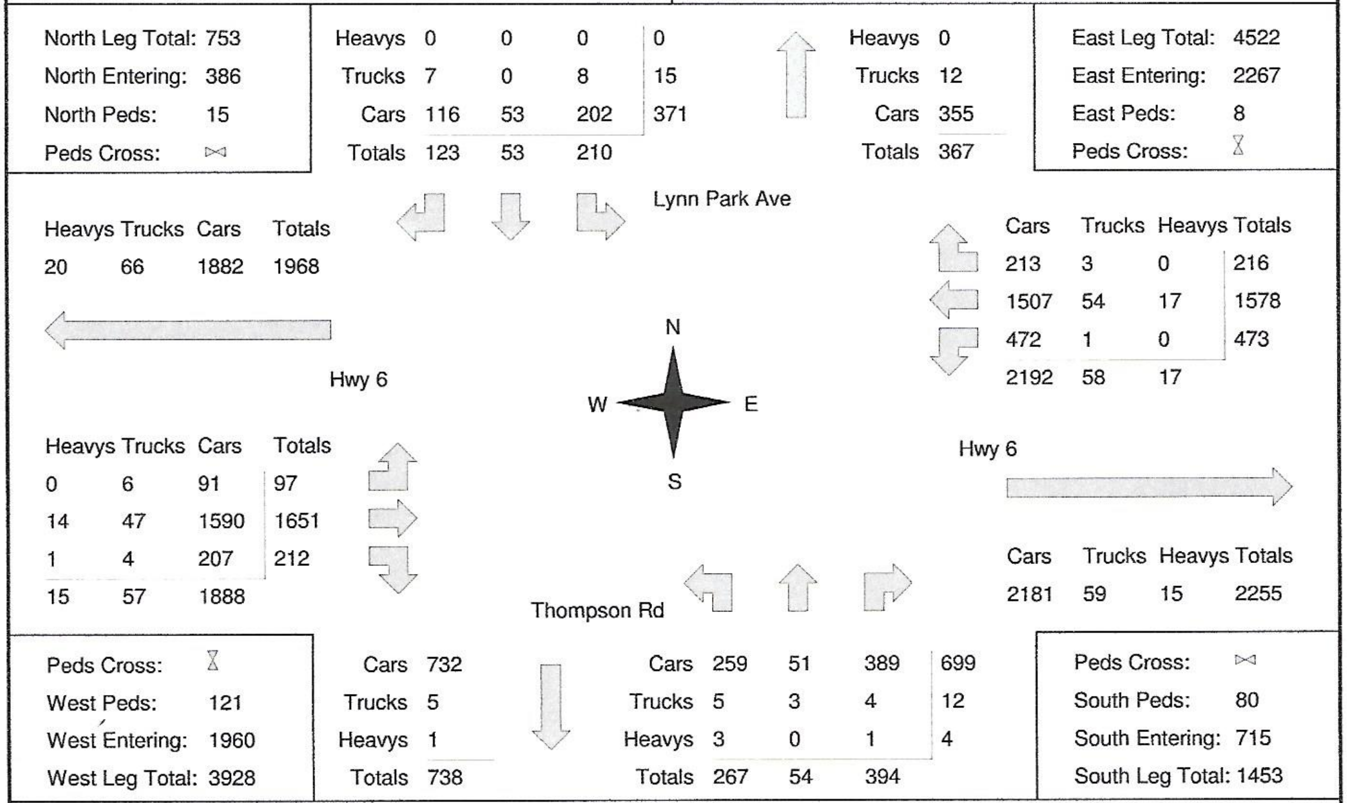
Municipality: Port Dover
Site #: 0000000001
Intersection: Hwy 6 & Lynn Park Ave
TFR File #: 2
Count date: 16-Jun-2016

Weather conditions:
Clear/Dry am, Rain mid+pm

Person(s) who counted:
Diane

**** Signalized Intersection ****

Major Road: Hwy 6 runs W/E



North Leg Total: 753
North Entering: 386
North Peds: 15
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	7	0	8	15
Cars	116	53	202	371
Totals	123	53	210	

Heavys	0
Trucks	12
Cars	355
Totals	367

East Leg Total: 4522
East Entering: 2267
East Peds: 8
Peds Cross: ⧗

Heavys	Trucks	Cars	Totals
20	66	1882	1968

Cars	Trucks	Heavys	Totals
213	3	0	216
1507	54	17	1578
472	1	0	473
2192	58	17	

Heavys	Trucks	Cars	Totals
0	6	91	97
14	47	1590	1651
1	4	207	212
15	57	1888	

Cars	Trucks	Heavys	Totals
2181	59	15	2255

Peds Cross: ⧗
West Peds: 121
West Entering: 1960
West Leg Total: 3928

Cars	732
Trucks	5
Heavys	1
Totals	738

Cars	259	51	389	699
Trucks	5	3	4	12
Heavys	3	0	1	4
Totals	267	54	394	

Peds Cross: ⋈
South Peds: 80
South Entering: 715
South Leg Total: 1453

Comments

Highway 6 @ Lynn Park Ave

Municipality: Port Dover
Major Road: Hwy 6
Minor Road: Lynn Park Ave

Date: Jun 16, 2016

Major Road Runs: East/West
Weather Conditions: Clear/Dry am, Rain mid+pm
Person No. 1 Diane
Person No. 2

Period	North Approach							East Approach							South Approach							West Approach							Veh. Summary	
	Cars			Trucks			Ped.	Cars			Trucks			Ped.	Cars			Trucks			Ped.	Cars			Trucks			Ped.		
Ending	Left	Thru	Right	Left	Thru	Right	Cross.	Left	Thru	Right	Left	Thru	Right	Cross.	Left	Thru	Right	Left	Thru	Right	Cross.	Left	Thru	Right	Left	Thru	Right	Cross.	15	60
7:15	6	0	0	0	0	0	0	5	20	2	0	0	0	0	10	1	4	0	0	0	2	0	13	1	0	1	0	1	63	
7:30	7	0	1	0	0	0	0	1	29	3	0	2	0	0	4	0	7	0	0	0	1	2	17	2	0	0	0	0	75	
7:45	6	0	2	1	0	0	2	4	32	6	0	3	0	0	5	0	7	0	0	1	1	1	15	2	1	3	0	3	89	
8:00	5	0	5	0	0	0	1	5	37	4	0	5	0	1	10	0	4	0	0	0	0	4	39	0	0	0	0	0	118	345
8:15	5	3	2	1	0	0	0	9	36	5	0	3	0	0	13	2	2	0	0	1	0	6	23	3	2	3	1	1	120	402
8:30	8	1	8	1	0	2	0	6	30	5	0	4	0	0	10	3	7	0	1	0	5	5	32	3	0	0	0	6	126	453
8:45	6	6	6	0	0	0	1	2	54	9	1	10	0	0	12	3	6	3	2	1	2	4	29	0	0	6	0	8	160	524
9:00	19	2	9	1	0	1	0	10	53	9	0	1	0	0	12	3	10	0	0	0	2	4	44	5	0	8	1	8	192	598
11:15	2	1	3	0	0	0	0	24	36	6	0	4	0	0	9	2	16	0	0	0	0	2	57	4	0	2	0	0	168	
11:30	6	2	2	1	0	0	0	17	28	5	0	1	0	0	4	0	12	1	0	0	0	3	47	9	0	0	0	0	138	
11:45	3	1	0	0	0	0	0	12	35	4	0	4	0	0	10	1	11	0	0	0	0	1	40	7	1	2	0	0	132	
12:00	5	1	1	0	0	1	0	14	56	5	0	1	0	0	6	1	11	0	0	1	0	2	50	7	0	2	0	0	164	602
12:15	5	2	2	0	0	0	0	16	51	4	0	2	0	0	6	2	10	0	0	0	26	1	57	5	0	0	0	24	163	597
12:30	4	1	1	1	0	0	0	17	47	6	0	2	0	0	7	2	11	0	0	0	0	1	44	8	0	4	0	0	156	615
12:45	5	0	3	0	0	0	0	8	43	8	0	3	0	0	14	1	15	0	0	0	0	1	49	3	0	1	0	1	154	637
13:00	7	2	2	0	0	0	0	17	60	4	0	1	0	0	11	4	12	0	0	0	0	4	45	5	0	2	0	1	176	649
13:15	8	1	4	0	0	0	0	15	52	5	0	1	0	0	4	2	17	0	0	0	1	3	51	4	0	3	0	0	170	656
13:30	2	2	2	0	0	0	2	16	50	2	0	3	0	0	5	2	11	1	0	0	1	3	48	8	1	0	0	2	156	656
13:45	5	1	2	0	0	0	2	15	58	4	0	3	0	1	8	0	13	0	0	0	1	0	46	7	0	0	0	0	162	664
14:00	11	0	8	0	0	0	0	13	46	7	0	1	0	0	7	2	13	0	0	1	0	1	62	6	1	1	0	0	180	668
15:15	11	8	9	2	0	1	1	16	56	20	0	4	0	0	5	5	12	0	0	0	24	4	57	6	0	4	0	48	220	
15:30	6	1	9	0	0	0	1	20	59	11	0	0	0	3	4	2	18	0	0	0	5	7	60	7	0	7	1	4	212	
15:45	6	2	6	0	0	1	0	18	67	7	0	1	1	0	6	2	20	2	0	0	0	5	57	12	0	2	1	0	216	
16:00	10	0	6	0	0	0	0	23	59	7	0	1	1	0	9	2	13	1	0	0	0	5	66	8	0	0	0	6	211	859
16:15	6	2	6	0	0	1	0	24	75	12	0	1	1	0	13	1	13	0	0	0	2	4	60	10	0	3	0	0	232	871
16:30	6	1	6	0	0	0	0	21	45	7	0	3	0	0	9	1	25	0	0	0	0	2	64	14	0	1	0	4	205	864
16:45	5	1	2	0	0	0	2	16	62	4	0	1	0	0	7	2	12	0	0	0	0	2	70	5	0	3	0	1	192	840
17:00	4	6	1	0	0	0	1	25	43	8	0	1	0	2	10	1	17	0	0	0	2	3	72	13	0	0	0	0	204	833
17:15	5	2	4	0	0	0	1	21	58	12	0	0	0	0	4	2	16	0	0	0	1	1	55	12	0	1	0	3	193	794
17:30	10	2	0	0	0	0	1	18	53	11	0	0	0	0	6	0	21	0	0	0	2	2	71	11	0	1	0	0	206	795
17:45	4	1	3	0	0	0	0	26	42	6	0	2	0	1	11	1	12	0	0	0	0	4	69	11	0	1	1	0	194	797
18:00	4	1	1	0	0	0	0	18	35	5	0	3	0	0	8	1	11	0	0	0	2	4	81	9	0	0	0	0	181	774

APPENDIX B

SIGNAL WARRANT ANALYSIS

B.2.03.08 TRAFFIC SIGNAL WARRANT ANALYSIS FORM FOR INTERSECTION CONTROL.

Minimum warrants for installation of traffic signals for roadways with two or more lanes.

Major street. CR 6
Minor street. Pheasant Trail

No. of lanes 2

FREE FLOW CONDITIONS (RURAL) ☑ ✓
RESTRICTED FLOW CONDITIONS (URBAN) ☑

WARRANT 1 – MINIMUM VEHICULAR VOLUME

100 % SATISFIED – YES ☐ NO ☑
80 % SATISFIED – YES ☐ NO ☑

	MINIMUM REQUIREMENTS (80 % SHOWN IN BRACKETS)				PERCENTAGE WARRANT									
APPROACH LANES	1		2 or MORE		HOUR ENDING									
FLOW CONDITION	FREE FLOW ☑	RESTR FLOW ☐	FREE FLOW ☐	RESTR FLOW ☐	0800	0900	1200	1300	1400	1600	1700	1800	TOTAL ACROSS	
A ALL APPROACHES	480 (385)	720 (575)	600 (480)	900 (720)	327	565	498	533	576	673	690	659		
	100% FULFILLED					✓	✓	✓	✓	✓	✓	✓	700	SECTIONAL PERCENT
	80% FULFILLED													
	ACTUAL % IF BELOW 80 % VALUE				68								68	
												TOTAL DOWN	768 ÷ 8 =	96
B. MINOR STREET BOTH APPROACHES	120* (95)*	170* (135)*	120* (95)*	170* (135)*	54	94	46	51	62	50	56	43	TOTAL ACROSS	
	100% FULFILLED													
	80% FULFILLED													SECTIONAL PERCENT
	ACTUAL % IF BELOW 80 % VALUE				45	78	38	42	52	42	47	36	380	
												TOTAL DOWN	380 ÷ 8 =	47.5

*FOR 'T' INTERSECTIONS THESE VALUES SHOULD BE INCREASED BY 50 %

WARRANT 2 – DELAY TO CROSS TRAFFIC

100 % SATISFIED – YES ☐ NO ☑
80 % SATISFIED – YES ☐ NO ☑

	MINIMUM REQUIREMENTS (80 % SHOWN IN BRACKETS)				PERCENTAGE WARRANT									
APPROACH LANES	1		2 or MORE		HOUR ENDING									
FLOW CONDITION	FREE FLOW ☑	RESTR FLOW ☐	FREE FLOW ☐	RESTR FLOW ☐	0800	0900	1200	1300	1400	1600	1700	1800	TOTAL ACROSS	
A MAJOR STREET BOTH APPROACHES	480 (385)	720 (575)	600 (480)	900 (720)	273	471	452	482	514	623	634	616		
	100% FULFILLED							✓	✓	✓	✓	✓	500	
	80% FULFILLED					✓	✓						160	SECTIONAL PERCENT
	ACTUAL % IF BELOW 80 % VALUE				57								57	
												TOTAL DOWN	717 ÷ 8 =	90
B. TRAFFIC CROSSING MAJOR STREET	50 (40)	75 (60)	50 (40)	75 (60)	31	61	32	37	31	35	30	23	TOTAL ACROSS	
	100 % FULFILLED					✓							100	
	80 % FULFILLED													SECTIONAL PERCENT
	ACTUAL % IF BELOW 80 % VALUE				62		64	74	62	70	60	46	438	
												TOTAL DOWN	538 ÷ 8 =	67

B 2.03.07

MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNALS FOR TWO LANE ROADWAYS

LOCATION CR 6 **AT** PHEASANT TRAIL

MUNICIPALITY PORT DOVER **DATE OF SURVEY** June 16 2016

	WARRANT		DESCRIPTION	MINIMUM REQUIREMENT FOR TWO-LANE ROADWAYS		COMPLIANCE	
				FREE FLOW OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	RESTRICTED FLOW OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	③ ENTIRE %
INTERSECTION	1. MINIMUM VEHICULAR VOLUME	①A	Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	[✓ 480]	720	96	47.5
		④B	Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	[✓ 120]	170	47.5	
	2. DELAY TO CROSS TRAFFIC	①A	Vehicle Volume, Along Major Street for Each of the Heaviest 8 Hours of an Average Day, and	[✓ 480]	720	90	67
		②B	Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours	[✓ 50]	75	67	
	3. ACCIDENT HAZARD	A	Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged Over a 36 Month Period, and	5		N/A	
		B	Adequate Trial of Less Restrictive Remedies, Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Accidents, and	YES ☐ NO ☐		N/A	
		C	Fulfillment of Either of the Above Warrants (Minimum Vehicular Volume or Delay to Cross Traffic) to the Extent of 80% or More.	YES ☐ NO ☑			
	4. COMBINATION WARRANT		Two or More of the Above Warrants (1, 2 or 3) Satisfied to the Extent of 80% or More.	YES ☐ NO ☑			
MID-BLOCK	5. MINIMUM PEDESTRIAN VOLUME	A	Pedestrian Volume Crossing the Major Street Average per Hour for the Heaviest 8 Hours of an Average Day, and	120	240		
		①B	Vehicle Volume Along Major Street Average Per Hour for the Same 8 Hours.	290	575		

NOTES:

① Vehicle Volume Warrants (1A), (2A) and (5B) for Roadways Having Two or More Moving Lanes in one Direction Should Be 25% Higher Than Values Given Above.

② For Definition of Crossing Volume Refer to Note ④ on the Signal Warrant Analysis Form B2.03.08

③ The Lowest Sectional Percentage Governs the Entire Warrant.

④ For "T" Intersections the Values for Warrant (1B) Should Be Increased by 50%

B 2.03.07

MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNALS FOR TWO LANE ROADWAYS

LOCATION CR 6 AT PHEASANT TRAIL

MUNICIPALITY PORT DOVER DATE OF SURVEY BACKGROUND 2026

WARRANT			DESCRIPTION	MINIMUM REQUIREMENT FOR TWO-LANE ROADWAYS		COMPLIANCE	
				FREE FLOW OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	RESTRICTED FLOW OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	③ ENTIRE %
INTERSECTION	1. MINIMUM VEHICULAR VOLUME	①A	Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	576 ~~480~~	720	65	32
		④B	Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	144 ~~120~~	170	32	
	2. DELAY TO CROSS TRAFFIC	①A	Vehicle Volume, Along Major Street for Each of the Heaviest 8 Hours of an Average Day, and	576 ~~480~~	720	57	52
		②B	Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours	60 ~~50~~	75	52	
	3. ACCIDENT HAZARD	A	Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged Over a 36 Month Period, and	5		N/A	
		B	Adequate Trial of Less Restrictive Remedies, Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Accidents, and	YES ☐ NO ☐		N/A	
		C	Fulfillment of Either of the Above Warrants (Minimum Vehicular Volume or Delay to Cross Traffic) to the Extent of 80% or More.	YES ☐ NO ☑			
	4. COMBINATION WARRANT		Two or More of the Above Warrants (1, 2 or 3) Satisfied to the Extent of 80% or More.	YES ☐ NO ☑			
MID-BLOCK	5. MINIMUM PEDESTRIAN VOLUME	A	Pedestrian Volume Crossing the Major Street Average per Hour for the Heaviest 8 Hours of an Average Day, and	120	240		
		①B	Vehicle Volume Along Major Street Average Per Hour for the Same 8 Hours.	290	575		

$\frac{666+840}{4} \rightarrow 376.5$

$\frac{111+75}{4} \rightarrow 46.5$

$\frac{555+765}{4} \rightarrow 330$

$\frac{75+50}{4} \rightarrow 31$

NOTES:

① Vehicle Volume Warrants (1A), (2A) and (5B) for Roadways Having Two or More Moving Lanes in one Direction Should Be 25% Higher Than Values Given Above.

② For Definition of Crossing Volume Refer to Note ④ on the Signal Warrant Analysis Form B2.03.08

③ The Lowest Sectional Percentage Governs the Entire Warrant.

④ For "T" Intersections the Values for Warrant (1B) Should Be Increased by 50%

B2.03.07

MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNALS FOR TWO LANE ROADWAYS

LOCATION CR 6 AT PHEASANT TRAIL

MUNICIPALITY PORT DOVER DATE OF SURVEY TOTAL 2026

WARRANT			DESCRIPTION	MINIMUM REQUIREMENT FOR TWO-LANE ROADWAYS		COMPLIANCE	
				FREE FLOW OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	RESTRICTED FLOW OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	③ ENTIRE %
INTERSECTION	1. MINIMUM VEHICULAR VOLUME	①A	Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	576 ~~480~~	720	82	47
		④B	Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	144 ~~120~~	170	47	
	2. DELAY TO CROSS TRAFFIC	①A	Vehicle Volume, Along Major Street for Each of the Heaviest 8 Hours of an Average Day, and	576 ~~480~~	720	71	71
		②B	Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours	60 ~~50~~	75	86	
	3. ACCIDENT HAZARD	A	Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged Over a 36 Month Period, and	5		N/A	
		B	Adequate Trial of Less Restrictive Remedies, Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Accidents, and	YES ☐ NO ☐		N/A	
		C	Fulfillment of Either of the Above Warrants (Minimum Vehicular Volume or Delay to Cross Traffic) to the Extent of 80% or More.	YES ☐ NO ☑			
	4. COMBINATION WARRANT		Two or More of the Above Warrants (1, 2 or 3) Satisfied to the Extent of 80% or More.	YES ☐ NO ☑			
MID-BLOCK	5. MINIMUM PEDESTRIAN VOLUME	A	Pedestrian Volume Crossing the Major Street Average per Hour for the Heaviest 8 Hours of an Average Day, and	120	240		
		①B	Vehicle Volume Along Major Street Average Per Hour for the Same 8 Hours.	290	575		

$\frac{836+1059}{4} \rightarrow 474$

$\frac{161+107}{4} \rightarrow 67$

$\frac{675+952}{4} \rightarrow 407$

$\frac{125+82}{4} \rightarrow 52$

NOTES:

① Vehicle Volume Warrants (1A), (2A) and (5B) for Roadways Having Two or More Moving Lanes in one Direction Should Be 25% Higher Than Values Given Above.

② For Definition of Crossing Volume Refer to Note ④ on the Signal Warrant Analysis Form B2.03.08

③ The Lowest Sectional Percentage Governs the Entire Warrant.

④ For "T" Intersections the Values for Warrant (1B) Should Be Increased by 50%

B 2.03.07

MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNALS FOR TWO LANE ROADWAYS

LOCATION CR 6 AT Street B

MUNICIPALITY PORT DOVER DATE OF SURVEY TOTAL 2026

	WARRANT	DESCRIPTION	MINIMUM REQUIREMENT FOR TWO-LANE ROADWAYS		COMPLIANCE	
			FREE FLOW OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	RESTRICTED FLOW OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	③ ENTIRE %
INTERSECTION	1. MINIMUM VEHICULAR VOLUME	①A Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	576 ~~480~~	720	84	34
		④B Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	216 ~~120~~	170	34	
	2. DELAY TO CROSS TRAFFIC	①A Vehicle Volume, Along Major Street for Each of the Heaviest 8 Hours of an Average Day, and	576 ~~480~~	720	71	52
		②B Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours	60 ~~50~~	75	52	
	3. ACCIDENT HAZARD	A Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged Over a 36 Month Period, and	5		N/A	
		B Adequate Trial of Less Restrictive Remedies, Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Accidents, and	YES ☐ NO ☐		N/A	
		C Fulfillment of Either of the Above Warrants (Minimum Vehicular Volume or Delay to Cross Traffic) to the Extent of 80% or More.	YES ☐ NO ☑			
	4. COMBINATION WARRANT	Two or More of the Above Warrants (1, 2 or 3) Satisfied to the Extent of 80% or More.	YES ☐ NO ☑			
MID-BLOCK	5. MINIMUM PEDESTRIAN VOLUME	A Pedestrian Volume Crossing the Major Street Average per Hour for the Heaviest 8 Hours of an Average Day, and	120	240		
		①B Vehicle Volume Along Major Street Average Per Hour for the Same 8 Hours.	290	575		

$\frac{849+1082}{4} \rightarrow 483$

$\frac{179+114}{4} \rightarrow 73$

$\frac{670+968}{4} \rightarrow$ 4[illegible]0

$\frac{77+49}{4} \rightarrow 31.5$

NOTES:

① Vehicle Volume Warrants (1A), (2A) and (5B) for Roadways Having Two or More Moving Lanes in one Direction Should Be 25% Higher Than Values Given Above.

② For Definition of Crossing Volume Refer to Note ④ on the Signal Warrant Analysis Form B2.03.08

③ The Lowest Sectional Percentage Governs the Entire Warrant.

④ For "T" Intersections the Values for Warrant (1B) Should Be Increased by 50%

B 2.03.07

MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNALS FOR TWO LANE ROADWAYS

LOCATION CR 6 AT Street B

MUNICIPALITY PORT DOVER DATE OF SURVEY 2026 FULL BUILD-OUT
NORTH & SOUTH

	WARRANT		DESCRIPTION	MINIMUM REQUIREMENT FOR TWO-LANE ROADWAYS FREE FLOW OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	MINIMUM REQUIREMENT FOR TWO-LANE ROADWAYS RESTRICTED FLOW OPERATING SPEED LESS THAN 70 km/h	COMPLIANCE SECTIONAL %	COMPLIANCE ③ ENTIRE %
INTERSECTION	1. MINIMUM VEHICULAR VOLUME	①A	Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	~~480~~ 576	720	113	113
		④B	Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	~~120~~ 144	170	119	
	2. DELAY TO CROSS TRAFFIC	①A	Vehicle Volume, Along Major Street for Each of the Heaviest 8 Hours of an Average Day, and	~~480~~ 576	720	84	84
		②B	Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours	~~50~~ 60	75	120	
	3. ACCIDENT HAZARD	A	Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged Over a 36 Month Period, and	5		N/A	
		B	Adequate Trial of Less Restrictive Remedies, Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Accidents, and	YES ☐ NO ☐		N/A	
		C	Fulfillment of Either of the Above Warrants (Minimum Vehicular Volume or Delay to Cross Traffic) to the Extent of 80% or More.	YES ☑ NO ☐			
	4. COMBINATION WARRANT		Two or More of the Above Warrants (1, 2 or 3) Satisfied to the Extent of 80% or More.	YES ☑ NO ☐			
MID-BLOCK	5. MINIMUM PEDESTRIAN VOLUME	A	Pedestrian Volume Crossing the Major Street Average per Hour for the Heaviest 8 Hours of an Average Day, and	120	240		
		①B	Vehicle Volume Along Major Street Average Per Hour for the Same 8 Hours.	290	575		

$\frac{1051+1560}{4} \rightarrow 653$

$\frac{293+390}{4} \rightarrow 171$

$\frac{758+1170}{4} \rightarrow 482$

$\frac{125+164}{4} \rightarrow 72$

NOTES:

① Vehicle Volume Warrants (1A), (2A) and (5B) for Roadways Having Two or More Moving Lanes in one Direction Should Be 25% Higher Than Values Given Above.

② For Definition of Crossing Volume Refer to Note ④ on the Signal Warrant Analysis Form B2.03.08

③ The Lowest Sectional Percentage Governs the Entire Warrant.

④ For "T" Intersections the Values for Warrant (1B) Should Be Increased by 50%

APPENDIX C

LEFT TURN LANE REQUIREMENTS

Left Turn Lane Requirements

County Road 6 at Site Access

Design Speed 70km/h

Total Traffic (Fig. 6)

AM Peak Hour

Percent left - 34/269 - 12.6% - use 15 percent
Va - 269vph Vo - 401vph S - 0

PM Peak Hour

Percent left - 110/500 - 22.0% - use 25 percent
Va - 500vph Vo - 468vph S - 30metres

County Road 6 at Pheasant Trail

Design Speed 70km/h

Total Traffic (Fig. 6)

Eastbound

AM Peak Hour

Percent left - 5/312 - 1.6% - use 5 percent
Va - 312vph Vo - 363vph S - 0

PM Peak Hour

Percent left - 20/439 - 4.6% - use 5 percent
Va - 439vph Vo - 513vph S - 15 metres

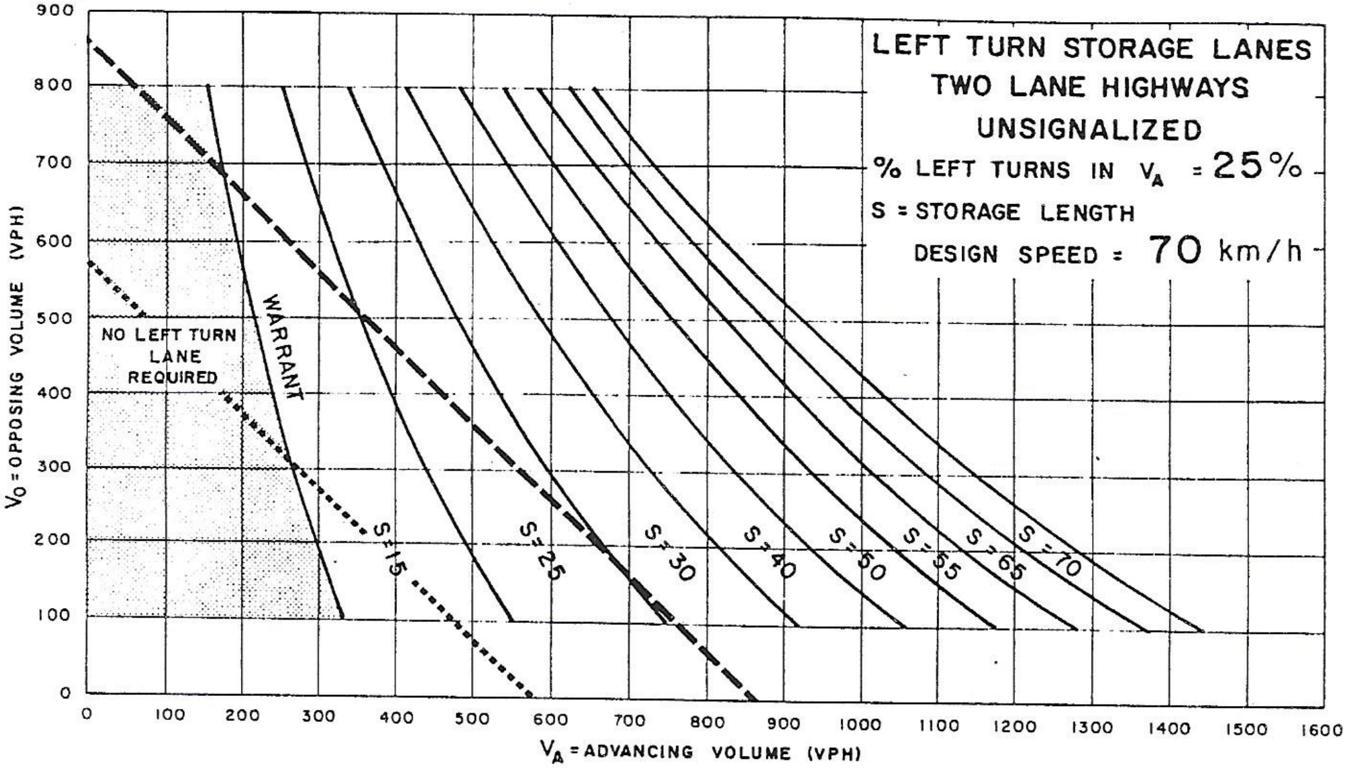
Westbound

AM Peak Hour

Percent left - 10/363 - 2.8% - use 5 percent
Va - 363vph Vo - 312vph S - 0

PM Peak Hour

Percent left - 10/513 - 1.9% - use 5 percent
Va - 513vph Vo - 439vph S - 15 metres



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

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

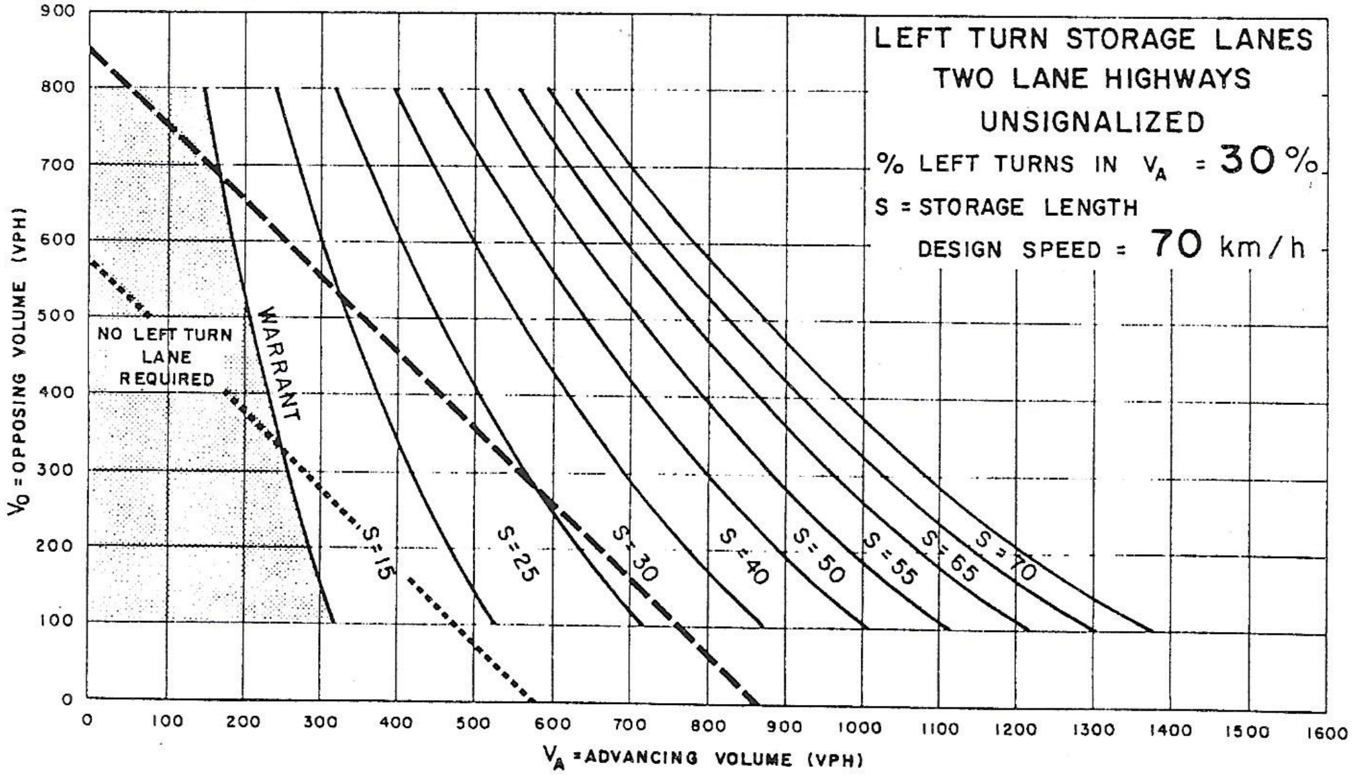


Figure EA-12

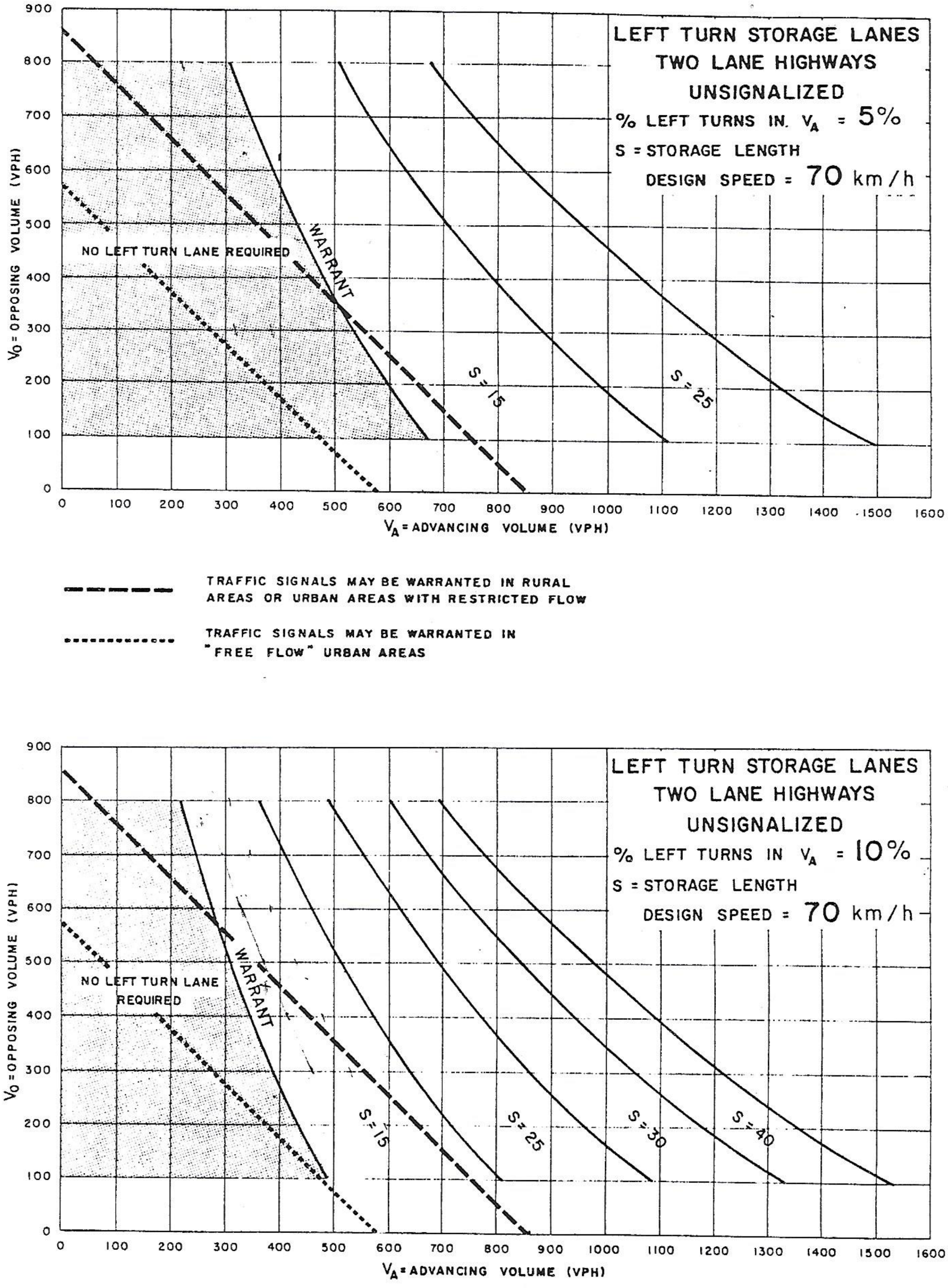
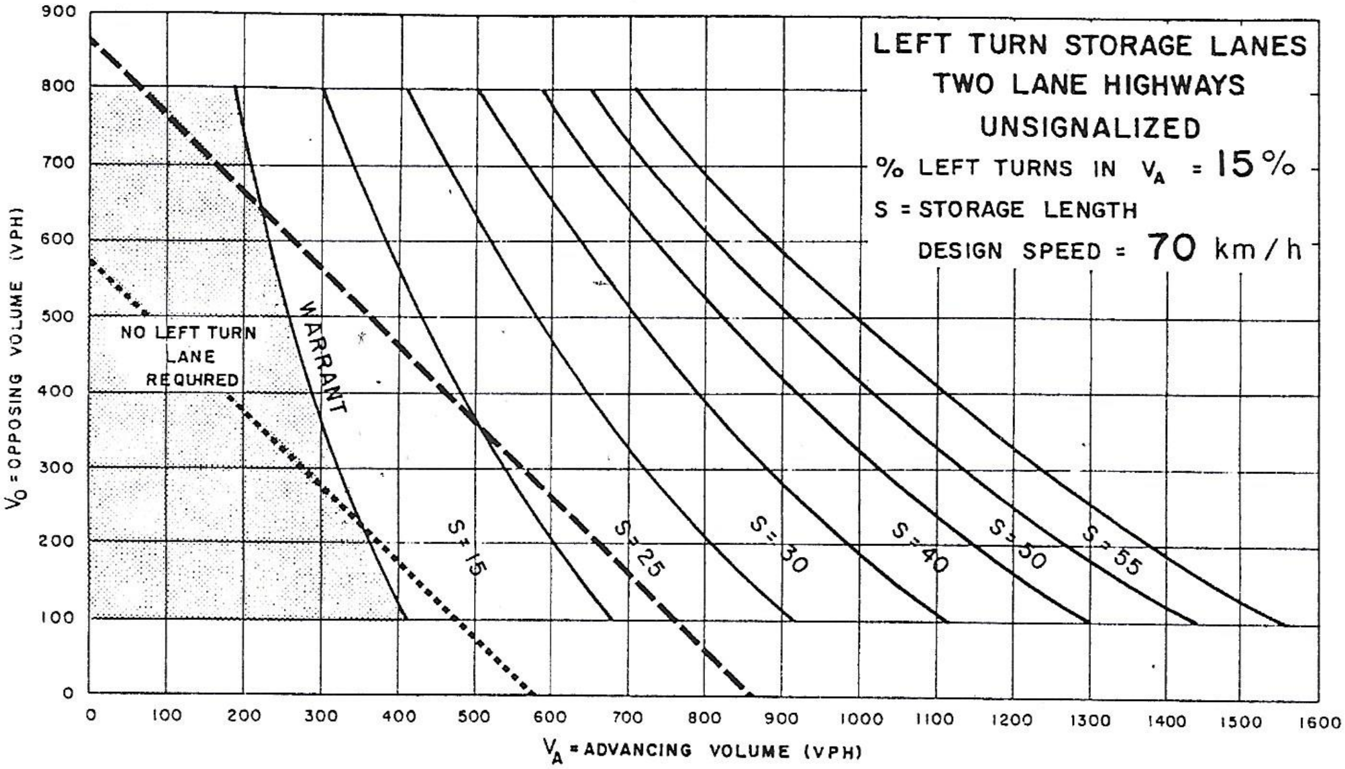

LEFT TURN STORAGE LANES
TWO LANE HIGHWAYS
UNSIGNALIZED
% LEFT TURNS IN V_A = 5%
S = STORAGE LENGTH
DESIGN SPEED = 70 km/h
V_O = OPPOSING VOLUME (VPH)
V_A = ADVANCING VOLUME (VPH)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
NO LEFT TURN LANE REQUIRED
WARRANT
S = 15
S = 25
TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW
TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS
LEFT TURN STORAGE LANES
TWO LANE HIGHWAYS
UNSIGNALIZED
% LEFT TURNS IN V_A = 10%
S = STORAGE LENGTH
DESIGN SPEED = 70 km/h
V_O = OPPOSING VOLUME (VPH)
V_A = ADVANCING VOLUME (VPH)
NO LEFT TURN LANE REQUIRED
WARRANT
S = 15
S = 25
S = 30
S = 40

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

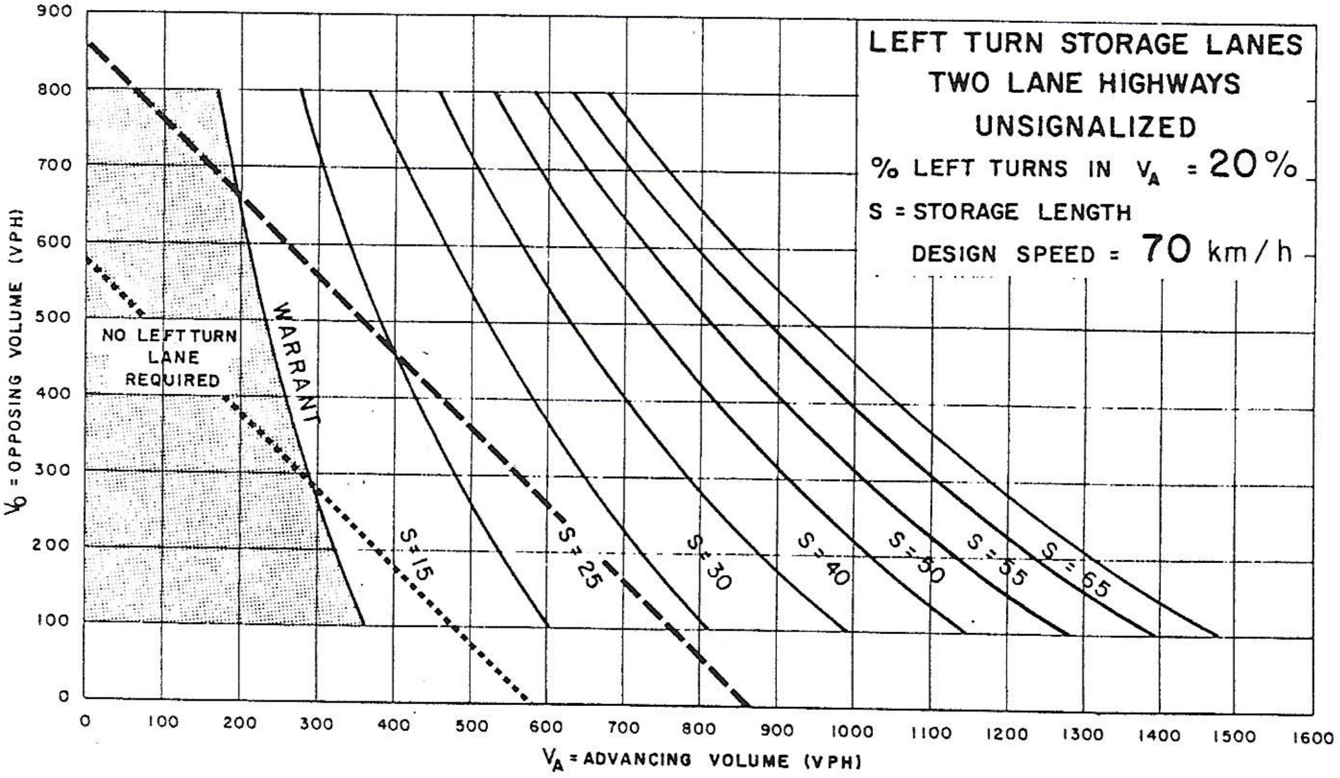


Figure EA-11

Max hourly demand = 4.0 x 0.450 x 1455/24/60/60 = 0.0303 cms = 30.3 L/sec

Therefore Max daily demand + fire flow = 84.58 L/sec governs

For the proposed Stage 1 of the development (112) dwelling units the max demand generated by 336 persons would be 2.25 x 0.450 x 336/24/60/60 = 0.00394 cms = 3.94 L/sec. Max daily demand + fire flow = 70.94 L/sec

These water design figures can be input to the County Water Models for analysis

girard ENGINEERING

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Lynn River Heights Subdivision Phase 2 Port Dover
Democrat Port Dover Limited
Functional Servicing Report

Sanitary Sewage Flow

A large portion of this developments sewage flow was designed to drain into existing sanitary sewers located on Willowdale Crescent (0.00541 cms) and Cardinal Lane (0.00615 cms) in Phase 1 of Lynn River Heights.
The remaining portion of the development will be served by an extension of the 250 mm trunk sewer on Highway 6. The cumulative population for this portion of the development is projected to be 1306 persons based on 3.5 persons per dwelling unit. The peak design sewage flow was calculated to be 0.02371 cms. This figure can be input to the County Sanitary Sewage Model for analysis
The proposed Stage 1 will include 112 dwelling units and produce approximately 0.008 cms of peak sewage flow.

Water Demand – Domestic and Fire Flow

Fire flow is determined from the formula F = 220CA^0.5 where C is taken as 1.25 for partial masonry covered walls and wood frame construction and A is the usable area of a typical home say 2500 SF (approx. 240 SM)
F = 220 x 1.25 x (240)^0.5 = 4260 L/min and we can assume F = 4000 L/min from Note 3. This equates to 67 L/sec

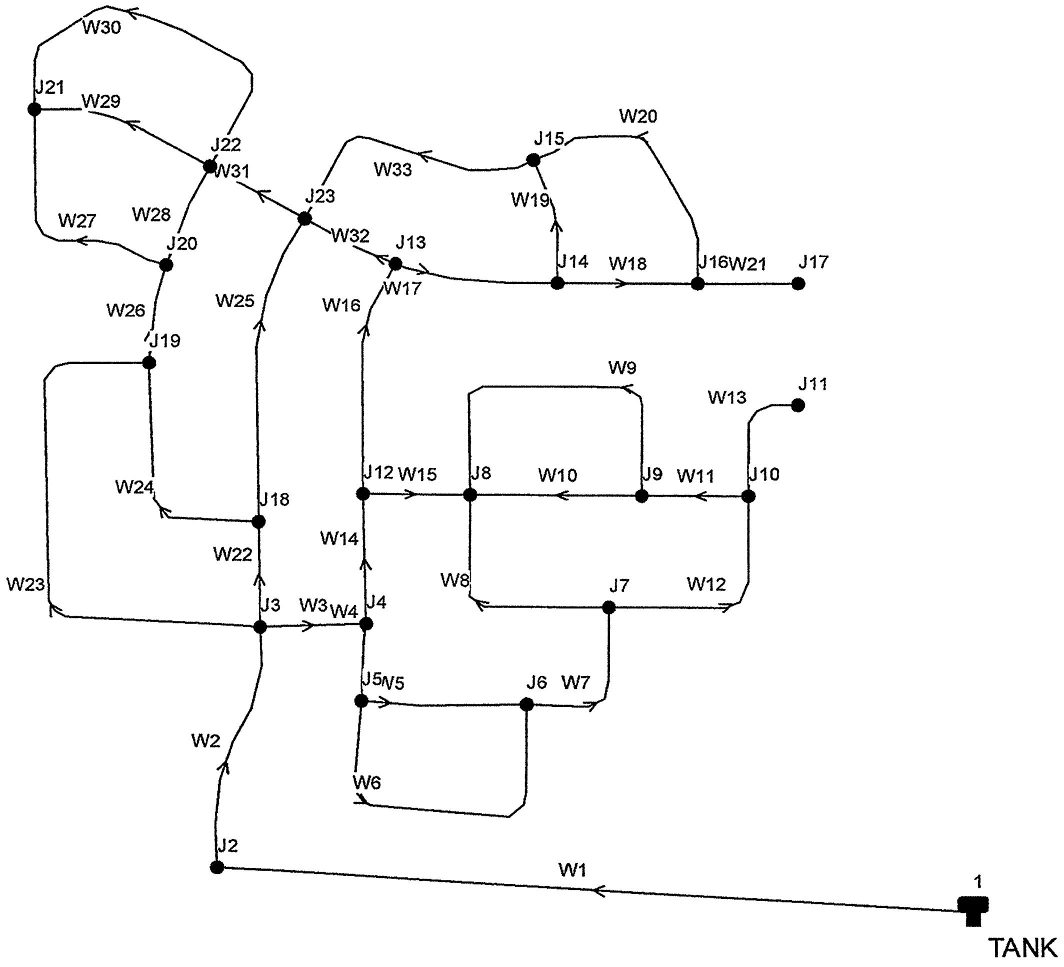
The design for water demand is the greater of max daily demand + fire flow or max hourly demand

Average daily demand per capita is 450 L/day
Max daily demand factor is 2.25 (based on Norfolk County data)
Max hourly demand factor for residential is 4.00

For 500 dwelling units with 3 persons per unit results in a design population of 1500 persons. Max daily domestic demand is 2.25 x 0.450 x 1500/24/60/60 = 0.01758 cms = 17.58 L/sec
Max daily demand + fire flow = 67 L/sec + 17.58 L/sec = 84.58 L/sec

LRH

Day 1, 12:00



LRH

Network Table - Nodes

Node ID	Elevation ft	Base Demand GPM	Demand GPM	Head ft	Pressure psi	Quality
Junc J10	656.8	10.58	10.58	731.28	32.27	0.00
Junc J6	658.2	8.4	8.40	731.32	31.68	0.00
Junc J9	658.2	0	0.00	731.28	31.66	0.00
Junc J8	661.8	23.4	23.40	731.28	30.10	0.00
Junc J19	671.78	2.23	2.23	730.84	25.59	0.00
Junc J17	656.66	0	0.00	730.78	32.12	0.00
Junc J16	658.8	15.027	15.03	730.78	31.19	0.00
Junc J22	674.60	22.82	22.82	730.02	24.01	0.00
Junc J14	662.8	8.35	8.35	730.79	29.46	0.00
Junc J15	661.15	11.69	11.69	730.76	30.16	0.00
Junc J21	682.2	1055.41	1055.41	729.26	20.39	0.00
Junc J23	671.65	0	0.00	730.70	25.59	0.00
Junc J3	665.1	27.3	27.30	731.77	28.89	0.00
Junc J4	663.88	15.03	15.03	731.37	29.24	0.00
Junc J5	659.55	26.16	26.16	731.36	31.11	0.00
Junc J12	665.42	17.25	17.25	731.28	28.54	0.00
Junc J7	656	21.71	21.71	731.28	32.62	0.00

LRH

Node ID	Elevation ft	Base Demand GPM	Demand GPM	Head ft	Pressure psi	Quality
Junc J2	666.2	8.91	8.91	734.77	29.71	0.00
Junc J13	668.4	10.02	10.02	730.82	27.05	0.00
Junc J20	673.2	11.7	11.70	730.11	24.66	0.00
Junc J11	654.76	0	0.00	731.28	33.15	0.00
Junc J18	668.2	26.72	26.72	731.43	27.40	0.00
Tank 1	734	#N/A	-1322.71	744.00	4.33	0.00

LRH

Network Table - Links

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe W11	262.5	8	100	1.51	0.01	0.00	0.000
Pipe W10	430	8	100	0.13	0.00	0.00	8.398
Pipe W21	249.3	10	110	0.00	0.00	0.00	0.000
Pipe W3	262.5	10	110	395.45	1.62	1.51	0.031
Pipe W14	99.35	10	110	299.98	1.23	0.90	0.032
Pipe W31	262.5	10	110	530.94	2.17	2.60	0.030
Pipe W15	262.5	6	95	9.81	0.11	0.03	0.066
Pipe W18	354.3	10	110	26.13	0.11	0.01	0.046
Pipe W2	616.8	12	120	1313.80	3.73	4.87	0.023
Pipe W4	190	10	110	80.44	0.33	0.08	0.039
Pipe W6	919	6	95	12.15	0.14	0.04	0.064
Pipe W5	410.1	8	100	42.13	0.27	0.08	0.050
Pipe W7	423.3	8	100	45.88	0.29	0.10	0.049
Pipe W8	607	8	100	12.07	0.08	0.01	0.060
Pipe W9	951.5	6	95	1.38	0.02	0.00	0.008
Pipe W12	594	8	100	12.09	0.08	0.01	0.061
Pipe W13	328	8	100	0.00	0.00	0.00	0.000

LRH

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe W23	1378	10	110	255.61	1.04	0.67	0.033
Pipe W16	603.7	10	110	272.92	1.11	0.76	0.033
Pipe W32	262.5	10	110	209.12	0.85	0.46	0.034
Pipe W26	256	10	110	558.99	2.28	2.86	0.029
Pipe W28	269	10	110	174.86	0.71	0.33	0.035
Pipe W27	633.2	10	110	372.43	1.52	1.35	0.031
Pipe W29	472.5	10	110	410.91	1.68	1.62	0.031
Pipe W30	1014	10	110	-272.07	1.11	0.75	0.033
Pipe W33	702.1	6	95	-18.71	0.21	0.08	0.060
Pipe W17	1000	10	110	53.77	0.22	0.04	0.042
Pipe W19	315	6	100	19.30	0.22	0.08	0.054
Pipe W20	689	6	95	-11.10	0.13	0.03	0.064
Pipe W25	794	10	110	303.11	1.24	0.92	0.032
Pipe W24	633.2	10	110	305.61	1.25	0.93	0.032
Pipe W22	262.5	12	120	635.44	1.80	1.27	0.025
Pipe W1	1870	12	120	1322.71	3.75	4.93	0.023

LRH

Network Table - Links

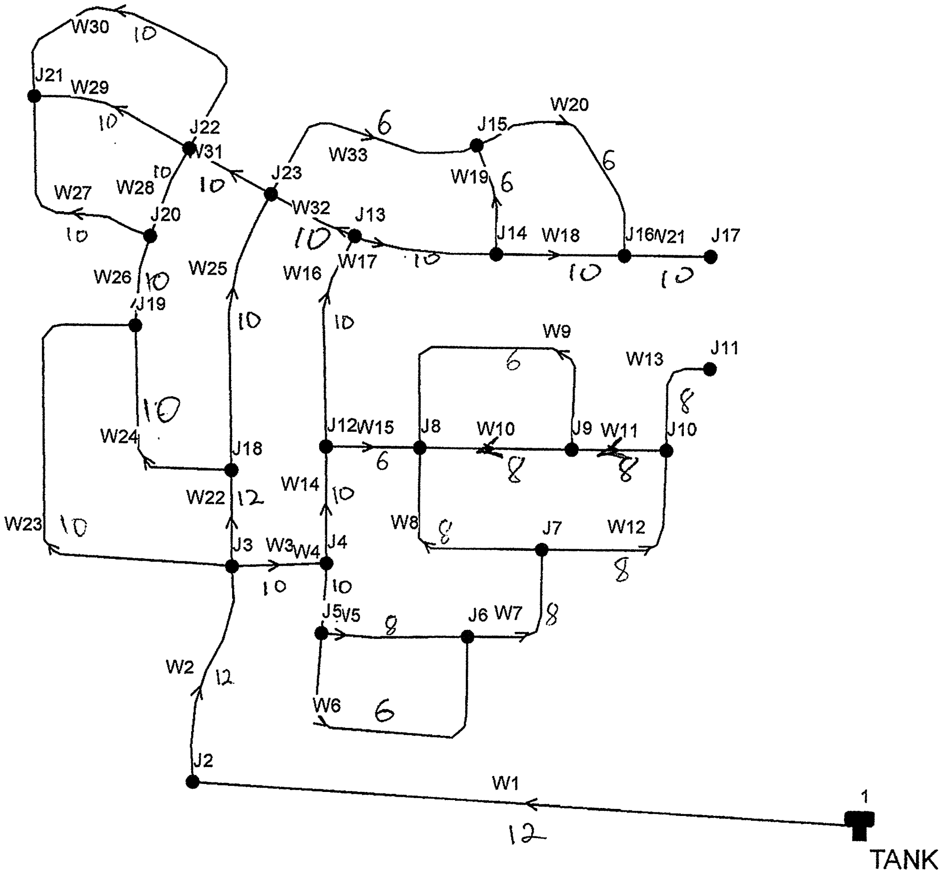
Link ID	Reaction Rate mg/L/d	Quality	Status
Pipe W11	0.00	0.00	Open
Pipe W10	0.00	0.00	Open
Pipe W21	0.00	0.00	Open
Pipe W3	0.00	0.00	Open
Pipe W14	0.00	0.00	Open
Pipe W31	0.00	0.00	Open
Pipe W15	0.00	0.00	Open
Pipe W18	0.00	0.00	Open
Pipe W2	0.00	0.00	Open
Pipe W4	0.00	0.00	Open
Pipe W6	0.00	0.00	Open
Pipe W5	0.00	0.00	Open
Pipe W7	0.00	0.00	Open
Pipe W8	0.00	0.00	Open
Pipe W9	0.00	0.00	Open
Pipe W12	0.00	0.00	Open
Pipe W13	0.00	0.00	Open

LRH

Link ID	Reaction Rate mg/L/d	Quality	Status
Pipe W23	0.00	0.00	Open
Pipe W16	0.00	0.00	Open
Pipe W32	0.00	0.00	Open
Pipe W26	0.00	0.00	Open
Pipe W28	0.00	0.00	Open
Pipe W27	0.00	0.00	Open
Pipe W29	0.00	0.00	Open
Pipe W30	0.00	0.00	Open
Pipe W33	0.00	0.00	Open
Pipe W17	0.00	0.00	Open
Pipe W19	0.00	0.00	Open
Pipe W20	0.00	0.00	Open
Pipe W25	0.00	0.00	Open
Pipe W24	0.00	0.00	Open
Pipe W22	0.00	0.00	Open
Pipe W1	0.00	0.00	Open

LRH

Day 1, 12:0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Lynn River Heights Subdivision Phase 2 Port Dover
Democrat Port Dover Limited
Planning Impact Analysis/Justification Report

PERMITTED USES AND LAND USE POLICIES

The proposed development is located within the urban boundary of Port Dover in an area designated in the Official Plan as Urban Residential

The predominant use of land shall be a variety of urban dwelling types, including single detached dwellings, semi-detached dwellings, duplex dwellings and similar low-profile residential buildings not exceeding two dwelling units per lot.

Accessory residential dwelling units or garden suites are permitted.

Single, semi-detached and duplex housing forms shall generally have an average net density of 15 units per hectare.

Watermains and sanitary sewers shall be capable of accommodating the development

The development shall be adequately services by parks and schools.

The development shall be designed and landscaped and buffering shall be provided to ensure that the visual impact of the development on adjacent uses is minimized.

PROPOSED DEVELOPMENT

This development proposes single detached units, semi-detached units and units with accessory units.

The average net density of the developed portion of the site (lots and roadways) is 15 units per hectare.

The development incorporates landscaped park land and stormwater management facilities with walking trails. In addition the development offers a 6 m buffer zone between the back lot lines of the lots adjacent to the treed area north of the development and access to the Lynn Valley Trail System. The park at the south end provides a landscaped buffer between lots and Highway 6 eliminating any “tunnel” effect with lots backing onto the highway.

The development features a variety of single family homes, more affordable semi-detached homes and homes that feature accessory units which would appeal to families looking after elderly relatives and persons with special needs.

Max hourly demand = 4.0 x 0.450 x 1455/24/60/60 = 0.0303 cms = 30.3 L/sec

Therefore Max daily demand + fire flow = 84.58 L/sec governs

For the proposed Stage 1 of the development (112) dwelling units the max demand generated by 336 persons would be 2.25 x 0.450 x 336/24/60/60 = 0.00394 cms = 3.94 L/sec. Max daily demand + fire flow = 70.94 L/sec

These water design figures can be input to the County Water Models for analysis

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London Ontario N6E 1A2 Canada
Tel 519 681 9916 Fax 855 833 4022
www.rvanderson.com

May 22, 2018 RVA 173757

Norfolk County
183 Main Street
Delhi, ON N4B 2M3

Attention: Mr. Devin Hunter, C.Tech., CMM I
Director, Development Engineering

Re: Port Dover Water Distribution Model
Lynn River Heights Subdivision

R.V. Anderson Associates Limited (RVA) has conducted an analysis of the impact of the proposed Lynn River Heights subdivision on the water distribution system in Port Dover, as requested by Norfolk County (County).

Background

The proposed Lynn River Heights subdivision is proposed in the Northwest corner of the Port Dover water distribution system. The development is planned to be constructed in two (2) stages, Phase I and Phase II.

The Integrated Sustainable Master Plan (ISMP) identified low pressures in the Northwest area of the distribution system and recommended the installation of a booster pumping station. The County wishes to review this proposed development in the context of the ISMP and review the requirement for a booster pumping station.

The objective of this report is to determine the impact of Lynn River Heights subdivision on the existing distribution system, review the requirements of a booster pumping station in the contexts of the ISMP, and define the new pressure zone as required.

RVA was provided with the Water Demands from the Functional Servicing Report and site plan drawings prepared by Girard Engineering outlining the proposed Phase I and Phase II developments.

Summary of the Water Distribution Hydraulic Modeling

RVA used the existing Port Dover Water Distribution Model to review the impact of the proposed development on the system. The following points summarizes the assumptions and analysis that was completed:

- New nodes, pipe segments, and average day demands were added to the water model in accordance with the data provided by the County. Average day demands were obtained from Girard's servicing report and were assigned to the closest node.

- Simulations were completed to estimate the pressure in the system during Peak Hour Demand and available fire flow during Max Day Demands. The simulations were completed using the scenarios in the existing Port Dover water distribution model.

- The required fire flow value was determined by Girard Engineering's Functional Servicing Report as 67 l/s.

- Watermains within the existing Lynn Park area were reviewed recently and were expected to be replaced. The following proposed upgrades may not be completed in the field, however they were modeled as completed with the understanding that the work will be completed prior to the Lynn River Heights Subdivision:

Street Name	**Existing Watermain Size**	**Modeled Watermain Size**
Willowdale Crescent	100mm	200mm
Cardinal Lane	100mm	200mm
Kelly Drive	100mm	200mm
Sparrow Way	100mm	200mm
Pleasant Trail	100mm	200mm
Lynn Park Avenue	100mm	200mm
Jackson Heights	100mm	150mm
O'Rourke Avenue	100mm	150mm
East St. S	100mm	200mm

It's important to note these upgrades have significant impact on the proposed Lynn River Heights subdivision. If any of these upgrades are likely not to occur, the results noted in this report may vary significantly.

- The proposed Silver Lakes Estates was included in the model, although RVA does not have confirmation if this development has been confirmed and approved.

Results of the Hydraulic Analysis

The following points summarize the results of the analysis completed by RVA:

Existing Conditions

- The pressures during Peak Hour Demand conditions in the vicinity of the proposed development, within the existing Lynn Park area, range between 50 – 60 psi (refer to Figure 1).

- The existing available fire flows during Max Day Demand conditions in the vicinity of the proposed development, within the existing Lynn Park area are greater than 150 l/s (refer to Figure 2).

Phase I – Lynn River Development

- The pressures during Peak Hour Demand conditions within the proposed Phase I Lynn River Development range between 40 – 50 psi. This development does not negatively impact the water distribution network as the pressures in the vicinity remain of the Lynn Park area remain within 50 – 60 psi (refer to Figure 3).

- The available fire flows during Max Day Demand within the Phase I Lynn River Development exceed 68 l/s and exceed the required fire flow rate of 67 l/s (refer to Figure 4).

Phase II – Lynn River Development

- The pressures during Peak Hour Demand conditions within the proposed Phase II Lynn River Development are below 40 psi, with the lowest node at 34 psi. The pressures in the vicinity of the existing Lynn Park area remain between 50 – 60 psi (refer to Figure 5).
- The available fire flows during Max Day Demand conditions within the proposed Phase II Lynn River Development range between 63 l/s and 159 l/s. Localized areas of Phase II fall below the required fire flow value of 67 l/s (refer to Figure 6).

Phase II – Lynn River Development with Booster Station

RVA reviewed the potential of adding a booster pumping station to service the proposed Lynn River Development. The booster station was located on Highway 6, just west of Pleasant Trail for modeling purposes, however the location may be refined with the input from County staff. Pressure sustaining valves were added at the west end of Lynn Park on Willowdale Crescent and Cardinal Lane.

Based on the modeling results, the main function of the booster pumping station would be to boost pressures to service the Lynn River Development during Peak Hour Demands. The station was sized conceptually to boost the hydraulic grade line (HGL) from 233.6m to 244m. A hydraulic grade line of 244m will provide a pressure of 70 psi at the lowest elevation point of 195m and maintain pressures above 50 psi at the highest elevation point 209m within the proposed development. This would allow the pressure zone to operate within the recommended range of 50 – 70 psi.

Except for localized areas, the existing water distribution network appears sufficient to provide the required fire flows during Max Day Demand. As a result, the station will be by-passed during fire flow conditions. The pressure sustaining valves on Willowdale Crescent and Cardinal Lane would also allow flow through during fire flow conditions.

The pump size was selected to match the demands of the proposed development of 12.6 l/s. The following points summarize the findings:

- The pressures during Peak Hour Demand conditions with the booster pumping station operating at a HGL of 244m will be in the range of 50 – 70 psi (refer to Figure 7).
- The pressures during 2041 Peak Hour Demand conditions, with the booster pumping station operating at a HGL of 244m will be maintained above 40 psi (refer to Figure 8).

- It is suggested that the pressure zone be created along the east boundary of the proposed Lynn River Development. The pressure zone could follow the contour elevation of 199m which separates the existing and new development and involves the least number of connections to be modified in the existing water distribution system. The pressure zone boundary along the 199m contour can extend to the south of Highway 6 to include future proposed developments. Refer to Figures 7 and 8 for an outline of the 199m contour.

- The size of the booster pumping station can be refined based on the County's development plans.

- During fire flow conditions, the booster station is by-passed and the pressure sustaining valves are open. The available fire flows during Max Day Demand conditions within the proposed Phase II Lynn River Development range between 63 l/s and 159 l/s. Localized areas of Phase II fall below the required fire flow value of 67 l/s (refer to Figure 9).

- The 2041 available fire flows during Mad Day Demand conditions range between 58 l/s and 159 l/s. Localized areas of Phase II fall below the required fire flow value of 67 l/s (refer to Figure 10).

We trust that the hydraulic analysis summarized in this letter is sufficient for your purposes. Please contact the undersigned if you have any questions or concerns.

Yours very truly,

R.V. ANDERSON ASSOCIATES LIMITED

Muhannad Bagajati, P.Eng.
Project Manager

Enclosures:

1. Figure 1 – Existing Conditions: Pressure During Peak Hour Demand
2. Figure 2 – Existing Conditions: Available Fire Flow During Max Day Demand
3. Figure 3 – Phase I: Pressures During Peak Hour Demand
4. Figure 4 – Phase I: Available Fire Flow During Max Day Demand
5. Figure 5 – Phase II: Pressures During Peak Hour Demand
6. Figure 6 – Phase II: Available Fire Flow During Max Day Demand
7. Figure 7 – Phase II & PS: Pressures During Peak Hour Demand
8. Figure 8 – Phase II & PS: 2041 Pressures During Peak Hour Demand
9. Figure 9 – Phase II & PS: Available Fire Flow During Max Day Demand
10. Figure 10 – Phase II & PS: 2041 Available Fire Flow During Max Day Demand

REVISIONS AND PUBLICATION REGISTER

Revision #	Date	Details	Distribution
00	22 May 2018	Report Issued via email	Devin Hunter – Norfolk County Gary Houghton – Norfolk County

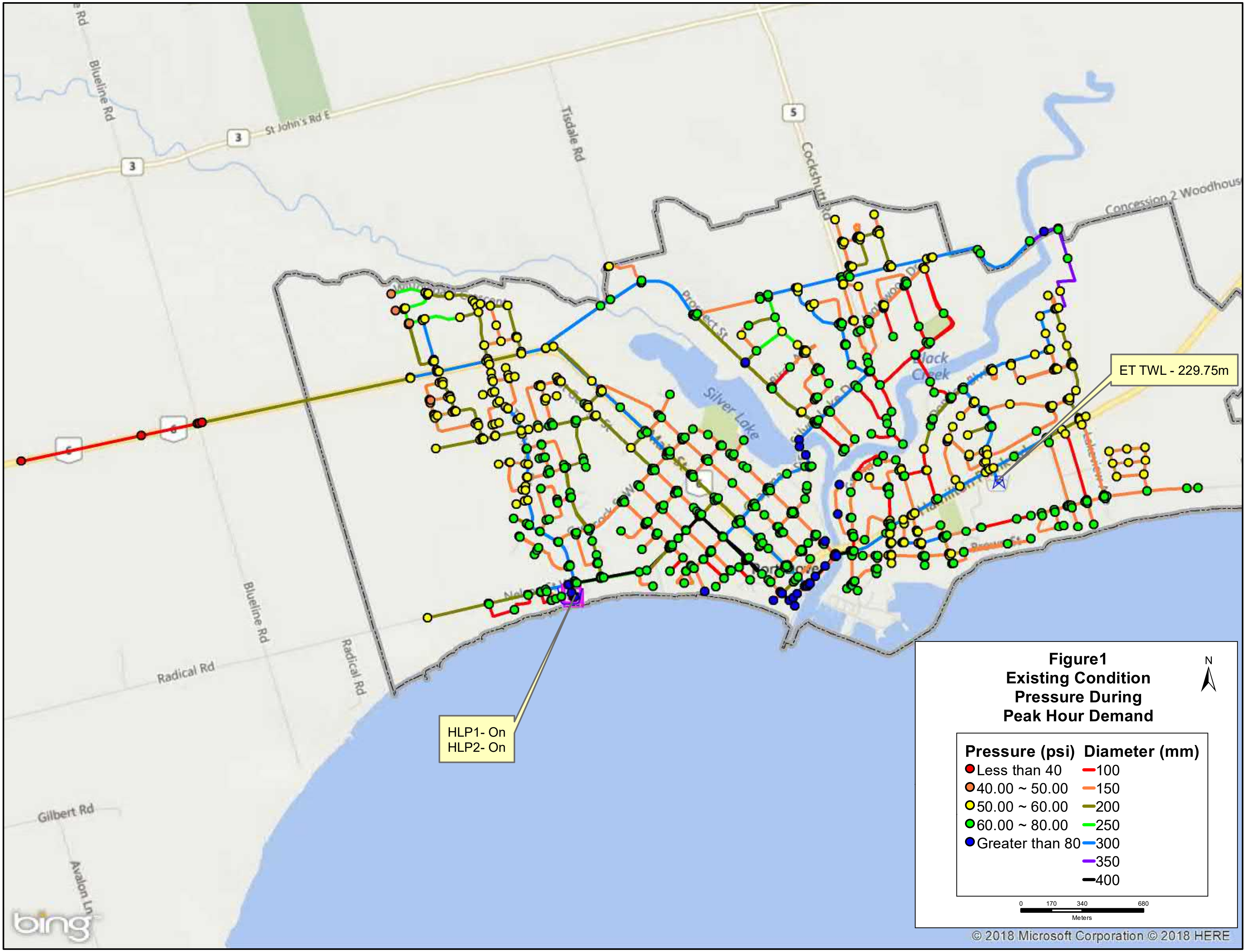

Figure1
Existing Condition
Pressure During
Peak Hour Demand

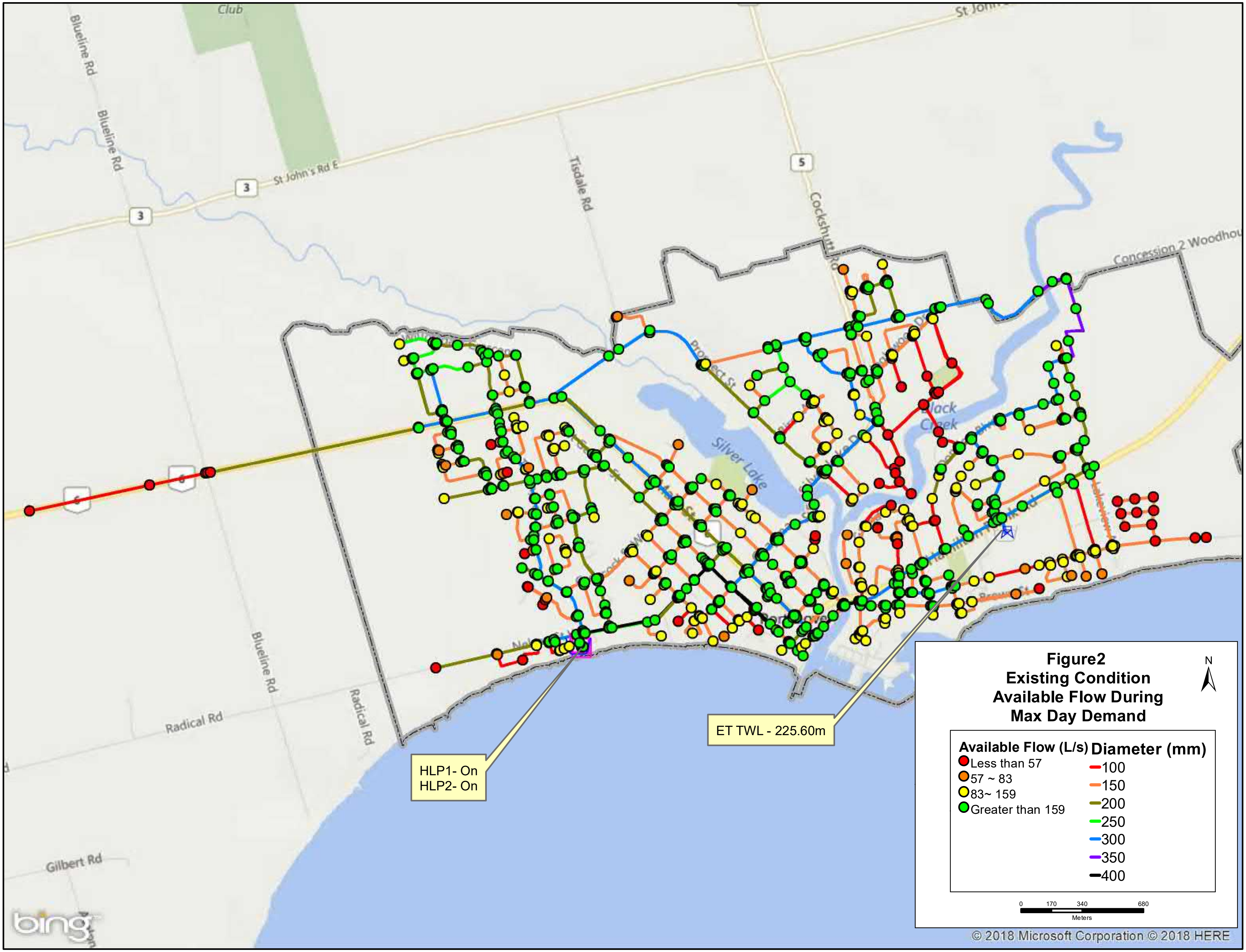

Figure2
Existing Condition
Available Flow During
Max Day Demand

ET TWL - 225.60m

HLP1- On
HLP2- On

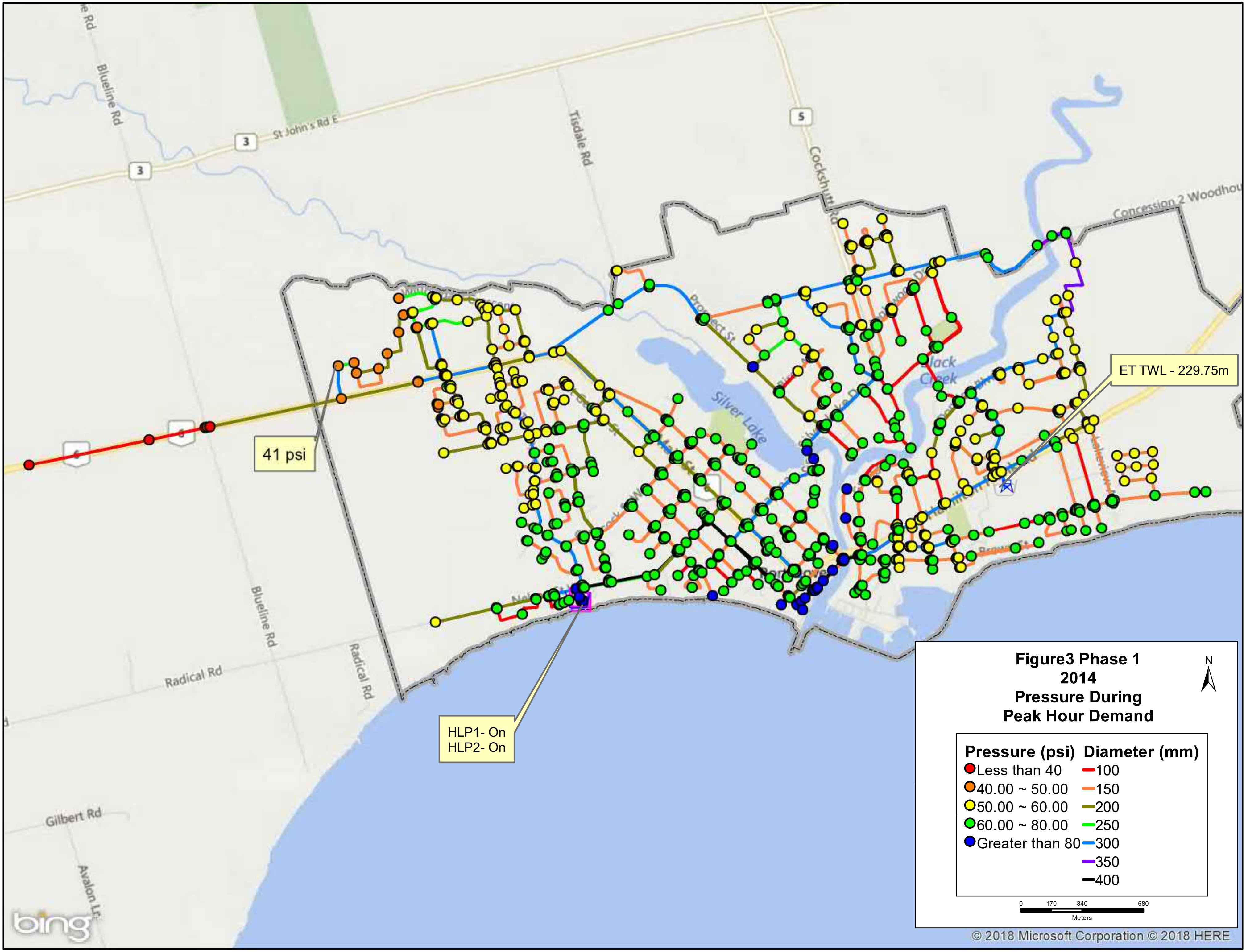

Figure3 Phase 1
2014
Pressure During Peak Hour Demand

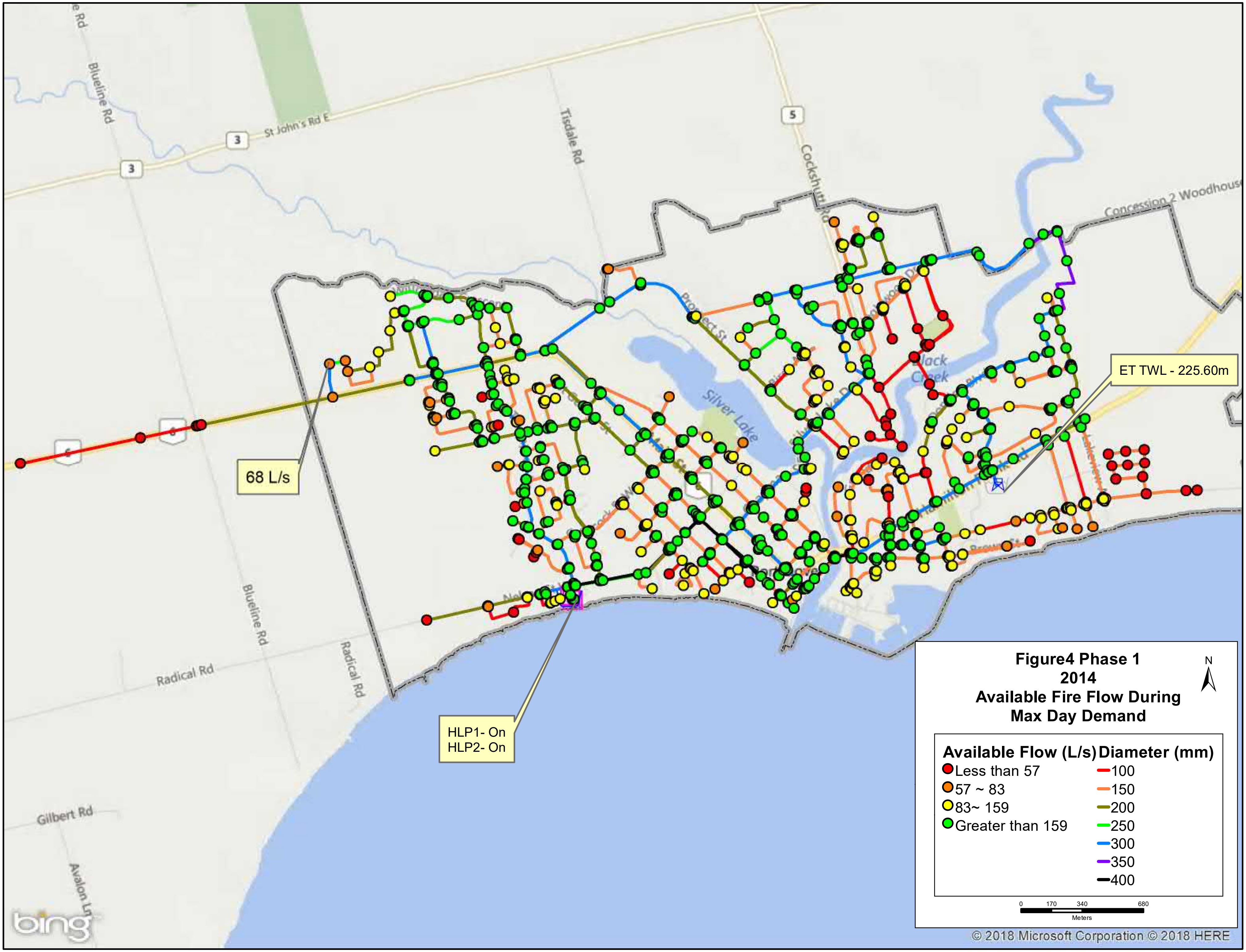

Figure4 Phase 1
2014
Available Fire Flow During
Max Day Demand

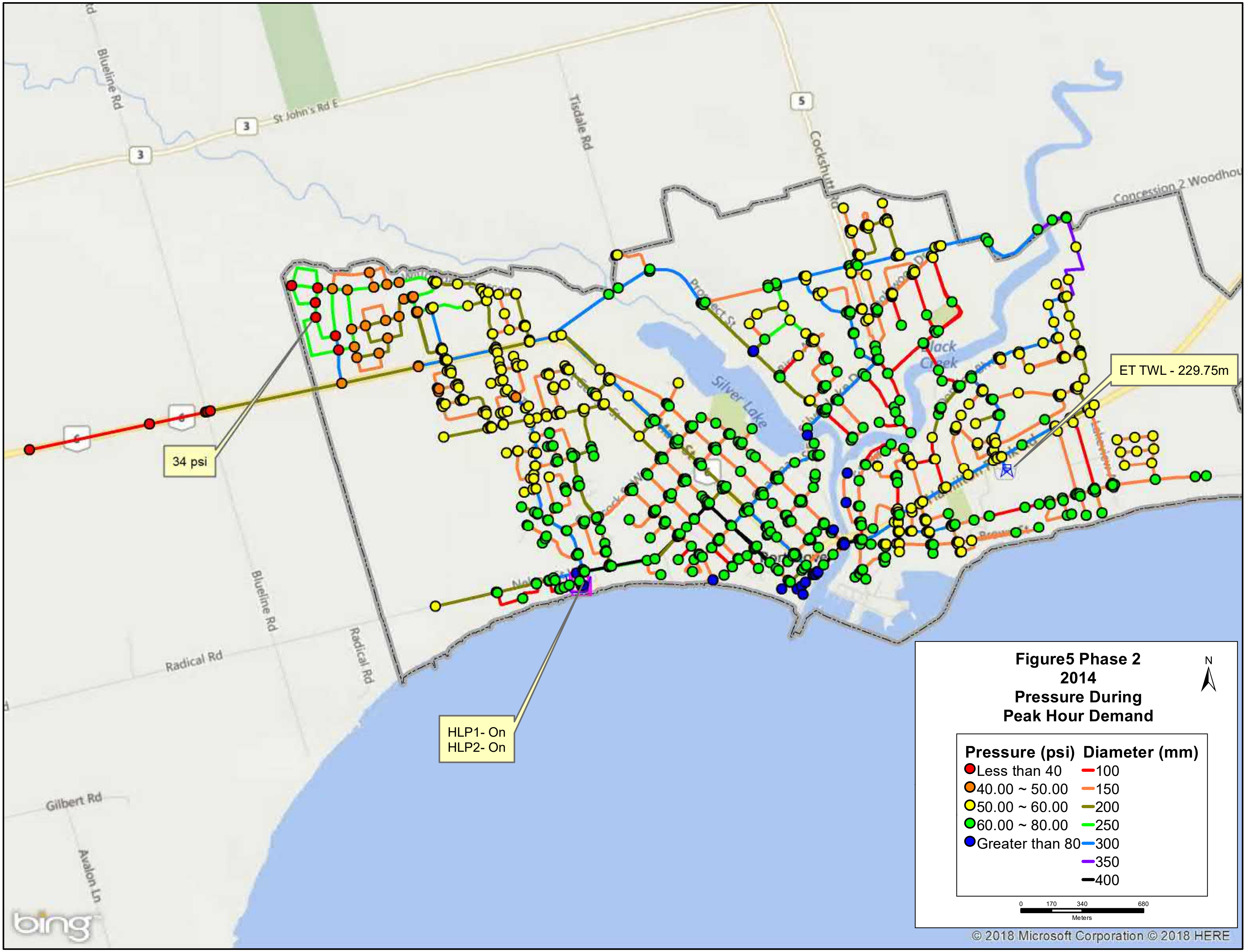

Figure5 Phase 2
2014
Pressure During
Peak Hour Demand

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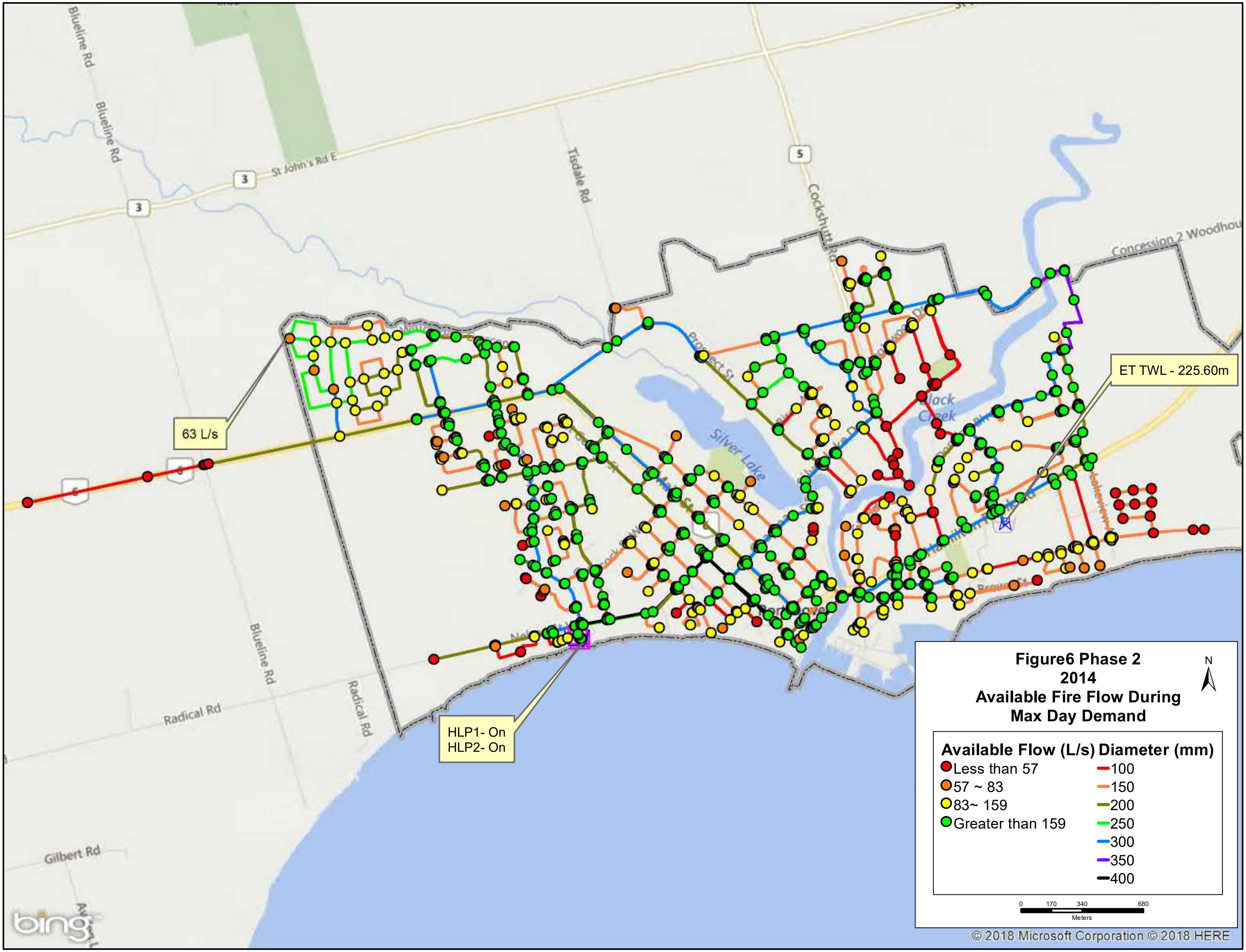

Figure6 Phase 2
2014
Available Fire Flow During Max Day Demand

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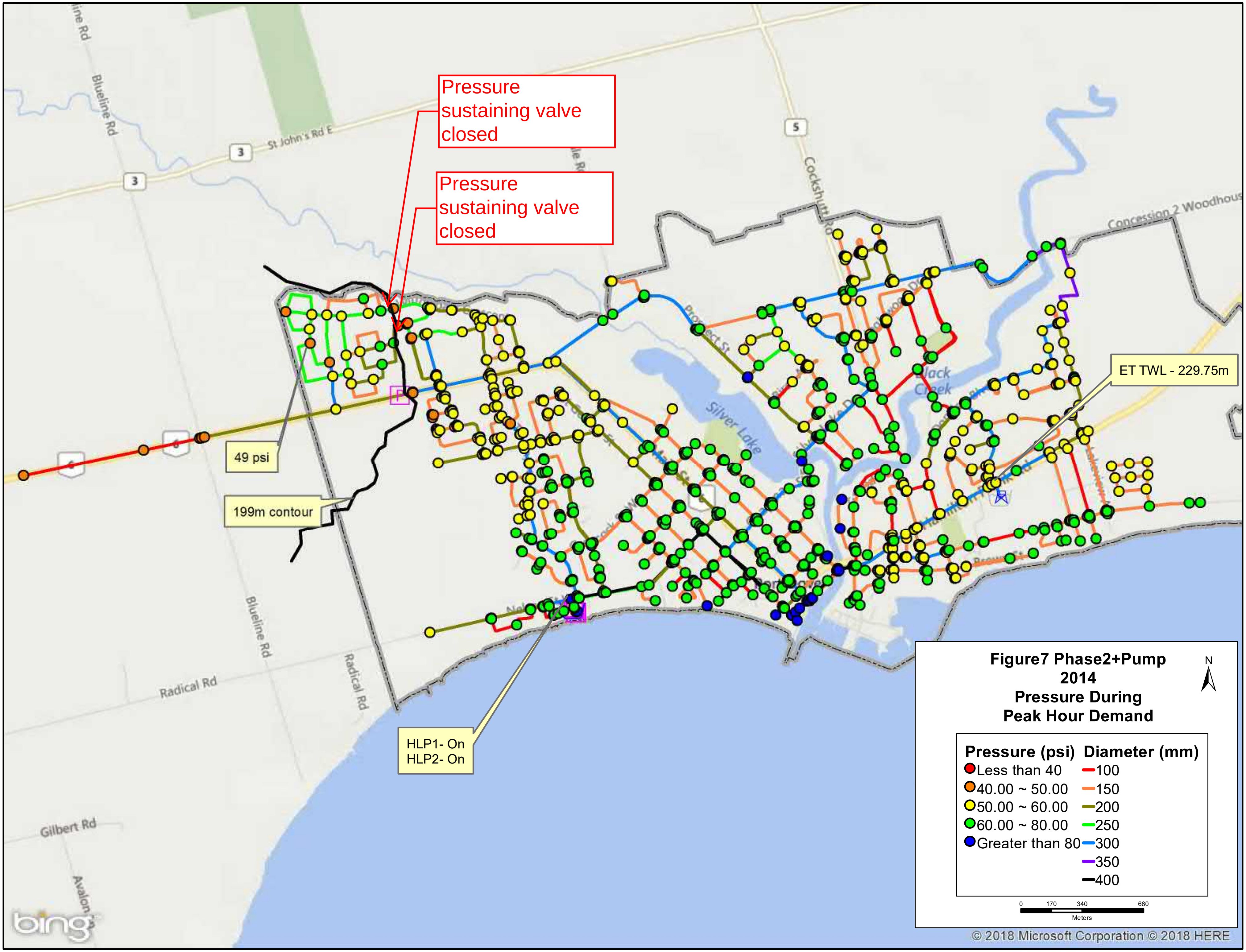


Pressure sustaining valve closed

Pressure sustaining valve closed

ET TWL - 229.75m

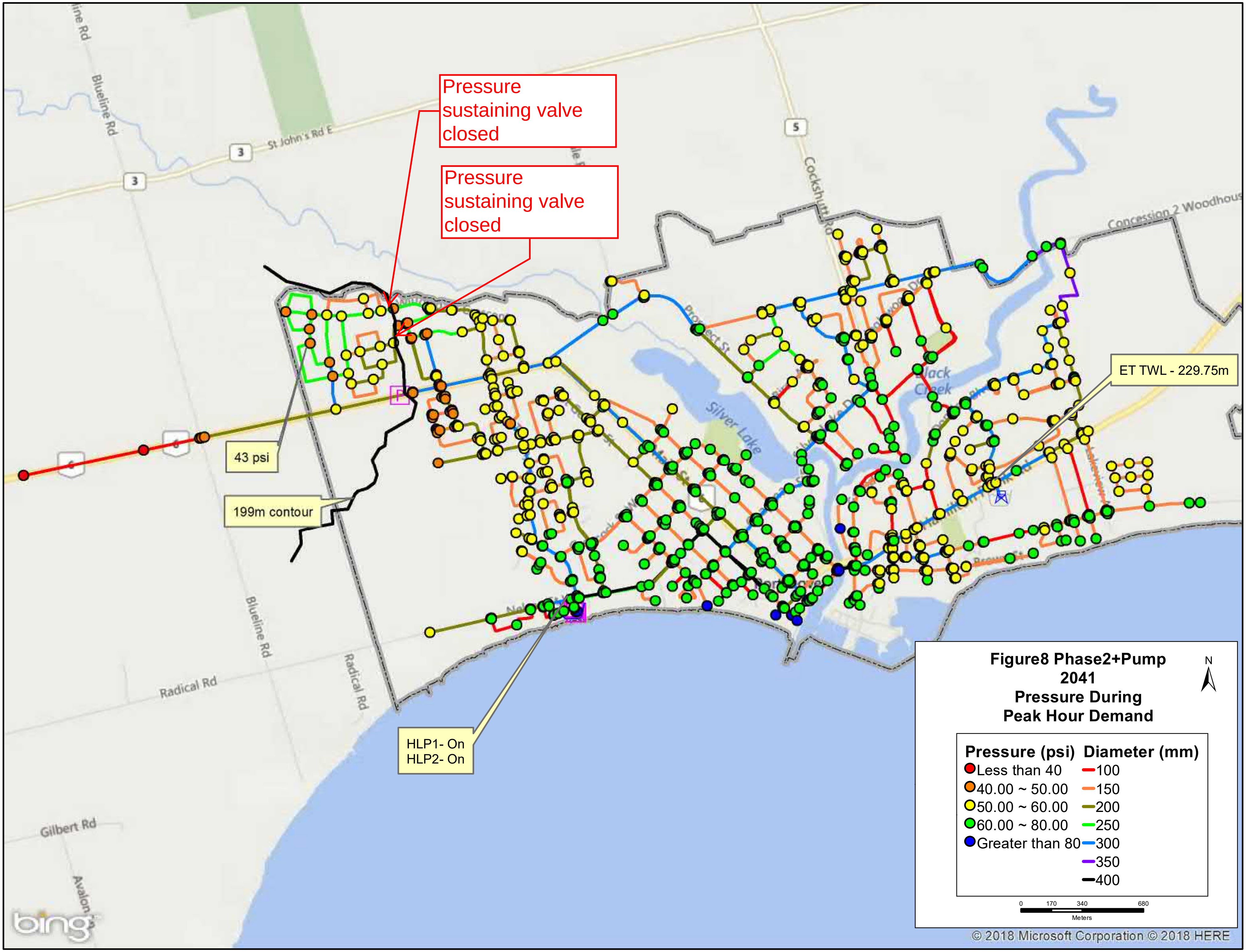
49 psi

199m contour

HLP1- On
HLP2- On

Figure7 Phase2+Pump
2014
Pressure During
Peak Hour Demand

Pressure (psi)	Diameter (mm)
🔴 Less than 40	100
🟠 40.00 ~ 50.00	150
🟡 50.00 ~ 60.00	200
🟢 60.00 ~ 80.00	250
🔵 Greater than 80	300
	350
	400



Pressure sustaining valve closed

Pressure sustaining valve closed

43 psi

199m contour

ET TWL - 229.75m

HLP1- On
HLP2- On

Figure8 Phase2+Pump
2041
Pressure During
Peak Hour Demand

Pressure (psi)
- ● Less than 40
- ● 40.00 ~ 50.00
- ● 50.00 ~ 60.00
- ● 60.00 ~ 80.00
- ● Greater than 80

Diameter (mm)
- — 100
- — 150
- — 200
- — 250
- — 300
- — 350
- — 400

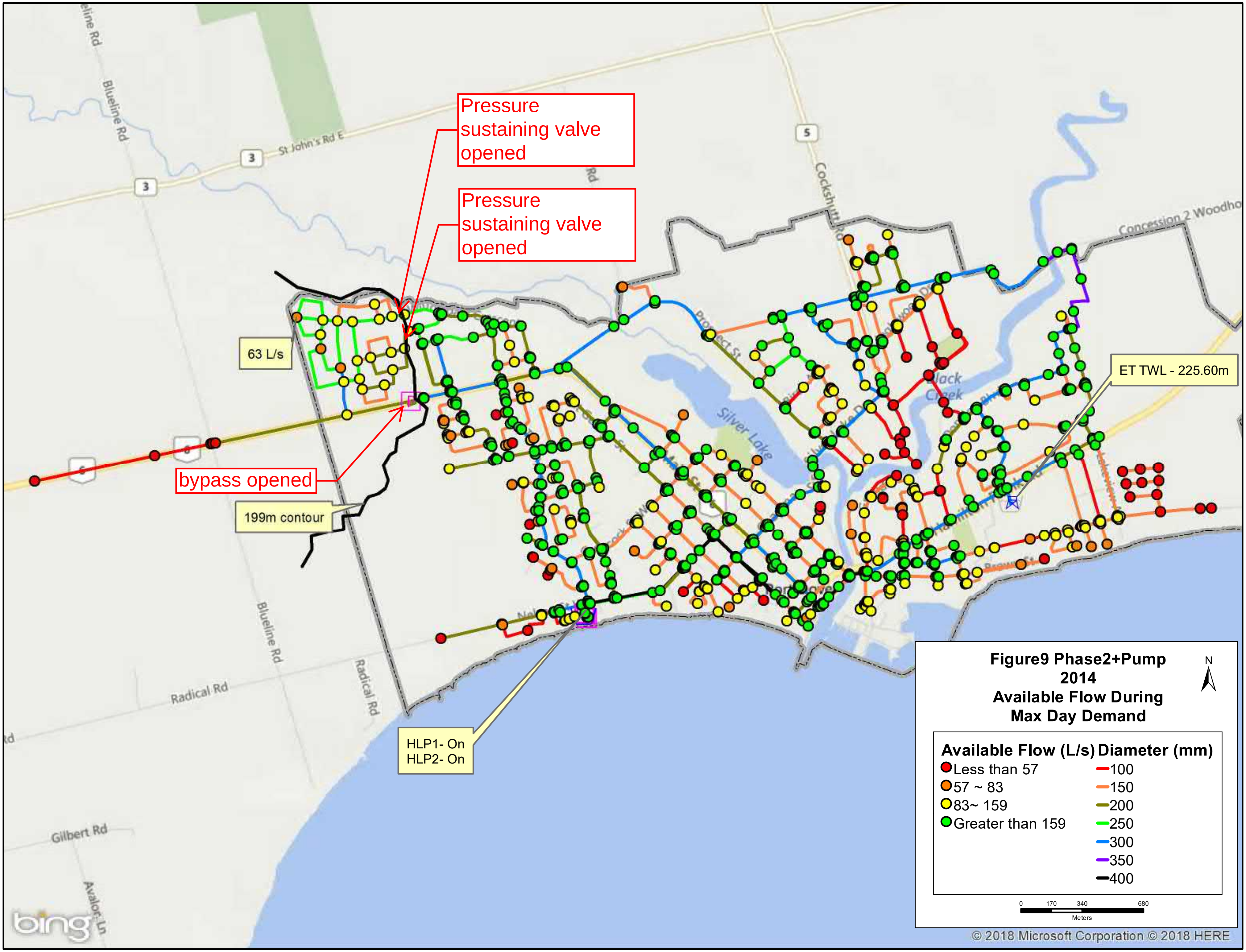


Figure9 Phase2+Pump
2014
Available Flow During
Max Day Demand

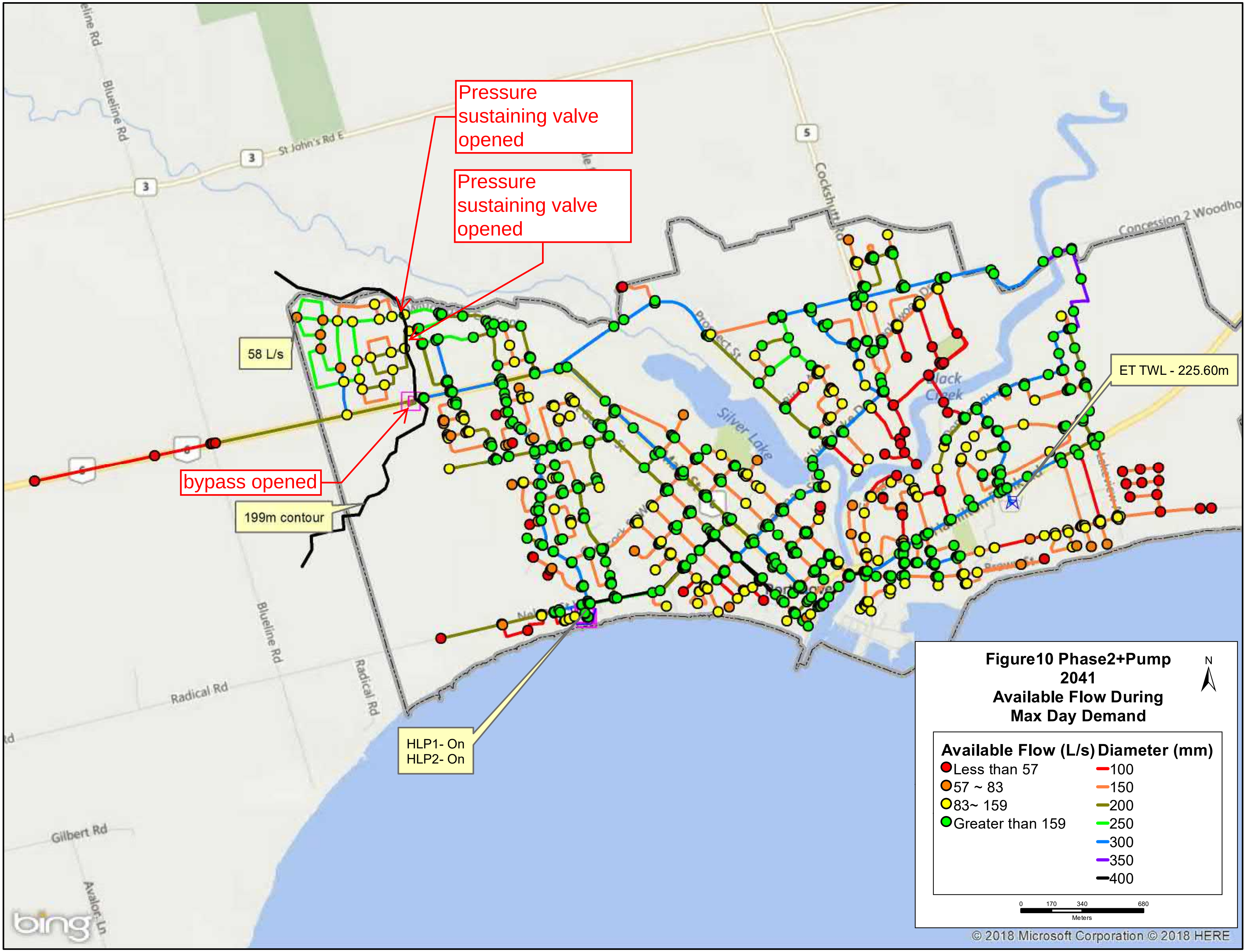


Figure10 Phase2+Pump 2041 Available Flow During Max Day Demand

girard
ENGINEERING

2478153 ONTARIO INC.
212 Main Street West, P.O. BOX 98
Otterville, Ontario N0J 1R0
Bus: 519-879-6875
Fax: 519-879-6536
Email: info@girardengineering.ca

March 18, 2019

County of Norfolk
Planning Department
Development and Cultural Services Division
22 Albert Street
Langton, Ontario N0E 1G0

Attn: Matt Vaughan, Principal Planner

Subject: Planning Application 28TPL2017317, ZNPL2017318
597 Highway 6, Port Dover
Lynn River Heights Subdivision

Dear Sirs:

Responses to Review Comments 06/18/2018

Agency Comments, Circulation #1

Zoning Examiner

R1-B zone requirements to be met with R2 Zoning and site specific zoning

Community Services (Forestry)

Second access to 4.28 ha hazard land conveyance has been provided
Removal or mitigation of hazard trees along the top of the slope 30 m into the woodland to be noted on the subdivision plans

Community Services (Parks)

If the proposed park area is not 5% of the site area the developer requests that cash in lieu be waived as the developer is conveying the hazard lands to the County and providing landscaping and a walking trail within the Storm Water Management Block

Hydro One:

We are following up directly with Hydro One.

Union Gas:

We are following up directly with Union Gas. Easements and/or agreements will be provided as required.

LPRCA:

Major flow routes are shown on the enclosed Major Storm Plan
Outlet for the SWM facility is shown on the enclosed Storm Water Management Pond Plan
Permanent Pool volume and active storage volume are separate and confirmed via the enclosed stage-storage-discharge table.
0.3 m freeboard is confirmed on the table and shown on the plan
Permanent Pool increased to 1.0 m depth and shown on enclosed drawings
Forebay is shown on the Pond drawing
Long term maintenance notes have been provided in the SWM Report addendum enclosed

Haldimand Norfolk Health Unit and Housing Services:

Active Transportation

Sidewalks are provided and will be detailed in each phase of this development
Pedestrian access and continuity of the trail network is provided through the SWM Pond and two drainage blocks connected to Sparrow Way in Phase 1. This augments the sidewalk system of pedestrian access and movement in the development,
The connection to the Lynn Valley Trail is provided via the buffer strip at the north end of the development. The hazard lands at the north end are to be conveyed to the County. The buffer strip is connected to the lands previously conveyed to the County in Phase 1 and there is a path through

Phase 1 off Willowdale that connects to the Trail. There is also an existing connection to the Trail further to the east off Willowdale. It is our understanding that the County will be constructing future connections to the Trail through the hazard lands once they are conveyed.

Housing Services

Mixed housing has been provided in this development which provides for increased density as desired by the County and addresses affordable housing concerns by providing more semi-detached units and dwellings with integrated second units.

Environmental Health

The Storm Water Management facility in this Phase (2) of the development provides the following features:
Frequent agitation of stored runoff with every storm event
Permanent pool depth has been increased
A large forebay and linear flow path have been provided for sediment removal. There are existing sediment removal units in Phase 1 of this development at the SWM facility in that Phase.
Extensive landscaping and tree planting is to be provided including reeds, sedges, floating and submerged plants for improved water quality.
Measures to encourage natural predators of mosquitoes to inhabit the facility are to be undertaken.

Access to Healthy Food

As noted in the comments there is a grocery store nearby to this development.
Community gardens could easily be established in the large buffer zone provided at the north end of the development if the County was to offer this in conjunction with their development of the conveyed hazard lands.

Canada Post:

Community Mail Boxes are in place in Phase 1. This policy will continue in Phase 2 and locations will be coordinated with Canada Post throughout the future stages of Phase 2.

Development Engineering – Ainley & Associates Ltd.

1.0 Proposed Draft Pla
- 1.1 Phasing shown on enclosed plan
- 1.2 Plan revised to show daylight triangles at corner lots and site entrances and 0.3 m reserves at lot flankages
- 1.3 Hydro One, Bell Telephone, Cable TV, Union Gas have all been circulated – we are awaiting responses.
- 1.4 Proposed roundabout has been offset so that construction does not involve other land owners.
- 1.5 The narrow lots are to be developed in pairs as semi-detached units. It is our opinion that the lot widths are adequate.
- 1.6 Coefficient of runoff for semi-detached development is listed as 0.6 in the County Design Standards
- 1.7 Second road connection to the west was discussed with Planning and Engineering previously and as the Port Dover development limit is the west boundary of this site a second connection was not considered necessary. The northerly connection could potentially become a lot in the future if the road connection never is extended.
- 1.8 All lots are outside the Erosion Hazard Limit and Erosion Access Allowance. This is clearly identified on the plan enclosed.

2.0 Sanitary Servicing

- 2.1 County Sanitary Sewer Capacity review has been undertaken. County to provide results.
- 2.2 Treatment Plant capacity being assessed by the County

3.0 Water Servicing

3.1 The County Water System Hydraulic Model has been updated and we have been advised that supply, fire flows and pressures are adequate.
3.2 The County has advised that a watermain stub into Block 490 is not required.
3.3 Valving will be addressed in the final design of each stage.
3.4 Hydrant spacing will be address in the final design of each stage.

4.0 Storm Water Management

4.1 The extent of the drainage boundaries was addressed in the SWM report for phase 1. Report enclosed for reference with plan showing the extent of outside drainage flowing into Phase 2.
4.2 A major storm plan is enclosed showing proposed design grades at all intersections. Contours on this plan show the existing grades at the site boundaries. Specific grades are highlighted to show how external runoff is to be conveyed.
4.3 Detailed design will confirm the capacity of the right of ways and drainage blocks to appropriately carry overland flow as per County Design Standards.
4.4 Phase 1 SWM report is enclosed.
4.5 SWM control (orifices) details have been provided on the enclosed pond plan and calculation sheets.
4.6 Pond sizing has been confirmed on the enclosed pond plan and calculation sheets. Forebay is shown on the plan. Permanent Pool depth is shown as 1.0 m. Outlet configuration is shown on the plan. Pre/Post comparison is shown in the enclosed calculation sheets.
4.7 Detailed design will address the “flood plain” to the north (Lynn River flood plain).
4.8 From the soil investigation reports and observations during construction of Phase 1 services the site consists of clayey silt and silty clay soils at shallow depth overlain by topsoil and a

thin layer of sandy/silt loam. The existing groundwater is perched. The existing pond on the site is at times filled from a well. During development of Phase 1 the servicing trenches intercepted the perched groundwater and directed it via the pipe bedding to the SWM facility in Phase 1. We expect the same thing to happen in Phase 2. The existing clayey silt/silty clay soils are not suitable for infiltration galleries as there will be little or no infiltration.

4.9 Manhole spacing to be addressed at final design.
4.10 Storm Water Design Sheets to be updated ar final design.
4.11 See response 4.8
4.12 See response 4.8
4.13 LPRCA has been circulated and their comments were addressed earlier. They are to be recirculated with updated report.
4.14 CBMH59A has been relocated inside the development on the drawings.
4.15 No other external flows need to be captured.
4.16 We proposed to capture only flows from the external drainage area noted on the predevelopment drainage plan in the Phase 1 SWM report. See response 1.7

5.0 R. Berry & Assoc.

5.1 Traffic Study was updated in 2016. Copy enclosed.
5.2 County has approved a roundabout at the main entrance to the subdivision
5.3 Roundabout has been shifted north so that it fits within the existing right of way and the development lands without the need to acquire other lands.

6.0 Geotechnical Investigation Report – CVD Engineering Ltd.

6.1 See response 4.8. Storm sewer service connections are to be provided to each lot to receive flow from basement sump pumps. Site groundwater (perched) to be conveyed via pipe bedding to SWM ponds.

6.2 See responses 4.8 and 6.1. Geotechnical consultants to be asked to provide comment if required.

7.0 Environmental Inventory and Assessment – Thompson Environmental

7.1 See responses 4.8, 6.1 and 6.2. Water balance will change as the future stages of Phase 2 are serviced as described in earlier responses. There have been no adverse effects in the development of Phase 1 (which is completely built out). The soil report and the Environmental report both noted groundwater seepage from the slope at the north end of the site. This condition was present at the north end of Phase 1. After the development of Phase 1 with the redirection of shallow groundwater via the servicing trench bedding the seepage from the slope diminished. We expect the same thing to happen in Phase 2.

Copy of County comments attached for reference.

Prepared by:

Len Girard, P. Eng.
Girard Engineering

Planning Department
Development and Cultural Services Division
22 Albert Street
Langton, Ontario N0E 1G0
519-426-5870 ext 1840
Fax: 519-428-3069
Mat.vaughan@norfolkcounty.ca

June 18th 2018

Girard Engineering (C/O Len Girard)
212 Main Street W P.O Box 98
Otterville, ON N0J1R0

Democrat Port Dover Ltd
155 Romina Drive
Concord, ON L4K 4Z9

Attention: L. Girard

Subject: **PLANNING APPLICATION COMMENTS: 28TPL2017317, ZNPL2017318**
597 Highway 6, Port Dover
Lynn River Heights Subdivision

Dear Mr. Girard:

Please find attached a summary of all the comments received to date regarding the Lynn River Heights draft plan of subdivision, and Zoning By-law amendment. At present, comments have not been received from Hydro One and Bell Canada. They will be forwarded to you upon receipt. You are welcome to contact me to discuss any of these details further.

Summary of Agency Comments, Circulation #1:

Planning Department

The Planning Department has worked closely with the developer in the design and layout of the proposed plan. Planning staff have no further comments at this time.

Zoning Examiner

Could go under R2 zone, and refer to 5.2.3 which would pick up R1-B zone requirements. Other than that, no comments as zoning will be site specific once applications are applied for.

Development Engineering:

See attached letter from Ainley & Associates Ltd., April 12, 2018

Community Services (Forestry)

In regards to the submitted application:

1) Parks and Recreation- Forestry is receptive to the conveyance of 4.28 Ha of hazard land for use as potential trail linkages, and for environmental protection purposes.
2) We would request that at least 2 access points also be conveyed to Norfolk County so that the land may be reasonably accessed for maintenance purposes.
3) Said access points should be located in an area that allows for pedestrian access, or where pedestrian access may be readily provided, with minimal modifications to the terrain.
4) We would also request that hazard trees be removed or hazards mitigated along the top of slope and into the woodland 30 meters. Such work will be done under the direction and approval of an ISA certified arborist.

Community Services (Parks)
Community Services has reviewed the proposed draft plan of subdivision and have no further comments. The location of the proposed park is acceptable. Please note that should the land area of the park not constitute 5% of the area of the said lands, additional cash-in-lieu of parkland will be required

EMS
Reviewed, no concerns at this time

Building Division:
No comments at this time

Fire & Rescue Services:
No comments at this time

Brant Haldimand Catholic District School Board
No comments at this time.

Grand Erie District School Board:
Reviewed, no comments at this time.

Hydro One:
No comments have been received from HydroOne. Please follow up directly with them.

Union Gas:
Thank you for your correspondence with regards to draft plan of approval for the above noted project.

It is Union Gas Limited's ("Union") request that as a condition of final approval that the owner/developer provide to Union the necessary easements and/or agreements required by Union for the provision of gas services for this project, in a form satisfactory to Union.

Should you require any further information, please contact the undersigned.

GIS:
Reviewed, no comments at this time.

LPRCA:
LPRCA staff have no concerns with the proposed development, however, the following items need to be addressed:

1) Please outline the major flow systems on the site plan and report.
2) Please show the proposed outlet of the SWM facility in the site plan.
3) Double check that the permanent pool and active storage volumes are separate ie: total volume of the pond should be Permanent Pool+Active Storage+0.3m freeboard.
4) It is noted that the permanent pool has a mean depth of 0.7m. The Table 4.6 of the 2003 MOECC SWM guidelines states that the minimum mean depth for permanent pools in a wet pond is 1-2m to avoid resuspension.
5) If there is a forebay, a section in the report should include this.
6) Long-term maintenance requirements should be included.

A portion of the subject lands are located within the regulated area as such permission from LPRCA for any development as defined in the Conservation Authorities Act is required.

Bell Canada:
No comments received.

Haldimand Norfolk Health Unit and Housing Services

The Haldimand-Norfolk Health Unit [HNHU] and Housing Services have a vested interest in new developments in Norfolk County from a number of perspectives that can impact the health of the community and its residents.

Active Transportation
The Health Unit encourages developments that make it easier for people to choose active forms of transportation [walking, cycling, wheeling] for short trips. Walkability, a measure of how easy, safe, and enjoyable it is to walk in a neighbourhood, can have a large impact on walking behaviour and willingness to use walking for transport and recreation. Public health, planning, and transportation researchers have identified key factors that influence walkability and promote walking. These important factors include access to amenities and destinations, residential density, positive walking experiences, street and sidewalk connectivity, and safety. Walkable communities encourage walking by investing in appropriate and safe infrastructure, which increases comfort and convenience of a route while also reducing the risk of collisions. A walkable community offers a safe and enjoyable walking experience for citizens of all ages and abilities.

Specific to this development:

- Sidewalks throughout as indicated on site plan will be required as a condition of draft plan approval
- The development is within walking distance [1-2km] from a grocery store, school, recreational facilities but there is no sidewalk on Hwy 6 until the east side of Pheasant Trail. Residents can choose to walk through the neighbouring development via Willowdale Cres (with sidewalks) or Cardinal Lane (no sidewalk)
- Walkway to connect subdivision to Lynn Valley Trail looks to pass through lands not part of this subdivision to connect to the trail. What is the plan for that connection?
- Mixed housing options increase density

Michele Crowley, Health Promoter
Haldimand-Norfolk Health Unit
Michele.crowley@hnhu.org
519-426-6170 x 3239

Housing Services
Norfolk County is in need of additional affordable housing options, including both rental and ownership-type units. The proposal outlines the development of housing that appears to reflect the need for these types of options, also including dwellings that incorporate second dwelling units within the primary dwelling. Housing Services supports development that includes and acknowledges developments offering a range of housing types. If the proponent requires further information in regards to housing trends in the community, they are welcome to contact Housing Services for further information.

Tricia Givens, M.Sc(Pl), MCIP, RPP
Program Manager, Housing Services
Social Housing Division
PH: 519.426.6170 / 905.318.6623 ext. 3748
E: tricia.givens@haldimand-norfolk.org
Fax: 519.426.9974
http://hnhousing.org/

Environmental Health
Stagnant bodies of water lacking an existing ecosystem (e.g. man-made ponds, storm water retention ponds) can make for ideal mosquito breeding sites; known vectors of West Nile virus and other vector-borne diseases. The HNHU encourages management practices for these types of bodies of water that include integrated pest management and integrating ecological principles. Such strategies can include but are not limited to:

- Increase rate of water flow or surface agitation.
- Increased water depth that creates cooler water temperatures (
- Sediment filtration to improve water quality.
- Planting trees and shrubs around perimeter of pond as female mosquitoes like to lay their eggs in sunlit areas.

- Planting emergent plants (e.g. reeds, sedges) as well as floating leaved and submerged vascular plants (e.g water lilies, pondweeds) to improve water quality and promote habitat for natural predators of mosquitoes.
- Introducing natural predators of mosquitoes including fish, amphibians, birds (e.g. install bird houses) and invertebrates such as dragonflies.

Please note, should the pond not be sufficiently maintained, the HNHU may legally order the owner of the storm water management pond to take additional remedial actions (e.g. larvaciding) to prevent mosquito breeding and the transmission of vector-borne disease(s) such as West Nile virus.

Kris Lutzi, BHS, BASc, CPHI (C)
Sr. Public Health Inspector and Emergency Planner,
Haldimand-Norfolk Health and Social Services Department
12 Gilbertson Dr., Simcoe, ON
N3Y 4L1
Phone: 519-426-6170 ext. 3261
Fax: 519-426-9974
E-mail: kris.lutzi@hnhu.org
Website: www.hnhu.org

Access to Healthy Food
the Health Unit encourages developments that make it easier for people to make healthy food choices. Access to healthy food benefits the health of a community.

Specific to this development:

- We encourage residential developments with access to a grocery store or farmers market (ideally within 1 km)
- This location is less than 1 km from a grocery store and a road side produce barn

The developer could also consider allocating a portion of land for a community gardens. Gardens offer many benefits to gardeners and other tenants such as fresh and affordable produce, a space to connect with others and a sense of community pride.

Laura Goyette, MSc, RD
Public Health Dietitian
Laura.Goyette@hnhu.org
519-426-6170 ext. 3247Finance Department

This application would have a positive impact on assessment growth and tax revenues. The amount of growth is dependent on the assessment of the properties by the Municipal Property Assessment Corporation (MPAC). Norfolk County would also receive Development Charges as per the most recent Development Charges By-law. This would be offset by increased costs as a result of Norfolk County assuming the subdivision infrastructure, amenities and operating costs. Accounting Services will work with Planning staff to administer the required security deposits of the potential development.

Canada Post

Thank you for contacting Canada Post regarding plans for a new development in Port Dover. Please see Canada Post's feedback regarding the proposal, below.

Service type and location

1. Canada Post will provide mail delivery service to this development through centralized Community Mail Boxes (CMBs) unless;
2. If the development includes plans for (a) multi-unit building(s) with a common indoor entrance, the developer must supply, install and maintain the mail delivery equipment within these buildings to Canada Post's specifications.

Municipal requirements

1. Please update our office if the project description changes so that we may determine the impact (if any).
2. Should this development application be approved, please provide notification of the new civic addresses as soon as possible.

Developer timeline and installation

1. Please provide Canada Post with the excavation date for the first foundation/first phase as well as the date development work is scheduled to begin. Finally, please provide the expected installation date(s) for the CMB(s).

Regards,
Connie Richardson

Public Input

A number of comments have been received from surrounding property owners. These comments are all in relation to stormwater runoff from the subject lands into the adjacent subdivision to the east. These matters will be address as we proceed through the review process.

Yours truly,

Mat Vaughan, BES, MCIP, RPP, CMMII
Principal Planner

c.c. Adam Biddle, Forestry
Todd Shoemaker, Parks

LPRCA
Public Works & Environmental Services
Building
Annette Helmig, Agreement Coordinator
Michelle Crowley, Health Unit

Attach:
Letter from Ainley & Associates Ltd., April 12, 2018

Ainley GROUP CONSULTING ENGINEERS PLANNERS

Ainley & Associates Limited
550 Welham Road, Barrie, Ontario, L4N 8Z7
Tel: (705) 726-3371 ▪ Fax: (705) 726-4391
E-mail barrie@ainleygroup.com

April 12, 2018 File #218020

"BY EMAIL"

Norfolk County
Development Engineering Department
185 Robinson Street, Suite 200
Simcoe, Ontario, N3Y 5L6

Attn: Mr. Devin Hunter, CET, CMM I
Director of Development Engineering

Ref: **Lynn River Heights – Phase 2 (Port Dover, ON)**
Peer Review – 1st Application for Draft Plan of Subdivision

Dear Mr. Hunter:

We have received for engineering review and comment the following information included in the submission of Application for Draft Plan of Subdivision, related to the above noted proposed development in the town of Port Dover. We have limited our comments, for the most part, to items which may affect the layout and Block dimensions of the Draft Plan of Subdivision and this letter should not be considered a detailed engineering review although we have provided general comments on several aspects of servicing. Some of our comments can be addressed during detailed design and we have identified them as such. We have many comments in Section4. Regarding Stormwater Management. Several have been noted as required in detailed design. Some of the comments need to be addressed at least partially to ensure the proposed SWM Block is sufficient in size as represented on the Draft Plan of Subdivision. Some, such as a request for additional grading detail is simply to confirm, at this stage, that boundary conditions can be accommodated. In Section 6, Geotechnical we need, at this stage, enough information to confirm that groundwater conditions are manageable for residential lots or is that area better suited to parkland.

The information received is listed below.

1. **Proposed Draft Plan of Subdivision (Dec 15, 2017) – MacKinnon & Associates**
2. **Engineering Design Drawings – Girard Engineering Ltd.**
    - **100 – Master Plan of Services (Oct 2017)**
    - **300 – Pre-Development Plan (Oct 2017)**
    - **301 – Contour Plan (Oct 2017)**
    - **302 – Sanitary Sewer Drainage Plan (Oct 2017)**
    - **303 – Storm Sewer Drainage Plan (Oct 2017)**
    - **304 – Water Distribution Plan (Oct 2017)**
    - **304A – Water Distribution Plan (Oct 2017)**

- **400 – Stormwater Management Pond Plan (Oct 2017)**

3. **Functional Servicing Report – Girard Engineering Ltd.**
4. **Preliminary Stormwater Management Report (Nov 2017) – Girard Engineering Ltd.**
5. **Traffic Impact Study (Dec 2006) – F.R Berry & Associates**
6. **Geotechnical Investigation Report (April 24, 2006) – Chung & Vander Doelen Engineering Ltd.**
7. **Environmental Inventory and Assessment (Feb 2007) – Thompson Environmental**

In addition, the following documents were provided for background information:

1. **Phase 1 ESA Report (May 12, 2006) – Chung & Vander Doelen Engineering Ltd.**
2. **Stage 1-3 Archeological Assessment (Dec, 2005) – AMICK Consultants Ltd.**

Based on our review of the documents listed above we provide the following comments:

1.0 Proposed Draft Plan of Subdivision (Dec 15, 2017) – MacKinnon & Associates

1.1 Show the proposed phasing of the development on all plans as illustrated on the hand drawn sketch provided with this application.

1.2 0.3 metre reserves are required along all flankages and daylight triangles of corner lots and site entrances.

1.3 Private utilities should be circulated on the proposed development plans prior to draft plan approval. Please provide letters of understanding from private utility companies including Hydro One, Bell Telephone and Enbridge natural gas and include as an appendix in the Functional Servicing Report.

1.4 The proposed round-about at the intersection of Highway 6 and Street B appears to encroach upon the lands to the south. Clarify if the proponent owns this property or if appropriate agreements are in place to allow this work to be completed.

1.5 Lot widths for the semi-detached units are as low as 9.0m. We question whether such narrow lots provide adequate frontage to accommodate street features (driveway width, light standards, utility structures, hydrants, etc.) and still provide a streetscape acceptable to the County.

1.6 Confirm that the County standard runoff coefficient of 0.6 for semi-detached lots is appropriate for the proposed semi-detached lots with 9.5m frontages.

1.7 Please confirm if a second connection to western developed lands is desired by the County similar to how Phase 2 is connected to Phase 1 by two roads. If this were the case it would seem logical to add another link for example at Street C.

1.8 The Erosion Hazard Limit and Erosion Access Allowance are to be clearly identified on the Draft Plan. The Lots are to lie outside of that limit.

2.0 Sanitary Servicing

2.1 In future submissions, provide details of the available sanitary capacity in the existing sewers downstream of the development on Highway 6.

2.2 The County's comments on the proposed staging and the current sanitary treatment plant capacity need to be confirmed.

3.0 Water Servicing

3.1 The County's Water System Hydraulic Model will need to be updated now, at the Developer's expense, to confirm watermain sizing for the proposed development layout and show adequate water supply, fire flows and pressures can be achieved for the final and interim (Stage 1) condition.

3.2 During detailed design we suggest that the watermain extending into Block 490. The watermain should be capped at the tee intersection of Street D and Willowdale Crescent. Alternatively, terminate this watermain line with a hydrant.

3.3 During detailed design the layout of valves within the watermain network shown on Drawing 304 are to be revised. As per County of Norfolk standards, 3 valves are required on all tee intersections and 4 valves are required at all cross intersections. Valves are to be located in line with the property line of the intersection street. In addition, no more than 20 water services shall be located between any 2 valves.

3.4 During detailed design, revise the spacing of hydrants as shown on drawing 304A. There is a gap in hydrant coverage at Lot 186.

4.0 Stormwater Management

4.1 Please provide a plan showing the external drainage areas and drainage routes including existing contours surrounding the development site for both the pre- and post-development conditions. Please extend existing contours beyond the subdivision limits to ensure that additional external areas do not drain into the proposed subdivision limits. Confirm no additional corridors between lots are required to accommodate an overland flow route into the subdivision.

4.2 Proposed grading details have not been provided. Provide adequate preliminary grading design to show that the proposed draft plan can be integrated with the abutting lands and drainage can be captured and conveyed to the appropriate outlets.

4.3 During detailed design the FSR and SWM Reports are to be updated and provide supporting calculations that ensure an overland flow route is accommodated in blocks of land or road right of ways as per the Norfolk County Design Criteria Section 7.8.03. Please ensure maximum depths of flow are not exceeded and the flows are contained within the municipal right-of-way.

4.4 The Phase 1 stormwater management report was not enclosed in the submitted materials. Please provide the report so that the anticipated capacity can be verified with the Phase 2 development and servicing sizes can be confirmed.

4.5 Please detail in the preliminary stormwater management report how the flows from the development will be controlled post development to pre-development and conveyed to a legal outlet on municipal property.

4.6 Further information is necessary to confirm that the Stormwater Management Pond Block is sized correctly so that it can function as intended and as required by MOECC and Norfolk County Design criteria. In particular, the following are necessary:

- Twenty four hour detention for the water quality (25mm) storm event (MOECC Stormwater Management Planning and Design Guidelines, 2003);
- A Forebay – as per MOECC criteria;
- Side slopes as per Norfolk County Design Criteria Section 7.4.01;
- Permanent Pool depth of 1.0-1.5m as per Norfolk County Design Criteria 7.4.01. (The permanent pool depth does not match the depth of the drawings (0.7m vs. 0.8m). Both of these depths do not meet the Norfolk County Design Criteria Section 7.4.01 requiring a permanent pool depth between 1.0 and 1.5m.)
- Outlet configuration;
- Post-pre flow controls. (The preliminary stormwater management report does not show how the development will restrict flows to pre-development limits. The outlet configuration has not been specified in the report. There is no post-pre flow comparison to show that the facility is meeting post-pre controls as no outflows are shown. Please provide confirmation that post-pre flow controls are maintained for the 2-100 year storm events.)

4.7 In detailed design, as the SWM Report is updated it is to acknowledge the presence of the floodplain to the north of the proposed development in Section 1.3 "Existing Drainage Conditions".

4.8 Please ensure during detailed design that infiltration galleries have a four-day maximum drawdown time. It is acknowledged that 15% extra capacity will be accounted for as per the standards. A discussion of where infiltration galleries may exist above measured groundwater levels should be forthcoming as a part of the water balance.

4.9 During detailed design, please confirm that storm sewer pipes do not exceed the maximum manhole distances as per Section 7.10.01 (Specifically, A26, A21, Ex. A17 exceed maximums).

4.10 As the design progresses, please continue headers on subsequent pages for the stormwater design sheet.

4.11 During detailed design describe how proposed LID measures are compatible with existing groundwater levels.

4.12 Please demonstrate how existing groundwater quality and quantity will be maintained as per the EIS.

4.13 Please provide a summary of any discussions with the LPRCA that have taken place regarding the current stage of the development as an appendix in the stormwater management report.

4.14 Stormwater infrastructure capturing external flows should be located within property limits. Specifically, CBMH59A should be within plan of subdivision boundaries.

4.15 Please also confirm if additional infrastructure is needed to capture other external flows.

4.16 Please confirm if the Phase II SWM facility and storm sewers will be servicing any portion of future development to the west. (We note that there is the provision for Willowdale crescent to continue into a future development.)

5.0 Traffic Impact Study (Dec 2006) – F.R Berry & Associates

5.1 Since the completion of the Traffic Impact Study in 2006, the Phase 1 lands have been constructed and occupied. The report needs to be updated with recent traffic data which incorporates this development. An updated 10-year design horizon of 2032 should be utilized assuming full buildout completion by 2022.

5.2 Report recommends a left turn lane and no signalization at the intersection of Highway 6 and Street A. The draft plan proposes a round-about at this intersection. Justify this change in design. The report has analyzed this intersection as a stop condition on Street A, the operation analysis of this intersection should be updated to reflect the proposed round-about. If a roundabout is selected as the solution the Draft Plan is to provide sufficient ROW.

5.3 It appears that the proponent does not own the required lands along the south side of Highway 6 to allow for the construction of the proposed roundabout at the intersection of Highway 6 and Street A.

6.0 Geotechnical Investigation Report (April 24, 2006) – Chung & Vander Doelen Engineering Ltd.

6.1 Discuss the implications of the groundwater fed pond located in the center of the site. What measures will be required to manage the groundwater table and saturated soils in this area to allow for basement construction.

6.2 The Geotechnical Report should be revised to include recommendations or constraints related to the construction of house foundations and/or foundation drains as a result of the shallow depth to groundwater table present on this site.

7.0 Environmental Inventory and Assessment (Feb 2007) – Thompson Environmental

7.1 During detailed design provide a water balance comparing post development to predevelopment conditions. Please discuss the existing groundwater conditions on the site. The geotechnical report (2006) discusses a pond fed by groundwater on the site as well as groundwater existing between 0.6 and 1.0m below surface. Please discuss the implications of this high groundwater table on the proposed servicing, infiltration gallery locations, and water balance. Please confirm the groundwater table in the proposed limits and compare to the measurements provided in the geotechnical report from 2006.

In summary, we ask that the proponent address the above comments and update their reports as necessary prior to granting Draft Plan approval. If you have any questions on the above comments, please call us.

Yours truly,
AINLEY & ASSOCIATES LIMITED

S. Fournier

S. Fournier P.Eng.
Senior Project Engineer

girard
ENGINEERING

LYNN RIVER HEIGHTS SUBDIVISION

(PORT DOVER, ON)

Preliminary Stormwater Management Report

Project Location:
Port Dover, Ontario

Project Legal Description:
WDH CON 2 PT LOT 8 AND RP
Town of Port Dover, Ontario

Prepared By:
Girard Engineering Ltd.
212 Main Street west
Otterville, Ontario

November, 2017
Updated March 2019
GEL Project No: 16-067

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List of Abbreviations

LPRCA	Long Point Region Conservation Authority
MOECC	Ministry of Environment and Climate Change - Ontario
MTO	Ministry of Transportation- Ontario
NCDM	Norfolk County Design Manual
SWM	Stormwater Management

1 Introduction

1.1 Background

Girard Engineering Limited has been engaged by Democrats Homes – As Client to perform a stormwater management (SWM) analysis and design for a proposed Phase 2 subdivision development titled Lynn River Heights Subdivision. The project is located at Port Dover, Ontario. The development of the subdivision deems it necessary to provide a stormwater management assessment and design for the proposed development.

The purpose of this report is to provide a preliminary analysis and assessment of the stormwater management requirements according to the criteria established by the County of Norfolk, Ministry of Transportation (MTO) – Ontario, Ministry of Environment and Climate Change (MOECC) – Ontario and the Long Point Region Conservation Authority (LPRCA). This report provides a general overview of the stormwater management considerations and provides the basis for detailed stormwater analysis and design for the proposed subdivision.

1.2 Site Description

The site (Figure 1) for the proposed subdivision is located between Blueline Road and Sparrow Way (Phase 1 of the subdivision) along Norfolk County Highway 6 in Port Dover, Ontario (42°47'49.1"N, 80°13'52.8"W). The site is residentially zoned and has an approximate area of 39.8 hectares (ha). The northern and southern areas of the site are bordered by unimproved lands and L.E & N Trial, and Norfolk County Highway 6 respectively. The western side of the site is bordered by undeveloped lands while the eastern side is bordered by existing buildings (Phase 1- subdivision).

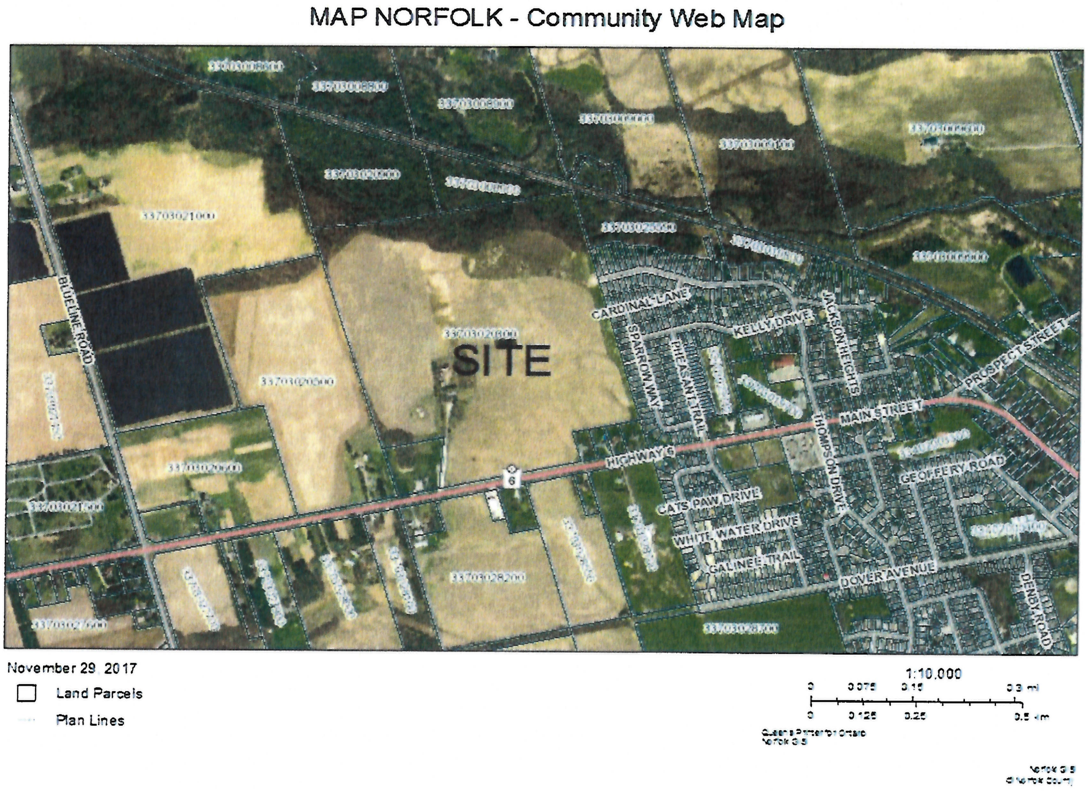

Figure 1. Site location (Source: Norfolk County maps)

The site is an open space mainly made up of unimproved areas. The topography of the site can be described as non-uniform. Some ditches can also be observed on the north and south parts of the site. Geotechnical investigation shows the western portion of the site is made up of silty sand to silt and the remaining areas comprise of clayey silt. The site also consists of gentle slopes.

1.3 Existing Drainage Conditions

The existing site is a large, rolling, open field divided into seven distinct drainage basins. The largest basins A1-pre and A2-pre are in the central portion of the site and drain to the east to existing storm sewers in the previously developed Phase 1 of the subdivision. A3-pre drains east and south to the road side ditch on the north side of County Road 6. Sub-basin A4-pre drains north-east to the Lynn River via a wide swale. Sub-basin A5-pre drains overland via sheet flow north to the Lynn River. Sub-basin A7-pre drains east and north to the Lynn via sheet flow and a wide swale.

Existing conditions are shown on the predevelopment drainage area plan attached. Although the entire site has an approximate area of 39.8 ha, approximately 30.868 ha of the entire area of the site will contribute into the proposed storm facility for Phase 2.

The original site drainage area was assigned a runoff coefficient of 0.2. The greatest overland flow length of any drainage basin is 784m with a watershed slope of 1.012% from headwater to outlet.

1.3.1 **Proposed Drainage**

The post-development drainage area plan divides the site into a number of sub-basins. It is proposed that sub-basins A59 to A70 will drain via the boulevard and storm sewer system (Willowdale and Streets F & G) to existing storm sewers on Willowdale Phase 1 and Sub-basin A5A will drain to existing storm sewers on Cardinal Road Phase 1. The storm sewer in Phase 1 (including the detention facility) was designed to accommodate the runoff from these sub-basins in Phase 2 (see stormwater management report for Phase 1 enclosed). The remaining Sub-basins A1 to A58 (including external drainage areas: EXT 1 and 2 o/s) will drain via the street and storm sewer system to the proposed stormwater management facility on the south east side of Phase 2 which will control quality and quantity of stormwater runoff discharging into Phase 1. Sub-basins A64 to A67 (rear yards of lots on Streets D & F, and undeveloped lands at the north end of the site) will drain directly to the river without mitigation. This design greatly reduces the pre-development drainage areas draining overland to the Lynn River directing runoff from the majority of the site to SWM facilities. An approximate area of 30.868 ha will be directed into the SWM facilities. The end of pipe facility to be designed for this phase (Phase 2) would eventually drain into the existing wet pond on phase 1. The pond in Phase 1 was designed to adequately handle the discharge from the end of pipe facility in Phase 2.

2 Design Basis and Criteria

The criteria used for the stormwater management design for this project is adopted in accordance with the County of Norfolk, Ministry of Natural Resource (MNR), Ministry of Environment Climate Change (MOECC) and the Long Point Region Conservation Authority (LPRCA). The criteria are as follows:

a) The peak flows discharged from the site shall not increase as a result of the proposed development for the calculated post-development runoffs through 100-year storm events.

b) All stormwater management measures shall provide an “Enhanced” level of protection in accordance with the MOE Stormwater Management Planning and Design Manual (March 2003).

c) The volume of runoff discharged from the site during the 25mm storm shall not increase as a result of the proposed development. Infiltration measures shall be employed where soils and water table conditions support such measures.

d) Infiltration measures shall be distributed around the site rather than at a single “end of pipe” location.

e) All infiltration facilities shall have a design capacity that exceeds the existing conditions recharge volume by 15% as a factor of safety to account for aging, compaction and potential clogging.

3 Methodology

The following processes are used in accordance to the Guidelines recommended by the MTO Drainage Management Technical Guidelines, which complies with the County of Norfolk for a successful stormwater management design for this project.

a) Calculate the pre-development runoff using the Rational Method;

b) Determine the post-development runoff using the Rational Method considering the anticipated site characteristics;

c) Compare the pre-development and post-development runoffs to determine the need for stormwater management with consultation of stakeholders;

d) Calculate the post-development runoff hydrographs using the Rational Method;

e) Determine the require flow volume, quantity control, orifices and pipe sizes, and ponding elevations.

The aim of this preliminary study is to determine the storage requirements needed to satisfy both quality and quantity criteria. The MOECC design manual is adopted to determine the volumetric water quality criteria and the quantity of runoff to be stored will be determined using the modified rational method. A storm pond will be used as the end of pipe storage facility.

4 Quantity Storage Requirements

The quantity of runoff to be stored is determined using the modified rational method considering pre-development and post development flows.

4.1 Pre-development and Allowable Flows

The pre-development flows were computed based on a 5-year storm event (Table 1). The time of concentration (tc) was calculated using the Airport Formula since the runoff coefficient for the pre-development case is less than 0.4 (i.e.; 0.2 < 0.4):

$$tc = \frac{3.26\ \times (1.1 - C) \times\ L^{0.5}}{Sw^{0.33}}\ , min$$

Where,
Runoff coefficient, C = 0.2 for undeveloped areas
Travel distance of watershed, L= 784m
Slope of watershed, Sw = 1.012%

$$tc = \frac{3.26\ \times (1.1 - 0.2) \times\ 784^{0.5}}{1.012^{0.33}} = 81.83\ min$$

The rainfall intensity (i) was based on the data and formula provided in Norfolk County Design Manual (NCDM):

$$i = \frac{583.017}{(tc + 3.007)^{0.703}}\ , mm/hr$$

$$i = \frac{583.017}{(81.83 + 3.007)^{0.703}} = 25.7 mm/hr$$

Peak Runoff/ Flow (Q peak) Formula:

Using the Rational Method, the Pre-development Peak Flow

$$Q_{peak} = \ 0.002778\ CIA\ , m^3/s$$

Where,
Area, A = 30.868 ha

Table 1. Pre-development runoff calculation

Pre Development (5 yr storm event - tc=81.83 min)						
						Q peak (m^3/s)
Description	C	**Area (ha)**	CA	CA/A	**I** mm/hr	**I** $_{54.4}$
drainage areas						
Single Family Homes	0.2	20.544	4.11	0.20	25.70	0.293
Semi/ Townhouse homes	0.2	7.995	1.60	0.20	25.70	0.114
A3A, A1A	0.2	0.155	0.03	0.20	25.70	0.002
Park	0.2	0.814	0.16	0.20	25.70	0.012
Pond	0.2	1.360	0.27	0.20	25.70	0.019
Total		**30.868**	**6.17**	**0.20**	25.70	**0.441**

4.2 Post development Flows

The post development flows were computed for 100 year storm for various durations. Different coefficients of runoffs were selected for the different post developed drainage areas (Table 2). The coefficients of runoffs have been increase by 25% for the 100 year storm as required by Norfolk County Design Manual. The factored average coefficient of runoff was calculated to be 0.60. The time of concentration obtained from the detailed storm sewer design (see attached) by routing the storm through the storm sewers- minor systems and via the road network- major systems was determined to be 27.2 min.

Using the Rational Method, and durations of 27.2 min intervals, the Post development Peak Flows are calculated according to:

$$Q_{peak} = \ 0.002778\ CIA\ , m^3/s$$

Where,
Area, A = 30.842 ha

Table 2. Post development peak flows

Post Development (100 yr storm event - tc=27.2 min)												
						Q peak (m^3/s)						
						$I_{27.2}$	**$I_{54.4}$**	**$I_{81.6}$**	**$I_{108.8}$**	**I_{136}**	**$I_{163.2}$**	**$I_{190.4}$**
Description	**C**	**Ca= 1.25 x C**	**Area (ha)**	**CA**	**CA/A**	**88.3**	**57.0**	**43.9**	**36.4**	**31.5**	**28.0**	**25.3**
drainage areas												
Single Family Homes	0.45	0.56	20.544	11.56	0.56	2.83	1.83	1.41	1.17	1.01	0.90	0.81
Semi/ Townhouse homes	0.60	0.75	7.995	6.00	0.75	1.47	0.95	0.73	0.61	0.53	0.47	0.42
A3A, A1A (Partly Asphalt	0.80	1.00	0.155	0.16	1.00	0.04	0.02	0.02	0.02	0.01	0.01	0.01
Park	0.25	0.31	0.814	0.25	0.31	0.06	0.04	0.03	0.03	0.02	0.02	0.02
Pond	0.25	0.31	1.360	0.43	0.31	0.10	0.07	0.05	0.04	0.04	0.03	0.03
Total			**30.868**	**18.39**	**0.60**	**4.51**	**2.91**	**2.24**	**1.86**	**1.61**	**1.43**	**1.29**

Post development flows for the 5 year storm for the various durations will be computed in the detailed and final storm water management report.

4.3 Determination of Storage Volume

The quantity of runoff to be stored was calculated using the Modified Rational Method. The 5 year pre-development and 100 year post development peak flows were plotted versus time for the various intensity durations (Figure 2). The 100 year peak flows were compared to the 5 year pre development peak flow (quantity control) and the area generated under each curve provided a storage volume. The largest volume generated is the maximum volume of runoff to be stored (Table 3).

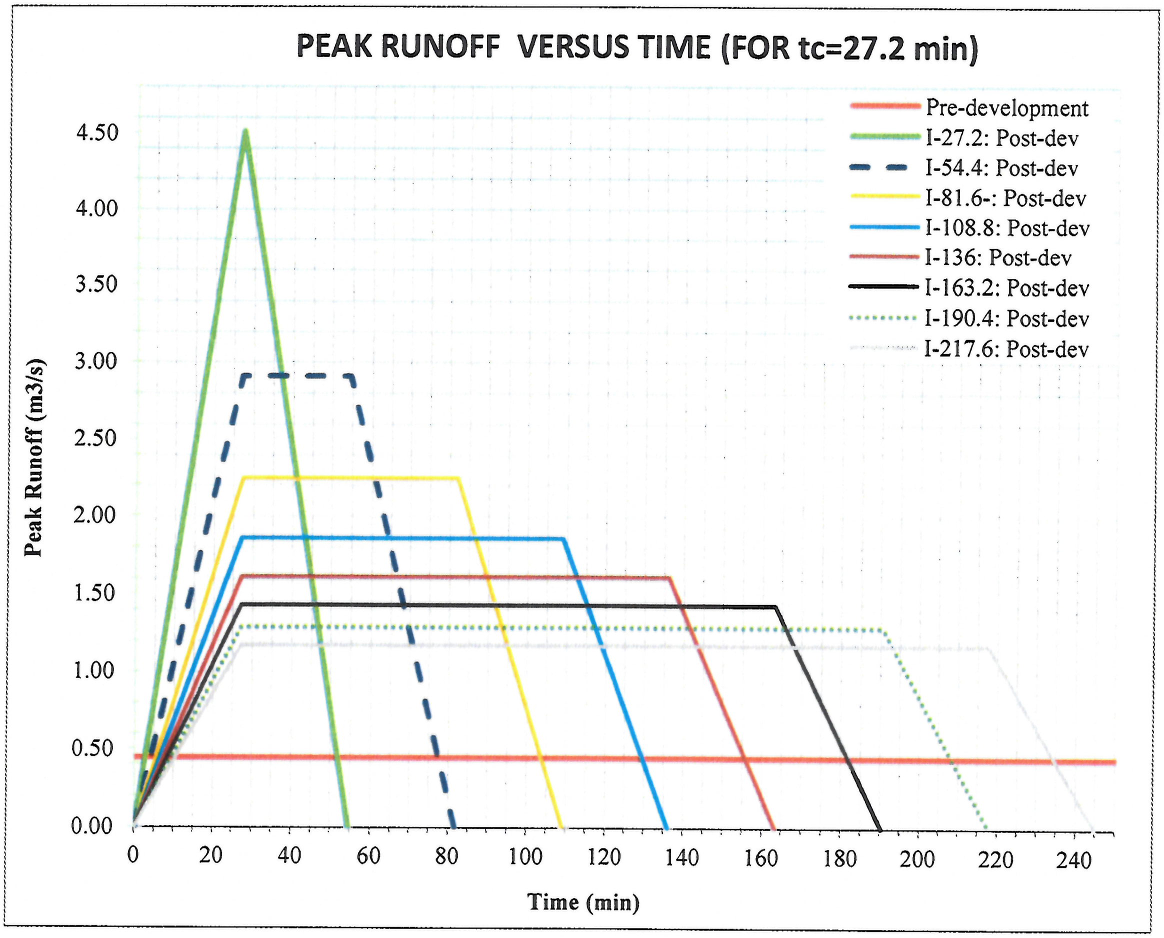

Figure 2. Graph showing storage volumes generated

Table 3. Storage volumes calculated

Intensity durations (min)	Volume of runoff (m^3)
$I_{27.2}$	5993.64
$I_{54.5}$	7458.85
$I_{81.6}$	8230.43
$I_{108.8}$	8709.82
$I_{136.0}$	9009.48
$I_{163.2}$	9185.83
$I_{190.4}$	**9225.23**
$I_{217.6}$	9067.30

From the table, the maximum volume of runoff to be stored is 9225.23 m^3. This is the 100 year flood level. The 5 year flood level will be calculated during the detailed design.

5 Quality Storage Requirements

This development requires an Enhanced level of protection (level 1) according to Norfolk County criteria. Thus a wet pond would be designed to meet the quality requirements. Using the MOECC design criteria for *Enhanced* 80% long-term S.S. removal, and an impervious level of 60%, the storage volume per area required for a wet pond is 201.67 m^3/ha.

The storage required for volumetric water quality = 201.67 m3/ha × 30.868 ha = 6,225.15 m^3. Extended detention storage required = 40 m^3/ha × 30.868 ha = 1,234.72 m^3. Thus, the permanent pool volume required = 6,225.15 m^3 – 1,234.72 m^3 = 4,990.43 m^3. The total active storage required will be 9,225.23 m^3.

6 Sizing of Pond

As mentioned in Section 1.3, the wet pond designed for this phase will eventually into the existing pond on Phase 1. The calculated volume of runoff for the 100 year storm (9225.23 m^3) was considered in sizing the pond. Since the 100 year active storage required is higher than the extended detention storage, the active storage volume will govern the size of the detention pond. The permanent pool part of the pond was designed with an embankment slope of 5:1 while the 100 year active storage part was designed with 4:1 embankment slope. Due to the configuration of the existing pond, and the nature and topography of the land, the bottom area of the pond is 5428 m^2 (92 m × 59 m). The depth of permanent pool pond is set at 1.0 m to produce a volume of 6233 m^3, and that of the active storage pond (i.e. 100 year storm pond) is set at 1.2 m above the permanent pool to achieve an active storage volume of 9,486 m^3. See attached Stage – Storage – Discharge Table.

Discharge control is to be provided by means of orifices. The preliminary design indicates the stored extended detention volume will be discharged over 24 hours by use of a 276 mm diameter orifice operating with a maximum head of 0.82 m. The active storage volume discharge will be controlled by a 439 mm diameter orifice operating at a maximum head of 1.2 m. The outlet from the pond discharges to an existing 750 mm diameter storm sewer at 0.8 % gradient having a capacity of 1.05 cms. This is a legal outlet connected by storm sewers to the SWM pond in Phase 1. The proposed SWM facility for Phase 2 is provided with a freeboard of 0.3 m. In the event of outlet blockage two 10 m wide channels are proposed to direct overflow to the right of ways in Phase 1 and ultimately to the existing Phase 1 SWM facility.

Prepared By
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Civil Engineer

Reviewed By
Len Girard, P.Eng
Senior Engineer

Lynn River Heights Phase 2 - Storm Water Management

Stage - Storage - Discharge Table

Stage (m)	depth (m)	Storage (cu m)	Active Storage	Discharge (cms)	
196	0	0	0		
196.2	0.2	1116	0		
196.4	0.4	2295	0		
196.6	0.6	3539	0		
196.8	0.8	4856	0		
197	1	6233	0	0	Permanent Pool
197.2	1.2	7668	1435	0.071	
197.4	1.4	9160	2927	0.101	
197.6	1.6	10709	4476	0.123	
197.8	1.8	12317	6084	0.142	
197.82	1.82	12482	6249	0.144	Extended Detention
198	2	13987	8612	0.402	
198.2	2.2	15719	9486	0.441	100 Yr Storm

Appendix A

Trapezoidal pond volume (capacity) calculations for Permanent Pool Storage

Volume of designed storage for trapezoidal shape = $\frac{1}{2} \times (a + b) \times \frac{1}{2} \times (c + d) \times (h)$

Embankment slope = 5:1

Bottom width of pond, a = 59 m

Top width of pond, b = 69 m

Bottom length of pond, c = 92 m

Top length of pond, d = 102 m

Average head of storage area, h = 1.0 m

Volume of designed storage = $\frac{1}{2} \times (59 + 92) \times \frac{1}{2} \times (92 + 102) \times (1.0)$ = 6233 m^3

Total volume of proposed permanent pool = 6233 m^3

Calculated permanent pool storage required= 4,990.43 m^3

Therefore, the designed permanent pool volume meets the largest volume of runoff requirements.

Trapezoidal pond volume (capacity) calculations for Active Storage

Volume of designed storage for trapezoidal shape = $\frac{1}{2} \times (a + b) \times \frac{1}{2} \times (c + d) \times (h)$

Bottom width at top of permanent pool, a = 69 m

Top width of pond, b = 78.6 m

Bottom length at top of permanent pool, c = 102 m

Top length of pond, d = 111.6 m

Average head of storage area, h = 1.2 m

Volume of designed storage = $\frac{1}{2} \times (69 + 102) \times \frac{1}{2} \times (78.6 + 111.6) \times (1.2)$ = 9,486 m^3

Total volume of proposed active storage = 9,486.12 m^3

Calculated maximum active storage require for 100 year storm= 9,225.23 m^3

Therefore, the designed detention volume meets the largest volume of runoff requirements.

LYNN RIVER HEIGHTS
RESIDENTIAL SUBDIVISION, PHASE 2
PORT DOVER

TRAFFIC IMPACT ASSESSMENT

F.R. Berry & Associates
August, 2016

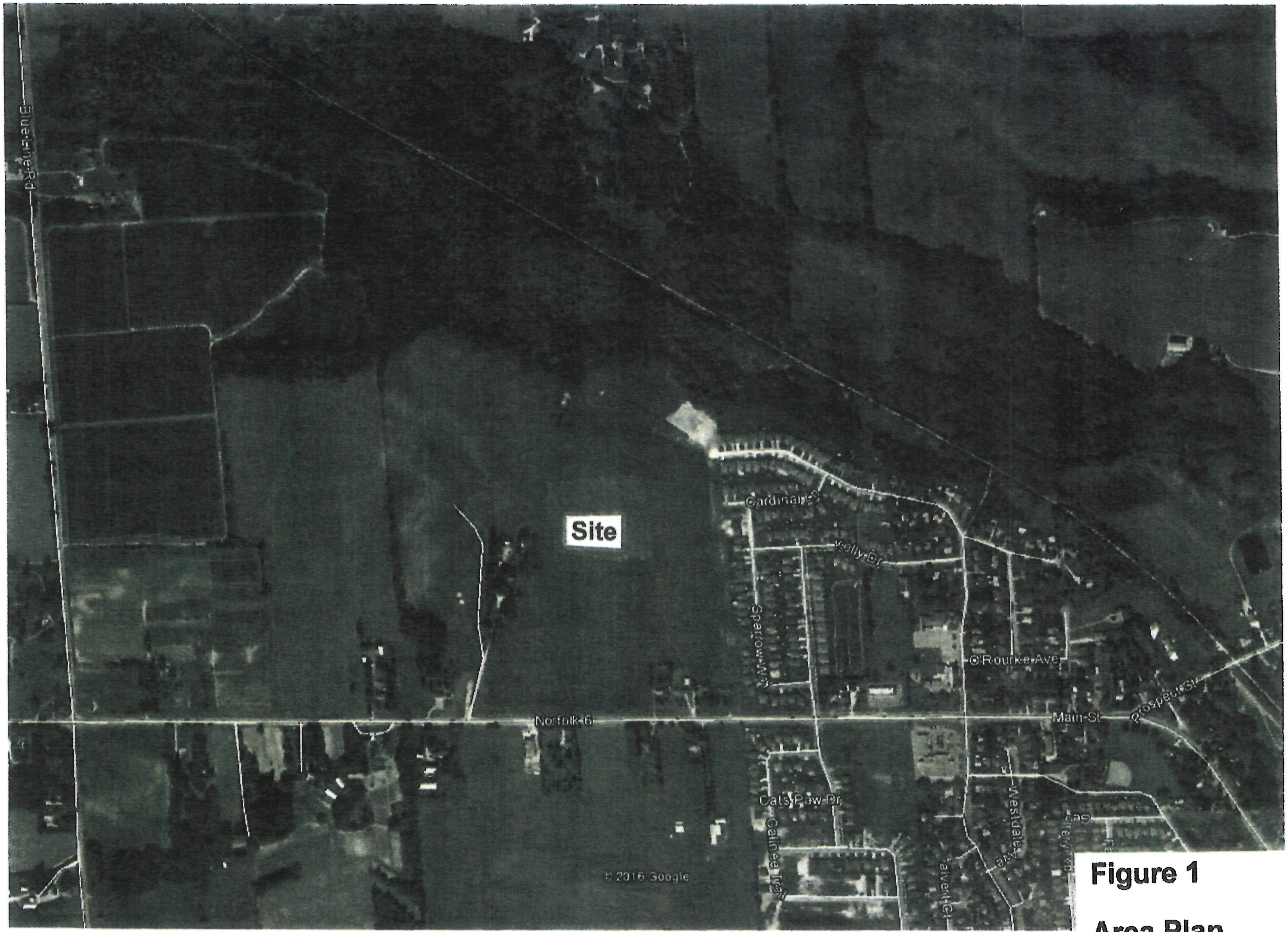


Figure 1

Area Plan

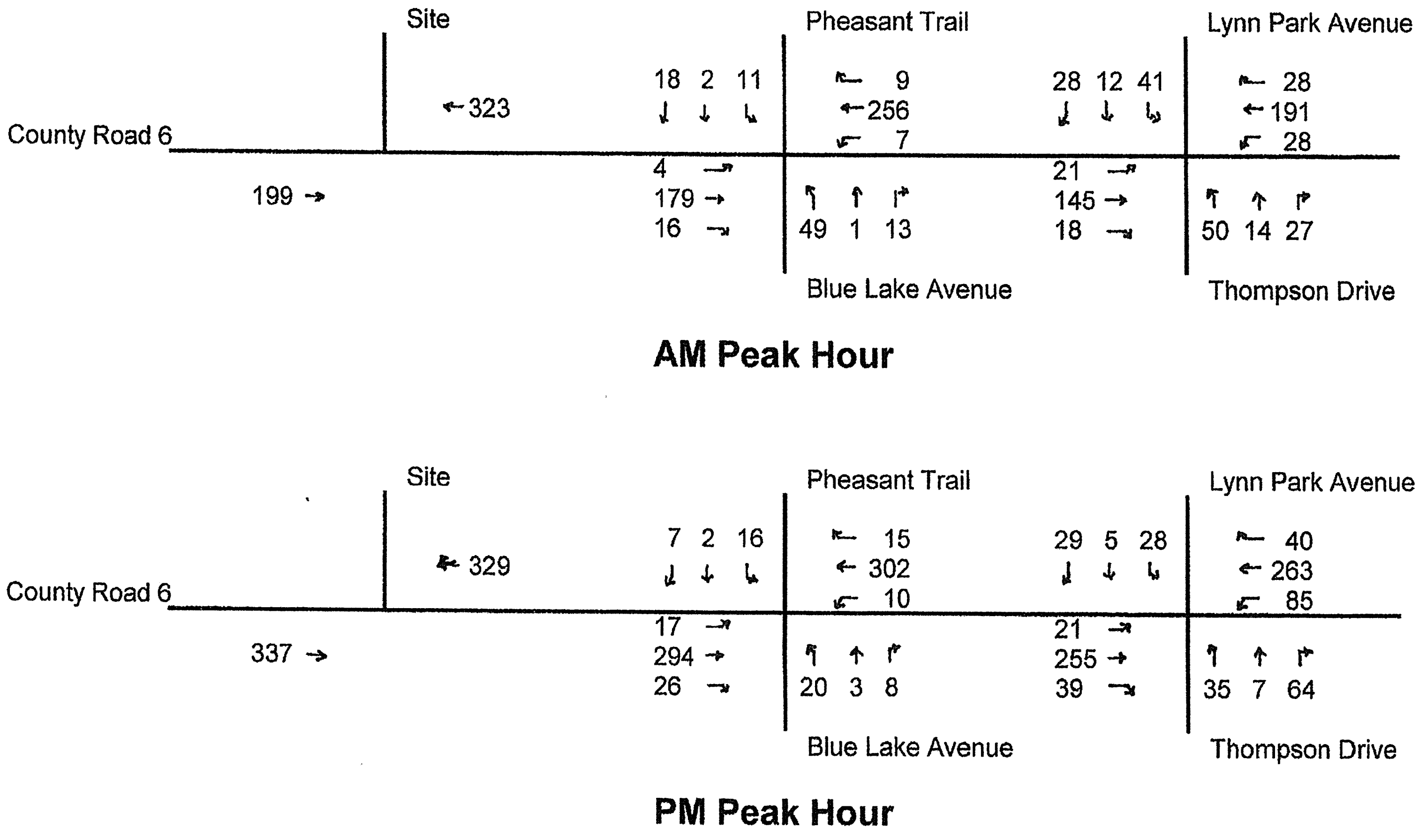


Figure 2

Existing Traffic
June 16, 2016

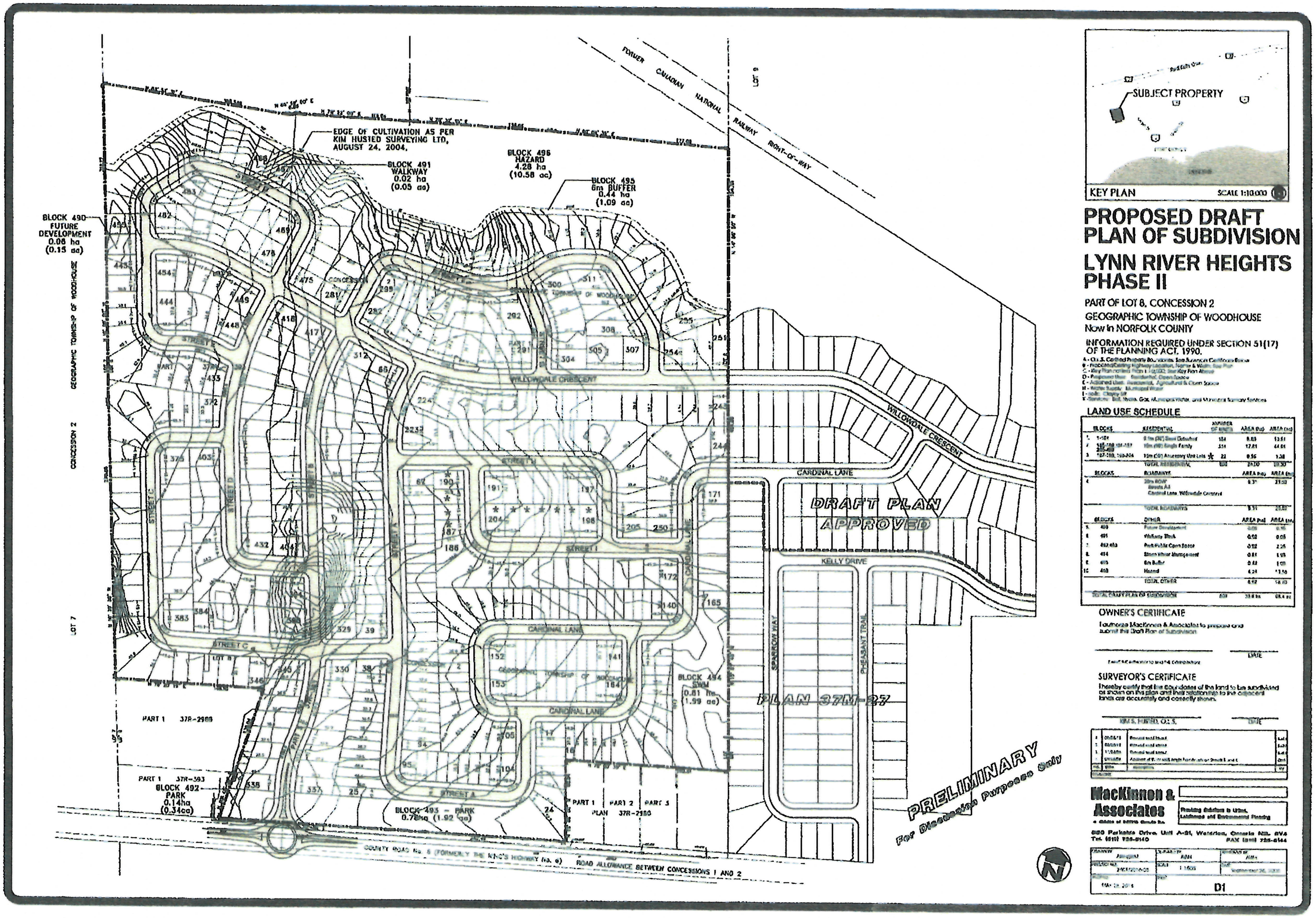


Figure 3

Draft Plan of Subdivision

The intersection of County Road 6 with Lynn Park Avenue and Thompson Drive is signalized. There are no left turn lanes on any of the approaches. A right turn taper on the westbound approach was recently replaced by a full right turn lane.

West of Pheasant Trail, County Road 6 has gravel shoulders. Between Pheasant Trail and Lynn Park Avenue there is a sidewalk on the north side of the street. A bicycle lane has recently been constructed on the south side of the street. East of Lynn Park Avenue, there is a sidewalk on the south side of the street.

Land uses in the area are primarily residential. A No Frills food store is located on the south-west corner of the intersection of County Road 6 and Thompson Drive. A small commercial plaza is located on the north side of County Road 6 between Pheasant Trail and Lynn Park Avenue.

St. Cecilia's Catholic Elementary School is located on Lynn Park Avenue, just north of County Road 6.

For the purposes of this study, traffic counts were made at the intersections of County Road 6 with Pheasant Trail and Lynn Park Avenue on Thursday, June 16, 2016. Peak hour turning movements derived from these counts are shown in **Figure 2**. Traffic count reports are contained in Appendix A.

3. PROPOSED DEVELOPMENT

The proposed development contains 489 single family lots. The draft plan of subdivision is shown in **Figure 3**. Access to the development is proposed at a new intersection on County Road 6 and through the existing subdivision to the east.

3.1 Vehicle Trip Generation

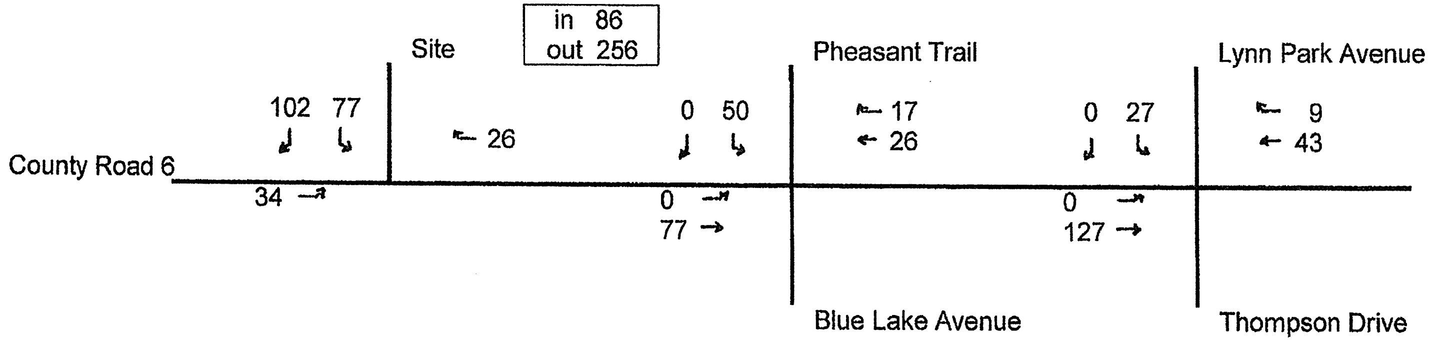
Peak hour vehicle trip generation was estimated based on regression equations contained in the Institute of Transportation Engineers (ITE) Trip Generation Manual, Eighth Edition, for ITE Land Use 210, Single Family Detached Housing.

Estimated peak hour vehicle trip generation for the 489 lot subdivision is shown in **Table 1**. **Table 1** also shows estimated and actual peak hour

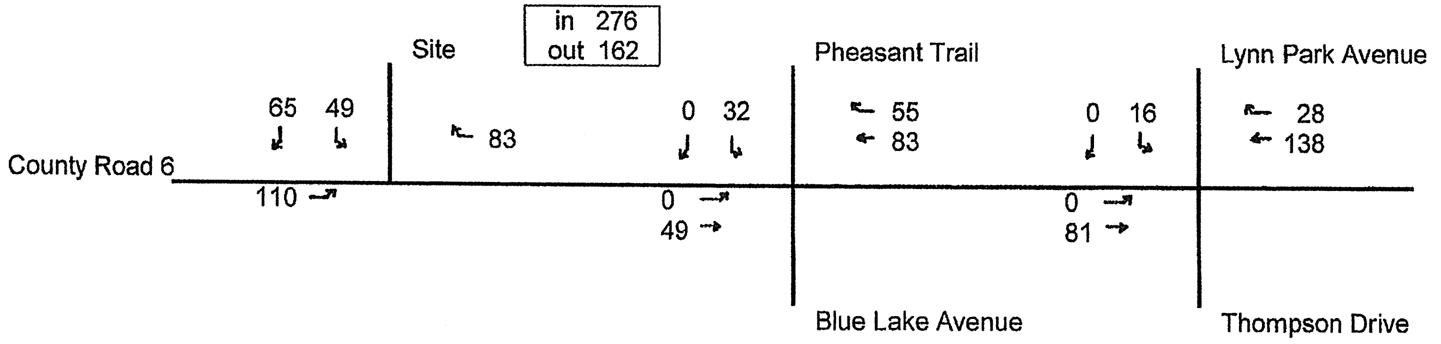
ITE Land Use	AM Peak Hour				PM Peak Hour			
	Ave. Rate	total	in	out	Ave. Rate	total	in	out
Lynn River Heights Phase 1								
223du Actual		189	77	112		190	103	87
ITE LU 210	eq'n	166	41	125	eq'n	216	136	80
Lynn River Heights Phase 2								
489du ITE LU 210	eq'n	342	86	256	eq'n	438	276	162
Concept Plan (Figure 7)								
230 Medium Density Residential 250du	eq'n	107	18	89	eq'n	127	85	42
710 General Office 20 000sf	eq'n	52	46	6	eq'n	101	17	84
820 Shopping Centre 110 000sf	1.00	110	67	43	3.73	410	201	209
Total		269	131	138		638	303	335
Less 25 percent internal trips		202	98	104		478	227	251

Table 1

Vehicle Trip Generation



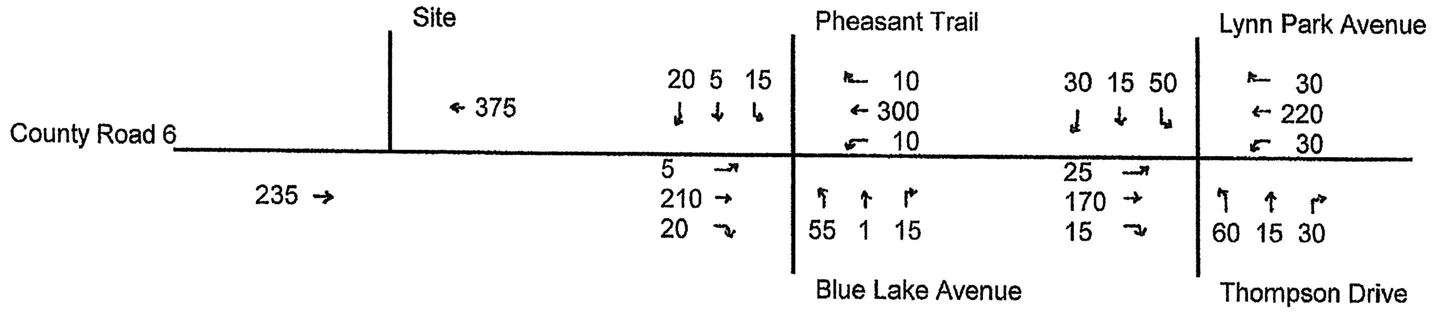
AM Peak Hour



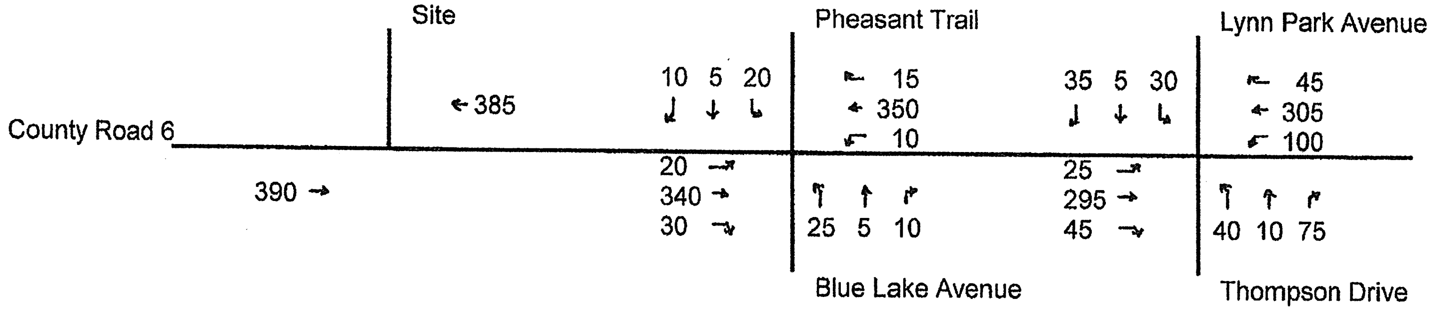
PM Peak Hour

Figure 4

Site Generated Traffic



AM Peak Hour



PM Peak Hour

Figure 5

Background Traffic 2026

Intersection	Warrant 1	Warrant 2	Overall
CR 6 at Pheasant Trail			
Existing	NO	NO	NO
Background 2026	NO	NO	NO
Total 2026	NO	NO	NO
CR 6 at Site Access			
Total 2026 Tee Intersection	NO	NO	NO
Total 2026 Four Leg Intersection	YES	NO	YES

Table 2

Signal Warrant Analysis

to determine appropriate road improvements and other mitigation measures. For more certainty, it is recommended that this assessment be updated in approximately five years.

Existing peak hour traffic volumes shown in **Figure 2** were projected to 2026 as shown in **Figure 5**. A 1.5 percent annual growth rate was assumed. Projected turning movement volumes were rounded to the nearest five vehicles.

4.2 Sight Distance

In the vicinity of the site, County Road 6 is on a tangent alignment. The grade generally rises from east to west with a crest vertical curve some distance to the west of the proposed site access.

Sight distance to and from the east is unrestricted. To the west, sight distance to and from the proposed access is estimated to be approximately 250 metres. For a design speed of 100km/h, consistent with the posted speed limit of 80km/h, the recommended minimum stopping sight distance is 200 metres. The available sight distance exceeds this requirement.

4.3 Signal Warrant Analysis

Traffic signal warrant analyses were made for the intersection of County Road 6 and Pheasant Trail for existing, projected background and projected total traffic conditions. The methodology used was that described in the Ontario Traffic Manual, Book 12, for existing eight hour traffic counts and for peak hour traffic projections. An analysis was also made for the intersection of County Road 6 and the site access for projected peak hour total traffic conditions.

The analyses assumed free flow rural conditions for both intersections, despite the 50km/h speed limit. County Road 6 in this location has more of the characteristics of a rural highway. For projected peak hour conditions, minimum warrant values were increased by 20 percent to reflect the uncertainty of the projected traffic volumes.

The results of the analyses are summarized in **Table 2**. Analysis worksheets are contained in Appendix B. Under existing and projected traffic conditions, traffic signals would not be warranted at the intersection of County Road 6 and Pheasant Trail. At the site access, traffic signals would not be warranted for a tee intersection serving only the proposed

the highest level of service and F indicates unacceptable congestion and delay. Level of service is measured in terms of average delay to all vehicles passing through the intersection in the peak hour.

4.5.1 County Road 6 and Lynn Park Avenue (Table 3)

Under existing and projected conditions, the intersection operates at a good level of service with average delays of less than 12 seconds (Level of service B). Intersection utilization is 48.9 percent in the morning peak hour and 65.6 percent in the afternoon peak hour, indicating a significant amount of reserve capacity.

Under projected background conditions, the intersection will continue to operate at a good level of service with only a minor increase in average delays. Under projected total traffic peak hour conditions, while average delays will remain within level of service B or better, v/c ratios for the shared eastbound and westbound lanes will increase.

At signalized intersections, it is common practice to construct left turn lanes on major approaches. This was not done when the intersection was signalized. Consideration should be given to introducing left turn lanes on County Road 6 at an appropriate time within the next ten years.

4.5.2 County Road 6 and Pheasant Trail (Table 4)

Under existing and projected background conditions, the intersection operates at a good level of service with all movements operating at level of service C or better. Under projected total traffic conditions delays will increase on the minor street approaches, particularly in the afternoon peak hour. The calculated 95th percentile queue lengths of 10.6 metres on the southbound approach suggests that at any given time in the afternoon peak hour up to two vehicles could be waiting to enter County Road 6.

The projected v/c ratios and levels of service do not warrant any improvements to the intersection.

4.5.3 County Road 6 and Site Access (Table 5)

Under projected total peak hour traffic conditions, with an eastbound left turn lane on County Road 6 and stop control on the minor street approach, the intersection will operate at a good level of service.

The calculated 95th percentile queue length for the eastbound left turn movement is 2.9 metres in the afternoon peak hour. There is only a five

Intersection	AM Peak Hour				PM Peak Hour			
	v/c	Del.	LofS	Q	v/c	Del.	LofS	Q
Existing, June 16, 2016								
Eastbound LTR	0.46	10.2	B	20.1	0.57	10.4	B	33.9
Westbound LT	0.51	11.1	B	24.7	0.65	11.9	B	40.8
Westbound R	0.06	3.9	A	3.1	0.07	2.8	A	3.3
Northbound LTR	0.16	7.0	A	10.5	0.22	7.5	A	12.7
Southbound LTR	0.14	6.7	A	9.3	0.14	8.4	A	9.6
Intersection ICU			48.9%				65.6%	
LofS			A				B	
Background 2026								
Eastbound LTR	0.51	10.6	B	23.6	0.61	10.6	B	40.1
Westbound LT	0.55	11.2	B	28.1	0.71	12.6	B	50.4
Westbound R	0.06	3.7	A	3.2	0.08	2.4	A	3.3
Northbound LTR	0.19	8.1	A	13.1	0.27	9.0	A	16.3
Southbound LTR	0.17	7.4	A	11.3	0.16	9.9	A	11.8
Intersection ICU			52.4%				72.4%	
LofS			A				B	
Total 2026								
Eastbound LTR	0.66	11.8	B	40.0	0.65	11.2	B	52.6
Westbound LT	0.53	10.6	B	32.3	0.81	15.0	B	77.6
Westbound R	0.07	2.8	A	3.2	0.11	1.8	A	3.9
Northbound LTR	0.25	11.2	B	16.8	0.30	11.4	B	18.9
Southbound LTR	0.29	12.4	B	20.2	0.23	14.0	B	16.5
Intersection ICU			63.2%				86.0%	
LofS			B				B	

Note: Del. - ave. delay (secs.)

LofS - level of service

v/c - volume to capacity ratio

ICU - intersection capacity utilization

Q - maximum queue length (metres)
(95th percentile)

Table 3

Level of Service
County Road 6 and Lynn Park Drive

Intersection	AM Peak Hour				PM Peak Hour			
	v/c	Del.	LofS	Q	v/c	Del.	LofS	Q
Existing, June 16, 2016								
Eastbound LTR	0.00	0.2	A	0.1	0.02	0.5	A	0.3
Westbound LTR	0.01	0.2	A	0.1	0.01	0.3	A	0.2
Northbound LTR	0.14	13.6	B	3.7	0.09	15.5	C	2.2
Southbound LTR	0.06	11.4	B	1.4	0.07	15.2	C	1.7
Intersection ICU			37.1%				40.8%	
LofS			A				A	
Background 2026								
Eastbound LTR	0.00	0.2	A	0.1	0.02	0.6	A	0.4
Westbound LTR	0.01	0.3	A	0.2	0.01	0.3	A	0.2
Northbound LTR	0.19	15.7	C	5.2	0.14	18.5	C	3.7
Southbound LTR	0.09	13.0	B	2.2	0.12	17.9	C	3.1
Intersection ICU			43.0%				47.5%	
LofS			A				A	
Total 2026								
Eastbound LTR	0.00	0.2	A	0.1	0.02	0.6	A	0.5
Westbound LTR	0.01	0.3	A	0.2	0.01	0.3	A	0.2
Northbound LTR	0.22	18.5	C	6.4	0.18	23.4	C	4.9
Southbound LTR	0.27	18.9	C	8.4	0.33	29.4	D	10.6
Intersection ICU			44.4%				54.1%	
LofS			A				A	

Note: Del. - ave. delay (secs.)

LofS - level of service

v/c - volume to capacity ratio

ICU - intersection capacity utilization

Q - maximum queue length (metres)
(95th percentile)

Table 4

Level of Service County Road 6 and Pheasant Trail

Intersection	AM Peak Hour				PM Peak Hour			
	v/c	Del.	LofS	Q	v/c	Del.	LofS	Q
Total 2026								
Eastbound L	0.03	8.3	A	0.8	0.11	8.9	A	2.9
Eastbound T	0.15	0.0	-	0.0	0.25	0.0	-	0.0
Westbound TR	0.26	0.0	-	0.0	0.30	0.0	-	0.0
Southbound LR	0.41	17.7	C	14.9	0.39	23.2	C	13.5
Intersection ICU			48.2%				53.0%	
LofS			A				A	

Note: Del. - ave. delay (secs.)

LofS - level of service

v/c - volume to capacity ratio

ICU - intersection capacity utilization

Q - maximum queue length (metres)
(95th percentile)

Table 5

Level of Service
County Road 6 and Site Access (Tee Intersection)

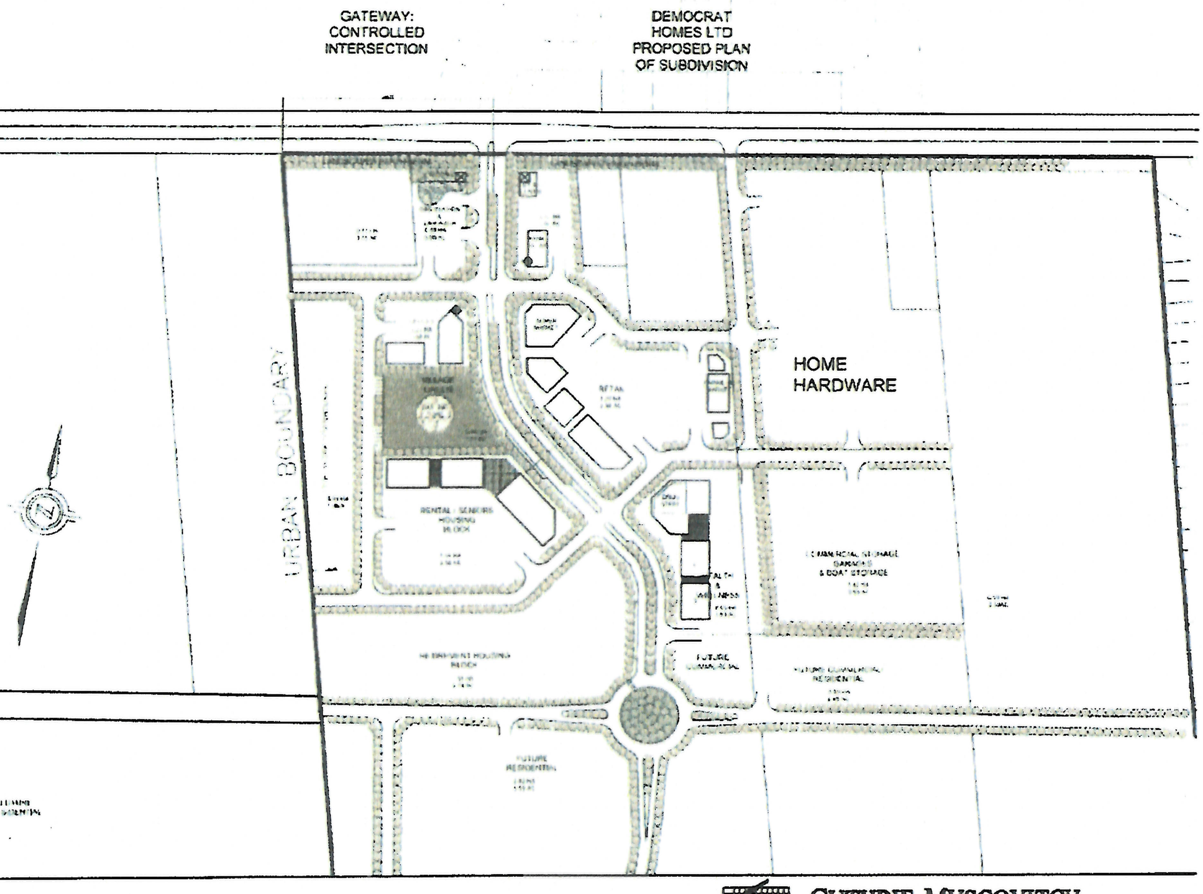
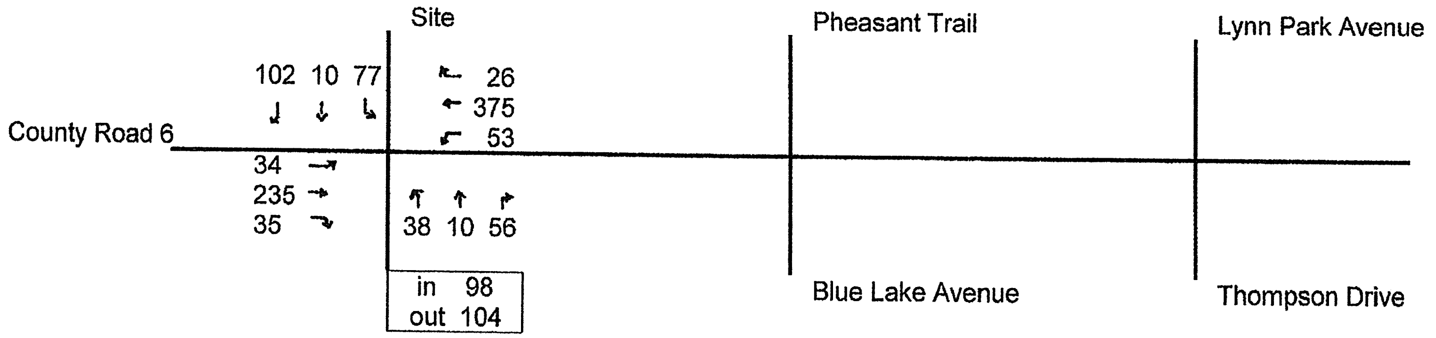


Figure 7

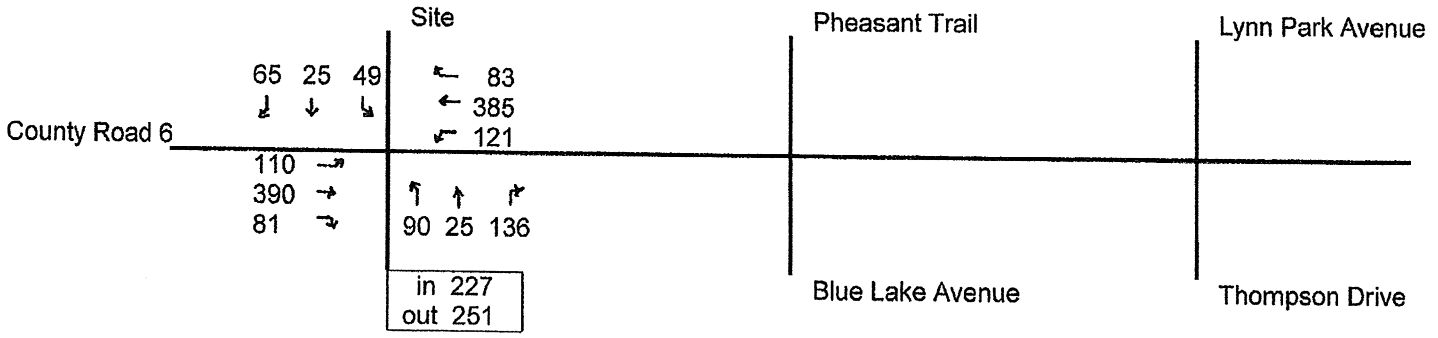
Concept Plan
Future Development

NOT TO SCALE
24 JUNE, 2009

GUTHRIE MUSCOVITCH
ARCHITECTS



AM Peak Hour



PM Peak Hour

Figure 8

Full Build-out 2026

Intersection	AM Peak Hour				PM Peak Hour			
	v/c	Del.	LofS	Q	v/c	Del.	LofS	Q
Total 2026								
Stop Control								
Eastbound L	0.03	8.4	A	0.8	0.12	8.9	A	3.0
Eastbound TR	0.17	0.0	-	0.0	0.30	0.0	-	0.0
Westound L	0.05	8.0	A	1.1	0.13	9.0	A	3.3
Westbound TR	0.26	0.0	-	0.0	0.30	0.0	-	0.0
Northbound LTR	0.39	25.1	D	13.4	2.31	673.0	F	179.7
Southbound LTR	0.66	36.5	E	33.3	1.70	438.5	F	93.9
Intersection ICU			56.9%				70.8%	
LofS			B				C	
Total 2026								
Signalized								
Eastbound L	0.11	7.5	A	5.1	0.37	9.7	A	14.5
Eastbound TR	0.45	9.1	A	26.9	0.70	11.5	B	52.8
Westbound L	0.14	7.7	A	7.0	0.41	10.2	B	16.2
Westbound TR	0.66	11.5	B	45.1	0.69	11.3	B	51.9
Northbound LTR	0.22	8.2	A	13.4	0.57	17.2	B	50.1
Southbound LTR	0.40	11.0	B	25.6	0.33	11.8	B	21.4
Intersection ICU			56.9%				70.8%	
LofS			B				B	
Total 2026								
Traffic Circle								
Eastbound LTR	0.32	-	-	-	0.65	-	-	-
Westbound LTR	0.46	-	-	-	0.68	-	-	-
Northbound LTR	0.13	-	-	-	0.39	-	-	-
Southbound LTR	0.27	-	-	-	0.23	-	-	-
Intersection ICU			63.2%				81.8%	
LofS			B				D	

Note: Del. - ave. delay (secs.)

LofS - level of service

v/c - volume to capacity ratio

ICU - intersection capacity utilization

Q - maximum queue length (metres)
(95th percentile)

Table 6

Level of Service
County Road 6 and
Site Access

Four Leg Intersection
Alternative Configurations

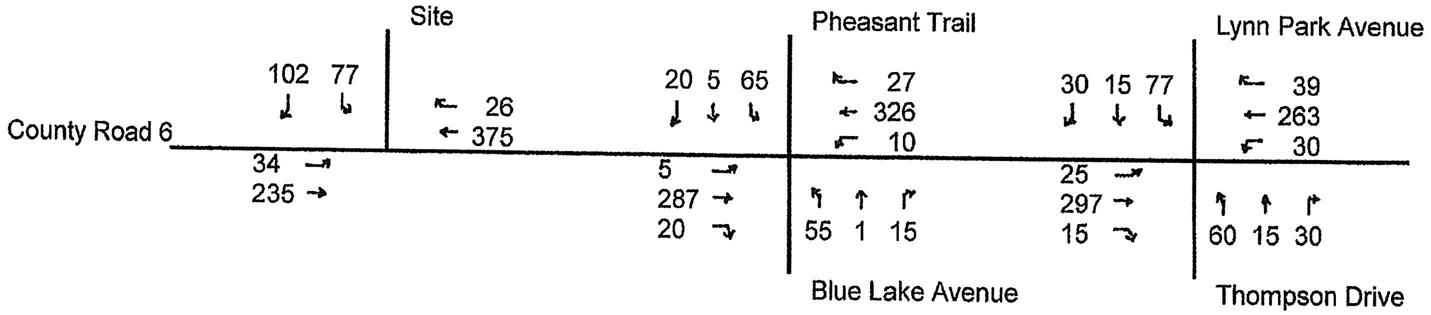
5. CONCLUSIONS

The proposed development would generate 342 vehicle trips in the morning peak hour and 438 vehicle trips in the afternoon peak hour.

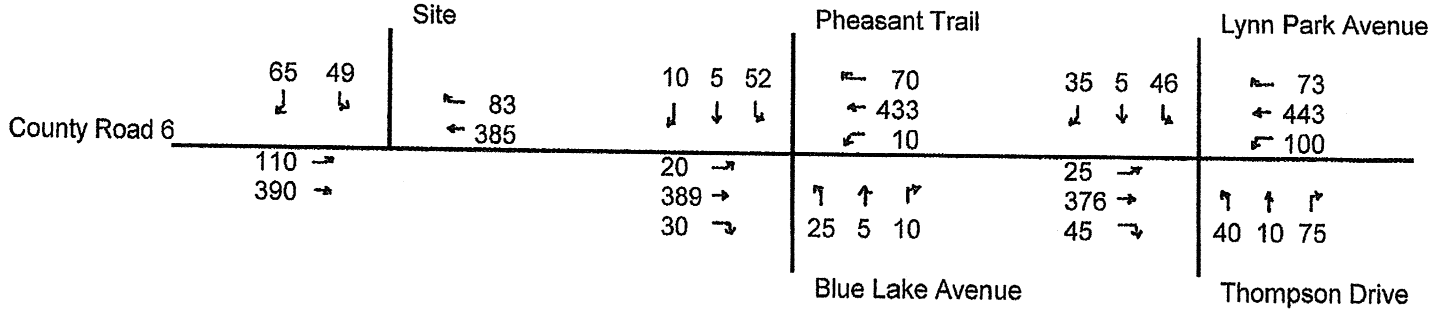
No improvements will be required to the intersections of County Road 6 with Lynn Park Avenue and Pheasant Trail in order to accommodate traffic generated by the proposed development. Consideration should be given to constructing left turn lanes on County Road 6 in both directions at Lynn Park Avenue to accommodate through traffic demand.

At the intersection of County Road 6 and the site access, a single lane approach on the site access, subject to stop control, would be appropriate. An eastbound left turn lane with a length of 15 metres is warranted on Country Road 6.

Future development on the south side of County Road 6 will warrant signalization or a roundabout. Further study, including refinement of the concept plan of development on the south side, will be required before a decision can be made on appropriate intersection treatment.



AM Peak Hour



PM Peak Hour

Figure 6

Total Traffic 2026

LYNN RIVER HEIGHTS
RESIDENTIAL SUBDIVISION, PHASE 2
PORT DOVER

TRAFFIC IMPACT ASSESSMENT

F.R. Berry & Associates
August, 2016

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APPENDICES

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LIST OF FIGURES

LYNN RIVER HEIGHTS
RESIDENTIAL SUBDIVISION, PHASE 2
PORT DOVER

TRAFFIC IMPACT ASSESSMENT

1. INTRODUCTION AND BACKGROUND

Democrat Homes has proposed the development of a 489 lot residential development on the north side of Norfolk County Road 6, west of the urban area of Port Dover. The location of the site is shown in **Figure 1**.

A report on the potential traffic impact of a development on this site was prepared in 2006 by F.R. Berry & Associates[1]. Subsequently, a number of things have changed in the area, including completion of the subdivision to the east and upgrades to County Road 6. The purpose of this report is to estimate potential vehicle trip generation from the proposed development and to assess the impact of these trips on traffic operation and safety on the adjacent street system.

2. EXISTING CONDITIONS

Norfolk County Road 6 is a two lane rural highway. In the vicinity of the site, the posted speed limit is 50km/h. This changes to 80km/h at the west limit of the site which is coincident with the Port Dover urban boundary.

To the east of the site, County Road 6 intersects Pheasant Trail and Lynn Park Avenue, which both provide access to Phase 1 of the Lynn River Heights subdivision. Pleasant Trail continues to the south as Blue Lake Avenue while Lynn Park Avenue continues to the south as Thompson Drive.

The intersection of County Road 6 with Pheasant Trail and Blue Lake Avenue is controlled by stop signs on the northbound and southbound approaches. There are no turning lanes on any of the approaches. The eastbound approach on County Road 6 has a short right turn taper.

---

[1] Lynn River Heights, Port Dover. Traffic Impact Study.
F.R. Berry & Associates, December 2006

The intersection of County Road 6 with Lynn Park Avenue and Thompson Drive is signalized. There are no left turn lanes on any of the approaches. A right turn taper on the westbound approach was recently replaced by a full right turn lane.

West of Pheasant Trail, County Road 6 has gravel shoulders. Between Pheasant Trail and Lynn Park Avenue there is a sidewalk on the north side of the street. A bicycle lane has recently been constructed on the south side of the street. East of Lynn Park Avenue, there is a sidewalk on the south side of the street.

Land uses in the area are primarily residential. A No Frills food store is located on the south-west corner of the intersection of County Road 6 and Thompson Drive. A small commercial plaza is located on the north side of County Road 6 between Pheasant Trail and Lynn Park Avenue.

St. Cecilia's Catholic Elementary School is located on Lynn Park Avenue, just north of County Road 6.

For the purposes of this study, traffic counts were made at the intersections of County Road 6 with Pheasant Trail and Lynn Park Avenue on Thursday, June 16, 2016. Peak hour turning movements derived from these counts are shown in **Figure 2**. Traffic count reports are contained in Appendix A.

3. PROPOSED DEVELOPMENT

The proposed development contains 489 single family lots. The draft plan of subdivision is shown in **Figure 3**. Access to the development is proposed at a new intersection on County Road 6 and through the existing subdivision to the east.

3.1 Vehicle Trip Generation

Peak hour vehicle trip generation was estimated based on regression equations contained in the Institute of Transportation Engineers (ITE) Trip Generation Manual, Eighth Edition, for ITE Land Use 210, Single Family Detached Housing.

Estimated peak hour vehicle trip generation for the 489 lot subdivision is shown in **Table 1**. **Table 1** also shows estimated and actual peak hour

trip generation from the subdivision to the east which contains approximately 223 single family homes. The only accesses to this subdivision are via Pheasant Trail and Lynn Park Avenue.

A comparison of the actual to estimated peak hour volumes shows that actual numbers were higher in the morning peak hour, in particular the inbound traffic flow, and lower in the afternoon peak hour. The difference in the morning peak hour volumes is likely due to traffic destined to St. Cecilia's School.

The comparison confirms the use of ITE estimates.

3.2 Vehicle Trip Distribution and Assignment

A comparison of the actual counts at both intersections shows that, in both peak hours, the proportion of trips generated by the existing residential subdivision with an origin or destination the east was 60 percent. This distribution was applied to the proposed development.

The assignment of peak hour site generated trips is shown in **Figure 4**. All trips with an origin or destination to the west were assigned to the proposed new access. Trips with an origin or destination to the east were assigned as follows:

new access	50 percent
Pheasant Trail	33 percent
Lynn Park Terrace	17 percent

This assignment was based on the assumption that drivers would use the most convenient and shortest route between home and County Road 6.

4. ANALYSIS

4.1 Projected Traffic

In most cases, a traffic projection for residential subdivision would be based on a five year planning horizon. In this case, however, it is unlikely that full build-out will be achieved within five years. A ten year planning horizon was assumed.

Because of uncertainties in the factors affecting growth, projections beyond a ten year horizon tend to become less reliable. While there is no certainty that the subdivision will be fully built out within ten years, the selection of this planning horizon provides a reasonable base from which

to determine appropriate road improvements and other mitigation measures. For more certainty, it is recommended that this assessment be updated in approximately five years.

Existing peak hour traffic volumes shown in **Figure 2** were projected to 2026 as shown in **Figure 5**. A 1.5 percent annual growth rate was assumed. Projected turning movement volumes were rounded to the nearest five vehicles.

4.2 Sight Distance

In the vicinity of the site, County Road 6 is on a tangent alignment. The grade generally rises from east to west with a crest vertical curve some distance to the west of the proposed site access.

Sight distance to and from the east is unrestricted. To the west, sight distance to and from the proposed access is estimated to be approximately 250 metres. For a design speed of 100km/h, consistent with the posted speed limit of 80km/h, the recommended minimum stopping sight distance is 200 metres. The available sight distance exceeds this requirement.

4.3 Signal Warrant Analysis

Traffic signal warrant analyses were made for the intersection of County Road 6 and Pheasant Trail for existing, projected background and projected total traffic conditions. The methodology used was that described in the Ontario Traffic Manual, Book 12, for existing eight hour traffic counts and for peak hour traffic projections. An analysis was also made for the intersection of County Road 6 and the site access for projected peak hour total traffic conditions.

The analyses assumed free flow rural conditions for both intersections, despite the 50km/h speed limit. County Road 6 in this location has more of the characteristics of a rural highway. For projected peak hour conditions, minimum warrant values were increased by 20 percent to reflect the uncertainty of the projected traffic volumes.

The results of the analyses are summarized in **Table 2**. Analysis worksheets are contained in Appendix B. Under existing and projected traffic conditions, traffic signals would not be warranted at the intersection of County Road 6 and Pheasant Trail. At the site access, traffic signals would not be warranted for a tee intersection serving only the proposed

subdivision. The implications of a four leg intersection are discussed below in Section 4.6.

4.4 Left Turn Lane Requirements

The need for left turn lanes on County Road 6 at Pheasant Trail and at the site access was assessed using the methodology described in the MTO Geometric Design Manual. The assessments were made for projected peak hour total traffic conditions. A design speed of 70km/h was assumed for the assessment. Typically, for a 50km.h speed limit, a design speed of 60km/h is appropriate. However, because of the transition from the 80km/h zone, the higher design speed was used.

A summary of the assessments is contained in Appendix C, together with the appropriate MTO charts.

At the site access under full development conditions, an eastbound left turn lane is warranted on County Road 6. The chart suggests a storage length requirement of 30 metres. The storage length will be confirmed below in the level of assessment.

At Pheasant Trail, left turn lanes would be warranted in both directions on County Road 6 at full build-out of the proposed development. It should be noted, however, that in both cases, the warrant is barely met.

As noted above, it would be prudent to update this study in approximately five years. Any decision on the construction of left turn lanes on County Road 6 should be deferred until then.

4.5 Level of Service Analysis

Each of the intersections of County Road 6 with Lynn Park Avenue, Pheasant Trail and the site access was analyzed for volume to capacity (v/c) ratios, delays and queue lengths using the Synchro 6 analysis program. At the two existing intersections, analyses were made for existing, projected background and projected total peak hour traffic volumes.

The results of the analyses are summarized in **Tables 3**, **4** and **5**. Analyses reports are contained in Appendix D.

Level of service is a measure of how well an intersection operates under prevailing traffic conditions. It is expressed on a scale of A to F where A is

the highest level of service and F indicates unacceptable congestion and delay. Level of service is measured in terms of average delay to all vehicles passing through the intersection in the peak hour.

4.5.1 County Road 6 and Lynn Park Avenue (Table 3)

Under existing and projected conditions, the intersection operates at a good level of service with average delays of less than 12 seconds (Level of service B). Intersection utilization is 48.9 percent in the morning peak hour and 65.6 percent in the afternoon peak hour, indicating a significant amount of reserve capacity.

Under projected background conditions, the intersection will continue to operate at a good level of service with only a minor increase in average delays. Under projected total traffic peak hour conditions, while average delays will remain within level of service B or better, v/c ratios for the shared eastbound and westbound lanes will increase.

At signalized intersections, it is common practice to construct left turn lanes on major approaches. This was not done when the intersection was signalized. Consideration should be given to introducing left turn lanes on County Road 6 at an appropriate time within the next ten years.

4.5.2 County Road 6 and Pheasant Trail (Table 4)

Under existing and projected background conditions, the intersection operates at a good level of service with all movements operating at level of service C or better. Under projected total traffic conditions delays will increase on the minor street approaches, particularly in the afternoon peak hour. The calculated 95th percentile queue lengths of 10.6 metres on the southbound approach suggests that at any given time in the afternoon peak hour up to two vehicles could be waiting to enter County Road 6.

The projected v/c ratios and levels of service do not warrant any improvements to the intersection.

4.5.3 County Road 6 and Site Access (Table 5)

Under projected total peak hour traffic conditions, with an eastbound left turn lane on County Road 6 and stop control on the minor street approach, the intersection will operate at a good level of service.

The calculated 95th percentile queue length for the eastbound left turn movement is 2.9 metres in the afternoon peak hour. There is only a five

percent probability of the queue length being longer. This suggests that a minimum storage length of 15 metres would be appropriate for the left turn lane. For a design speed of 80km/h, MTO design standards suggest an additional full width lane length of 50 metres and a taper length of 130 metres.

4.6 Future Development

A concept plan for future development on the south side of County Road 6 is shown in **Figure 7**. County staff have indicated a preference for a roundabout where the access to this development intersects County Road 6 opposite the proposed site access.

In order to assess the feasibility of a roundabout, an estimate was made of peak hour traffic generation based on the concept plan shown in **Figure 7**. This estimate is shown in **Table 1**.

It must be stressed that this estimate is very approximate and should not be used for design purposes. The intention is to provide "ball park" numbers for the purposes of comparing intersection options.

The assignment of peak hour trips is shown in **Figure 8**. Ten percent of the generated trips were assigned to the proposed development on the north side, in addition to those trips shown in **Figure 4**, while the remainder were split 60 percent to and from the east and 40 percent to and from the west.

Table 6 shows a summary of level of service assessments for three alternative intersection treatments:

- stop control on the minor approaches
- signalization
- roundabout

Stop control would not be feasible. Delays to traffic on the minor street approaches would not be acceptable.

The signalization and roundabout options are both feasible and give approximately the same v/c ratios for each of the approaches. Further work, including refinement of the concept plan for the development on the south side of County Road 6, would be required before a decision on the preferred option is made.

5. CONCLUSIONS

The proposed development would generate 342 vehicle trips in the morning peak hour and 438 vehicle trips in the afternoon peak hour.

No improvements will be required to the intersections of County Road 6 with Lynn Park Avenue and Pheasant Trail in order to accommodate traffic generated by the proposed development. Consideration should be given to constructing left turn lanes on County Road 6 in both directions at Lynn Park Avenue to accommodate through traffic demand.

At the intersection of County Road 6 and the site access, a single lane approach on the site access, subject to stop control, would be appropriate. An eastbound left turn lane with a length of 15 metres is warranted on Country Road 6.

Future development on the south side of County Road 6 will warrant signalization or a roundabout. Further study, including refinement of the concept plan of development on the south side, will be required before a decision can be made on appropriate intersection treatment.

REGISTERED PROFESSIONAL ENGINEER
F.R. BERRY
May 15/19
PROVINCE OF ONTARIO

ITE Land Use	AM Peak Hour				PM Peak Hour			
	Ave. Rate	total	in	out	Ave. Rate	total	in	out
Lynn River Heights Phase 1								
223du Actual		189	77	112		190	103	87
ITE LU 210	eq'n	166	41	125	eq'n	216	136	80
Lynn River Heights Phase 2								
489du ITE LU 210	eq'n	342	86	256	eq'n	438	276	162
Concept Plan (Figure 7)								
230 Medium Density Residential 250du	eq'n	107	18	89	eq'n	127	85	42
710 General Office 20 000sf	eq'n	52	46	6	eq'n	101	17	84
820 Shopping Centre 110 000sf	1.00	110	67	43	3.73	410	201	209
Total		269	131	138		638	303	335
Less 25 percent internal trips		202	98	104		478	227	251

Table 1

Vehicle Trip Generation

Intersection	Warrant 1	Warrant 2	Overall
CR 6 at Pheasant Trail			
Existing	NO	NO	NO
Background 2026	NO	NO	NO
Total 2026	NO	NO	NO
CR 6 at Site Access			
Total 2026 Tee Intersection	NO	NO	NO
Total 2026 Four Leg Intersection	YES	NO	YES

Table 2

Signal Warrant Analysis

Intersection	AM Peak Hour				PM Peak Hour			
	v/c	Del.	LofS	Q	v/c	Del.	LofS	Q
Existing, June 16, 2016								
Eastbound LTR	0.46	10.2	B	20.1	0.57	10.4	B	33.9
Westbound LT	0.51	11.1	B	24.7	0.65	11.9	B	40.8
Westbound R	0.06	3.9	A	3.1	0.07	2.8	A	3.3
Northbound LTR	0.16	7.0	A	10.5	0.22	7.5	A	12.7
Southbound LTR	0.14	6.7	A	9.3	0.14	8.4	A	9.6
Intersection ICU	48.9%				65.6%			
LofS	A				B			
Background 2026								
Eastbound LTR	0.51	10.6	B	23.6	0.61	10.6	B	40.1
Westbound LT	0.55	11.2	B	28.1	0.71	12.6	B	50.4
Westbound R	0.06	3.7	A	3.2	0.08	2.4	A	3.3
Northbound LTR	0.19	8.1	A	13.1	0.27	9.0	A	16.3
Southbound LTR	0.17	7.4	A	11.3	0.16	9.9	A	11.8
Intersection ICU	52.4%				72.4%			
LofS	A				B			
Total 2026								
Eastbound LTR	0.66	11.8	B	40.0	0.65	11.2	B	52.6
Westbound LT	0.53	10.6	B	32.3	0.81	15.0	B	77.6
Westbound R	0.07	2.8	A	3.2	0.11	1.8	A	3.9
Northbound LTR	0.25	11.2	B	16.8	0.30	11.4	B	18.9
Southbound LTR	0.29	12.4	B	20.2	0.23	14.0	B	16.5
Intersection ICU	63.2%				86.0%			
LofS	B				B			

Note: Del. - ave. delay (secs.)

LofS - level of service

v/c - volume to capacity ratio

ICU - intersection capacity utilization

Q - maximum queue length (metres)
(95th percentile)

Table 3

Level of Service
County Road 6 and
Lynn Park Avenue

Intersection	AM Peak Hour				PM Peak Hour			
	v/c	Del.	LofS	Q	v/c	Del.	LofS	Q
Existing, June 16, 2016								
Eastbound LTR	0.00	0.2	A	0.1	0.02	0.5	A	0.3
Westbound LTR	0.01	0.2	A	0.1	0.01	0.3	A	0.2
Northbound LTR	0.14	13.6	B	3.7	0.09	15.5	C	2.2
Southbound LTR	0.06	11.4	B	1.4	0.07	15.2	C	1.7
Intersection ICU	37.1%				40.8%			
LofS	A				A			
Background 2026								
Eastbound LTR	0.00	0.2	A	0.1	0.02	0.6	A	0.4
Westbound LTR	0.01	0.3	A	0.2	0.01	0.3	A	0.2
Northbound LTR	0.19	15.7	C	5.2	0.14	18.5	C	3.7
Southbound LTR	0.09	13.0	B	2.2	0.12	17.9	C	3.1
Intersection ICU	43.0%				47.5%			
LofS	A				A			
Total 2026								
Eastbound LTR	0.00	0.2	A	0.1	0.02	0.6	A	0.5
Westbound LTR	0.01	0.3	A	0.2	0.01	0.3	A	0.2
Northbound LTR	0.22	18.5	C	6.4	0.18	23.4	C	4.9
Southbound LTR	0.27	18.9	C	8.4	0.33	29.4	D	10.6
Intersection ICU	44.4%				54.1%			
LofS	A				A			

Note: Del. - ave. delay (secs.)

LofS - level of service

v/c - volume to capacity ratio

ICU - intersection capacity utilization

Q - maximum queue length (metres)
(95th percentile)

Table 4

Level of Service County Road 6 and Pheasant Trail

Intersection	AM Peak Hour				PM Peak Hour			
	v/c	Del.	LofS	Q	v/c	Del.	LofS	Q
Total 2026								
Eastbound L	0.03	8.3	A	0.8	0.11	8.9	A	2.9
Eastbound T	0.15	0.0	-	0.0	0.25	0.0	-	0.0
Westbound TR	0.26	0.0	-	0.0	0.30	0.0	-	0.0
Southbound LR	0.41	17.7	C	14.9	0.39	23.2	C	13.5
Intersection ICU			48.2%				53.0%	
LofS			A				A	

Note: Del. - ave. delay (secs.)

LofS - level of service

v/c - volume to capacity ratio

ICU - intersection capacity utilization

Q - maximum queue length (metres)
(95th percentile)

Table 5

Level of Service
County Road 6 and
Site Access
(Tee Intersection)

Intersection	AM Peak Hour				PM Peak Hour			
	v/c	Del.	LofS	Q	v/c	Del.	LofS	Q
Total 2026								
Stop Control								
Eastbound L	0.03	8.4	A	0.8	0.12	8.9	A	3.0
Eastbound TR	0.17	0.0	-	0.0	0.30	0.0	-	0.0
Westound L	0.05	8.0	A	1.1	0.13	9.0	A	3.3
Westbound TR	0.26	0.0	-	0.0	0.30	0.0	-	0.0
Northbound LTR	0.39	25.1	D	13.4	2.31	673.0	F	179.7
Southbound LTR	0.66	36.5	E	33.3	1.70	438.5	F	93.9
Intersection ICU	56.9%				70.8%			
LofS	B				C			
Total 2026								
Signalized								
Eastbound L	0.11	7.5	A	5.1	0.37	9.7	A	14.5
Eastbound TR	0.45	9.1	A	26.9	0.70	11.5	B	52.8
Westbound L	0.14	7.7	A	7.0	0.41	10.2	B	16.2
Westbound TR	0.66	11.5	B	45.1	0.69	11.3	B	51.9
Northbound LTR	0.22	8.2	A	13.4	0.57	17.2	B	50.1
Southbound LTR	0.40	11.0	B	25.6	0.33	11.8	B	21.4
Intersection ICU	56.9%				70.8%			
LofS	B				B			
Total 2026								
Traffic Circle								
Eastbound LTR	0.32	-	-	-	0.65	-	-	-
Westbound LTR	0.46	-	-	-	0.68	-	-	-
Northbound LTR	0.13	-	-	-	0.39	-	-	-
Southbound LTR	0.27	-	-	-	0.23	-	-	-
Intersection ICU	63.2%				81.8%			
LofS	B				D			

Note: Del. - ave. delay (secs.)

LofS - level of service

v/c - volume to capacity ratio

ICU - intersection capacity utilization

Q - maximum queue length (metres)
(95th percentile)

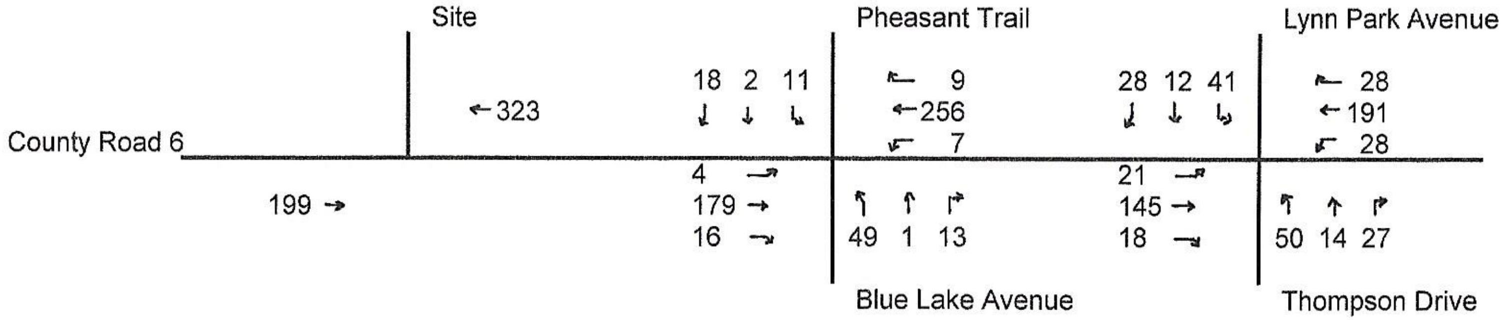
Table 6

Level of Service
County Road 6 and
Site Access

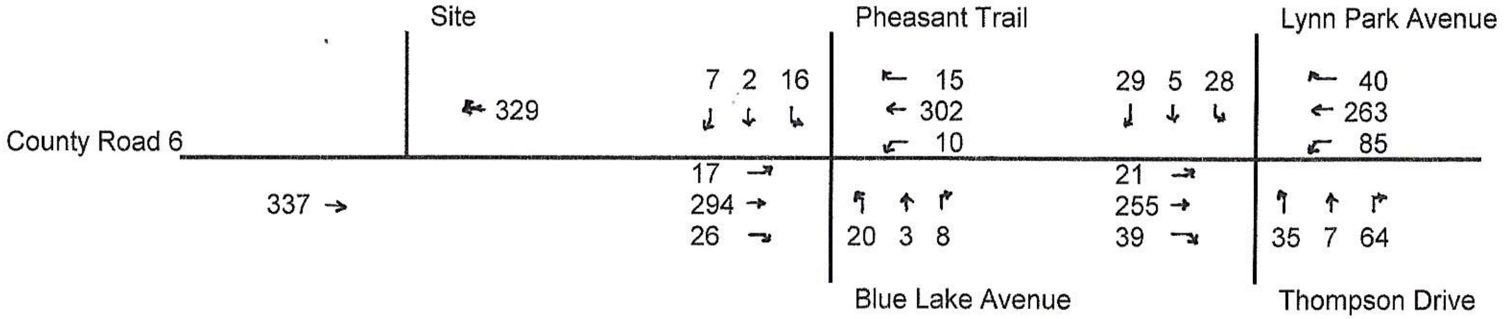
Four Leg Intersection
Alternative Configurations

Figure 1

Area Plan



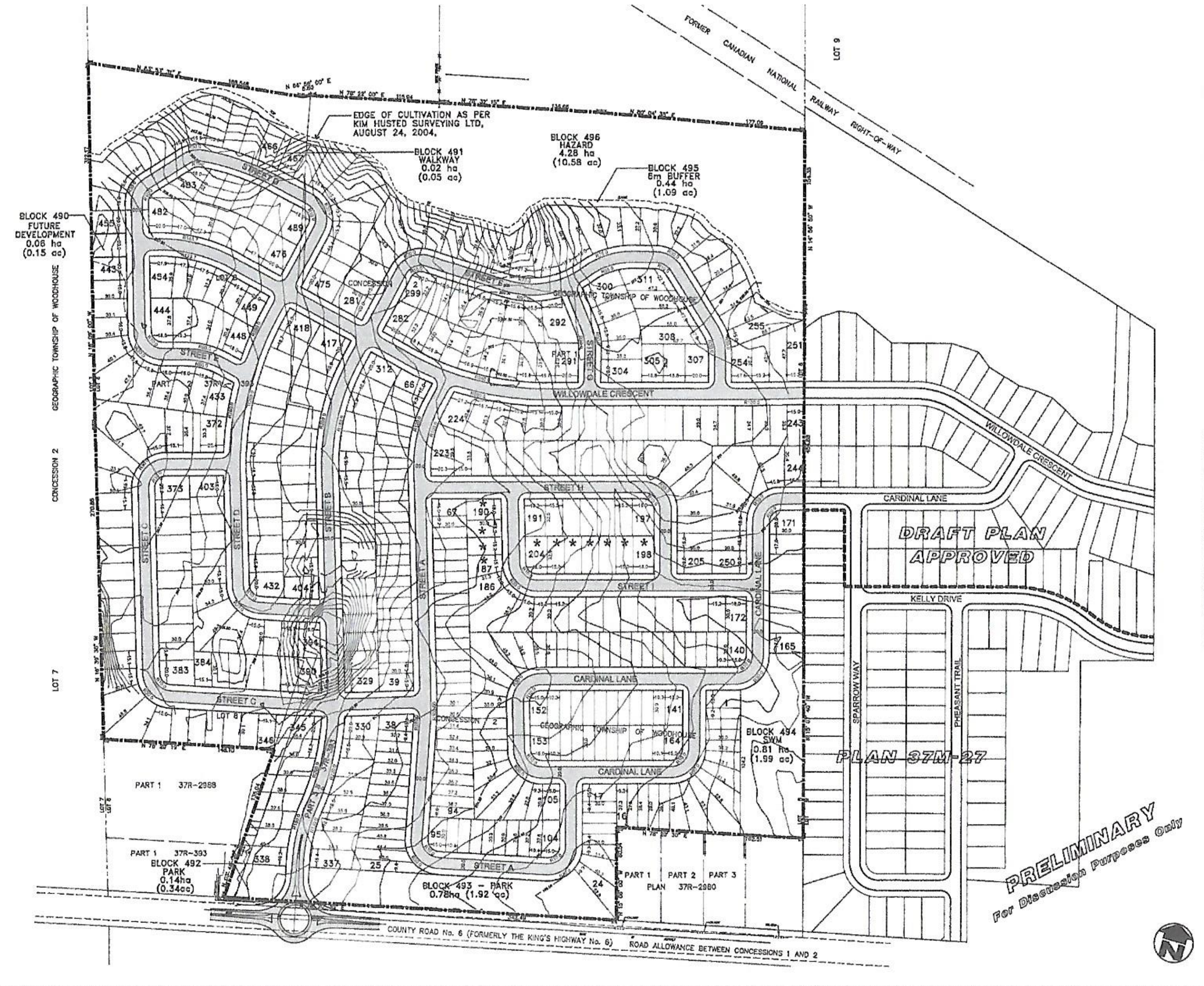
AM Peak Hour

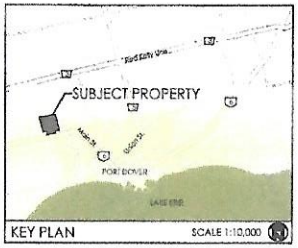


PM Peak Hour

Figure 2

Existing Traffic
June 16, 2016





PROPOSED DRAFT PLAN OF SUBDIVISION

LYNN RIVER HEIGHTS PHASE II

PART OF LOT 8, CONCESSION 2
GEOGRAPHIC TOWNSHIP OF WOODHOUSE
Now In NORFOLK COUNTY

INFORMATION REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT, 1990.

A - O.L.S. Certified Property Boundaries; See Surveyor's Certificate Below
B - Proposed/Existing Highway Location, Name & Width; See Plan
C - Key Plan not less than 1:10,000; See Key Plan Above
D - Proposed Uses: Residential, Open Space
E - Adjoined Uses: Residential, Agricultural & Open Space
H - Water Supply: Municipal Water
I - Soils: Clayey Silt
K - Services: Bell, Hydro, Gas, Municipal Water, and Municipal Sanitary Services

LAND USE SCHEDULE

	BLOCKS	RESIDENTIAL	NUMBER OF UNITS	AREA (ha)	AREA (ac)
1.	1-164	9.1m (30') Semi Detached	164	5.63	13.91
2.	185-186,191-197 205-489	15m (50') Single Family	314	17.81	44.01
3.	187-190, 198-204	15m (50') Accessory Unit Lots *	22	0.56	1.38
		TOTAL RESIDENTIAL	500	24.00	59.30
	BLOCKS	ROADWAYS		AREA (ha)	AREA (ac)
4.		20m ROW: Streets A-I Cardinal Lane, Willowdale Crescent		9.31	23.02
		TOTAL ROADWAYS		9.31	23.02
	BLOCKS	OTHER		AREA (ha)	AREA (ac)
5.	490	Future Development		0.06	0.15
6.	491	Walkway Block		0.02	0.05
7.	492,493	Park/Public Open Space		0.92	2.26
8.	494	Storm Water Management		0.81	1.99
9.	495	8m Buffer		0.44	1.09
10.	496	Hazard		4.28	10.58
		TOTAL OTHER		6.52	16.10
	TOTAL DRAFT PLAN OF SUBDIVISION		500	39.8 ha	98.4 ac

OWNER'S CERTIFICATE

I authorize MacKinnon & Associates to prepare and submit this Draft Plan of Subdivision

(I HAVE THE AUTHORITY TO BIND THE CORPORATION) DATE

SURVEYOR'S CERTIFICATE

I hereby certify that the boundaries of the land to be subdivided as shown on this plan and their relationship to the adjacent lands are accurately and correctly shown.

KIM S. HUSTED, O.L.S. DATE

no.	date	description	by
4.	05/26/16	Revised road layout.	AWH
3.	03/03/16	Revised road layout.	AWH
2.	11/24/05	Revised road layout.	AWH
1.	09/26/06	Addition of 9.1m (30') Single Family Lots on Streets B and C	DMP

REVISIONS

MacKinnon & Associates
a division of [illegible] Ontario Inc.
Providing Solutions in Urban, Landscape and Environmental Planning
550 Parkside Drive, Unit A-21, Waterloo, Ontario N2L 5V4
Tel. (519) 725-5140 FAX (519) 725-5144

DRAWN BY: AWH/SKM	CHECKED BY: AWH	APPROVED BY: AWH
PROJECT NO: 2401/2016-05	SCALE: 1:1500	DATE: September 26, 2006
PLOTTED: MAY 26, 2016	SHEET: D1	

Figure 3

Draft Plan of Subdivision

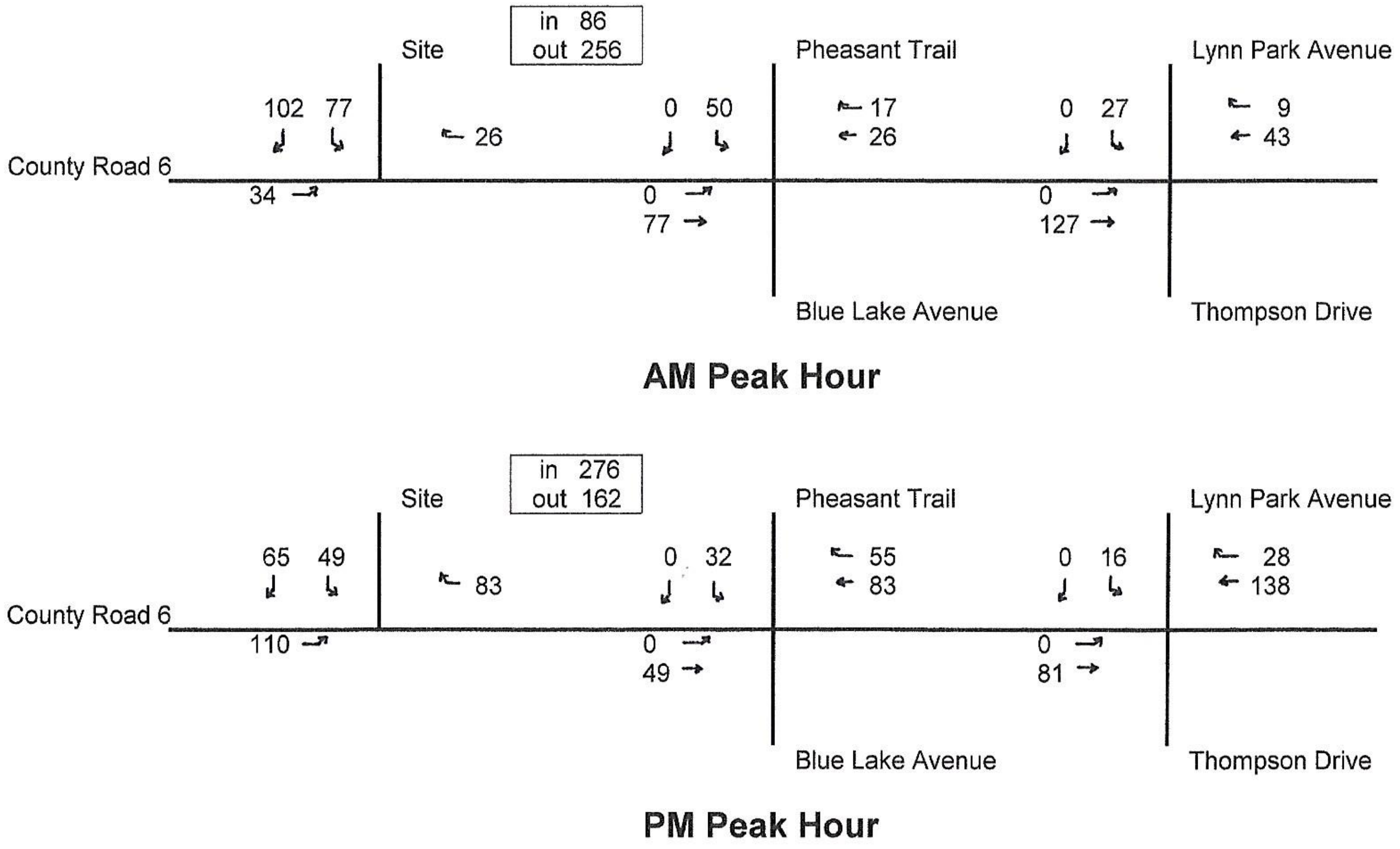
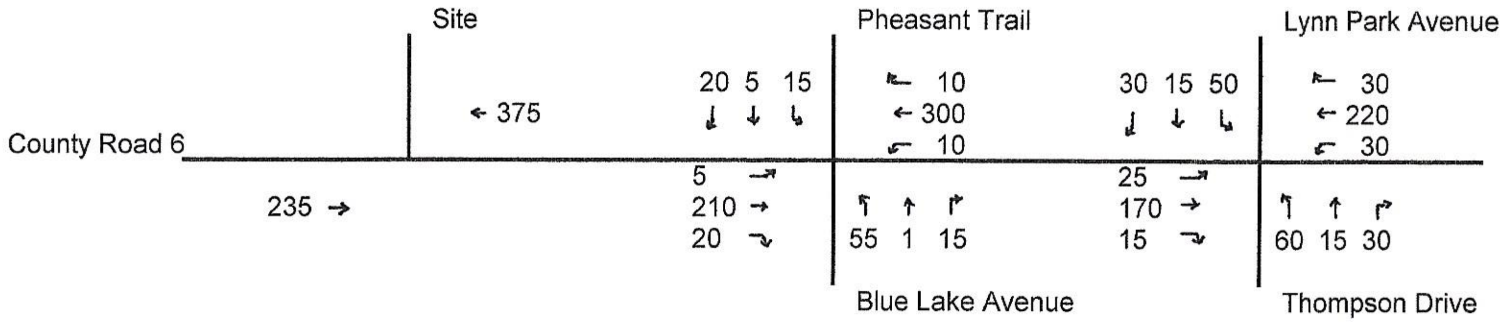
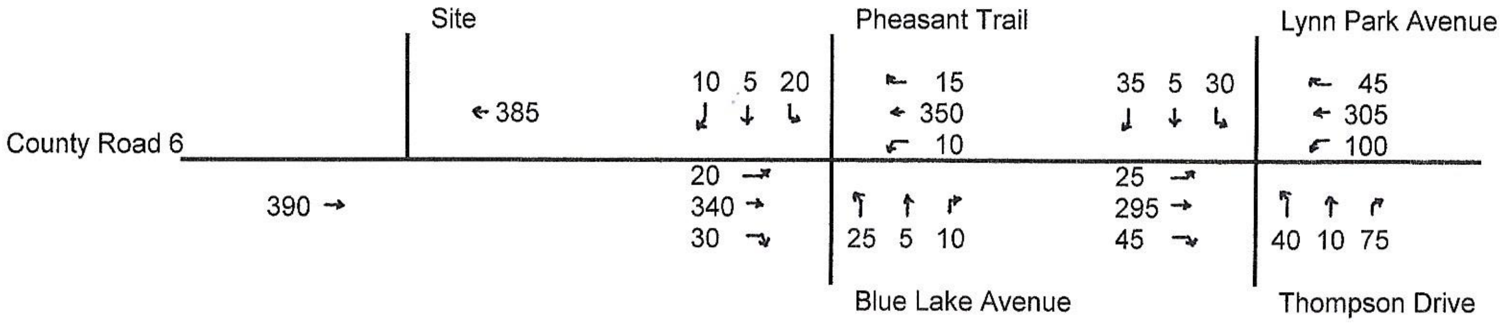


Figure 4

Site Generated Traffic



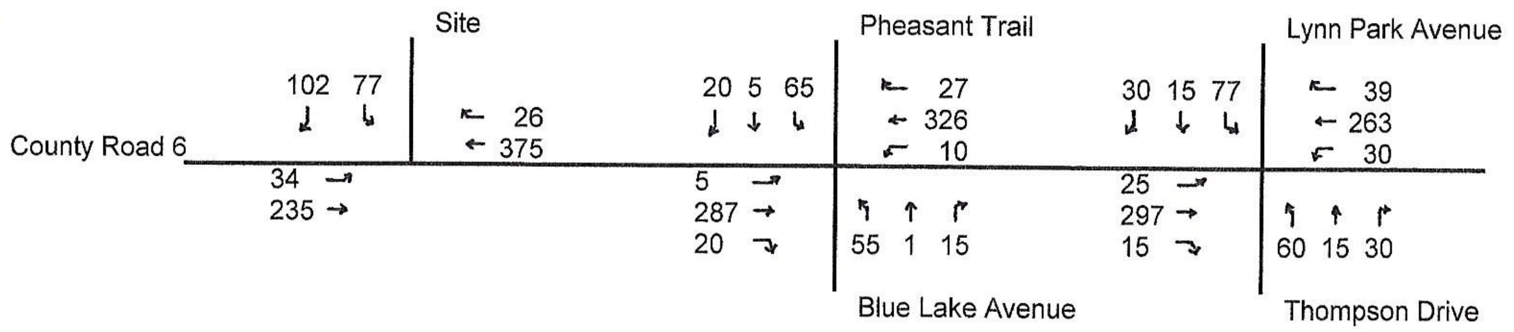
AM Peak Hour



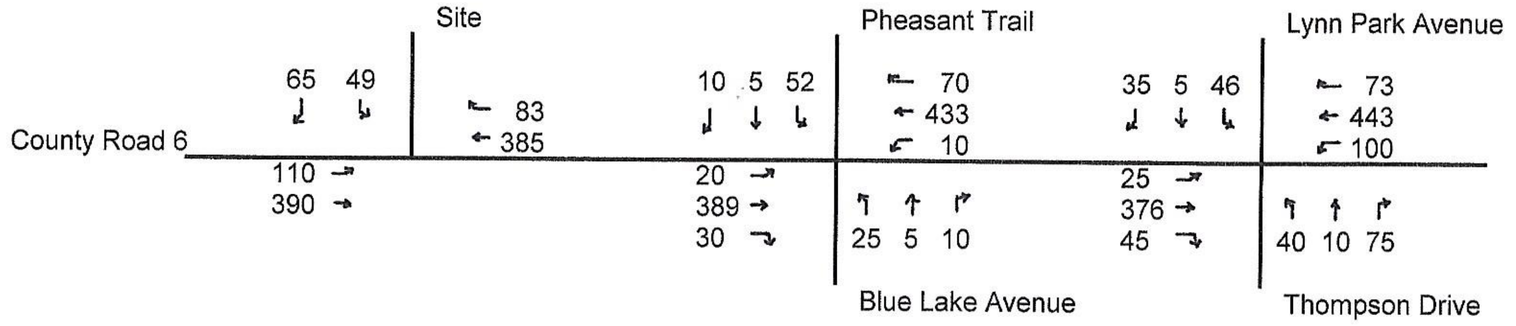
PM Peak Hour

Figure 5

Background Traffic 2026



AM Peak Hour



PM Peak Hour

Figure 6

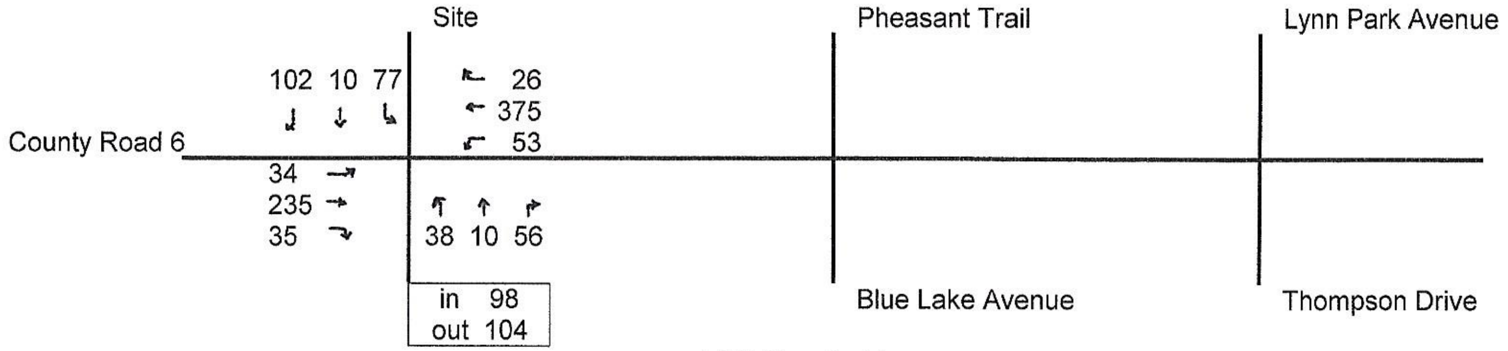
Total Traffic 2026

GUTHRIE MUSCOVITCH
A R C H I T E C T S

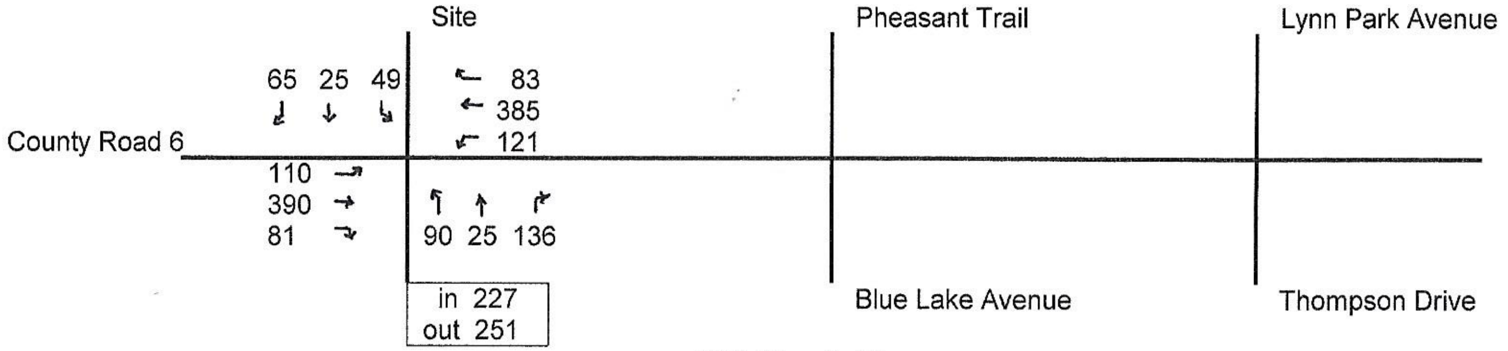
NOT TO SCALE
24 JUNE, 2009

Figure 7

Concept Plan
Future Development



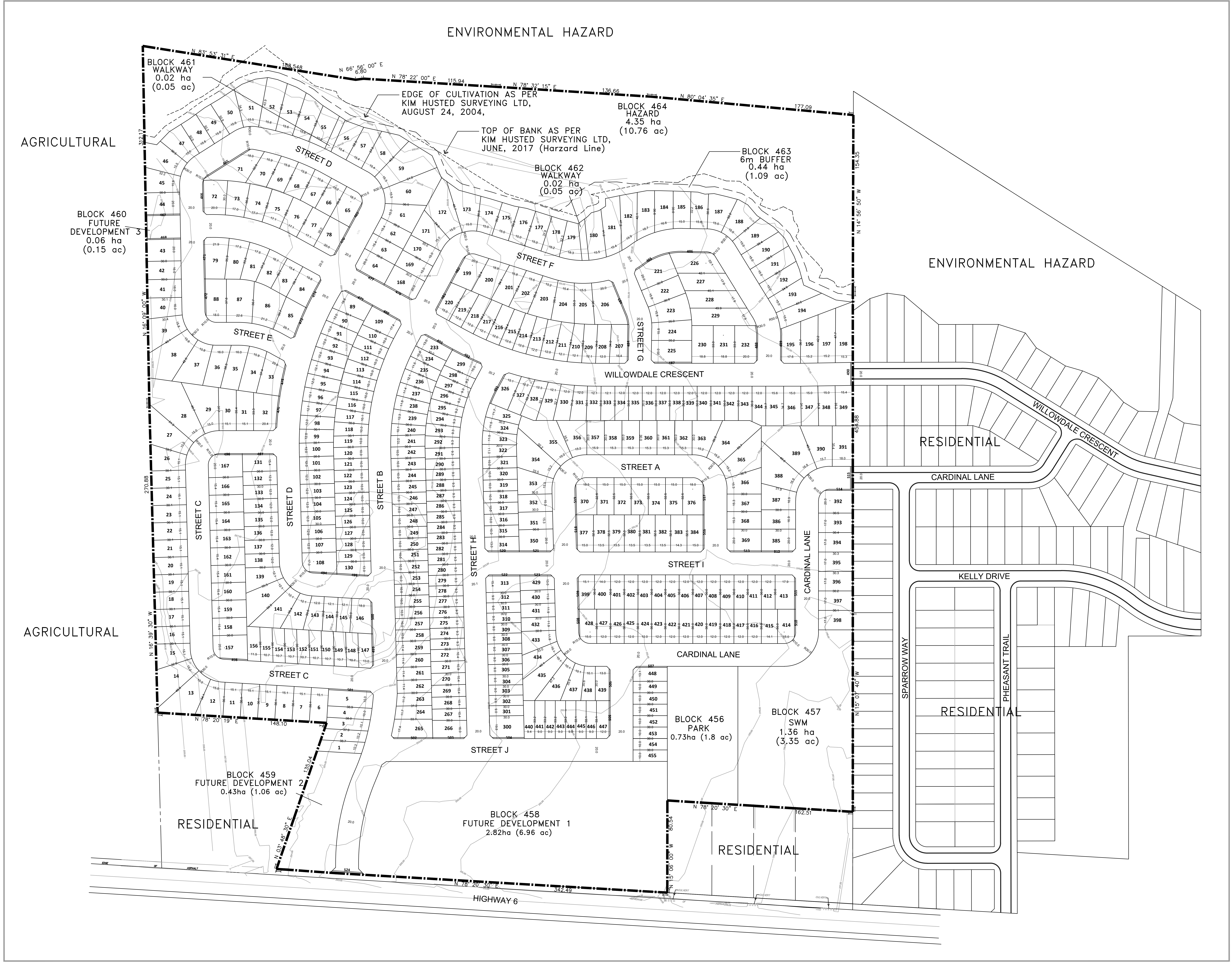
AM Peak Hour



PM Peak Hour

Figure 8

Full Build-out 2026



Legal Description

LYNN RIVER HEIGHTS PHASE 2
PART OF LOT 8, CONCESSION 2, GEOGRAPHIC
TOWNSHIP OF WOODHOUSE
NOW IN NORFOLK COUNTY

Owner's Certificate

I HEREBY AUTHORIZE MACNAUGHTON HERMSEN BRITTON CLARKSON PLANNING LIMITED TO SUBMIT THIS PLAN FOR APPROVAL.

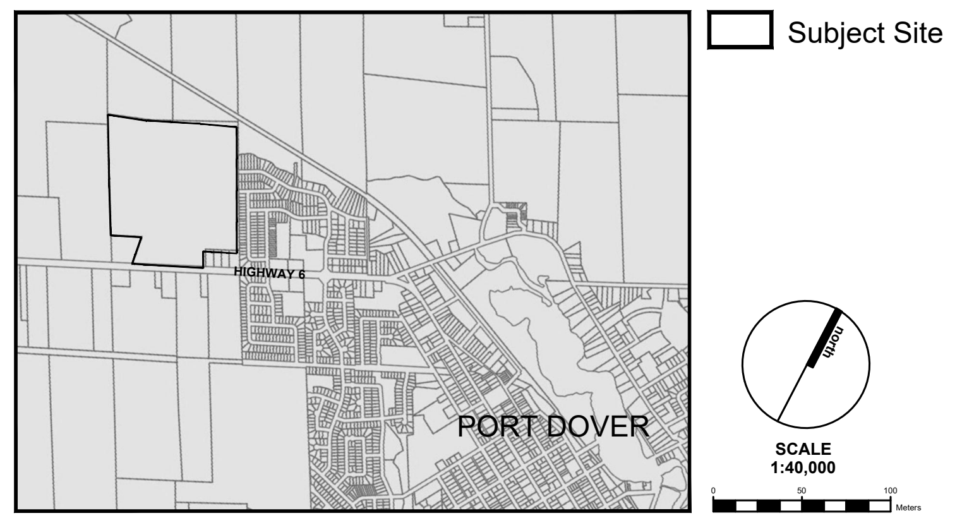
DATE: JUNE 2023
DEMOCRAT PORT DOVER LIMITED.

Surveyor's Certificate

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATE: JUNE 2017
KIM S. HUSTED, - O.L.S.

Key Plan



Revision No.	Date	Issued / Revision	By

Additional Information Required Under Section 51(17) of the Planning Act R.S.O. 1990, c.P.13 as Amended

A. As Shown
B. As Shown
C. As Shown
D. Residential, Employment, Commercial, Park, Stormwater Management, Open Space
E. As Shown
F. As Shown
G. As Shown
H. Municipal Water Supply
I. Loam
J. As Shown
K. All Services As Required
L. As Shown

Description	Lots/Blocks	Units	Area
9.0m Semi Detached	266-313, 440-447	56	1.69ha/4.18ac
10m Single Detached	1-5,109-130,147-156,233-265, 314-325,429-439, 448-455	101	3.42ha/8.46ac
12m Single Detached	89-108,131-146,207-220, 326-345,377-384,399-428	108	4.31ha/10.65ac
15m Single Detached	6-88, 157-206, 221-232, 346-376,385-398	190	11.38ha/28.12ac
Total Residential	1-455	455	**20.75ha/51.27ac**
20m ROW	Street A-J, Cardinal Lane, Willowdale Crescent	N/A	8.78ha/21.69ac
Total Roadways			**8.77ha/21.69ac**
Walkway	461,462	N/A	0.04ha/0.10ac
Parks & Open Space	456	N/A	0.73ha/1.8ac
SWM	457	N/A	1.36ha/3.35ac
6m Buffer	463	N/A	0.44ha/1.09ac
Hazard	464	N/A	4.35ha/10.76ac
Future Development	458, 459, 460	N/A	3.30ha/8.17ac
0.3 Reserves* (already included in lot area calculations)	465-524	N/A	0.05ha/0.12ac
Total Other	69 (Blocks 456 - 524)		**10.22ha/25.27ac**

Total Draft Plan of Subdivision: 39.8ha/98.2ac

MHBC
PLANNING
URBAN DESIGN
& LANDSCAPE
ARCHITECTURE

230-7050 WESTON ROAD WOODBRIDGE, ON, L4L 8G7 | P: 905 761 5588 F: 905 761 5589 | WWW.MHBCPLAN.COM

Stamp

Date June 23, 2023

File No. 08103-B

Plan Scale 1:1500 (Arch D)

Drawn By P.B.

Checked By D.W.

Other

Project

LYNN RIVER HEIGHTS PHASE 2

north

File Name DRAFT PLAN OF SUBDIVISION

Dwg No. 1 of 1

Scale Bar 0 2 4 Meters

Legal Description

LYNN RIVER HEIGHTS PHASE 2
PART OF LOT 8, CONCESSION 2, GEOGRAPHIC
TOWNSHIP OF WOODHOUSE
NOW IN NORFOLK COUNTY

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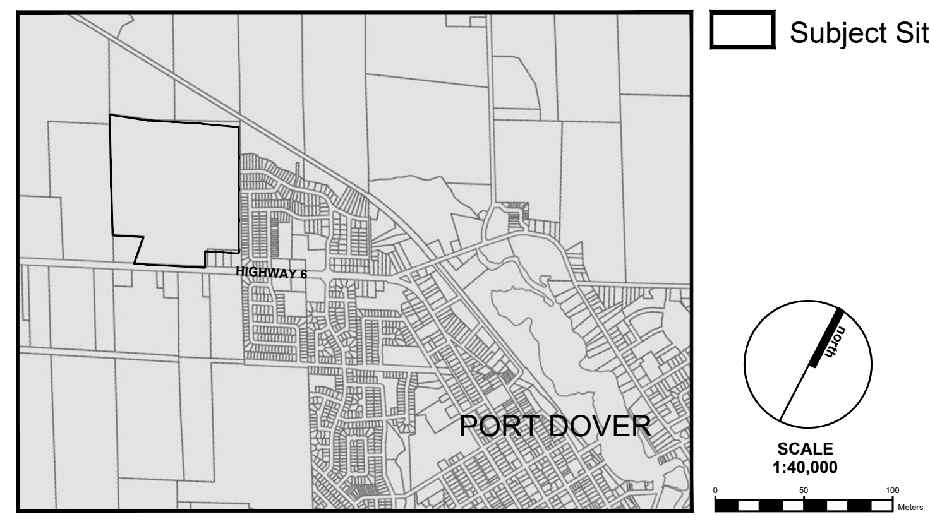
DATE: JUNE 2017 KIM S. HUSTED, - O.L.S.

Key Plan



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L. As Shown

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12m Single Detached	89-108,131-146,207-220, 326-345,377-384,399-428	108	4.31ha/10.65ac
15m Single Detached	6-88, 157-206, 221-232, 346-376,385-398	190	11.38ha/28.12ac
Total Residential	1-455	455	**20.75ha/51.27ac**
20m ROW	Street A-J, Cardinal Lane, Willowdale Crescent	N/A	8.78ha/21.69ac
Total Roadways			**8.77ha/21.69ac**
Walkway	461,462	N/A	0.04ha/0.10ac
Parks & Open Space	456	N/A	0.73ha/1.8ac
SWM	457	N/A	1.36ha/3.35ac
6m Buffer	463	N/A	0.44ha/1.09ac
Hazard	464	N/A	4.35ha/10.76ac
Future Development	458, 459, 460	N/A	3.30ha/8.17ac
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Total Other	69 (Blocks 456 - 524)		**10.22ha/25.27ac**

Total Draft Plan of Subdivision: 39.8ha/98.2ac

MHBC
PLANNING
URBAN DESIGN
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ARCHITECTURE

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Stamp

Date	**June 23, 2023**
File No.	**08103-B**
Plan Scale	**1:1500 (Arch D)**
Drawn By	**P.B.**
Checked By	**D.W.**
Other	

Project

LYNN RIVER HEIGHTS PHASE 2

north

File Name **DRAFT PLAN OF SUBDIVISION**

Dwg No. **1 of 1**

Scale Bar 0 2 4 Meters

Lynn River Heights Phase 2
June 23, 2023 Draft Plan Lot Areas and Frontages

Lot Number	Unit Type	Area (m^2)	Frontage (m)	Lot Num	Unit-Type	Area(m^2)	Frontage(m)
1	10m Single Detached	388.94	10.30	53	15m Single Detached	684.27	15.60
2	10m Single Detached	383.56	15.00	54	15m Single Detached	603.54	15.60
3	10m Single Detached	376.28	10.10	55	15m Single Detached	519.71	15.60
4	10m Single Detached	384.61	10.00	56	15m Single Detached	504.81	15.40
5*	10m Single Detached	586.01	15.00	57	15m Single Detached	535.33	15.40
6	15m Single Detached	455.40	15.10	58	15m Single Detached	776.62	15.40
7	15m Single Detached	455.43	15.10	59	15m Single Detached	1119.28	15.30
8	15m Single Detached	455.46	15.10	60	15m Single Detached	1034.92	15.30
9	15m Single Detached	455.49	15.10	61	15m Single Detached	635.48	15.30
10	15m Single Detached	455.52	15.10	62	15m Single Detached	467.00	15.40
11	15m Single Detached	455.54	15.10	63	15m Single Detached	465.09	15.40
12	15m Single Detached	581.56	15.00	64*	15m Single Detached	595.50	20.00
13	15m Single Detached	906.71	15.00	65*	15m Single Detached	565.84	18.70
14	15m Single Detached	817.14	15.00	66	15m Single Detached	456.16	15.20
15	15m Single Detached	545.80	15.00	67	15m Single Detached	464.04	15.90
16	15m Single Detached	454.37	15.10	68	15m Single Detached	477.22	15.90
17	15m Single Detached	454.46	15.10	69	15m Single Detached	477.55	15.90
18	15m Single Detached	454.56	15.10	70	15m Single Detached	505.74	15.90
19	15m Single Detached	454.65	15.10	71*	15m Single Detached	774.19	18.00
20	15m Single Detached	454.74	15.10	72*	15m Single Detached	619.25	20.00
21	15m Single Detached	454.84	15.10	73	15m Single Detached	542.28	17.00
22	15m Single Detached	454.93	15.10	74	15m Single Detached	544.93	17.10
23	15m Single Detached	455.03	15.10	75	15m Single Detached	543.60	17.10
24	15m Single Detached	455.12	15.10	76	15m Single Detached	535.68	17.10
25	15m Single Detached	455.22	15.10	77	15m Single Detached	513.09	17.10
26	15m Single Detached	562.11	15.10	78*	15m Single Detached	593.80	20.00
27	15m Single Detached	860.73	15.00	79*	15m Single Detached	731.02	21.90
28	15m Single Detached	1458.00	15.00	80	15m Single Detached	552.35	17.50
29	15m Single Detached	912.30	15.00	81	15m Single Detached	517.10	17.50
30	15m Single Detached	560.94	15.10	82	15m Single Detached	482.94	16.70
31	15m Single Detached	520.66	15.10	83	15m Single Detached	464.25	15.40
32*	15m Single Detached	673.64	20.40	84*	15m Single Detached	592.36	19.80
33*	15m Single Detached	667.03	20.00	85*	15m Single Detached	599.04	20.10
34	15m Single Detached	619.61	15.90	86	15m Single Detached	831.50	21.20
35	15m Single Detached	615.07	16.00	87	15m Single Detached	877.83	22.60
36	15m Single Detached	580.11	16.00	88*	15m Single Detached	699.59	18.00
37	15m Single Detached	774.22	15.80	89*	12m Single Detached	521.88	18.60
38	15m Single Detached	1105.45	15.80	90	12m Single Detached	360.73	12.00
39	15m Single Detached	709.13	15.80	91	12m Single Detached	353.71	12.00
40	15m Single Detached	507.34	16.00	92	12m Single Detached	341.40	12.00
41	15m Single Detached	479.93	16.00	93	12m Single Detached	355.26	12.00
42	15m Single Detached	479.95	16.00	94	12m Single Detached	347.13	12.10
43*	15m Single Detached	600.13	20.00	95	12m Single Detached	348.73	12.00
44*	15m Single Detached	599.35	20.00	96	12m Single Detached	354.17	12.10
45	15m Single Detached	551.72	15.60	97	12m Single Detached	342.67	12.10
46	15m Single Detached	724.03	15.50	98	12m Single Detached	346.56	12.00
47	15m Single Detached	562.72	15.60	99	12m Single Detached	349.02	12.00
48	15m Single Detached	471.43	15.60	100	12m Single Detached	360.03	12.00
49	15m Single Detached	483.38	15.60	101	12m Single Detached	360.00	12.00
50	15m Single Detached	598.14	15.60	102	12m Single Detached	360.00	12.00
51	15m Single Detached	843.24	15.50	103	12m Single Detached	360.00	12.00
52	15m Single Detached	729.09	15.60	104	12m Single Detached	360.00	12.00

105	12m Single Detached	360.00	12.00	158	15m Single Detached	460.90	15.40
106	12m Single Detached	360.00	12.00	159	15m Single Detached	460.90	15.40
107	12m Single Detached	360.00	12.00	160	15m Single Detached	460.90	15.40
108*	12m Single Detached	531.86	17.00	161	15m Single Detached	460.90	15.40
109*	10m Single Detached	538.86	17.40	162	15m Single Detached	460.90	15.40
110	10m Single Detached	301.14	10.00	163	15m Single Detached	460.90	15.40
111	10m Single Detached	314.05	10.20	164	15m Single Detached	460.90	15.40
112	10m Single Detached	325.22	10.30	165	15m Single Detached	460.90	15.40
113	10m Single Detached	321.54	10.00	166	15m Single Detached	460.90	15.40
114	10m Single Detached	310.23	10.10	167*	15m Single Detached	599.29	20.00
115	10m Single Detached	321.15	10.00	168*	15m Single Detached	595.50	20.00
116	10m Single Detached	301.23	10.00	169	15m Single Detached	448.30	15.00
117	10m Single Detached	322.49	10.10	170	15m Single Detached	450.00	15.00
118	10m Single Detached	329.78	10.00	171	15m Single Detached	578.34	15.00
119	10m Single Detached	300.24	10.00	172	15m Single Detached	897.38	15.00
120	10m Single Detached	300.00	10.00	173	15m Single Detached	715.65	15.00
121	10m Single Detached	300.00	10.00	174	15m Single Detached	506.13	15.00
122	10m Single Detached	300.00	10.00	175	15m Single Detached	455.61	15.00
123	10m Single Detached	300.00	10.00	176	15m Single Detached	473.31	15.00
124	10m Single Detached	300.00	10.00	177	15m Single Detached	476.85	15.00
125	10m Single Detached	300.00	10.00	178	15m Single Detached	489.83	16.20
126	10m Single Detached	300.00	10.00	179	15m Single Detached	486.07	18.30
127	10m Single Detached	300.00	10.00	180	15m Single Detached	613.53	15.50
128	10m Single Detached	300.00	10.00	181	15m Single Detached	744.25	15.40
129	10m Single Detached	300.00	10.00	182	15m Single Detached	645.34	15.90
130*	10m Single Detached	363.34	13.00	183	15m Single Detached	601.93	16.70
131*	12m Single Detached	462.24	15.40	184	15m Single Detached	563.24	16.60
132	12m Single Detached	359.27	12.00	185	15m Single Detached	493.48	15.00
133	12m Single Detached	359.33	12.00	186	15m Single Detached	476.39	15.00
134	12m Single Detached	359.39	12.00	187	15m Single Detached	595.01	15.00
135	12m Single Detached	359.45	12.00	188	15m Single Detached	617.00	15.00
136	12m Single Detached	359.51	12.00	189	15m Single Detached	588.84	15.00
137	12m Single Detached	359.56	12.00	190	15m Single Detached	592.52	15.00
138	12m Single Detached	359.94	12.00	191	15m Single Detached	584.52	15.00
139	12m Single Detached	509.34	12.10	192	15m Single Detached	547.63	15.00
140	12m Single Detached	754.57	12.10	193	15m Single Detached	613.03	15.00
141	12m Single Detached	693.23	12.10	194	15m Single Detached	836.35	15.00
142	12m Single Detached	475.32	12.10	195*	15m Single Detached	582.09	17.60
143	12m Single Detached	414.48	12.00	196	15m Single Detached	600.96	15.20
144	12m Single Detached	363.31	12.10	197	15m Single Detached	684.49	15.20
145	12m Single Detached	363.31	12.10	198	15m Single Detached	762.88	15.30
146*	12m Single Detached	561.60	18.00	199*	15m Single Detached	612.35	20.00
147*	10m Single Detached	386.85	13.00	200	15m Single Detached	616.93	18.90
148	10m Single Detached	322.00	10.70	201	15m Single Detached	556.77	15.80
149	10m Single Detached	322.22	10.70	202	15m Single Detached	580.56	15.60
150	10m Single Detached	322.22	10.70	203	15m Single Detached	623.48	15.20
151	10m Single Detached	322.22	10.70	204	15m Single Detached	612.73	15.40
152	10m Single Detached	322.22	10.70	205	15m Single Detached	587.63	15.50
153	10m Single Detached	322.22	10.70	206*	15m Single Detached	933.27	20.00
154	10m Single Detached	322.22	10.70	207*	12m Single Detached	538.19	16.40
155	10m Single Detached	322.22	10.70	208	12m Single Detached	408.01	12.00
156	10m Single Detached	343.41	11.50	209	12m Single Detached	403.80	12.10
157*	15m Single Detached	321.17	20.00	210	12m Single Detached	365.29	12.10

211	12m Single Detached	401.82	12.10	264	10m Single Detached	376.59	11.70
212	12m Single Detached	408.89	12.00	265*	10m Single Detached	590.50	14.00
213	12m Single Detached	383.77	12.00	266*	9m Semi-Detached	475.86	12.80
214	12m Single Detached	387.92	12.00	267	9m Semi-Detached	305.99	10.40
215	12m Single Detached	390.00	12.00	268	9m Semi-Detached	312.00	10.40
216	12m Single Detached	405.66	12.00	269	9m Semi-Detached	312.00	10.40
217	12m Single Detached	386.76	12.10	270	9m Semi-Detached	312.00	10.40
218	12m Single Detached	402.40	12.00	271	9m Semi-Detached	312.00	10.40
219	12m Single Detached	387.92	12.00	272	9m Semi-Detached	312.00	10.40
220*	12m Single Detached	462.35	15.00	273	9m Semi-Detached	277.95	9.30
221*	15m Single Detached	747.73	20.00	274	9m Semi-Detached	277.95	9.30
222	15m Single Detached	567.72	15.80	275	9m Semi-Detached	277.95	9.30
223	15m Single Detached	668.07	15.80	276	9m Semi-Detached	277.95	9.30
224	15m Single Detached	586.28	15.80	277	9m Semi-Detached	277.95	9.30
225*	15m Single Detached	702.89	20.00	278	9m Semi-Detached	277.95	9.30
226*	15m Single Detached	755.39	22.10	279	9m Semi-Detached	277.95	9.30
227	15m Single Detached	665.00	17.90	280	9m Semi-Detached	277.95	9.30
228	15m Single Detached	720.76	17.90	281	9m Semi-Detached	277.95	9.30
229	15m Single Detached	813.50	17.90	282	9m Semi-Detached	277.95	9.30
230	15m Single Detached	619.12	18.80	283	9m Semi-Detached	277.95	9.30
231	15m Single Detached	619.12	18.80	284	9m Semi-Detached	277.95	9.30
232*	15m Single Detached	653.46	20.00	285	9m Semi-Detached	277.95	9.30
233*	10m Single Detached	373.51	13.00	286	9m Semi-Detached	277.95	9.30
234	10m Single Detached	300.02	10.00	287	9m Semi-Detached	277.95	9.30
235	10m Single Detached	327.57	11.50	288	9m Semi-Detached	277.95	9.30
236	10m Single Detached	342.57	12.10	289	9m Semi-Detached	277.95	9.30
237	10m Single Detached	324.00	11.40	290	9m Semi-Detached	277.95	9.30
238	10m Single Detached	330.99	11.80	291	9m Semi-Detached	278.47	9.30
239	10m Single Detached	343.83	12.30	292	9m Semi-Detached	297.80	9.30
240	10m Single Detached	275.91	10.10	293	9m Semi-Detached	297.80	9.30
241	10m Single Detached	300.33	10.00	294	9m Semi-Detached	298.97	9.30
242	10m Single Detached	300.00	10.00	295	9m Semi-Detached	296.63	9.20
243	10m Single Detached	300.00	10.00	296	9m Semi-Detached	297.80	9.30
244	10m Single Detached	300.00	10.00	297	9m Semi-Detached	297.80	9.30
245	10m Single Detached	300.00	10.00	298	9m Semi-Detached	278.02	9.30
246	10m Single Detached	300.00	10.00	299*	9m Semi-Detached	457.92	15.00
247	10m Single Detached	300.00	10.00	300*	9m Semi-Detached	593.94	16.60
248	10m Single Detached	300.00	10.00	301	9m Semi-Detached	270.02	9.00
249	10m Single Detached	300.00	10.00	302	9m Semi-Detached	270.02	9.00
250	10m Single Detached	300.00	10.00	303	9m Semi-Detached	270.02	9.00
251	10m Single Detached	300.00	10.00	304	9m Semi-Detached	270.02	9.00
252	10m Single Detached	300.00	10.00	305	9m Semi-Detached	273.98	9.00
253	10m Single Detached	300.00	10.00	306	9m Semi-Detached	270.13	9.00
254	10m Single Detached	300.00	10.00	307	9m Semi-Detached	270.13	9.00
255	10m Single Detached	300.00	10.00	308	9m Semi-Detached	270.13	9.00
256	10m Single Detached	300.00	10.00	309	9m Semi-Detached	270.13	9.00
257	10m Single Detached	300.00	10.00	310	9m Semi-Detached	270.13	9.00
258	10m Single Detached	300.00	10.00	311	9m Semi-Detached	270.13	9.00
259	10m Single Detached	340.50	11.40	312	9m Semi-Detached	270.13	9.00
260	10m Single Detached	340.50	11.40	313*	9m Semi-Detached	449.56	15.40
261	10m Single Detached	340.50	11.40	314*	10m Single Detached	392.80	13.00
262	10m Single Detached	340.50	11.40	315	10m Single Detached	300.00	10.00
263	10m Single Detached	343.23	11.20	316	10m Single Detached	300.00	10.00

317	10m Single Detached	300.00	10.00	370*	15m Single Detached	573.93	18.50
318	10m Single Detached	300.00	10.00	371	15m Single Detached	487.50	15.00
319	10m Single Detached	300.00	10.00	372	15m Single Detached	487.50	15.00
320	10m Single Detached	300.00	10.00	373	15m Single Detached	487.50	15.00
321	10m Single Detached	300.00	10.00	374	15m Single Detached	487.50	15.00
322	10m Single Detached	319.18	11.00	375	15m Single Detached	487.50	15.00
323	10m Single Detached	316.11	11.50	376*	15m Single Detached	590.64	18.00
324	10m Single Detached	313.25	11.50	377*	12m Single Detached	491.65	15.00
325*	10m Single Detached	315.24	11.70	378	12m Single Detached	438.44	13.50
326*	12m Single Detached	491.53	15.10	379	12m Single Detached	438.44	13.50
327	12m Single Detached	391.93	12.20	380	12m Single Detached	438.44	13.50
328	12m Single Detached	452.90	12.30	381	12m Single Detached	438.44	13.50
329	12m Single Detached	438.23	12.10	382	12m Single Detached	438.44	13.50
330	12m Single Detached	408.04	12.00	383	12m Single Detached	465.16	14.30
331	12m Single Detached	394.79	12.00	384*	12m Single Detached	482.67	15.00
332	12m Single Detached	369.73	12.10	385*	15m Single Detached	595.50	20.00
333	12m Single Detached	366.07	12.10	386	15m Single Detached	507.24	16.90
334	12m Single Detached	360.00	12.00	387	15m Single Detached	583.41	16.90
335	12m Single Detached	360.00	12.00	388	15m Single Detached	903.57	16.80
336	12m Single Detached	360.00	12.00	389	15m Single Detached	1279.10	16.80
337	12m Single Detached	360.00	12.00	390	15m Single Detached	763.27	15.70
338	12m Single Detached	360.00	12.00	391	15m Single Detached	637.16	18.00
339	12m Single Detached	360.00	12.00	392*	15m Single Detached	604.30	20.00
340	12m Single Detached	360.00	12.00	393	15m Single Detached	518.88	17.00
341	12m Single Detached	360.00	12.00	394	15m Single Detached	517.30	17.00
342	12m Single Detached	360.00	12.00	395	15m Single Detached	515.86	17.00
343	12m Single Detached	360.88	12.00	396	15m Single Detached	514.42	17.00
344	12m Single Detached	400.76	12.00	397	15m Single Detached	512.98	17.00
345	12m Single Detached	541.47	15.60	398	15m Single Detached	511.53	17.00
346	15m Single Detached	526.66	15.00	399*	15m Single Detached	440.56	15.10
347	15m Single Detached	524.98	15.00	400	12m Single Detached	420.00	14.00
348	15m Single Detached	526.67	15.00	401	12m Single Detached	360.00	12.00
349*	15m Single Detached	535.78	15.40	402	12m Single Detached	360.00	12.00
350*	15m Single Detached	588.21	20.00	403	12m Single Detached	360.00	12.00
351	15m Single Detached	460.34	15.30	404	12m Single Detached	360.00	12.00
352	15m Single Detached	460.34	15.30	405	12m Single Detached	360.00	12.00
353	15m Single Detached	573.73	15.30	406	12m Single Detached	360.00	12.00
354	15m Single Detached	882.96	15.20	407	12m Single Detached	360.00	12.00
355	15m Single Detached	1019.37	15.20	408	12m Single Detached	360.00	12.00
356	15m Single Detached	616.42	15.20	409	12m Single Detached	360.00	12.00
357	15m Single Detached	460.34	15.90	410	12m Single Detached	360.00	12.00
358	15m Single Detached	460.34	15.30	411	12m Single Detached	360.00	12.00
359	15m Single Detached	460.34	15.30	412	12m Single Detached	360.00	12.00
360	15m Single Detached	460.34	15.30	413*	12m Single Detached	532.25	17.90
361	15m Single Detached	460.34	15.30	414*	12m Single Detached	453.53	15.00
362	15m Single Detached	460.34	15.30	415	12m Single Detached	423.47	14.10
363	15m Single Detached	616.09	15.20	416	12m Single Detached	360.00	12.00
364	15m Single Detached	977.94	15.20	417	12m Single Detached	360.00	12.00
365	15m Single Detached	585.79	15.20	418	12m Single Detached	360.00	12.00
366	15m Single Detached	561.22	15.30	419	12m Single Detached	360.00	12.00
367	15m Single Detached	460.34	15.30	420	12m Single Detached	360.00	12.00
368	15m Single Detached	460.41	15.30	421	12m Single Detached	360.00	12.00
369*	15m Single Detached	595.50	20.00	422	12m Single Detached	360.00	12.00

423	12m Single Detached	360.00	12.00
424	12m Single Detached	360.00	12.00
425	12m Single Detached	360.00	12.00
426	12m Single Detached	360.00	12.00
427	12m Single Detached	360.00	12.00
428*	12m Single Detached	459.07	15.00
429*	10m Single Detached	394.86	13.00
430	10m Single Detached	357.30	11.90
431	10m Single Detached	357.30	11.90
432	10m Single Detached	357.30	11.90
433	10m Single Detached	465.95	11.80
434	10m Single Detached	496.70	10.10
435	10m Single Detached	728.99	10.10
436	10m Single Detached	568.26	10.10
437	10m Single Detached	419.63	10.10
438	10m Single Detached	333.92	10.10
439*	10m Single Detached	385.32	13.00
440	9m Semi-Detached	317.79	9.40
441	9m Semi-Detached	298.57	9.00
442	9m Semi-Detached	298.50	9.00
443	9m Semi-Detached	298.43	9.00
444	9m Semi-Detached	298.35	9.00
445	9m Semi-Detached	298.28	9.00
446	9m Semi-Detached	298.20	9.00
447*	9m Semi-Detached	392.99	12.00
448*	10m Single Detached	386.75	13.10
449	10m Single Detached	299.21	10.00
450	10m Single Detached	299.33	10.00
451	10m Single Detached	299.46	10.00
452	10m Single Detached	299.59	10.00
453	10m Single Detached	299.72	10.00
454	10m Single Detached	299.84	10.00
455	10m Single Detached	299.97	10.00
* Signifies Corner Lot			

LYNN RIVER HEIGHTS PHASE 2 | COMMENTS & RESPONSE MATRIX

NORFOLK COUNTY FILE NOS. 28TPL2017317 & ZNPL2017318

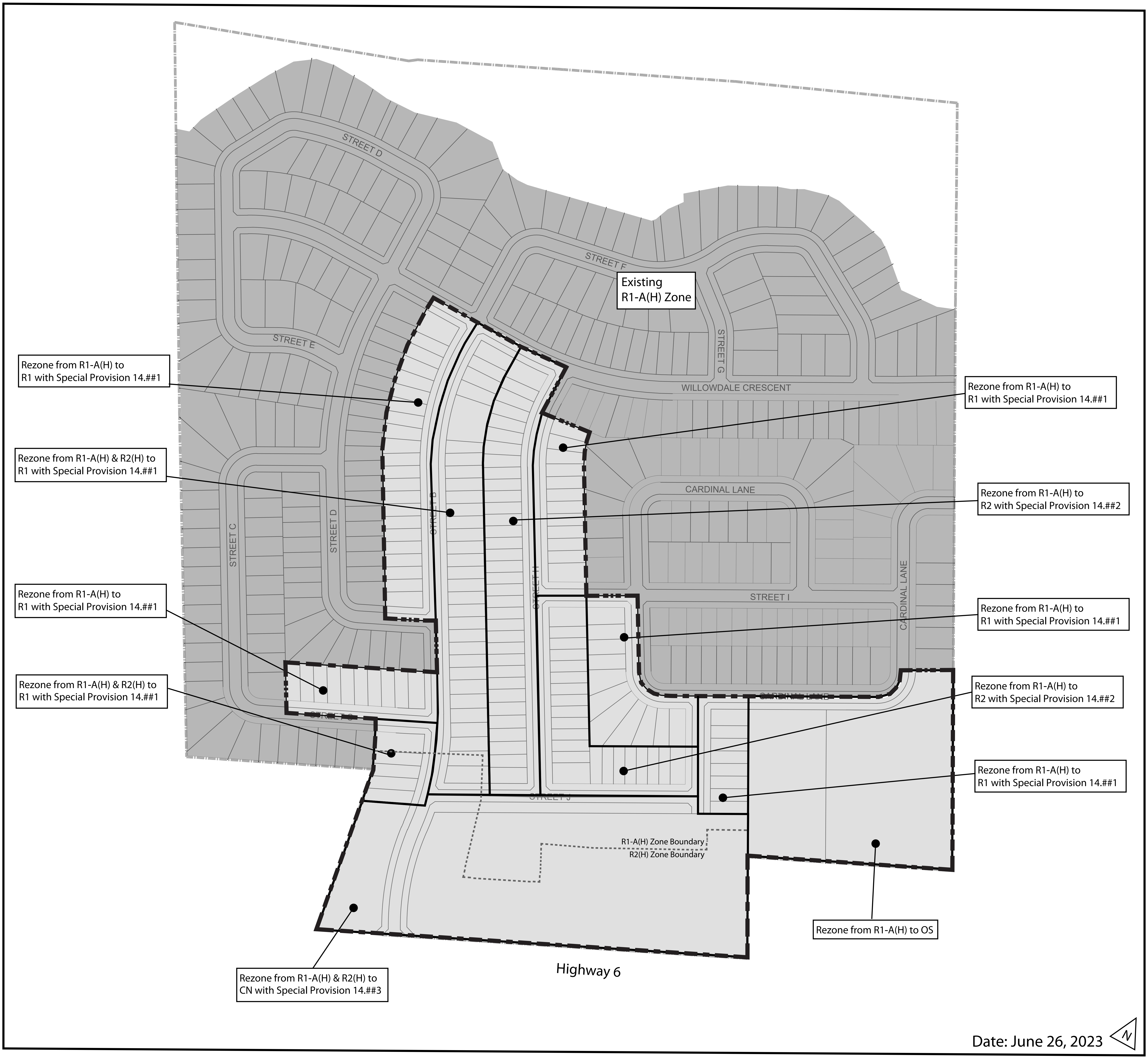
COMMENTS RECEIVED FROM COUNTY PLANNING APRIL 14, 2023

NO.	COUNTY COMMENTS – APRIL 14, 2023	MHBC RESPONSE – JUNE 23, 2023
1.0	**ZONING COMMENTS**	
1.1	Planning staff recommend that the applicant provide a draft zoning by-law amendment identifying all the zoning relieves required. This will help Staff to further review the zoning application.	• A draft zoning by-law amendment (text and Map "A") has been submitted to implement the June 23, 2023 revised DPOS.
1.2	Please provide a zoning table to identify the zoning compliance and the zoning relieves that need to be addressed in the zoning by-law amendment.	• A zoning compliance table (for lot area and lot frontages) together with a draft zoning by-law amendment has been provided. Note: once draft plan approval has been issued, a draft M-Plan will be prepared by a surveyor to further confirm lot area and frontages of each lot and block.
2.0	**SUBDIVISION COMMENTS**	
2.1	• It is the planning Staff's opinion that the consolidation of the proposed parkland with the stormwater management pond is appropriate;	• Noted. The consolidated location of the park and SWM blocks are provided on the June 2023 revised DPOS.
2.2	• Willowdale Crescent extension and Street B should be considered as 'Green / Vista Streets' – These streets should be designed to visually and physically connect new neighbourhoods and the northern natural context.	• Willowdale Crescent extension and Street B have been designed according to Norfolk County's Design Criteria dated August 2017 (Section 6.6.01).
2.3	• Green / Vista Streets should include upgraded front elevations for all dwellings on either side of the street with plenty of lay-by parking opportunities and green boulevards.	• The proposed street and boulevard design provide sufficient on-street parking as shown on the June 2023 Conceptual Streetscape Plan prepared in support of the June 23, 2023 DPOS.
2.4	• Green / Vista Streets should incorporate visually impactful street trees distinct in their size, form and fall leaf colour. A tree plantation plan will be a condition of the draft approval.	• A detailed Tree Planting Plan will be provided to address street trees as a condition of draft plan approval.
2.5	• 10 m singles may not allow the required space for on-street parking between driveways. A minimum of 12 m singles are encouraged along Street B and Willowdale Cres.	• Sufficient parking can be accommodated on Street B and Willowdale Crescent as shown on the June 2023 Conceptual Streetscape Plan.
2.6	• An on-street parking layout will be required to support the reduced lot frontage (10m; Please show the driveway of each unit to identify the spaces required for on-street parking)	• The June 23, 2023 10-metre Lot Conceptual Streetscape Plan has been provided to demonstrate that on-street parking can be accommodated with specific zoning provisions and design elements proposed.
2.7	• Staff would like to see streetscape design for Street B and Willowdale Cres as a condition of the draft plan approval.	• Noted

NO.	COUNTY COMMENTS – APRIL 14, 2023	MHBC RESPONSE – JUNE 23, 2023
2.8	• Please submit an appropriate draft plan of subdivision with a table identifying all lot and block numbers and reserved blocks with their areas. The reserve blocks will include 0.3 m reserves at all exterior side yard lines.	• Provided
2.9	• Please include a minimum of 5mX5m daylight triangle as part of the ROW; please contact Staff if you have any questions in this regard.	• In accordance with the municipality's engineering design standards and with Staff direction, a 5mx5m daylight triangle is provided at the intersection of Street B and Highway 6, and 3mx3m daylight triangles are provided at the intersections of all other internal streets.
2.10	• Please include a phasing plan if the proposal is divided into phases.	• Phasing of the subdivision is not proposed relative to plan registration. However, it is expected the subdivision will be constructed in phases. Further, detailed development plans for the two mixed-use future development blocks will be provided at a later date, and any necessary planning applications will be made at that time.
2.11	• As per previous Staff comments and the Draft Port Dover Secondary Plan, an entry/gateway feature would be recommended for this development proposal. The future mixed-use block should incorporate the gateway features with future planning applications.	• Noted – a gateway feature will be incorporated in the design and development of the two mixed-use future development blocks.
3.0	**MIXED-USE/FUTURE DEVELOPMENT BLOCK ALONG HIGHWAY 6**	
3.1	• Staff highly recommends exploring the possibility of a mixed-use block incorporating neighborhood-scale commercial on the ground floor and residential on the upper floors along Highway 6. While vehicular access and parking can be provided from the rear side of the block, there should have an active pedestrian frontage with potential retail/office/food facilities at the front.	• Noted – the June 23, 2023 revised DPOS includes two future development blocks which are intended for mixed-use and/or medium density development. These blocks comprise the 2nd development phase of the Phase 2 subdivision and will be subject to further site plan review and approvals.
3.2	• Staff would be able to further assist in identifying the density, FAR and parking requirements as appropriate;	• Noted
4.0	**AGREEMENT & DEVELOPMENT COORDINATOR**	
4.1	• During the draft plan of subdivision application, conditions will be included as part of the planning report which includes the requirement of a subdivision agreement. • One of these conditions will be for the Owner to enter into a Subdivision Agreement, and any subsequent amending or supplementary Agreements thereto, and that the Agreements shall be registered on title to the subject lands, all at the Owner's expense. The draft plan conditions will need to be fulfilled or satisfied prior to registration of your subdivision agreement.	• Noted

Zoning By-law Amendment
Norfolk County - Map A

In the Geographic Township of Woodhouse (Port Dover)



Existing R1-A(H) Zone

Rezone from R1-A(H) to R1 with Special Provision 14.##1

Rezone from R1-A(H) & R2(H) to R1 with Special Provision 14.##1

Rezone from R1-A(H) to R1 with Special Provision 14.##1

Rezone from R1-A(H) & R2(H) to R1 with Special Provision 14.##1

Rezone from R1-A(H) to R1 with Special Provision 14.##1

Rezone from R1-A(H) to R2 with Special Provision 14.##2

Rezone from R1-A(H) to R1 with Special Provision 14.##1

Rezone from R1-A(H) to R2 with Special Provision 14.##2

Rezone from R1-A(H) to R1 with Special Provision 14.##1

Rezone from R1-A(H) to OS

Rezone from R1-A(H) & R2(H) to CN with Special Provision 14.##3

Date: June 26, 2023

⬚ Lands Subject to Rezoning

(H) - Holding

(R1) - Urban Residential Type 1

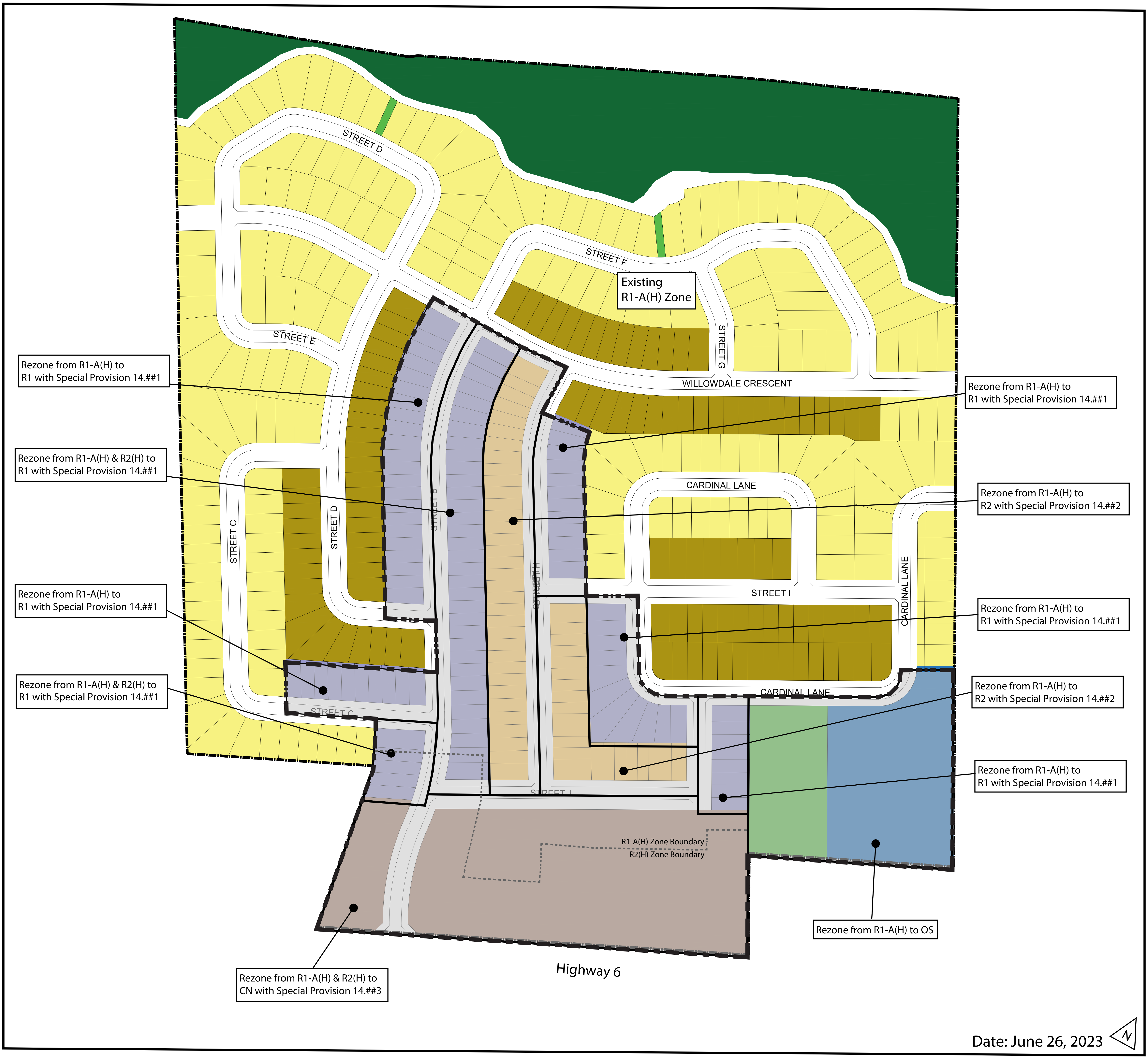
(OS) - Open Space

(R2) - Urban Residential Type 2

(CN) - Neighbourhood Commercial

Zoning By-law Amendment
Norfolk County - Map A

In the Geographic Township of Woodhouse (Port Dover)



⸾ Lands Subject to Rezoning
(H) - Holding
(R1) - Urban Residential Type 1
(OS) - Open Space
(R2) - Urban Residential Type 2
(CN) - Neighbourhood Commercial

🟧	9m Semis
🟪	10m Singles
🟫	12m Singles
🟨	15m Singles
🟫	Future Development
🟩	Parks and Open Space
🟦	Storm Water Management
🟩	Environmental Protection

LYNN RIVER HEIGHTS PHASE 2 – PORT DOVER

DRAFT ENGINEERING CONDITIONS OF DRAFT PLAN APPROVAL

(June 27, 2023 Update to the County's April 25, 2019 Recommended Engineering Conditions of DPA)

Studies, Reports and Assessments Prior to Final Plan Approval:

1. AND FURTHER THAT prior to final approval the Owner covenants and agrees in the Subdivision Agreement that all studies, reports, and assessments will be completed by a qualified professional, and their findings and recommendations will be implemented accordingly.
2. AND FURTHER THAT prior to final approval and registration of the plan in whole, or in part, the Owner, as part of the subdivision agreement, shall agree to carry out the recommendations and any necessary mitigation provided in the required studies, reports and assessments including, but not limited to and to the satisfaction of Norfolk County:
    a) Functional Servicing Report prepared by Girard Engineering; or as amended;
    b) Stormwater Management Report dated March 2019 prepared by Girard Engineering; or as amended;
    c) Geotechnical Report dated (April 24, 2016) prepared by Chung & Vander Doelen Engineering Ltd; or as amended;
    d) Water Modelling Report, dated May 22, 2018 and the Sanitary Modelling Report, dated January 4, 2019 prepared by RV Anderson; or as amended; and
    e) Traffic Impact Assessment dated August 2016 prepared by F.R. Berry & Associates; or as amended.

Development Engineering:

2. AND FURTHER THAT the Owner shall agree, prior to any site alteration, to provide a copy of the Environmental Compliance Approval from the appropriate Ministry relating to the municipal water, sanitary and storm systems for the whole development or phase thereof.
3. AND FURTHER THAT the Owner understands and accepts that Norfolk County is under no obligation to provide final plan approval for this development until sewage capacity at the Port Dover Wastewater Treatment facility and water capacity at the Port Dover Water Treatment facility is available and allocated to this development.
4. AND FURTHER THAT the Owner shall agree that prior to assumption that they will be responsible for the clean out of the sediment forebay which will involve removing all sediment and returning the forebay to its original design condition in conformance with the Ministry's Environmental Compliance Approval. Removal of the sediment is subject to the requirements of the *Environmental Assessment Act, R.S.O. 1990, c. E. 18.*

5. AND FURTHER THAT the Owner shall agree to obtain a road occupancy permit from Norfolk County prior to the commencement of any servicing or other works within any County road right-of-way.
6. AND FURTHER THAT, should phasing of plan registration be proposed, the Owner shall agree within each phase of the development, that any road that is not a through street at the completion of the phase will be terminated as a temporary turning circle in accordance with Norfolk County Design Criteria (2017), to the satisfaction of Norfolk County.
7. AND FURTHER THAT the Owner agrees to install sidewalks in the general locations identified on the Draft Plan of Subdivision prepared by MHBC Planning, dated June 23, 2023, and to the satisfaction of Norfolk County.
8. AND FURTHER THAT the Owner shall agree that prior to final plan approval and registration of the plan in whole, or in part, that a water distribution system report that documents the simulation of fire flows and domestic usage be completed with recommendations implemented at the expense of the Owner to the satisfaction of Norfolk County.
9. AND FURTHER THAT the Owner shall agree prior to final plan approval and registration of the plan in whole, or in part, that a sewer collection system modeling report that documents the simulation of domestic usage be completed with recommendations implemented at the expense of the Owner to the satisfaction of Norfolk County.
10. AND FURTHER THAT the Owner shall agree to prepare engineering design drawings, including, but not limited to general plan of services, grading, drainage, sediment and erosion control, plan and profile design drawings, to the satisfaction of Norfolk County, as may be required for the subject lands in accordance with the most recent Norfolk County Design Criteria (2017) and the recommendations of the studies, reports and assessments. In addition, the Owner shall further agree at the Owner's sole expense, to construct the accepted works, to the satisfaction of Norfolk County.
11. AND FURTHER THAT the Owner shall provide a suitable legal outlet for the stormwater management facilities to the satisfaction of Norfolk County.
12. AND FURTHER THAT the Owner shall agree that all construction access shall be from Norfolk County Highway 6. In addition, the Owner shall also agree to undertake works and pay all costs related to the restoration of Norfolk County Highway 6 if damaged during development. The owner shall agree to develop and provide a construction staging plan to the satisfaction of Norfolk County.
13. AND FURTHER THAT the Owner shall agree to prepare engineering as-constructed drawings, to the satisfaction of Norfolk County in accordance with the most recent Norfolk County Design Criteria (2017).

Street B and Norfolk County Highway 6 Intersection Conditions:

14. AND FURTHER THAT the Owner shall include design and cost estimate schedules and provisions for the construction of traffic control measures as recommended by the Traffic Impact Assessment set out in Condition 2 to allow registration of the subject lands, at the owner's cost, at the intersection of Street B and Norfolk County Highway 6. The control measures must be designed by a qualified professional, to the satisfaction of Norfolk County.
15. AND FURTHER THAT, prior to final plan approval, the Owner shall agree in the Subdivision Agreement to convey, if necessary, sufficient lands to the County for road widening and daylight triangles, to the satisfaction of Norfolk County.

KITCHENER | WOODBRIDGE | LONDON | BARRIE | BURLINGTON

CELEBRATING 50 YEARS est. 1973 MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE

July 13, 2023

Tricia Givens, M.Sc.(Pl), MCIP, RPP
Director, Planning
Community Development Division
Norfolk County
185 Robinson St., Suite 200
Simcoe, ON N3Y 5L6

Dear Ms. Givens:

RE: LYNN RIVER HEIGHTS PHASE 2, PORT DOVER
REVISED DRAFT PLAN OF SUBDIVISION and ZONING BY-LAW AMENDMENT
COUNTY FILE NUMBERS: 28TPL2017317 and ZNPL2017318. OUR FILE: 08103

We are writing further to our ongoing 2022 and 2023 communications with County Staff regarding the Lynn River Heights Phase 2 subdivision located in Port Dover. On behalf of our client, Democrat Port Dover Limited (the "Owners"), we are pleased to submit a revised Draft Plan of Subdivision ("DPOS") and a proposed Zoning By-law Amendment ("ZBLA") for the Phase 2 development.

This letter summarizes the background chronology of the Phase 2 project and outlines the revisions proposed by the June 2023 DPOS and implementing ZBLA.

In support of the revised DPOS, and in accordance with Staff's direction, we are pleased to provide digital (PDF) copies of the following materials:

i) Revised Draft Plan of Subdivision (DPOS) dated June 23, 2023 which includes all lot statistics and has been updated to address Staff's June 17, 2022 and April 14, 2023 review comments;
ii) Minimum Lot Area / Lot Frontage Table for the June 23, 2023 revised DPOS;
iii) Draft Zoning By-law Amendment text and Map A to implement the June 23, 2023 DPOS;
iv) Comment Response Matrix in reply to Planning Staff's April 14, 2023 review comments; and,
v) Draft set of Engineering Draft Approval Conditions which have been updated from County Engineering's draft Engineering Conditions issued on April 25, 2019.

Cheque payment for the County's $1,070.00 application recirculation fee is being provided by the Owner under separate cover.

PROJECT BACKGROUND

Original Draft Plan of Subdivision

The Lynn River Heights Phase 2 subdivision was originally Draft Plan Approved ("DPA") around 2006 for approximately 484 residential units. ZBLA 73-Z-2006 rezoned the lands from Agricultural (A) and Hazard Land (HL) to Urban Residential Types R1-A(H) and R2(H) and Hazard Land (HL) to implement the subdivision. Unfortunately, DPA for the development lapsed in 2015.

2017 Draft Plan and Zoning By-Law Amendment Applications

In 2016, new DPOS and ZBLA applications were initiated by the Owner's engineer Len Girard (Girard Engineering). In accordance with the 2016 pre-consultation direction provided by County Staff, Girard Engineering submitted concurrent DPOS and ZBLA applications in 2017. The 2017 applications were subsequently deemed complete by Planning Staff.

The 2017 applications requested exceptions to allow 2nd suites in the R1 Zone, to increase the number of R2 units, and remove the Holding (H) provision. The 2017 DPOS contained certain lots marked by an asterisk indicating the accessory units/2nd suites. A draft ZBLA text and schedule were not included in the 2017 application.

2019

In January 2019, Mitchinson Planning was retained by the Owners to obtain approval for the 2017 DPOS. Mitchinson Planning worked with Girard Engineering to ensure all outstanding technical requirements (i.e. SWM, site servicing, traffic impact studies, etc.) were completed and submitted to the County. To this end, Girard Engineering filed a further technical submission with the County on March 22, 2019.

On May 3, 2019, County Staff issued a second set of comments and included a draft set of Engineering Draft Approval Conditions (dated April 25, 2019) in support of the 2017 DPOS. Planning Staff advised they had no concerns with the 2017 DPOS. They did not identify any zoning requirements and were preparing to take a Report to Council recommending DPA of the December 2017 Draft Plan.

Girard Engineering responded to the County's May 2019 comments on May 28, 2019. However, on June 3, 2019, the County advised the Phase 2 development was on hold due to Port Dover servicing constraints.

2019 Interim Control By-law

On June 3, 2019, the County advised all development applications in Port Dover were on hold due to municipal servicing constraints. An Interim Control By-law was subsequently enacted.

2022 Reactivation of the 2017 Applications

In March 2022, the Owners were advised the servicing study associated with the Interim Control By-law was completed and that development applications in Port Dover were being reactivated, including the Owners' Phase 2 subdivision suspended in May 2019.

On April 5, 2022, the project team met with County Staff and were advised Staff were re-circulating the 2017 DPOS given the project had been on hold for over two years, and there were new staff who were unfamiliar with the Phase 2 development.

On June 17, 2022, County Planning Staff provided comments on the 2017 DPOS including comments related to the 2017 ZBLA. This was the first time any comments were provided on the 2017 ZBLA application.

In August 2022, the project was transferred to MHBC Planning as Nicola Mitchinson was transitioning into retirement. Between August 2022 and December 2022, Mitchinson Planning and MHBC met and corresponded with County Planning and Engineering Staff on numerous occasions to discuss the applications and obtain outstanding Engineering review comments. As of July 2023, the Engineering review comments requested since April 2022 had not been received by the project team.

After extensive consultation and consideration, the project team determined that certain revisions to the 2017 DPOS would enhance the proposed development, including: the introduction of additional housing types and tenures; the establishment of two mixed-use future development blocks along Highway 6; and relocation of the public park to a more centralized and accessible site adjacent to the SWM facility.

2023

Between January and March 2023, the team assessed several design options. On March 27, 2023, a preliminary revised DPOS was submitted to County Planning Staff for discussion purposes.

On April 14, 2023, Planning Staff provided written comments on the March 27th DPOS. Responses to the County's April 14 review comments are provided in a Comment Response Matrix attached to this submission as **Appendix A**, and are reflected in the June 23, 2023 revised DPOS.

The preliminary March 27, 2023 DPOS has now been formalized as the June 23, 2023 DPOS and constitutes the basis of this July 2023 submission.

JUNE 2023 REVISED DRAFT PLAN OF SUBDIVISION AND ZONING BY-LAW AMENDMENT

June 2023 Revised Draft Plan of Subdivision

In response to County review comments, and to ensure the Draft Plan's alignment with the policies and objectives of the County's 2022 Official Plan and Port Dover's June 2021 draft Secondary Plan, the following changes have been incorporated in the June 23, 2023 revised DPOS:

- A broader ranges of housing types, tenures, and levels of affordability have been introduced including 12 m single detached lots, a new 10 m single detached lot category, and two mixed-use local commercial / medium density future development blocks;
- The public park has been relocated to the area adjacent to the stormwater management ("SWM") facility providing a more centralized, desirable, and functional park configuration as well as opportunities for more efficient park / SWM maintenance;
- The area previously occupied by the public park and residential lots has been replaced with two future development blocks to support mixed uses along Highway 6 as contemplated by Port Dover's Draft Secondary Plan;
- There has been a slight adjustment to Streets H and J due to the park relocation and to provide a more direct internal access to the future development blocks. Street J, as proposed, will help minimize any potential traffic conflicts between residential uses within the subdivision and the future mixed-use development;
- The proposed round-about entrance at Highway 6 and Street B has been replaced with a traditional intersection (including 5 m x 5 m daylight triangles) due to jurisdictional issues (MTO ownership of Highway 6) and design/construction/land ownership/cost share challenges associated with the round-about; and,
- 3 m x 3 m daylight triangles have been included at the intersections of local streets.

While the June 2023 DPOS introduces a greater variety of housing types, the Draft Plan revisions result in a reduction in the total number of residential units from 499 proposed in the December 2017 DPOS to 455 residential units in the June 23, 2023 DPOS, including:

- A reduction in the 9 m semi-detached lots from 156 to 56
- The introduction of 101, 10 m single detached lots
- The introduction of 108, 12 m single detached lots
- A reduction in 15 m single detached lots from 295 to 190.

The number of residential units in the two future development blocks (Blocks 458 and 459) is dependent on the type of development ultimately proposed (i.e. medium density only, commercial only, or mixed-use), the type of built form (i.e. the number of building storeys), and the density factor applied. For example, in accordance with the current density factor in the County's Official Plan, a maximum of 49 residential units could be developed in the 2 blocks. Pursuant to the density factor proposed by the draft Port Dover Secondary Plan, a maximum of 266 residential units could be generated. As such, development of the future mixed-use blocks will be addressed at a later stage in the approval process through Site Plan Control and/or condominium applications. These processes involve a comprehensive assessment of the future development blocks including site servicing, SWM, and entrance analysis/traffic impact study (if applicable depending on type and scale of development).

Given the preceding, it is our professional opinion that the June 2023 DPOS does not require updates to the supporting technical reports for the following reasons:

i) The total number of residential units in the June 2023 DPOS represents a minor decrease of 44 units (499 units to 455 units).
ii) The submission and municipal approval of detailed engineering reports / drawings is already required to verify the proposed subdivision design and subdivision agreement details in accordance with County Engineering's standard DPA Conditions and in accordance with the Engineering conditions previously issued in April 2019.
iii) The submission of detailed engineering reports / drawings will be required as standard conditions of Site Plan Approval for the two mixed-use blocks once the type and scale of development is determined.
iv) The Highway 6 / Street B intersection is consistent with the findings of the Traffic Impact Study.
v) The internal street layout remains essentially the same.
vi) The moratorium in Port Dover placed a hold on development so there has been no significant change to traffic and servicing demand since May 2019 when the 2017 DPOS was being recommended by County Staff for DPA. The Highway 6 / Street B intersection is consistent with the findings of the Traffic Impact Study.

June 2023 Zoning By-Law Amendment

The June 2023 Zoning By-Law Amendment proposes the following zone standards and permitted uses to implement the June 2023 DPOS:

- An Urban Residential Type 2 Zone with Special Provision 14.##2 (R2-14.##2) is proposed for the 9 m semi-detached lots which includes special standards to recognize the minimum lot areas reflected in the Plan and to ensure adequate on-site and on-street parking is provided.
- An Urban Residential Type 1 Zone with Special Provision 14.##1 (R1-14.##1) is proposed which introduces a new 10 m single detached lot with minimum lot areas / frontages reflected in the Plan and special standards to ensure adequate on-site and on-street parking is provided.
- A Neighborhood Commercial Zone with Special Provision 14.##3 (CN-14.##3) is proposed which permits mixed-use development, including a 6 storey apartment building, consistent with the policy direction contained in Port Dover's June 2021 draft Secondary Plan.
- An Open Space Zone (OS) is proposed for the public park and SWM blocks.

The June 2023 ZBLA does not propose to change the Urban Residential Type R1-A Zone provisions applicable to the 12 metre and 15 metre lots, or the Hazard Land Zone (HL) applicable to the northern ravine lands.

A draft ZBLA, including Map A, is attached.

June 2023 Conceptual Streetscape Plan

In response to Staff comments regarding the optimization of on-lot and on-street parking opportunities, a Conceptual Streetscape Plan has been prepared to demonstrate the following:

- Sufficient on-site and on-street parking and green space for street tree planting will be provided on Street B (and Street H) through special exception zone provisions which limit the semi-detached and 10 m lot driveway width at the street to 3 m and require a minimum landscaped frontage of 6.5 m along the street line of each lot for on-street parking.
- The proposed sidewalk locations have been designed to provide pedestrian connectivity as well as sufficient space for parking (as sidewalks limit on-site and on-street parking opportunities). The Phase 2 sidewalk locations also align with existing sidewalks in the existing Phase 1 subdivision to the east.

CONCLUSION

In conclusion, it is our professional opinion that the June 23, 2023 revised Lynn River Heights Phase 2 DPOS and implementing ZBLA are consistent with and conform with Provincial, County and Port Dover planning policies, are appropriate and desirable, and represent good planning for the following reasons:

1. The proposed subdivision is located in a fully serviced urban settlement area on lands which have been designated and zoned for development for over 15 years (including Draft Plan Approval until DPA lapsed in 2015).

2. The subdivision introduces a mix of residential types, tenures, and levels of affordability which provides additional housing choices for existing and future residents of Port Dover/Norfolk County.

3. The subdivision has been designed at an appropriate and reasonable density for the surrounding area and supports the growth projections established for Port Dover/Norfolk County.

4. The subdivision has been designed with the importance of healthy and active community living in mind including pedestrian connectivity to existing development, parks, walkways, and trail systems in the surrounding community (i.e. access to passive recreational opportunities in the northern ravine lands).

5. The proposed subdivision permits mixed-use development along Highway 6, including local commercial uses, which helps support a complete community. It is our understanding based on recent municipal studies, that local commercial uses are desired by the community and there is a shortage of supply.

6. The subdivision is planned to ensure high-quality urban design by implementing the urban design policies and guidelines of Port Dover/Norfolk County.

7. Development of the subdivision will optimize the effective and efficient use of municipal services and infrastructure. It will be serviced in accordance with best management engineering practices and procedures, including sustainable low-impact development measures.

8. Development of the subdivision does not cause environmental or public health and safety impacts. The ravine lands in the northern portion of the site are protected from development, including a 6 m buffer, and will be dedicated to the municipality or Conservation Authority in the long-term public interest.

We trust this submission will allow you to circulate the revised DPOS and ZBLA and advance their review and approval in a timely manner.

We look forward to working with County Staff and all interested stakeholders on this important development.

Do not hesitate to contact the undersigned if you have any questions.

Yours truly,
MHBC

Debra Walker, BES, MBA, MCIP, RPP
Partner | Planner

Francis Kwashie, MSc, MES, MCIP, RPP
Associate

Encl.

C. Mohammad Alam, Supervisor, Norfolk County Planning
Democrat Port Dover Limited (client)
Mitchinson Planning

The Corporation of Norfolk County
By-Law __-Z-2023

Being a By-Law to Amend Zoning By-Law 1-Z-2014, as amended, for property described as Part of Lot 8, Concession 2, Geographic Township of Woodhouse, County of Norfolk, municipally addressed as 597 Highway 6, Port Dover

WHEREAS Norfolk Council is empowered to enact this By-Law, by virtue of the provisions of Section 34 of the *Planning Act, R.S.O. 1990, CHAPTER P.13*, as amended;

AND WHEREAS this By-Law conforms to the Norfolk County Official Plan.

NOW THEREFORE the Council of The Corporation of Norfolk County hereby enacts as follows:

1. That Schedule A of By-Law 1-Z-2014, as amended, is hereby further amended by changing the zoning of a portion of the subject lands described as Part of Lot 8, Concession 2, Geographic Township of Woodhouse, Norfolk County, municipally addressed as 597 Highway 6, Port Dover, and identified on Map A (attached to and forming part of this By-Law):

   a. From Urban Residential Type 1 Zone (R1-A) with a Holding (H) Provision and Urban Residential Type 2 Zone (R2) with a Holding (H) Provision to Urban Residential Type 1 Zone (R1) with a Special Provision 14.##1;
   b. From Urban Residential Type 1 Zone (R1-A) with a Holding (H) Provision to Urban Residential Type 2 Zone (R2) with a Special Provision 14.##2;
   c. From Urban Residential Type 1 Zone (R1-A) with a Holding (H) Provision and Urban Residential Type 2 Zone (R2) with a Holding (H) Provision to Neighbourhood Commercial (CN) Zone with Special Provision 14.##3;
   d. From Urban Residential Type 1 Zone (R1-A) with a Holding (H) Provision to Open Space Zone (OS).

2. That Subsection 14 Special Provisions is hereby further amended by adding a new **Subsection R1-14.##1** as follows:

   i) In lieu of the corresponding provisions in the R1 Zone, the following provisions shall apply to lands zoned Urban Residential Type 1 Zone (R1) with a Special Provision 14.##1:

a) Minimum *lot area*:	
i) *Interior lot*	272 square metres
ii) *Corner lot*	360 square metres
b) Minimum *lot frontage*:	
i) *Interior lot*	10 metres
ii) *Corner lot*	13 metres
c) Minimum *front yard*:	
i) To residential dwelling unit	3 metres
ii) To attached garage	6 metres
d) Minimum *exterior side yard*:	3 metres
e) Minimum *interior side yard*:	1.2 metres
f) Minimum *rear yard*:	6.5 metres
g) Maximum *driveway* width along *street line*:	3 metres
h) Minimum length of landscape area along *street line*:	6 metres

ii) Notwithstanding Section 3.20.1, where in any Zone a 0.30 metre reserve separates a side yard from a street, the exterior side yard requirement and the minimum lot area requirement shall be provided and measured as though the reserve is non-existent.

iii) Notwithstanding Section 3.31, a sight triangle shall be measured back from an intersection at a distance of 3 metres along the *street lines*.

3. That Subsection 14 Special Provisions is hereby further amended by adding a new Subsection **14.##2** as follows:

i) In lieu of the provisions in the corresponding R2 Zone, the following provisions shall apply to lands zoned Urban Residential Type 2 Zone (R2) with a Special Provision **14.##2**:

Provision	*Semi-detached* (per unit)
a) Minimum *lot area*:	
i) *Interior lot*	267 square metres
ii) *Corner lot*	352 square metres
b) Minimum *front yard*:	
iii) To residential dwelling unit	3 metres

iv) To attached garage	6 metres
c) Minimum *exterior side yard*:	3 metres
d) Minimum *rear yard*:	6.5 metres
e) Maximum *driveway* width along *street line*:	3 metres
f) Minimum length of landscape area along *street line*:	6 metres

ii) Notwithstanding Section 3.20.1, where in any *Zone* a *0.30 metre reserve* separates a *side yard* from a *street,* the *exterior side yard* requirement and the minimum lot area requirement shall be provided and measured as though the reserve is non-existent.

iii) Notwithstanding Section 3.31, a sight triangle shall be measured back from an intersection at a distance of 3 metres along the street lines.

4. That Subsection 14 Special Provisions is hereby further amended by adding **14.##3** as follows:

i) In addition to the "Permitted Uses" provisions in the CN Zone, the following provision shall apply to lands zoned Neighbourhood Commercial (CN) Zone with Special Provision 14.##3:

a) a dwelling apartment use shall also be a permitted use.

ii) In lieu of the corresponding "Zone Provisions for any Sole Residential Use" in the CN Zone, the following provisions shall apply to lands zoned Neighbourhood Commercial (CN) Zone with Special Provision 14.##3:

a) Notwithstanding the provisions in Subsection 6.5.3, any sole residential use and *home occupations* shall conform to the provisions in the Urban Residential Type 4 Zone (R4) and the Urban Residential Type 6 Zone (R6) as the respective provisions apply to the type of sole residential use.

iii) In lieu of or in addition to the corresponding "Zone Provisions for Non-Residential Uses or Non-Residential Uses in Combination with Residential Uses" in the CN Zone, the following provisions shall apply to lands zoned Neighbourhood Commercial (CN) Zone with Special Provision 14.##3:

a) Minimum *front yard, exterior side yard, interior side yard* and *rear yard* requirements shall not apply

b) Minimum setback from a *street line*:	3 metres
c) Minimum setback from an adjoining residential *Zone*	7.5 metres
d) Minimum *building height*	3 storeys
e) Maximum *building height*	6 storeys
f) Maximum *lot coverage*	50 percent
g) *Outdoor storage*:	prohibited in a yard adjoining a residential *Zone*

iv) Notwithstanding Section 3.20.1, where in any Zone a 0.30 metre reserve separates a side yard from a street, the exterior side yard requirement and the minimum lot area requirement shall be provided and measured as though the reserve is non-existent.

v) Notwithstanding Section 3.31, a sight triangle shall be measured back from an intersection at a distance of 3 metres along the street lines, except for the intersection of a road and Highway 6, which shall be measured at a distance of 6 metres along the two intersection street lines.

5. That the effective date of this By-Law shall be the date of passage thereof.

ENACTED AND PASSED this date day _ of month _, 2023

Mayor

County Clerk

Explanation of the Purpose and Effect of By-Law __-Z-2023

This By-Law affects a parcel of land described as Part of Lot 8, Concession 2, Geographic Township of Woodhouse, Norfolk County, municipally addressed as 597 Highway 6, Port Dover.

The subject lands were originally zoned in 2006 for residential uses in accordance with the Lynn River Heights Phase 2 Plan of Subdivision. However, the original Draft Plan of Subdivision Approval lapsed in 2015 and a revised June 2023 Draft Plan of Subdivision has now been approved.

The purpose of this By-Law is to implement the 2023 revised Draft Plan of Subdivision. The By-law implements a development which conforms with objectives and policies of Norfolk County's 2022 Official Plan, including: the provision of a range of housing types, tenures, and lot sizes including a new 10m lot category; the introduction of local commercial and mixed-use development along the Highway 6 frontage; and the centralized, accessible location of a neighbourhood park and stormwater management facility. The location of the subject lands and the associated Zone categories are shown on Map A which is attached to and forms part of this By-law.

CONCEPTUAL STREETSCAPE PLAN

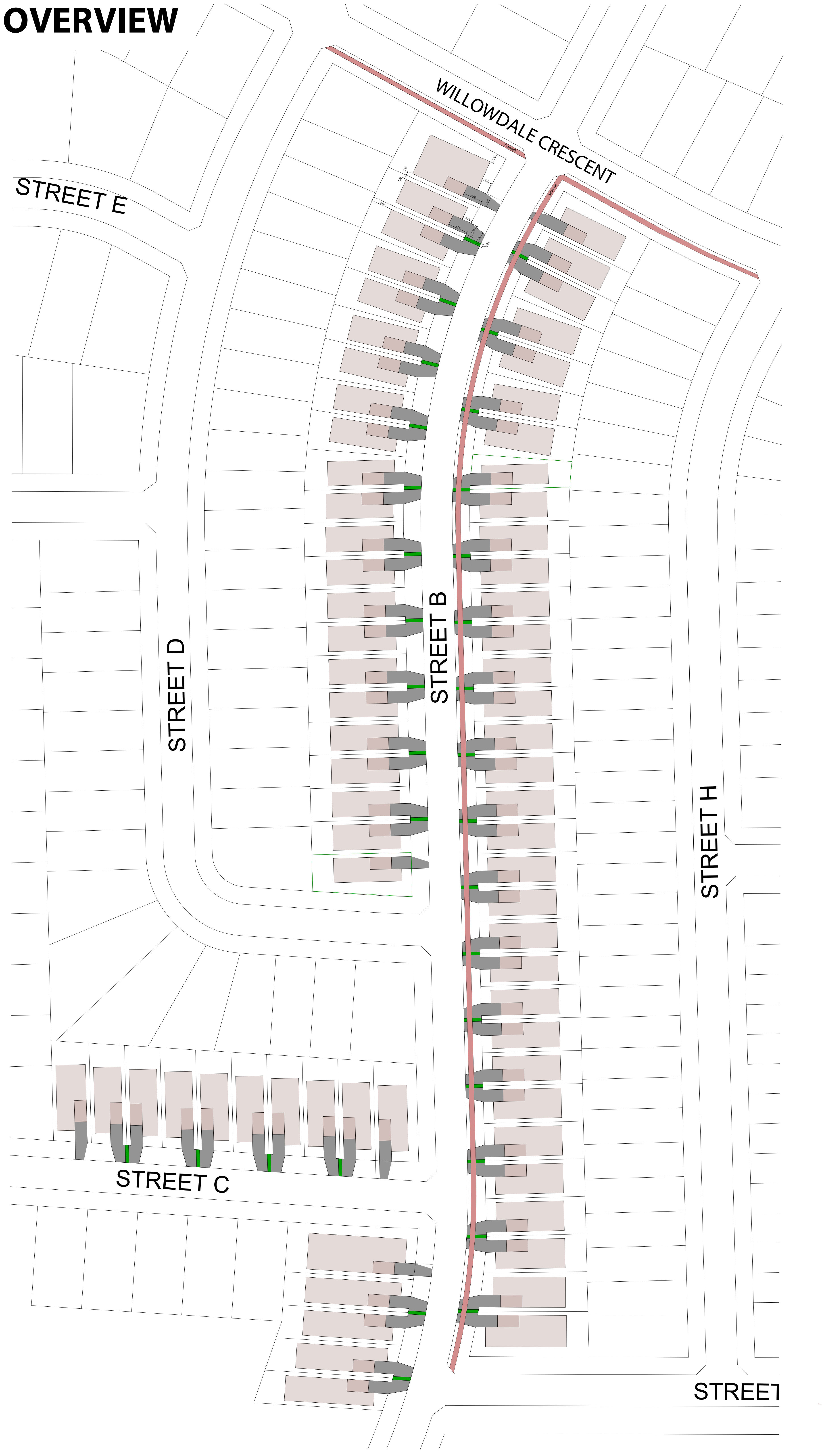
(10m lots on Street B & C within Lynn River Heights Phase 2)

Driveway at street would be maximum 3 m, allowing for additional parking space
10 metre frontage – 6.5 m for parking space, 3 m for driveway, 0.5 space for landscape strip
Minimum setbacks with the following exceptions:

- Front yard to dwelling would be reduced from 6 m to 3 m
- Front yard to attached garage face would maintain 6 m setback (to allow for parking space)
- Exterior side yard would be reduced from 6 m to 3 m
- Interior side yard would maintain 1.2 m
- Rear yard would be reduced from 7.5 m to 6.5 m

DIMENSIONS

OVERVIEW



LYNN RIVER HEIGHTS
RESIDENTIAL SUBDIVISION, PHASE 2
PORT DOVER

TRAFFIC IMPACT ASSESSMENT

F.R. Berry & Associates
August, 2016

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LYNN RIVER HEIGHTS
RESIDENTIAL SUBDIVISION, PHASE 2
PORT DOVER

TRAFFIC IMPACT ASSESSMENT

1. INTRODUCTION AND BACKGROUND

Democrat Homes has proposed the development of a 489 lot residential development on the north side of Norfolk County Road 6, west of the urban area of Port Dover. The location of the site is shown in **Figure 1**.

A report on the potential traffic impact of a development on this site was prepared in 2006 by F.R. Berry & Associates[1]. Subsequently, a number of things have changed in the area, including completion of the subdivision to the east and upgrades to County Road 6. The purpose of this report is to estimate potential vehicle trip generation from the proposed development and to assess the impact of these trips on traffic operation and safety on the adjacent street system.

2. EXISTING CONDITIONS

Norfolk County Road 6 is a two lane rural highway. In the vicinity of the site, the posted speed limit is 50km/h. This changes to 80km/h at the west limit of the site which is coincident with the Port Dover urban boundary.

To the east of the site, County Road 6 intersects Pheasant Trail and Lynn Park Avenue, which both provide access to Phase 1 of the Lynn River Heights subdivision. Pleasant Trail continues to the south as Blue Lake Avenue while Lynn Park Avenue continues to the south as Thompson Drive.

The intersection of County Road 6 with Pheasant Trail and Blue Lake Avenue is controlled by stop signs on the northbound and southbound approaches. There are no turning lanes on any of the approaches. The eastbound approach on County Road 6 has a short right turn taper.

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[1] Lynn River Heights, Port Dover. Traffic Impact Study.
F.R. Berry & Associates, December 2006

The intersection of County Road 6 with Lynn Park Avenue and Thompson Drive is signalized. There are no left turn lanes on any of the approaches. A right turn taper on the westbound approach was recently replaced by a full right turn lane.

West of Pheasant Trail, County Road 6 has gravel shoulders. Between Pheasant Trail and Lynn Park Avenue there is a sidewalk on the north side of the street. A bicycle lane has recently been constructed on the south side of the street. East of Lynn Park Avenue, there is a sidewalk on the south side of the street.

Land uses in the area are primarily residential. A No Frills food store is located on the south-west corner of the intersection of County Road 6 and Thompson Drive. A small commercial plaza is located on the north side of County Road 6 between Pheasant Trail and Lynn Park Avenue.

St. Cecilia's Catholic Elementary School is located on Lynn Park Avenue, just north of County Road 6.

For the purposes of this study, traffic counts were made at the intersections of County Road 6 with Pheasant Trail and Lynn Park Avenue on Thursday, June 16, 2016. Peak hour turning movements derived from these counts are shown in **Figure 2**. Traffic count reports are contained in Appendix A.

3. PROPOSED DEVELOPMENT

The proposed development contains 489 single family lots. The draft plan of subdivision is shown in **Figure 3**. Access to the development is proposed at a new intersection on County Road 6 and through the existing subdivision to the east.

3.1 Vehicle Trip Generation

Peak hour vehicle trip generation was estimated based on regression equations contained in the Institute of Transportation Engineers (ITE) Trip Generation Manual, Eighth Edition, for ITE Land Use 210, Single Family Detached Housing.

Estimated peak hour vehicle trip generation for the 489 lot subdivision is shown in **Table 1**. **Table 1** also shows estimated and actual peak hour

trip generation from the subdivision to the east which contains approximately 223 single family homes. The only accesses to this subdivision are via Pheasant Trail and Lynn Park Avenue.

A comparison of the actual to estimated peak hour volumes shows that actual numbers were higher in the morning peak hour, in particular the inbound traffic flow, and lower in the afternoon peak hour. The difference in the morning peak hour volumes is likely due to traffic destined to St. Cecilia's School.

The comparison confirms the use of ITE estimates.

3.2 Vehicle Trip Distribution and Assignment

A comparison of the actual counts at both intersections shows that, in both peak hours, the proportion of trips generated by the existing residential subdivision with an origin or destination the east was 60 percent. This distribution was applied to the proposed development.

The assignment of peak hour site generated trips is shown in **Figure 4**. All trips with an origin or destination to the west were assigned to the proposed new access. Trips with an origin or destination to the east were assigned as follows:

new access	50 percent
Pheasant Trail	33 percent
Lynn Park Terrace	17 percent

This assignment was based on the assumption that drivers would use the most convenient and shortest route between home and County Road 6.

4. ANALYSIS

4.1 Projected Traffic

In most cases, a traffic projection for residential subdivision would be based on a five year planning horizon. In this case, however, it is unlikely that full build-out will be achieved within five years. A ten year planning horizon was assumed.

Because of uncertainties in the factors affecting growth, projections beyond a ten year horizon tend to become less reliable. While there is no certainty that the subdivision will be fully built out within ten years, the selection of this planning horizon provides a reasonable base from which

to determine appropriate road improvements and other mitigation measures. For more certainty, it is recommended that this assessment be updated in approximately five years.

Existing peak hour traffic volumes shown in **Figure 2** were projected to 2026 as shown in **Figure 5**. A 1.5 percent annual growth rate was assumed. Projected turning movement volumes were rounded to the nearest five vehicles.

4.2 Sight Distance

In the vicinity of the site, County Road 6 is on a tangent alignment. The grade generally rises from east to west with a crest vertical curve some distance to the west of the proposed site access.

Sight distance to and from the east is unrestricted. To the west, sight distance to and from the proposed access is estimated to be approximately 250 metres. For a design speed of 100km/h, consistent with the posted speed limit of 80km/h, the recommended minimum stopping sight distance is 200 metres. The available sight distance exceeds this requirement.

4.3 Signal Warrant Analysis

Traffic signal warrant analyses were made for the intersection of County Road 6 and Pheasant Trail for existing, projected background and projected total traffic conditions. The methodology used was that described in the Ontario Traffic Manual, Book 12, for existing eight hour traffic counts and for peak hour traffic projections. An analysis was also made for the intersection of County Road 6 and the site access for projected peak hour total traffic conditions.

The analyses assumed free flow rural conditions for both intersections, despite the 50km/h speed limit. County Road 6 in this location has more of the characteristics of a rural highway. For projected peak hour conditions, minimum warrant values were increased by 20 percent to reflect the uncertainty of the projected traffic volumes.

The results of the analyses are summarized in **Table 2**. Analysis worksheets are contained in Appendix B. Under existing and projected traffic conditions, traffic signals would not be warranted at the intersection of County Road 6 and Pheasant Trail. At the site access, traffic signals would not be warranted for a tee intersection serving only the proposed

subdivision. The implications of a four leg intersection are discussed below in Section 4.6.

4.4 Left Turn Lane Requirements

The need for left turn lanes on County Road 6 at Pheasant Trail and at the site access was assessed using the methodology described in the MTO Geometric Design Manual. The assessments were made for projected peak hour total traffic conditions. A design speed of 70km/h was assumed for the assessment. Typically, for a 50km.h speed limit, a design speed of 60km/h is appropriate. However, because of the transition from the 80km/h zone, the higher design speed was used.

A summary of the assessments is contained in Appendix C, together with the appropriate MTO charts.

At the site access under full development conditions, an eastbound left turn lane is warranted on County Road 6. The chart suggests a storage length requirement of 30 metres. The storage length will be confirmed below in the level of assessment.

At Pheasant Trail, left turn lanes would be warranted in both directions on County Road 6 at full build-out of the proposed development. It should be noted, however, that in both cases, the warrant is barely met.

As noted above, it would be prudent to update this study in approximately five years. Any decision on the construction of left turn lanes on County Road 6 should be deferred until then.

4.5 Level of Service Analysis

Each of the intersections of County Road 6 with Lynn Park Avenue, Pheasant Trail and the site access was analyzed for volume to capacity (v/c) ratios, delays and queue lengths using the Synchro 6 analysis program. At the two existing intersections, analyses were made for existing, projected background and projected total peak hour traffic volumes.

The results of the analyses are summarized in **Tables 3**, **4** and **5**. Analyses reports are contained in Appendix D.

Level of service is a measure of how well an intersection operates under prevailing traffic conditions. It is expressed on a scale of A to F where A is

the highest level of service and F indicates unacceptable congestion and delay. Level of service is measured in terms of average delay to all vehicles passing through the intersection in the peak hour.

4.5.1 County Road 6 and Lynn Park Avenue (Table 3)

Under existing and projected conditions, the intersection operates at a good level of service with average delays of less than 12 seconds (Level of service B). Intersection utilization is 48.9 percent in the morning peak hour and 65.6 percent in the afternoon peak hour, indicating a significant amount of reserve capacity.

Under projected background conditions, the intersection will continue to operate at a good level of service with only a minor increase in average delays. Under projected total traffic peak hour conditions, while average delays will remain within level of service B or better, v/c ratios for the shared eastbound and westbound lanes will increase.

At signalized intersections, it is common practice to construct left turn lanes on major approaches. This was not done when the intersection was signalized. Consideration should be given to introducing left turn lanes on County Road 6 at an appropriate time within the next ten years.

4.5.2 County Road 6 and Pheasant Trail (Table 4)

Under existing and projected background conditions, the intersection operates at a good level of service with all movements operating at level of service C or better. Under projected total traffic conditions delays will increase on the minor street approaches, particularly in the afternoon peak hour. The calculated 95th percentile queue lengths of 10.6 metres on the southbound approach suggests that at any given time in the afternoon peak hour up to two vehicles could be waiting to enter County Road 6.

The projected v/c ratios and levels of service do not warrant any improvements to the intersection.

4.5.3 County Road 6 and Site Access (Table 5)

Under projected total peak hour traffic conditions, with an eastbound left turn lane on County Road 6 and stop control on the minor street approach, the intersection will operate at a good level of service.

The calculated 95th percentile queue length for the eastbound left turn movement is 2.9 metres in the afternoon peak hour. There is only a five

percent probability of the queue length being longer. This suggests that a minimum storage length of 15 metres would be appropriate for the left turn lane. For a design speed of 80km/h, MTO design standards suggest an additional full width lane length of 50 metres and a taper length of 130 metres.

4.6 Future Development

A concept plan for future development on the south side of County Road 6 is shown in **Figure 7**. County staff have indicated a preference for a roundabout where the access to this development intersects County Road 6 opposite the proposed site access.

In order to assess the feasibility of a roundabout, an estimate was made of peak hour traffic generation based on the concept plan shown in **Figure 7**. This estimate is shown in **Table 1**.

It must be stressed that this estimate is very approximate and should not be used for design purposes. The intention is to provide "ball park" numbers for the purposes of comparing intersection options.

The assignment of peak hour trips is shown in **Figure 8**. Ten percent of the generated trips were assigned to the proposed development on the north side, in addition to those trips shown in **Figure 4**, while the remainder were split 60 percent to and from the east and 40 percent to and from the west.

Table 6 shows a summary of level of service assessments for three alternative intersection treatments:

- stop control on the minor approaches
- signalization
- roundabout

Stop control would not be feasible. Delays to traffic on the minor street approaches would not be acceptable.

The signalization and roundabout options are both feasible and give approximately the same v/c ratios for each of the approaches. Further work, including refinement of the concept plan for the development on the south side of County Road 6, would be required before a decision on the preferred option is made.

5. CONCLUSIONS

The proposed development would generate 342 vehicle trips in the morning peak hour and 438 vehicle trips in the afternoon peak hour.

No improvements will be required to the intersections of County Road 6 with Lynn Park Avenue and Pheasant Trail in order to accommodate traffic generated by the proposed development. Consideration should be given to constructing left turn lanes on County Road 6 in both directions at Lynn Park Avenue to accommodate through traffic demand.

At the intersection of County Road 6 and the site access, a single lane approach on the site access, subject to stop control, would be appropriate. An eastbound left turn lane with a length of 15 metres is warranted on Country Road 6.

Future development on the south side of County Road 6 will warrant signalization or a roundabout. Further study, including refinement of the concept plan of development on the south side, will be required before a decision can be made on appropriate intersection treatment.

REGISTERED PROFESSIONAL ENGINEER
F. R. BERRY
May 15/19
PROVINCE OF ONTARIO

ITE Land Use	AM Peak Hour				PM Peak Hour			
	Ave. Rate	total	in	out	Ave. Rate	total	in	out
Lynn River Heights Phase 1								
223du Actual		189	77	112		190	103	87
ITE LU 210	eq'n	166	41	125	eq'n	216	136	80
Lynn River Heights Phase 2								
489du ITE LU 210	eq'n	342	86	256	eq'n	438	276	162
Concept Plan (Figure 7)								
230 Medium Density Residential 250du	eq'n	107	18	89	eq'n	127	85	42
710 General Office 20 000sf	eq'n	52	46	6	eq'n	101	17	84
820 Shopping Centre 110 000sf	1.00	110	67	43	3.73	410	201	209
Total		269	131	138		638	303	335
Less 25 percent internal trips		202	98	104		478	227	251

Table 1

Vehicle Trip Generation

Intersection	Warrant 1	Warrant 2	Overall
CR 6 at Pheasant Trail			
Existing	NO	NO	NO
Background 2026	NO	NO	NO
Total 2026	NO	NO	NO
CR 6 at Site Access			
Total 2026 Tee Intersection	NO	NO	NO
Total 2026 Four Leg Intersection	YES	NO	YES

Table 2

Signal Warrant Analysis

Intersection	AM Peak Hour				PM Peak Hour			
	v/c	Del.	LofS	Q	v/c	Del.	LofS	Q
Existing, June 16, 2016								
Eastbound LTR	0.46	10.2	B	20.1	0.57	10.4	B	33.9
Westbound LT	0.51	11.1	B	24.7	0.65	11.9	B	40.8
Westbound R	0.06	3.9	A	3.1	0.07	2.8	A	3.3
Northbound LTR	0.16	7.0	A	10.5	0.22	7.5	A	12.7
Southbound LTR	0.14	6.7	A	9.3	0.14	8.4	A	9.6
Intersection ICU	48.9%				65.6%			
LofS	A				B			
Background 2026								
Eastbound LTR	0.51	10.6	B	23.6	0.61	10.6	B	40.1
Westbound LT	0.55	11.2	B	28.1	0.71	12.6	B	50.4
Westbound R	0.06	3.7	A	3.2	0.08	2.4	A	3.3
Northbound LTR	0.19	8.1	A	13.1	0.27	9.0	A	16.3
Southbound LTR	0.17	7.4	A	11.3	0.16	9.9	A	11.8
Intersection ICU	52.4%				72.4%			
LofS	A				B			
Total 2026								
Eastbound LTR	0.66	11.8	B	40.0	0.65	11.2	B	52.6
Westbound LT	0.53	10.6	B	32.3	0.81	15.0	B	77.6
Westbound R	0.07	2.8	A	3.2	0.11	1.8	A	3.9
Northbound LTR	0.25	11.2	B	16.8	0.30	11.4	B	18.9
Southbound LTR	0.29	12.4	B	20.2	0.23	14.0	B	16.5
Intersection ICU	63.2%				86.0%			
LofS	B				B			

Note: Del. - ave. delay (secs.)

LofS - level of service

v/c - volume to capacity ratio

ICU - intersection capacity utilization

Q - maximum queue length (metres)
(95th percentile)

Table 3

Level of Service County Road 6 and Lynn Park Avenue

Intersection	AM Peak Hour				PM Peak Hour			
	v/c	Del.	LofS	Q	v/c	Del.	LofS	Q
Existing, June 16, 2016								
Eastbound LTR	0.00	0.2	A	0.1	0.02	0.5	A	0.3
Westbound LTR	0.01	0.2	A	0.1	0.01	0.3	A	0.2
Northbound LTR	0.14	13.6	B	3.7	0.09	15.5	C	2.2
Southbound LTR	0.06	11.4	B	1.4	0.07	15.2	C	1.7
Intersection ICU	37.1%				40.8%			
LofS	A				A			
Background 2026								
Eastbound LTR	0.00	0.2	A	0.1	0.02	0.6	A	0.4
Westbound LTR	0.01	0.3	A	0.2	0.01	0.3	A	0.2
Northbound LTR	0.19	15.7	C	5.2	0.14	18.5	C	3.7
Southbound LTR	0.09	13.0	B	2.2	0.12	17.9	C	3.1
Intersection ICU	43.0%				47.5%			
LofS	A				A			
Total 2026								
Eastbound LTR	0.00	0.2	A	0.1	0.02	0.6	A	0.5
Westbound LTR	0.01	0.3	A	0.2	0.01	0.3	A	0.2
Northbound LTR	0.22	18.5	C	6.4	0.18	23.4	C	4.9
Southbound LTR	0.27	18.9	C	8.4	0.33	29.4	D	10.6
Intersection ICU	44.4%				54.1%			
LofS	A				A			

Note: Del. - ave. delay (secs.)
LofS - level of service
v/c - volume to capacity ratio
ICU - intersection capacity utilization
Q - maximum queue length (metres) (95th percentile)

Table 4

Level of Service County Road 6 and Pheasant Trail

Intersection	AM Peak Hour				PM Peak Hour			
	v/c	Del.	LofS	Q	v/c	Del.	LofS	Q
Total 2026								
Eastbound L	0.03	8.3	A	0.8	0.11	8.9	A	2.9
Eastbound T	0.15	0.0	-	0.0	0.25	0.0	-	0.0
Westbound TR	0.26	0.0	-	0.0	0.30	0.0	-	0.0
Southbound LR	0.41	17.7	C	14.9	0.39	23.2	C	13.5
Intersection ICU			48.2%				53.0%	
LofS			A				A	

Note: Del. - ave. delay (secs.)

LofS - level of service

v/c - volume to capacity ratio

ICU - intersection capacity utilization

Q - maximum queue length (metres)
(95th percentile)

Table 5

Level of Service
County Road 6 and
Site Access
(Tee Intersection)

Intersection	AM Peak Hour				PM Peak Hour			
	v/c	Del.	LofS	Q	v/c	Del.	LofS	Q
Total 2026								
Stop Control								
Eastbound L	0.03	8.4	A	0.8	0.12	8.9	A	3.0
Eastbound TR	0.17	0.0	-	0.0	0.30	0.0	-	0.0
Westound L	0.05	8.0	A	1.1	0.13	9.0	A	3.3
Westbound TR	0.26	0.0	-	0.0	0.30	0.0	-	0.0
Northbound LTR	0.39	25.1	D	13.4	2.31	673.0	F	179.7
Southbound LTR	0.66	36.5	E	33.3	1.70	438.5	F	93.9
Intersection ICU	56.9%				70.8%			
LofS	B				C			
Total 2026								
Signalized								
Eastbound L	0.11	7.5	A	5.1	0.37	9.7	A	14.5
Eastbound TR	0.45	9.1	A	26.9	0.70	11.5	B	52.8
Westbound L	0.14	7.7	A	7.0	0.41	10.2	B	16.2
Westbound TR	0.66	11.5	B	45.1	0.69	11.3	B	51.9
Northbound LTR	0.22	8.2	A	13.4	0.57	17.2	B	50.1
Southbound LTR	0.40	11.0	B	25.6	0.33	11.8	B	21.4
Intersection ICU	56.9%				70.8%			
LofS	B				B			
Total 2026								
Traffic Circle								
Eastbound LTR	0.32	-	-	-	0.65	-	-	-
Westbound LTR	0.46	-	-	-	0.68	-	-	-
Northbound LTR	0.13	-	-	-	0.39	-	-	-
Southbound LTR	0.27	-	-	-	0.23	-	-	-
Intersection ICU	63.2%				81.8%			
LofS	B				D			

Note: Del. - ave. delay (secs.)
LofS - level of service
v/c - volume to capacity ratio
ICU - intersection capacity utilization
Q - maximum queue length (metres)
(95th percentile)

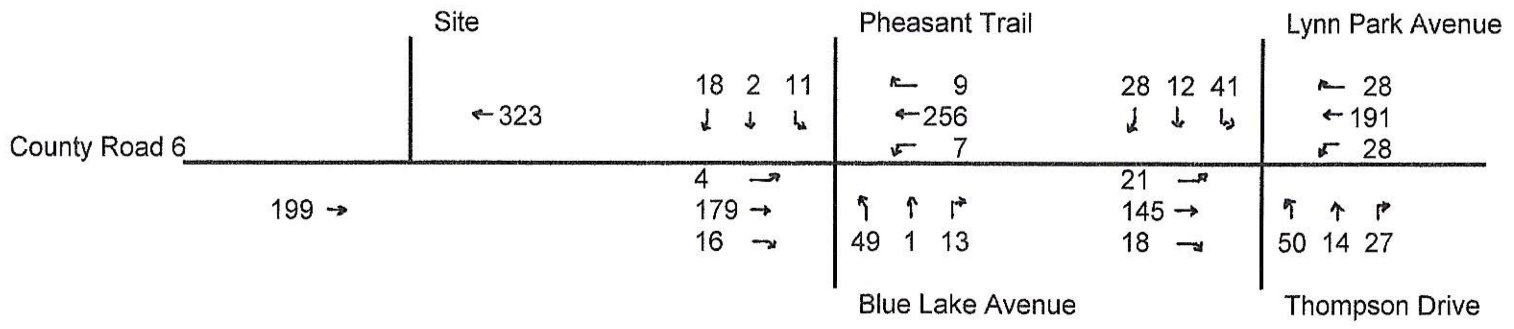
Table 6

Level of Service County Road 6 and Site Access

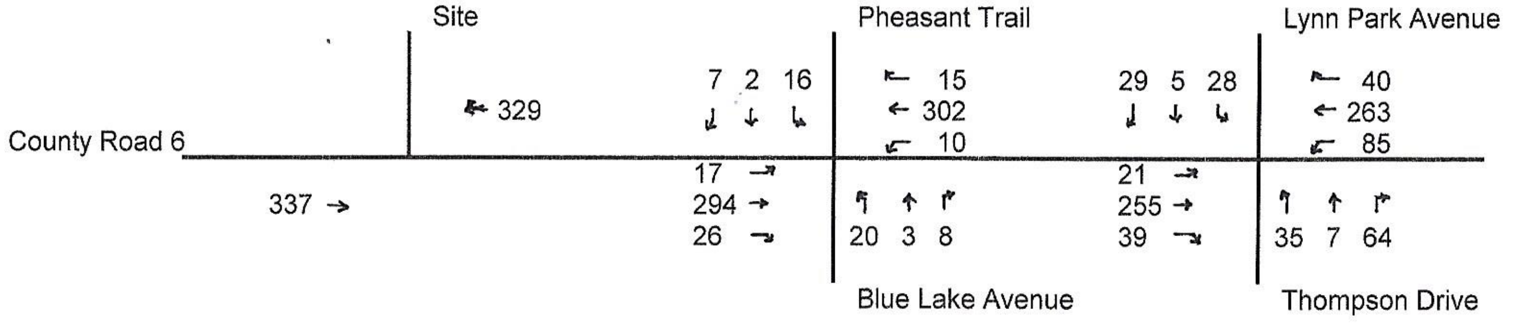
Four Leg Intersection
Alternative Configurations

Figure 1

Area Plan



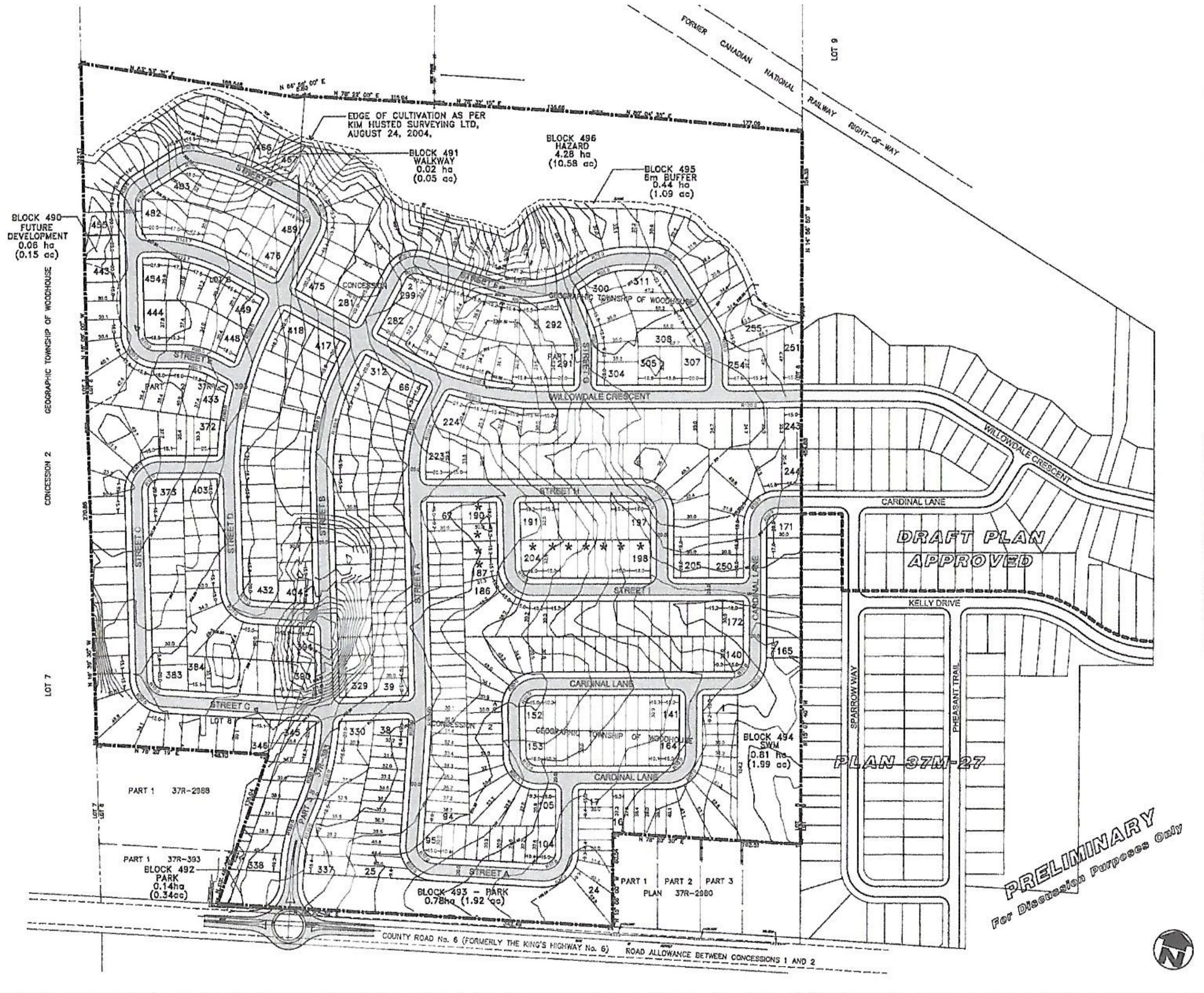
AM Peak Hour

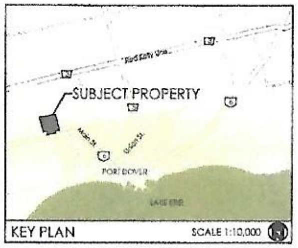


PM Peak Hour

Figure 2

Existing Traffic
June 16, 2016





KEY PLAN SCALE 1:10,000

PROPOSED DRAFT PLAN OF SUBDIVISION

LYNN RIVER HEIGHTS PHASE II

PART OF LOT 8, CONCESSION 2

GEOGRAPHIC TOWNSHIP OF WOODHOUSE

Now In NORFOLK COUNTY

INFORMATION REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT, 1990.

A - O.L.S. Certified Property Boundaries; See Surveyor's Certificate Below
B - Proposed/Existing Highway Location, Name & Width: See Plan
C - Key Plan not less than 1:10,000: See Key Plan Above
D - Proposed Uses: Residential, Open Space
E - Adjoined Uses: Residential, Agricultural & Open Space
H - Water Supply: Municipal Water
I - Soils: Clayey Silt
K - Services: Bell, Hydro, Gas, Municipal Water, and Municipal Sanitary Services

LAND USE SCHEDULE

	BLOCKS	RESIDENTIAL	NUMBER OF UNITS	AREA (ha)	AREA (ac)
1.	1-164	9.1m (30') Semi Detached	164	5.63	13.91
2.	165-186,191-197 205-489	15m (50') Single Family	314	17.81	44.01
3.	187-190, 198-204	15m (50') Accessory Unit Lots *	22	0.56	1.38
		TOTAL RESIDENTIAL	500	24.00	59.30
	BLOCKS	ROADWAYS		AREA (ha)	AREA (ac)
4.		20m ROW: Streets A-I Cardinal Lane, Willowdale Crescent		9.31	23.02
		TOTAL ROADWAYS		9.31	23.02
	BLOCKS	OTHER		AREA (ha)	AREA (ac)
5.	490	Future Development		0.06	0.15
6.	491	Walkway Block		0.02	0.05
7.	492,493	Park/Public Open Space		0.92	2.26
8.	494	Storm Water Management		0.81	1.99
9.	495	8m Buffer		0.44	1.09
10.	496	Hazard		4.28	10.58
		TOTAL OTHER		6.52	16.10
	TOTAL DRAFT PLAN OF SUBDIVISION		500	39.8 ha	98.4 ac

OWNER'S CERTIFICATE

I authorize MacKinnon & Associates to prepare and submit this Draft Plan of Subdivision

(I HAVE THE AUTHORITY TO BIND THE CORPORATION) DATE

SURVEYOR'S CERTIFICATE

I hereby certify that the boundaries of the land to be subdivided as shown on this plan and their relationship to the adjacent lands are accurately and correctly shown.

KIM S. HUSTED, O.L.S. DATE

no.	date	description	by
4.	05/26/16	Revised road layout.	AWH
3.	03/03/16	Revised road layout.	AWH
2.	11/24/06	Revised road layout.	AWH
1.	09/26/06	Addition of 9.1m (30') Single Family Lots on Streets B and C	DMF

REVISIONS

MacKinnon & Associates
a division of SOTZ10 Ontario Inc.

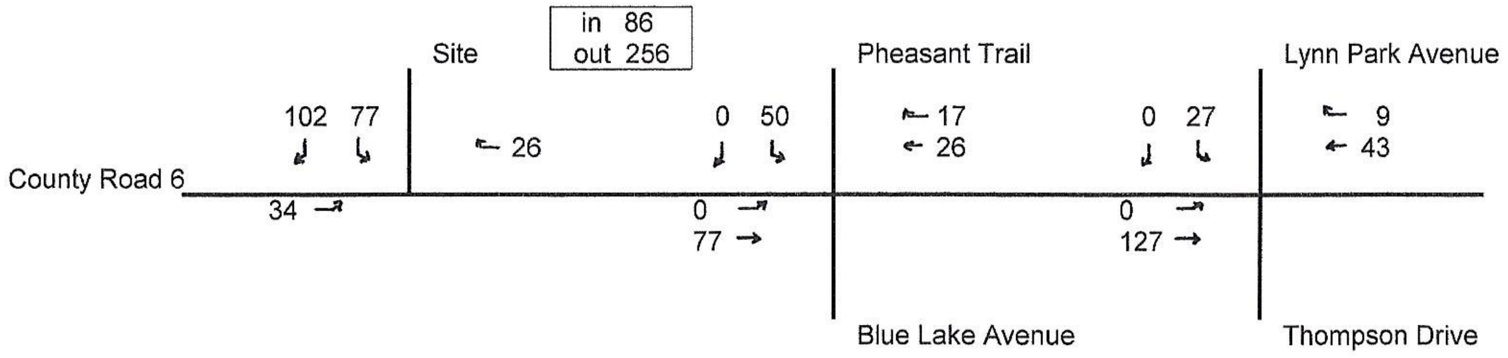
Providing Solutions in Urban, Landscape and Environmental Planning

550 Parkside Drive, Unit A-21, Waterloo, Ontario N2L 5V4
Tel. (519) 725-5140 FAX (519) 725-5144

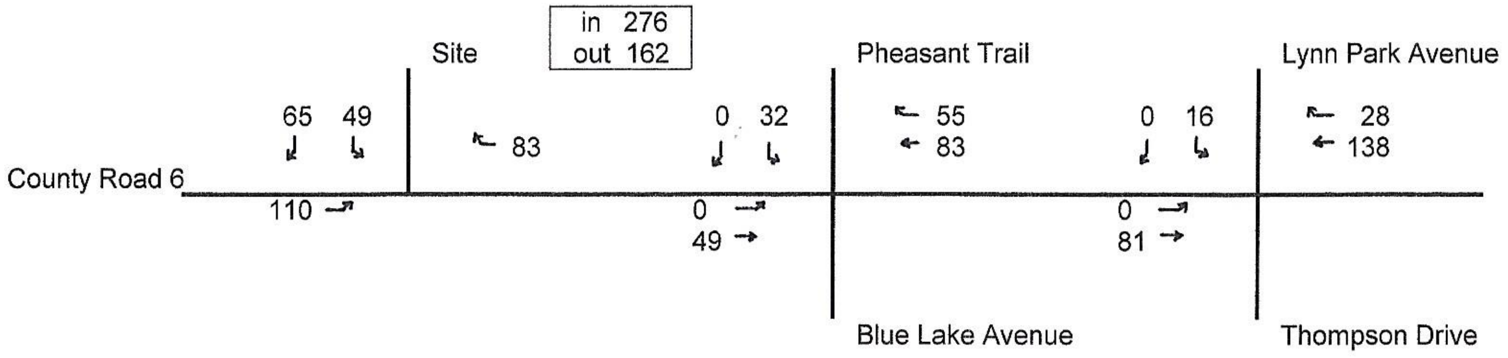
DRAWN BY: AWH/SKM	DESIGNED BY: AWH	APPROVED BY: AWH
PROJECT NO. 2401/2016-05	SCALE: 1:1500	DATE: September 26, 2006
PLOTTED: MAY 26, 2016	SHEET: D1	

Figure 3

Draft Plan of Subdivision



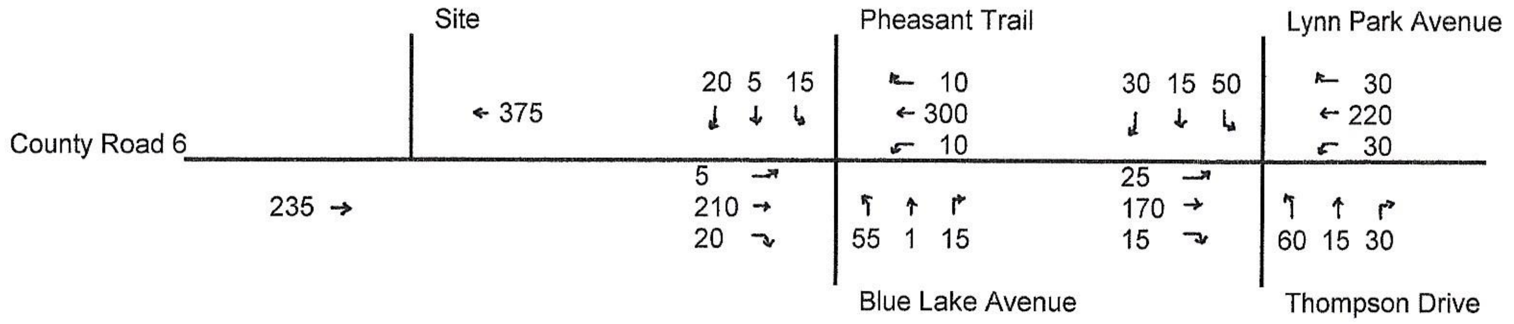
AM Peak Hour



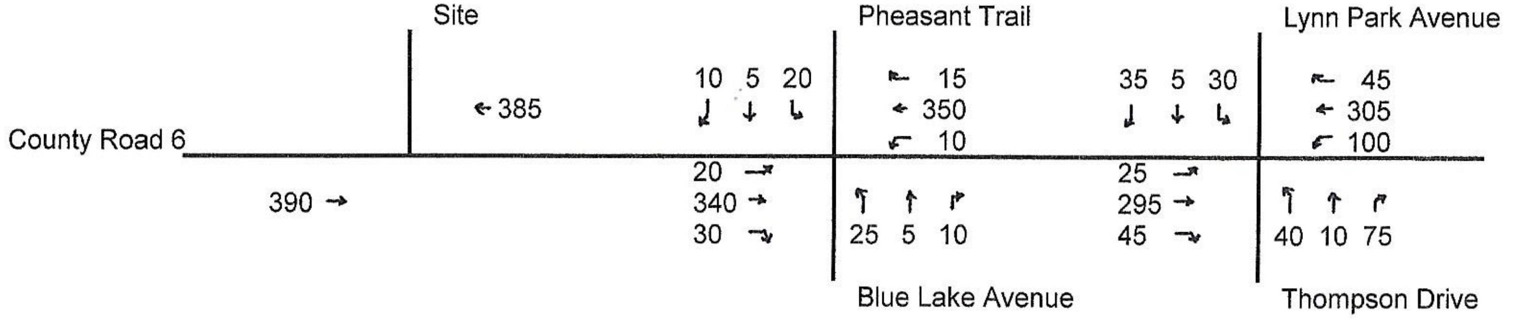
PM Peak Hour

Figure 4

Site Generated Traffic



AM Peak Hour



PM Peak Hour

Figure 5

Background Traffic 2026

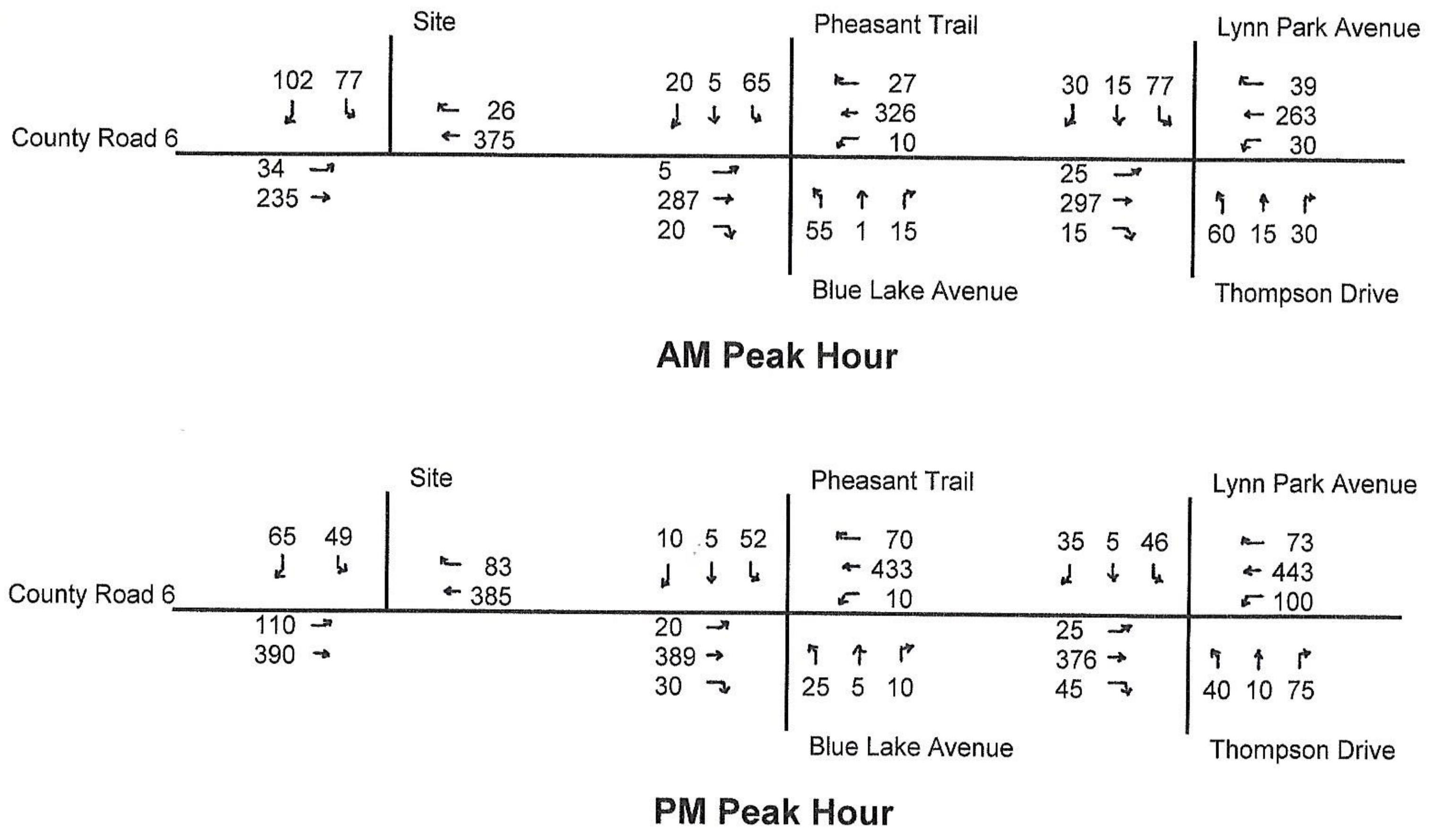


Figure 6

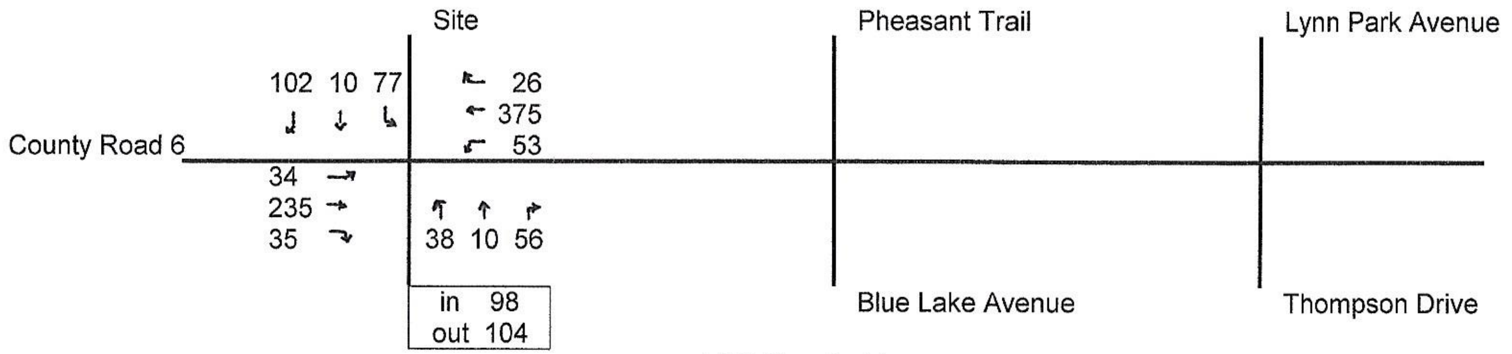
Total Traffic 2026

GUTHRIE MUSCOVITCH
ARCHITECTS

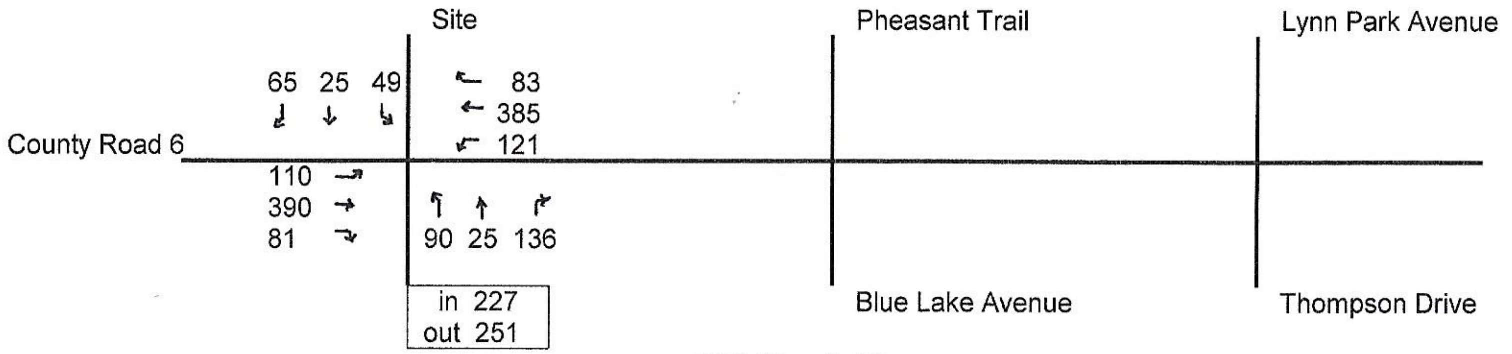
NOT TO SCALE
24 JUNE, 2009

Figure 7

Concept Plan
Future Development



AM Peak Hour



PM Peak Hour

Figure 8

Full Build-out 2026

APPENDIX D

LEVEL OF SERVICE ANALYSIS

CR 6 AND LYNN PARK AVENUE

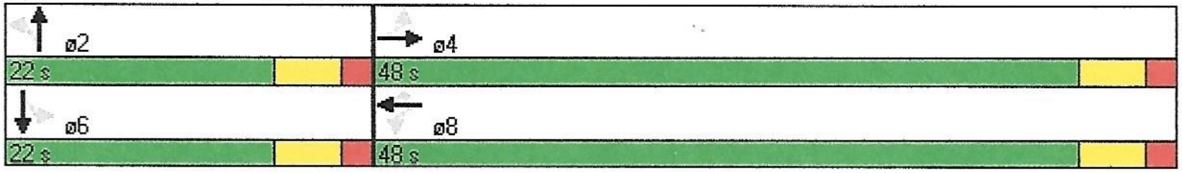
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱			↰↑	↱		↰↑↱			↰↑↱	
Ideal Flow (vphpl)	1550	1550	1550	1650	1650	1750	1550	1550	1550	1550	1550	1550
Storage Length (m)	0.0		0.0	0.0		25.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		1	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2	15.2	15.2	15.2		15.2	15.2	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00	0.98		0.98			0.98	
Frt		0.990				0.850		0.960			0.956	
Flt Protected		0.994			0.994			0.973			0.975	
Satd. Flow (prot)	0	1364	0	0	1530	1504	0	1348	0	0	1331	0
Flt Permitted		0.957			0.954			0.813			0.823	
Satd. Flow (perm)	0	1313	0	0	1466	1471	0	1100	0	0	1124	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11				30		29			28	
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		863.4			583.0			364.6			372.0	
Travel Time (s)		64.8			43.7			27.3			27.9	
Volume (vph)	21	145	13	28	191	28	50	14	27	41	12	26
Confl. Peds. (#/hr)	1		9	9		1	23					23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	13%	15%	4%	9%	0%	6%	21%	7%	7%	0%	11%
Adj. Flow (vph)	23	158	14	30	208	30	54	15	29	45	13	28
Lane Group Flow (vph)	0	195	0	0	238	30	0	98	0	0	86	0
Turn Type	Perm			Perm		Perm	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		
Detector Phases	4	4		8	8	8	2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0	22.0	22.0	22.0		22.0	22.0	
Total Split (s)	48.0	48.0	0.0	48.0	48.0	48.0	22.0	22.0	0.0	22.0	22.0	0.0
Total Split (%)	68.6%	68.6%	0.0%	68.6%	68.6%	68.6%	31.4%	31.4%	0.0%	31.4%	31.4%	0.0%
Maximum Green (s)	42.0	42.0		42.0	42.0	42.0	16.0	16.0		16.0	16.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)		14.2			14.3	14.3		23.6			23.6	
Actuated g/C Ratio		0.32			0.32	0.32		0.55			0.55	
v/c Ratio		0.46			0.51	0.06		0.16			0.14	
Control Delay		10.2			11.1	3.9		7.0			6.7	

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0			0.0	0.0		0.0			0.0	
Total Delay		10.2			11.1	3.9		7.0			6.7	
LOS		B			B	A		A			A	
Approach Delay		10.2			10.3			7.0			6.7	
Approach LOS		B			B			A			A	
Queue Length 50th (m)		9.0			12.0	0.0		2.4			2.0	
Queue Length 95th (m)		20.1			24.7	3.1		10.5			9.3	
Internal Link Dist (m)		839.4			559.0			340.6			348.0	
Turn Bay Length (m)						25.0						
Base Capacity (vph)		784			870	886		621			634	
Starvation Cap Reductn		0			0	0		0			0	
Spillback Cap Reductn		0			0	0		0			0	
Storage Cap Reductn		0			0	0		0			0	
Reduced v/c Ratio		0.25			0.27	0.03		0.16			0.14	

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 42.6
Natural Cycle: 45
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.51
Intersection Signal Delay: 9.3 Intersection LOS: A
Intersection Capacity Utilization 48.9% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: CR 6 &



CR 6 and Lynn Park Avenue
AM Peak Hour, Background 2026

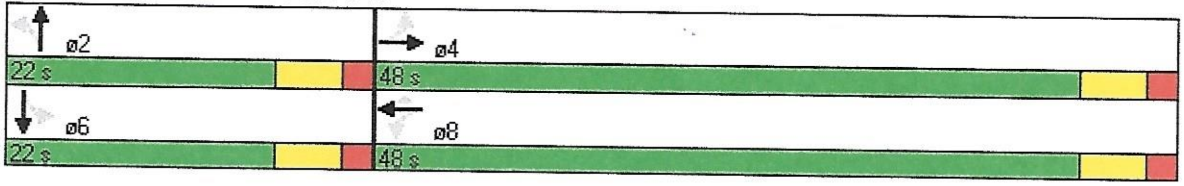
	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱		✥			✥	
Ideal Flow (vphpl)	1550	1550	1550	1650	1650	1750	1550	1550	1550	1550	1550	1550
Storage Length (m)	0.0		0.0	0.0		25.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		1	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2	15.2	15.2	15.2		15.2	15.2	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00	0.97		0.97			0.97	
Frt		0.991				0.850		0.961			0.957	
Flt Protected		0.994			0.994			0.972			0.974	
Satd. Flow (prot)	0	1365	0	0	1530	1504	0	1339	0	0	1331	0
Flt Permitted		0.951			0.951			0.805			0.809	
Satd. Flow (perm)	0	1305	0	0	1461	1458	0	1081	0	0	1100	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10				33		28			33	
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		863.4			583.0			364.6			372.0	
Travel Time (s)		64.8			43.7			27.3			27.9	
Volume (vph)	25	170	15	30	220	30	60	15	30	50	15	30
Confl. Peds. (#/hr)	5		10	10		5	25		5	5		25
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	13%	15%	4%	9%	0%	6%	21%	7%	7%	0%	11%
Adj. Flow (vph)	27	185	16	33	239	33	65	16	33	54	16	33
Lane Group Flow (vph)	0	228	0	0	272	33	0	114	0	0	103	0
Turn Type	Perm			Perm		Perm	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		
Detector Phases	4	4		8	8	8	2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0	22.0	22.0	22.0		22.0	22.0	
Total Split (s)	48.0	48.0	0.0	48.0	48.0	48.0	22.0	22.0	0.0	22.0	22.0	0.0
Total Split (%)	68.6%	68.6%	0.0%	68.6%	68.6%	68.6%	31.4%	31.4%	0.0%	31.4%	31.4%	0.0%
Maximum Green (s)	42.0	42.0		42.0	42.0	42.0	16.0	16.0		16.0	16.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)		14.7			14.9	14.9		22.4			22.4	
Actuated g/C Ratio		0.34			0.34	0.34		0.54			0.54	
v/c Ratio		0.51			0.55	0.06		0.19			0.17	
Control Delay		10.6			11.2	3.7		8.1			7.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0			0.0	0.0		0.0			0.0	
Total Delay		10.6			11.2	3.7		8.1			7.4	
LOS		B			B	A		A			A	
Approach Delay		10.6			10.4			8.1			7.4	
Approach LOS		B			B			A			A	
Queue Length 50th (m)		11.1			14.2	0.0		3.3			2.6	
Queue Length 95th (m)		23.6			28.1	3.2		13.1			11.3	
Internal Link Dist (m)		839.4			559.0			340.6			348.0	
Turn Bay Length (m)						25.0						
Base Capacity (vph)		794			885	896		600			613	
Starvation Cap Reductn		0			0	0		0			0	
Spillback Cap Reductn		0			0	0		0			0	
Storage Cap Reductn		0			0	0		0			0	
Reduced v/c Ratio		0.29			0.31	0.04		0.19			0.17	

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 41.3
Natural Cycle: 45
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 9.7 Intersection LOS: A
Intersection Capacity Utilization 52.4% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: CR 6 &



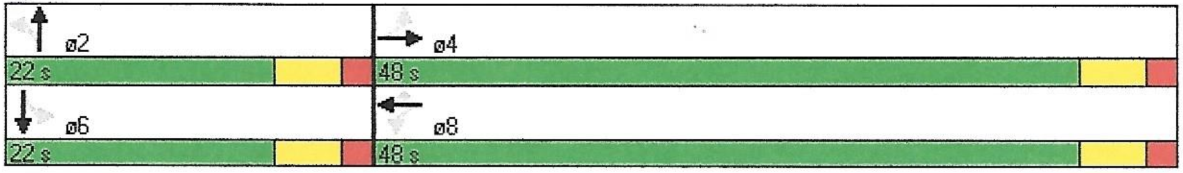
	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱		✥			✥	
Ideal Flow (vphpl)	1550	1550	1550	1650	1650	1750	1550	1550	1550	1550	1550	1550
Storage Length (m)	0.0		0.0	0.0		25.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		1	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2	15.2	15.2	15.2		15.2	15.2	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00	0.97		0.97			0.98	
Frt		0.994				0.850		0.961			0.967	
Flt Protected		0.996			0.995			0.972			0.969	
Satd. Flow (prot)	0	1372	0	0	1530	1504	0	1339	0	0	1345	0
Flt Permitted		0.965			0.944			0.806			0.786	
Satd. Flow (perm)	0	1329	0	0	1450	1458	0	1084	0	0	1085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6				42		28			23	
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		863.4			583.0			364.6			372.0	
Travel Time (s)		64.8			43.7			27.3			27.9	
Volume (vph)	25	297	15	30	263	39	60	15	30	77	15	30
Confl. Peds. (#/hr)	5		10	10		5	25		5	5		25
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	13%	15%	4%	9%	0%	6%	21%	7%	7%	0%	11%
Adj. Flow (vph)	27	323	16	33	286	42	65	16	33	84	16	33
Lane Group Flow (vph)	0	366	0	0	319	42	0	114	0	0	133	0
Turn Type	Perm			Perm		Perm	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		
Detector Phases	4	4		8	8	8	2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0	22.0	22.0	22.0		22.0	22.0	
Total Split (s)	48.0	48.0	0.0	48.0	48.0	48.0	22.0	22.0	0.0	22.0	22.0	0.0
Total Split (%)	68.6%	68.6%	0.0%	68.6%	68.6%	68.6%	31.4%	31.4%	0.0%	31.4%	31.4%	0.0%
Maximum Green (s)	42.0	42.0		42.0	42.0	42.0	16.0	16.0		16.0	16.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)		19.0			19.0	19.0		18.4			18.4	
Actuated g/C Ratio		0.42			0.42	0.42		0.40			0.40	
v/c Ratio		0.66			0.53	0.07		0.25			0.29	
Control Delay		11.8			10.6	2.8		11.2			12.4	

	⤴	→	⤵	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0			0.0	0.0		0.0			0.0	
Total Delay		11.8			10.6	2.8		11.2			12.4	
LOS		B			B	A		B			B	
Approach Delay		11.8			9.7			11.2			12.4	
Approach LOS		B			A			B			B	
Queue Length 50th (m)		20.9			17.3	0.0		4.1			5.4	
Queue Length 95th (m)		40.0			32.3	3.2		16.8			20.2	
Internal Link Dist (m)		839.4			559.0			340.6			348.0	
Turn Bay Length (m)						25.0						
Base Capacity (vph)		838			911	932		454			452	
Starvation Cap Reductn		0			0	0		0			0	
Spillback Cap Reductn		0			0	0		0			0	
Storage Cap Reductn		0			0	0		0			0	
Reduced v/c Ratio		0.44			0.35	0.05		0.25			0.29	

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 45.5
Natural Cycle: 45
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.66
Intersection Signal Delay: 11.0 Intersection LOS: B
Intersection Capacity Utilization 63.2% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 3: CR 6 &



CR 6 and Lynn Park Avenue
PM Peak Hour, June 16, 2016

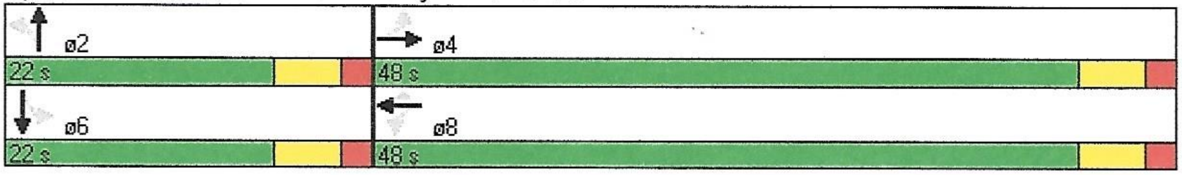
	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱			↰↑	↱		↰↑↱			↰↑↱	
Ideal Flow (vphpl)	1550	1550	1550	1650	1650	1750	1550	1550	1550	1550	1550	1550
Storage Length (m)	0.0		0.0	0.0		25.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		1	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2	15.2	15.2	15.2		15.2	15.2	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00	0.98		0.98			0.98	
Frt		0.983				0.850		0.919			0.936	
Flt Protected		0.997			0.988			0.984			0.978	
Satd. Flow (prot)	0	1461	0	0	1636	1393	0	1355	0	0	1361	0
Flt Permitted		0.966			0.845			0.894			0.852	
Satd. Flow (perm)	0	1416	0	0	1396	1362	0	1223	0	0	1183	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		19				43		70			32	
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		841.1			347.6			275.7			402.8	
Travel Time (s)		63.1			26.1			20.7			30.2	
Volume (vph)	21	255	39	85	263	40	35	7	64	28	5	29
Confl. Peds. (#/hr)	1		7	7		1	10		3	3		10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	5%	5%	0%	1%	8%	9%	0%	0%	0%	0%	7%
Adj. Flow (vph)	23	277	42	92	286	43	38	8	70	30	5	32
Lane Group Flow (vph)	0	342	0	0	378	43	0	116	0	0	67	0
Turn Type	Perm			Perm		Perm	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		
Detector Phases	4	4		8	8	8	2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0	22.0	22.0	22.0		22.0	22.0	
Total Split (s)	48.0	48.0	0.0	48.0	48.0	48.0	22.0	22.0	0.0	22.0	22.0	0.0
Total Split (%)	68.6%	68.6%	0.0%	68.6%	68.6%	68.6%	31.4%	31.4%	0.0%	31.4%	31.4%	0.0%
Maximum Green (s)	42.0	42.0		42.0	42.0	42.0	16.0	16.0		16.0	16.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)		19.0			19.0	19.0		18.4			18.4	
Actuated g/C Ratio		0.42			0.42	0.42		0.40			0.40	
v/c Ratio		0.57			0.65	0.07		0.22			0.14	
Control Delay		10.4			11.9	2.8		7.5			8.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0			0.0	0.0		0.0			0.0	
Total Delay		10.4			11.9	2.8		7.5			8.4	
LOS		B			B	A		A			A	
Approach Delay		10.4			10.9			7.5			8.4	
Approach LOS		B			B			A			A	
Queue Length 50th (m)		17.7			21.9	0.0		2.1			1.6	
Queue Length 95th (m)		33.9			40.8	3.3		12.7			9.6	
Internal Link Dist (m)		817.1			323.6			251.7			378.8	
Turn Bay Length (m)						25.0						
Base Capacity (vph)		897			877	872		535			496	
Starvation Cap Reductn		0			0	0		0			0	
Spillback Cap Reductn		0			0	0		0			0	
Storage Cap Reductn		0			0	0		0			0	
Reduced v/c Ratio		0.38			0.43	0.05		0.22			0.14	

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 45.5
Natural Cycle: 45
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 10.1 Intersection LOS: B
Intersection Capacity Utilization 65.6% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 18: CR 6 & Lynn Park Ave.



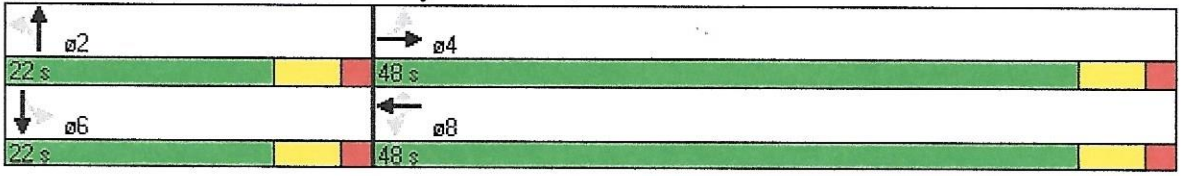
	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			↰	↱		✣			✣	
Ideal Flow (vphpl)	1550	1550	1550	1650	1650	1750	1550	1550	1550	1550	1550	1550
Storage Length (m)	0.0		0.0	0.0		25.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		1	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2	15.2	15.2	15.2		15.2	15.2	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99			1.00	0.97		0.98			0.98	
Frt		0.983				0.850		0.919			0.932	
Flt Protected		0.997			0.988			0.984			0.979	
Satd. Flow (prot)	0	1460	0	0	1636	1393	0	1352	0	0	1353	0
Flt Permitted		0.959			0.821			0.891			0.846	
Satd. Flow (perm)	0	1404	0	0	1356	1350	0	1217	0	0	1165	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		19				49		82			38	
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		841.1			347.6			275.7			402.8	
Travel Time (s)		63.1			26.1			20.7			30.2	
Volume (vph)	25	295	45	100	305	45	40	10	75	30	5	35
Confl. Peds. (#/hr)	5		10	10		5	10		5	5		10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	5%	5%	0%	1%	8%	9%	0%	0%	0%	0%	7%
Adj. Flow (vph)	27	321	49	109	332	49	43	11	82	33	5	38
Lane Group Flow (vph)	0	397	0	0	441	49	0	136	0	0	76	0
Turn Type	Perm			Perm		Perm	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		
Detector Phases	4	4		8	8	8	2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0	22.0	22.0	22.0		22.0	22.0	
Total Split (s)	48.0	48.0	0.0	48.0	48.0	48.0	22.0	22.0	0.0	22.0	22.0	0.0
Total Split (%)	68.6%	68.6%	0.0%	68.6%	68.6%	68.6%	31.4%	31.4%	0.0%	31.4%	31.4%	0.0%
Maximum Green (s)	42.0	42.0		42.0	42.0	42.0	16.0	16.0		16.0	16.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)		22.6			22.6	22.6		18.5			18.5	
Actuated g/C Ratio		0.46			0.46	0.46		0.38			0.38	
v/c Ratio		0.61			0.71	0.08		0.27			0.16	
Control Delay		10.6			12.6	2.4		9.0			9.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0			0.0	0.0		0.0			0.0	
Total Delay		10.6			12.6	2.4		9.0			9.9	
LOS		B			B	A		A			A	
Approach Delay		10.6			11.5			9.0			9.9	
Approach LOS		B			B			A			A	
Queue Length 50th (m)		22.0			27.6	0.0		2.9			2.0	
Queue Length 95th (m)		40.1			50.4	3.3		16.3			11.8	
Internal Link Dist (m)		817.1			323.6			251.7			378.8	
Turn Bay Length (m)						25.0						
Base Capacity (vph)		890			852	867		508			461	
Starvation Cap Reductn		0			0	0		0			0	
Spillback Cap Reductn		0			0	0		0			0	
Storage Cap Reductn		0			0	0		0			0	
Reduced v/c Ratio		0.45			0.52	0.06		0.27			0.16	

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 49.3
Natural Cycle: 50
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 10.8 Intersection LOS: B
Intersection Capacity Utilization 72.4% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 18: CR 6 & Lynn Park Ave.



CR 6 and Lynn Park Avenue
PM Peak Hour, Total 2026

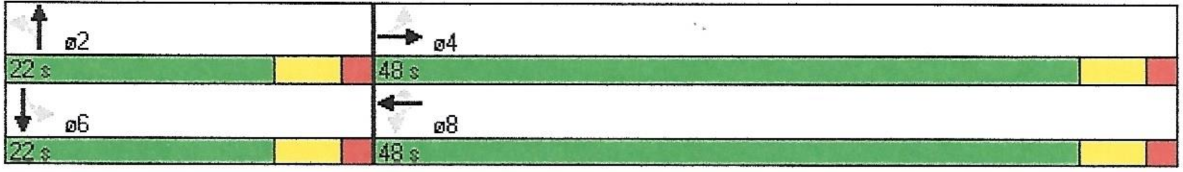
	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱		✥			✥	
Ideal Flow (vphpl)	1550	1550	1550	1650	1650	1750	1550	1550	1550	1550	1550	1550
Storage Length (m)	0.0		0.0	0.0		25.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		1	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2	15.2	15.2	15.2		15.2	15.2	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00	0.97		0.98			0.98	
Frt		0.986				0.850		0.919			0.945	
Flt Protected		0.997			0.991			0.984			0.974	
Satd. Flow (prot)	0	1465	0	0	1640	1393	0	1352	0	0	1379	0
Flt Permitted		0.957			0.839			0.886			0.826	
Satd. Flow (perm)	0	1406	0	0	1386	1350	0	1211	0	0	1164	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16				79		82			38	
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		841.1			347.6			275.7			402.8	
Travel Time (s)		63.1			26.1			20.7			30.2	
Volume (vph)	25	376	45	100	443	73	40	10	75	46	5	35
Confl. Peds. (#/hr)	5		10	10		5	10		5	5		10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	5%	5%	0%	1%	8%	9%	0%	0%	0%	0%	7%
Adj. Flow (vph)	27	409	49	109	482	79	43	11	82	50	5	38
Lane Group Flow (vph)	0	485	0	0	591	79	0	136	0	0	93	0
Turn Type	Perm			Perm		Perm	Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		
Detector Phases	4	4		8	8	8	2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0	22.0	22.0	22.0		22.0	22.0	
Total Split (s)	48.0	48.0	0.0	48.0	48.0	48.0	22.0	22.0	0.0	22.0	22.0	0.0
Total Split (%)	68.6%	68.6%	0.0%	68.6%	68.6%	68.6%	31.4%	31.4%	0.0%	31.4%	31.4%	0.0%
Maximum Green (s)	42.0	42.0		42.0	42.0	42.0	16.0	16.0		16.0	16.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)		29.8			29.8	29.8		18.6			18.6	
Actuated g/C Ratio		0.53			0.53	0.53		0.33			0.33	
v/c Ratio		0.65			0.81	0.11		0.30			0.23	
Control Delay		11.2			15.0	1.8		11.4			14.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0			0.0	0.0		0.0			0.0	
Total Delay		11.2			15.0	1.8		11.4			14.0	
LOS		B			B	A		B			B	
Approach Delay		11.2			13.4			11.4			14.0	
Approach LOS		B			B			B			B	
Queue Length 50th (m)		30.0			43.6	0.0		4.0			4.0	
Queue Length 95th (m)		52.6			77.6	3.9		18.9			16.5	
Internal Link Dist (m)		817.1			323.6			251.7			378.8	
Turn Bay Length (m)						25.0						
Base Capacity (vph)		890			871	878		453			408	
Starvation Cap Reductn		0			0	0		0			0	
Spillback Cap Reductn		0			0	0		0			0	
Storage Cap Reductn		0			0	0		0			0	
Reduced v/c Ratio		0.54			0.68	0.09		0.30			0.23	

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 56.7
Natural Cycle: 60
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 12.5 Intersection LOS: B
Intersection Capacity Utilization 86.0% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 18: CR 6 & Lynn Park Ave.



CR 6 AND PHEASANT TRAIL

CR 6 and Pheasant Trail
AM Peak Hour, June 16, 2016

1639Lynn

	↰	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	4	179	16	7	256	9	49	1	13	11	2	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	195	17	8	278	10	53	1	14	12	2	20
Pedestrians					1			2				
Lane Width (m)					3.7			3.7				
Walking Speed (m/s)					1.2			1.2				
Percent Blockage					0			0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	288			214			533	517	206	526	521	283
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	288			214			533	517	206	526	521	283
tC, single (s)	4.1			4.1			7.1	7.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.9	3.3	3.5	4.0	3.3
p0 queue free %	100			99			88	100	98	97	100	97
cM capacity (veh/h)	1286			1366			443	345	837	453	458	761

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	216	296	68	34
Volume Left	4	8	53	12
Volume Right	17	10	14	20
cSH	1286	1366	488	592
Volume to Capacity	0.00	0.01	0.14	0.06
Queue Length 95th (m)	0.1	0.1	3.7	1.4
Control Delay (s)	0.2	0.2	13.6	11.4
Lane LOS	A	A	B	B
Approach Delay (s)	0.2	0.2	13.6	11.4
Approach LOS			B	B

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	37.1%	ICU Level of Service	A
Analysis Period (min)	15		

CR 6 and Pheasant Trail
AM Peak Hour, Background 2026

1639Lynn

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	210	20	10	300	10	55	1	15	15	5	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	228	22	11	326	11	60	1	16	16	5	22
Pedestrians		5			5			5			5	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	342			255			638	619	249	630	624	342
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	342			255			638	619	249	630	624	342
tC, single (s)	4.1			4.1			7.1	7.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.9	3.3	3.5	4.0	3.3
p0 queue free %	100			99			84	100	98	96	99	97
cM capacity (veh/h)	1223			1316			367	293	788	378	396	700

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	255	348	77	43
Volume Left	5	11	60	16
Volume Right	22	11	16	22
cSH	1223	1316	412	495
Volume to Capacity	0.00	0.01	0.19	0.09
Queue Length 95th (m)	0.1	0.2	5.2	2.2
Control Delay (s)	0.2	0.3	15.7	13.0
Lane LOS	A	A	C	B
Approach Delay (s)	0.2	0.3	15.7	13.0
Approach LOS			C	B

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	43.0%	ICU Level of Service	A
Analysis Period (min)	15		

8/17/2016
FR Berry & Associates

CR 6 and Pheasant Trail
AM Peak Hour, Total 2026

1639Lynn

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	287	20	10	326	27	55	1	15	65	5	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	312	22	11	354	29	60	1	16	71	5	22
Pedestrians		5			5			5			5	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	389			339			759	749	333	751	745	379
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	389			339			759	749	333	751	745	379
tC, single (s)	4.1			4.1			7.1	7.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.9	3.3	3.5	4.0	3.3
p0 queue free %	100			99			80	100	98	77	98	97
cM capacity (veh/h)	1176			1226			303	241	707	313	337	667

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	339	395	77	98
Volume Left	5	11	60	71
Volume Right	22	29	16	22
cSH	1176	1226	343	356
Volume to Capacity	0.00	0.01	0.22	0.27
Queue Length 95th (m)	0.1	0.2	6.4	8.4
Control Delay (s)	0.2	0.3	18.5	18.9
Lane LOS	A	A	C	C
Approach Delay (s)	0.2	0.3	18.5	18.9
Approach LOS			C	C

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	17	294	26	10	302	15	20	3	8	16	2	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	320	28	11	328	16	22	3	9	17	2	8
Pedestrians					2			2				
Lane Width (m)					3.7			3.7				
Walking Speed (m/s)					1.2			1.2				
Percent Blockage					0			0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	345			350			740	739	338	741	745	336
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	345			350			740	739	338	741	745	336
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			99			93	99	99	95	99	99
cM capacity (veh/h)	1226			1218			323	339	707	321	336	710

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	366	355	34	27
Volume Left	18	11	22	17
Volume Right	28	16	9	8
cSH	1226	1218	378	381
Volume to Capacity	0.02	0.01	0.09	0.07
Queue Length 95th (m)	0.3	0.2	2.2	1.7
Control Delay (s)	0.5	0.3	15.5	15.2
Lane LOS	A	A	C	C
Approach Delay (s)	0.5	0.3	15.5	15.2
Approach LOS			C	C

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	40.8%	ICU Level of Service	A
Analysis Period (min)	15		

CR 6 and Pheasant Trail
PM Peak Hour, Background 2026

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	20	340	30	10	350	15	25	5	10	20	5	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	370	33	11	380	16	27	5	11	22	5	11
Pedestrians		5			5			5			5	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	402			407			863	858	396	863	866	399
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	402			407			863	858	396	863	866	399
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			99			89	98	98	92	98	98
cM capacity (veh/h)	1163			1158			259	286	652	259	283	650

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	424	408	43	38
Volume Left	22	11	27	22
Volume Right	33	16	11	11
cSH	1163	1158	309	317
Volume to Capacity	0.02	0.01	0.14	0.12
Queue Length 95th (m)	0.4	0.2	3.7	3.1
Control Delay (s)	0.6	0.3	18.5	17.9
Lane LOS	A	A	C	C
Approach Delay (s)	0.6	0.3	18.5	17.9
Approach LOS			C	C

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	20	389	30	10	433	70	25	5	10	52	5	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	423	33	11	471	76	27	5	11	57	5	11
Pedestrians		5			5			5			5	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	552			460			1037	1061	449	1037	1039	519
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	552			460			1037	1061	449	1037	1039	519
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			99			86	97	98	71	98	98
cM capacity (veh/h)	1024			1106			196	217	609	196	223	556

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	477	558	43	73
Volume Left	22	11	27	57
Volume Right	33	76	11	11
cSH	1024	1106	239	219
Volume to Capacity	0.02	0.01	0.18	0.33
Queue Length 95th (m)	0.5	0.2	4.9	10.6
Control Delay (s)	0.6	0.3	23.4	29.4
Lane LOS	A	A	C	D
Approach Delay (s)	0.6	0.3	23.4	29.4
Approach LOS			C	D

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

CR 6 AND SITE ACCESS

CR 6 and Site Access
AM Peak Hour, Total 2026

	↗	→	←	↖	↘	↙
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↱		Y	
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	34	235	375	26	77	102
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	37	255	408	28	84	111
Pedestrians					5	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	441				756	427
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	441				756	427
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				77	82
cM capacity (veh/h)	1114				362	625

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	37	255	436	195
Volume Left	37	0	0	84
Volume Right	0	0	28	111
cSH	1114	1700	1700	476
Volume to Capacity	0.03	0.15	0.26	0.41
Queue Length 95th (m)	0.8	0.0	0.0	14.9
Control Delay (s)	8.3	0.0	0.0	17.7
Lane LOS	A			C
Approach Delay (s)	1.1		0.0	17.7
Approach LOS				C

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	48.2%	ICU Level of Service	A
Analysis Period (min)	15		

	↗	→	←	↖	↘	↙
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↱		Y	
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	110	390	385	83	49	65
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	120	424	418	90	53	71
Pedestrians					5	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	514				1132	469
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	514				1132	469
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	89				73	88
cM capacity (veh/h)	1047				198	592

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	120	424	509	124
Volume Left	120	0	0	53
Volume Right	0	0	90	71
cSH	1047	1700	1700	319
Volume to Capacity	0.11	0.25	0.30	0.39
Queue Length 95th (m)	2.9	0.0	0.0	13.5
Control Delay (s)	8.9	0.0	0.0	23.2
Lane LOS	A			C
Approach Delay (s)	2.0		0.0	23.2
Approach LOS				C

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		

CR 6 and Site Access
AM Peak Hour, Total 2026

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**
Lane Configurations	↰	↱		↰	↱			✣			✣	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	34	235	35	53	375	26	38	10	56	77	10	102
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	37	255	38	58	408	28	41	11	61	84	11	111
Pedestrians		10			10			10			10	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	446			303			1008	919	294	953	924	442
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	446			303			1008	919	294	953	924	442
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			95			74	96	92	57	96	82
cM capacity (veh/h)	1105			1247			158	246	732	193	244	605

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	37	293	58	436	113	205
Volume Left	37	0	58	0	41	84
Volume Right	0	38	0	28	61	111
cSH	1105	1700	1247	1700	291	311
Volume to Capacity	0.03	0.17	0.05	0.26	0.39	0.66
Queue Length 95th (m)	0.8	0.0	1.1	0.0	13.4	33.3
Control Delay (s)	8.4	0.0	8.0	0.0	25.1	36.5
Lane LOS	A		A		D	E
Approach Delay (s)	0.9		0.9		25.1	36.5
Approach LOS					D	E

Intersection Summary			
Average Delay	9.7		
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

CR 6 and Site Access
PM Peak Hour, Total 2026

1639Lynn
Four Leg Intersection

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱			✥			✥	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	110	390	81	121	385	83	90	25	136	49	25	65
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	120	424	88	132	418	90	98	27	148	53	27	71
Pedestrians		10			10			10			10	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	519			522			1493	1499	488	1571	1498	484
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	519			522			1493	1499	488	1571	1498	484
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	88			87			0	71	74	0	71	88
cM capacity (veh/h)	1038			1035			56	93	570	42	93	573

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	120	512	132	509	273	151
Volume Left	120	0	132	0	98	53
Volume Right	0	88	0	90	148	71
cSH	1038	1700	1035	1700	118	89
Volume to Capacity	0.12	0.30	0.13	0.30	2.31	1.70
Queue Length 95th (m)	3.0	0.0	3.3	0.0	179.7	93.9
Control Delay (s)	8.9	0.0	9.0	0.0	673.0	438.5
Lane LOS	A		A		F	F
Approach Delay (s)	1.7		1.8		673.0	438.5
Approach LOS					F	F

Intersection Summary			
Average Delay	148.7		
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

CR 6 and Site Access
AM Peak Hour, Total 2026

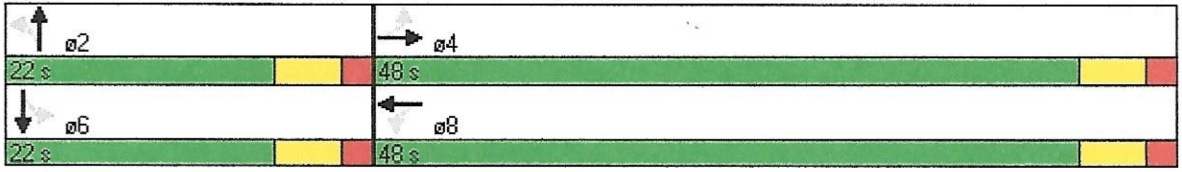
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱			✥			✥	
Ideal Flow (vphpl)	1775	1650	1650	1775	1650	1650	1550	1550	1550	1550	1550	1550
Storage Length (m)	30.0		0.0	30.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2		15.2	15.2		15.2	15.2	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99	0.99		0.99	1.00			0.97			0.97	
Frt		0.981			0.990			0.927			0.927	
Flt Protected	0.950			0.950				0.982			0.980	
Satd. Flow (prot)	1672	1494	0	1672	1544	0	0	1367	0	0	1365	0
Flt Permitted	0.459			0.567				0.854			0.849	
Satd. Flow (perm)	799	1494	0	984	1544	0	0	1183	0	0	1174	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21			10			61			81	
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		195.7			182.4			147.8			146.4	
Travel Time (s)		14.7			13.7			11.1			11.0	
Volume (vph)	34	235	35	53	375	26	38	10	56	77	10	102
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	10%	2%	2%	7%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	37	255	38	58	408	28	41	11	61	84	11	111
Lane Group Flow (vph)	37	293	0	58	436	0	0	113	0	0	206	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0		22.0	22.0		22.0	22.0	
Total Split (s)	48.0	48.0	0.0	48.0	48.0	0.0	22.0	22.0	0.0	22.0	22.0	0.0
Total Split (%)	68.6%	68.6%	0.0%	68.6%	68.6%	0.0%	31.4%	31.4%	0.0%	31.4%	31.4%	0.0%
Maximum Green (s)	42.0	42.0		42.0	42.0		16.0	16.0		16.0	16.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	19.6	19.6		19.6	19.6			18.4			18.4	
Actuated g/C Ratio	0.43	0.43		0.43	0.43			0.40			0.40	
v/c Ratio	0.11	0.45		0.14	0.66			0.22			0.40	
Control Delay	7.5	9.1		7.7	11.5			8.2			11.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.5	9.1		7.7	11.5			8.2			11.0	
LOS	A	A		A	B			A			B	
Approach Delay		8.9			11.0			8.3			11.0	
Approach LOS		A			B			A			B	
Queue Length 50th (m)	1.6	14.0		2.6	24.9			2.4			6.3	
Queue Length 95th (m)	5.1	26.9		7.0	45.1			13.4			25.6	
Internal Link Dist (m)		171.7			158.4			123.8			122.4	
Turn Bay Length (m)	30.0			30.0								
Base Capacity (vph)	502	947		619	974			508			516	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.07	0.31		0.09	0.45			0.22			0.40	

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 46.1
Natural Cycle: 45
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.66
Intersection Signal Delay: 10.1 Intersection LOS: B
Intersection Capacity Utilization 56.9% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 5: Int



CR 6 and Site Access
PM Peak Hour, Total 2026

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱			✣			✣	
Ideal Flow (vphpl)	1775	1650	1650	1775	1650	1650	1550	1550	1550	1550	1550	1550
Storage Length (m)	30.0		0.0	30.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2		15.2	15.2		15.2	15.2	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99	0.99		0.99	0.99			0.97			0.98	
Frt		0.974			0.973			0.927			0.937	
Flt Protected	0.950			0.950				0.982			0.983	
Satd. Flow (prot)	1672	1569	0	1672	1580	0	0	1367	0	0	1388	0
Flt Permitted	0.409			0.407				0.825			0.790	
Satd. Flow (perm)	713	1569	0	710	1580	0	0	1142	0	0	1111	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		29			30			82			61	
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		163.7			164.1			161.5			123.5	
Travel Time (s)		12.3			12.3			12.1			9.3	
Volume (vph)	110	390	81	121	385	83	90	25	136	49	25	65
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	120	424	88	132	418	90	98	27	148	53	27	71
Lane Group Flow (vph)	120	512	0	132	508	0	0	273	0	0	151	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0		22.0	22.0		22.0	22.0	
Total Split (s)	48.0	48.0	0.0	48.0	48.0	0.0	22.0	22.0	0.0	22.0	22.0	0.0
Total Split (%)	68.6%	68.6%	0.0%	68.6%	68.6%	0.0%	31.4%	31.4%	0.0%	31.4%	31.4%	0.0%
Maximum Green (s)	42.0	42.0		42.0	42.0		16.0	16.0		16.0	16.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	22.1	22.1		22.1	22.1			18.5			18.5	
Actuated g/C Ratio	0.45	0.45		0.45	0.45			0.38			0.38	
v/c Ratio	0.37	0.70		0.41	0.69			0.57			0.33	
Control Delay	9.7	11.5		10.2	11.3			17.2			11.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	9.7	11.5		10.2	11.3			17.2			11.8	
LOS	A	B		B	B			B			B	
Approach Delay		11.2			11.1			17.2			11.8	
Approach LOS		B			B			B			B	
Queue Length 50th (m)	6.1	29.7		6.9	29.2			11.8			5.1	
Queue Length 95th (m)	14.5	52.8		16.2	51.9			#50.1			21.4	
Internal Link Dist (m)		139.7			140.1			137.5			99.5	
Turn Bay Length (m)	30.0			30.0								
Base Capacity (vph)	448	997		446	1004			483			458	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.27	0.51		0.30	0.51			0.57			0.33	

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 48.8
Natural Cycle: 50
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.70
Intersection Signal Delay: 12.2 Intersection LOS: B
Intersection Capacity Utilization 70.8% ICU Level of Service C
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Int

[redacted]

	⤴	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Volume (veh/h)	34	235	35	53	375	26	38	10	56	77	10	102
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	37	255	38	58	408	28	41	11	61	84	11	111
Approach Volume (veh/h)		330			493			113			205	
Crossing Volume (veh/h)		152			89			376			507	
High Capacity (veh/h)		1229			1292			1030			929	
High v/c (veh/h)		0.27			0.38			0.11			0.22	
Low Capacity (veh/h)		1020			1077			841			750	
Low v/c (veh/h)		0.32			0.46			0.13			0.27	

Intersection Summary			
Maximum v/c High	0.38		
Maximum v/c Low	0.46		
Intersection Capacity Utilization	63.2%	ICU Level of Service	B

CR 6 and Site Access
PM Peak Hour, Total 2026

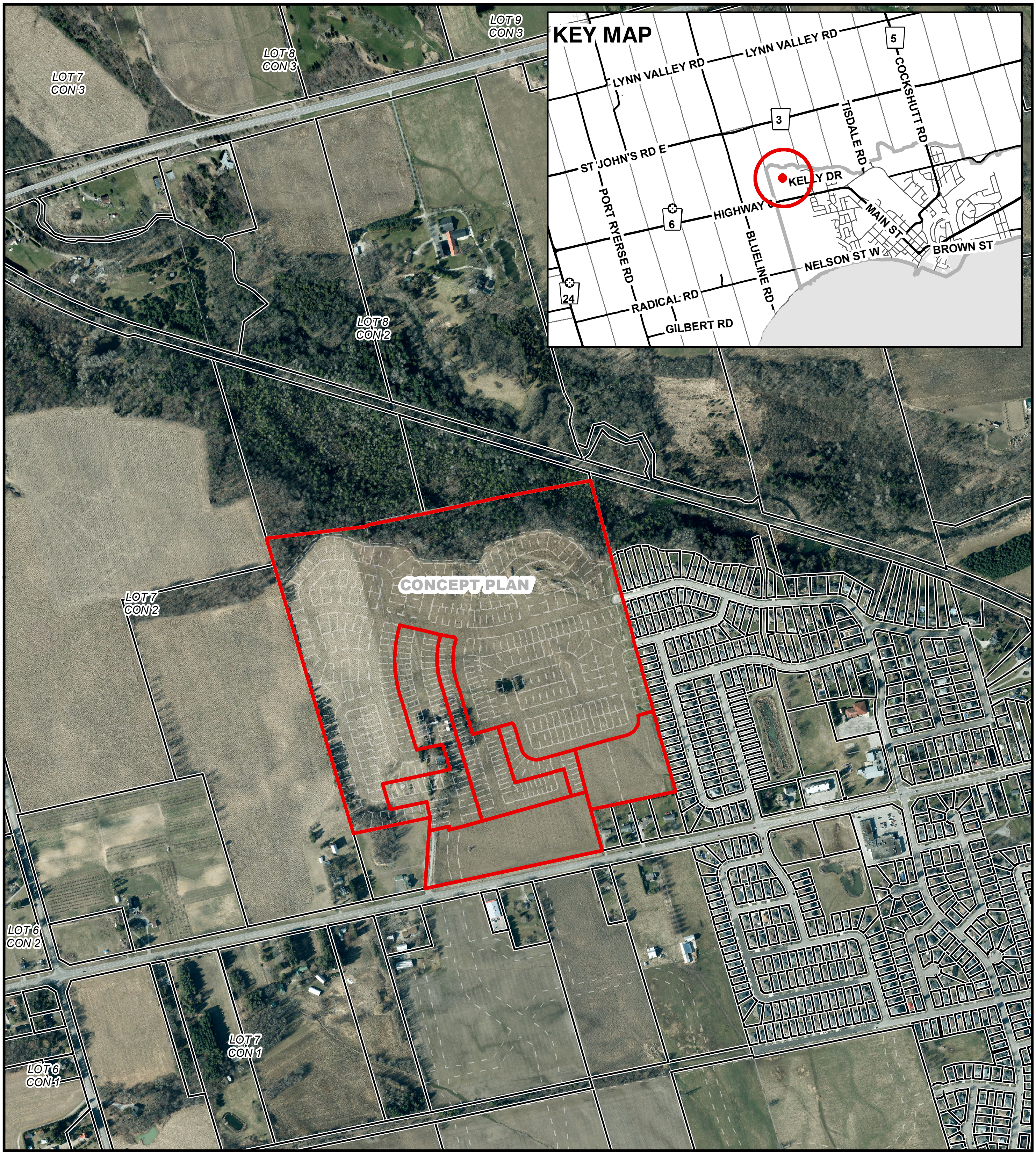
1639Lynn
Four Leg Intersection

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Volume (veh/h)	110	390	81	121	385	83	90	25	136	49	25	65
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	120	424	88	132	418	90	98	27	148	53	27	71
Approach Volume (veh/h)		632			640			273			151	
Crossing Volume (veh/h)		212			245			597			648	
High Capacity (veh/h)		1173			1143			864			829	
High v/c (veh/h)		0.54			0.56			0.32			0.18	
Low Capacity (veh/h)		969			942			693			662	
Low v/c (veh/h)		0.65			0.68			0.39			0.23	

Intersection Summary			
Maximum v/c High	0.56		
Maximum v/c Low	0.68		
Intersection Capacity Utilization	81.8%	ICU Level of Service	D

MAP A
CONTEXT MAP
Geographic Township of WOODHOUSE

28TPL2017317
ZNPL2017318



8/25/2023

Legend

🟥 Subject Lands

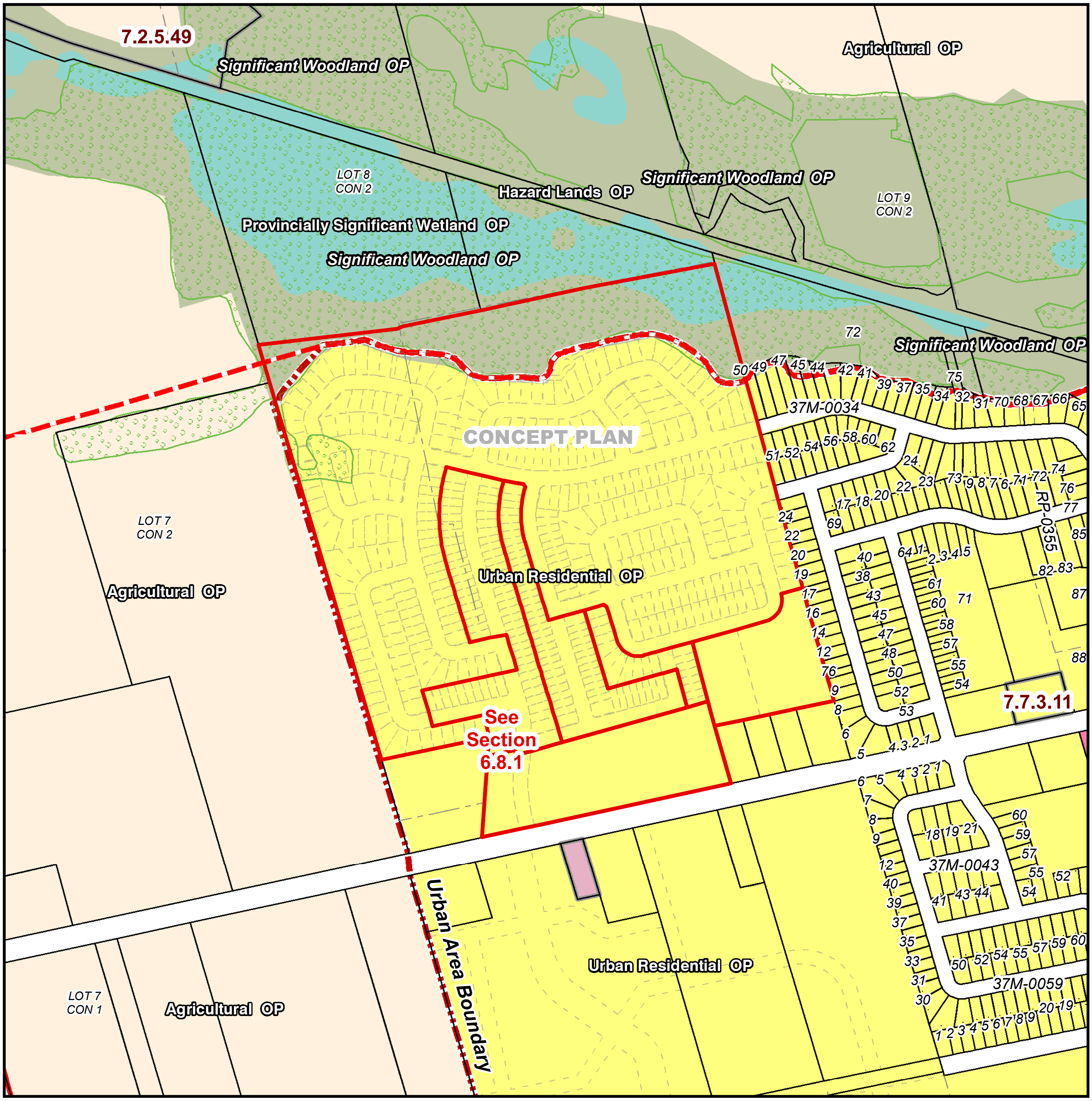
2020 Air Photo

N

80 40 0 80 160 240 320
Meters

MAP B
OFFICIAL PLAN MAP
Geographic Township of WOODHOUSE

28TPL2017317
ZNPL2017318



8/25/2023

Legend

🟥 Subject Lands

Official Plan Designations

- Agricultural
- Hazard Lands
- Provincially Significant Wetland
- Urban Residential
- Shopping Centre Commercial
- Commercial
- Special Policy Area
- Urban Area Boundary
- Significant Woodland

N

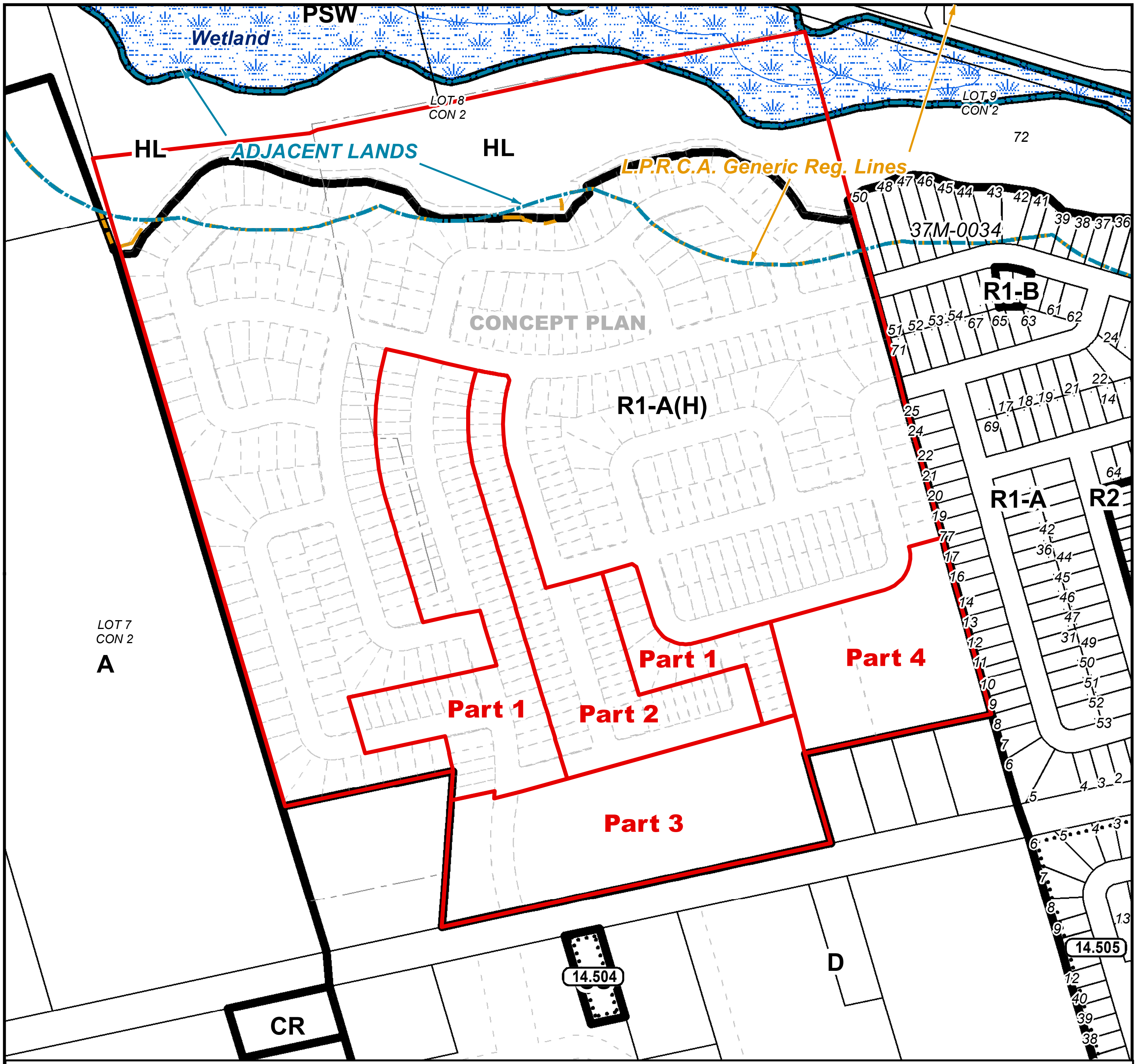
60 30 0 60 120 180 240 Meters

MAP C

PROPOSED ZONING BY-LAW AMENDMENT MAP

Geographic Township of WOODHOUSE

28TPL2017317
ZNPL2017318



Part 1	Part 2	Part 3	Part 4
From: R1-A(H) &R2(H)	From: R1-A(H)	From: R1-A(H) &R2(H)	From: R1-A(H)
To: R1 with Special Provision 14.040	To: R2 with Special Provision 14.041	To: CN with Special Provision 14.042	To: OS

ZONING BY-LAW 1-Z-2014

8/25/2023

LEGEND

- 🟥 Subject Lands
- ▭ Adjacent Lands
- ▨ Wetland
- ▭ LPRCA Generic RegLines

(H) - Holding
A - Agricultural Zone
CS - Service Commercial Zone
CR - Rural Commercial Zone
D - Development Zone
HL - Hazard Land Zone
PSW - Provincially Significant Wetland Zone
R1-A - Residential R1-A Zone
R1-B - Residential R1-B Zone
R2 - Residential R2 Zone

N

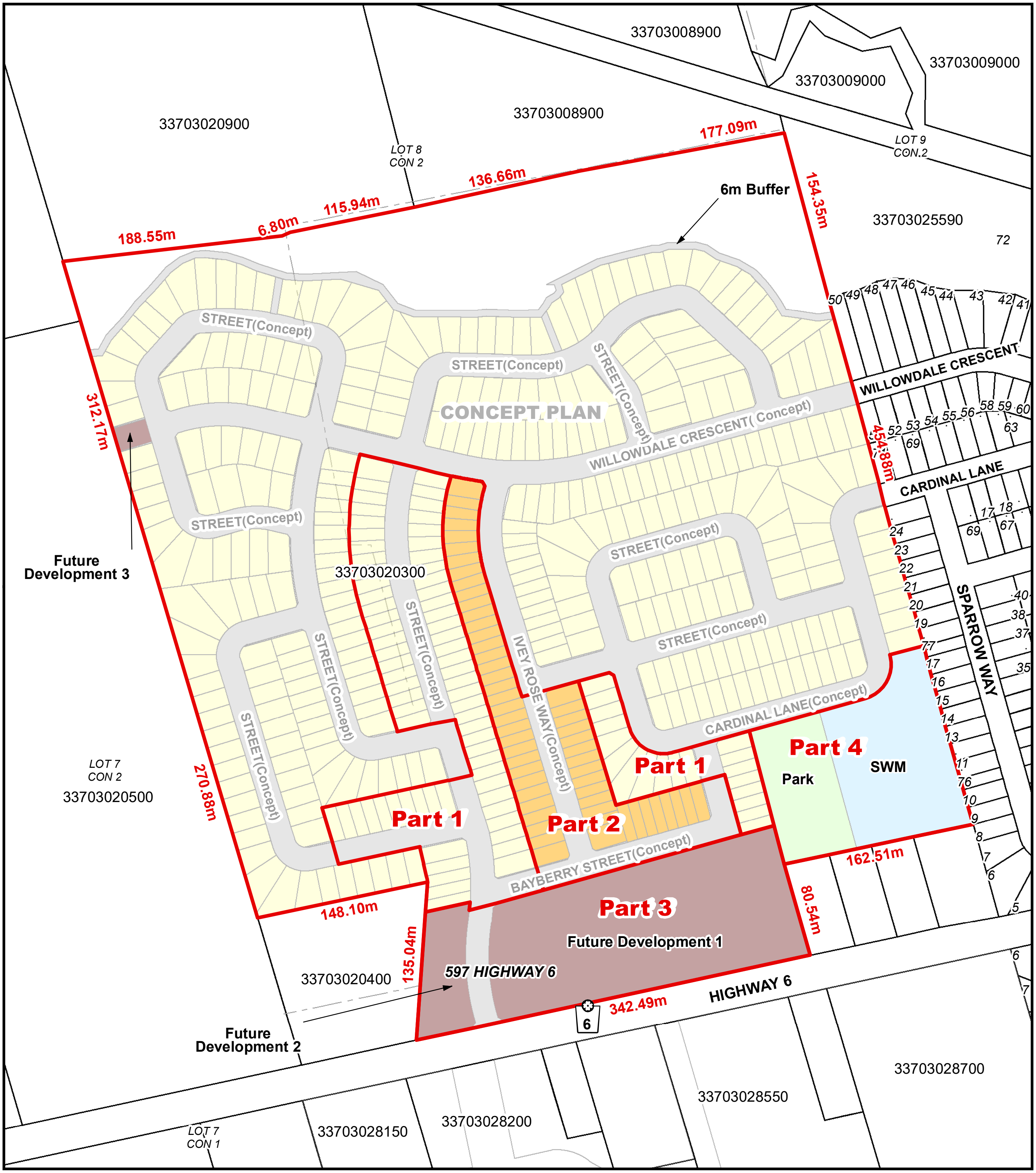
40 20 0 40 80 120 160 Meters

MAP D

CONCEPTUAL PLAN

Geographic Township of WOODHOUSE

28TPL2017317
ZNPL2017318



Legend

☐ Subject Lands

8/25/2023

N

30 15 0 30 60 90 120
Meters