

**Traffic Impact Assessment
Queen's Court Homes Subdivision
Town of Penetanguishene**

**WMI File 09-062
April 2014**

Prepared by

**WMI & Associates Limited
119 Collier Street, Barrie Ontario L4M 1H5**



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1.0 Background

WMI & Associates has been retained by Queen's Court Homes Ltd. to prepare a Traffic Impact Assessment to analyze the projected traffic volume, sight-distance, and vehicular entrance / exit movement impacts that the proposed Queen's Court Homes residential development will have on the existing road network.

The proposed development is an infill residential subdivision development bound between Fox St. to the west, Church Street to the east, Broad Street to the north, and the Village at Bay Moorings Development to the south. The development plan consists of 4 roads, 87 residential lots, 1 medium density residential block containing 28 units, 3 open space blocks, and a SWM facility block. The residential lots are proposed to have driveway access onto each of the 4 new roads, and the medium density residential block is proposed to have 2 driveway accesses onto the new Beck Boulevard extension. All new roads, including Beck Boulevard, are proposed to have 8.5m pavement widths throughout the corridor.

This Traffic Impact Assessment considers the future condition as being the full build-out of Beck Boulevard between Broad St. and Hunter Road, including all new development which this road will service within this corridor. These developments include the subject Queen's Court Homes development, and the Village at Bay Moorings Development (phases 2, 3, and 4) located to the South.

Analysis of the future connection of Beck Boulevard south of Hunter Road to Fox St. is beyond the scope of this study.

The Site Location Plan, contained in **Appendix A**, illustrates the new development and existing road locations within the study area.

2.0 Background Traffic

Traffic count data, and Annual Average Daily Traffic (AADT) estimates for existing Town roads utilized in this Traffic Impact Assessment have been provided by the Town of Penetanguishene. An AADT & Traffic Counts Figure provided by the Town of Penetanguishene is contained in Appendix B for reference.

For the purpose of this analysis, the weekday PM peak hour background traffic is assumed to be 10% of the AADT values derived from the traffic count data. Furthermore, to estimate the effects of anticipated background traffic growth at such time when the subject development is fully built-out, a 20% increase in background traffic has been assumed for the ultimate future traffic impact condition.

From this provided data and the noted assumptions, background traffic distribution sketches have been prepared. The Background Traffic Impact Sketch (Figure 2), and the Future Background Traffic Impact sketch for the weekday PM peak hour conditions (Figure 3) are contained in **Appendix A** for reference.

3.0 Future Traffic

3.1 Critical Intersections

Under the full build-out condition, the critical intersections which require analysis are the new intersection of Beck Boulevard and Broad Street, and the existing intersection of Hunter Road and Fox Street. It should be noted that the analysis contained herein conservatively assumes that all traffic to / from the south leg of Beck boulevard will utilize Hunter Road to access Fox street rather than Bay Moorings Boulevard.

3.2 Trip Generation

The Institute of Transportation Engineering (ITE) Trip Generation Manual, 8th Edition, provides trip generation rate information (i.e. entering and exiting traffic volumes for various types of developments) based on statistical records from Canada and the United States. The vehicle end trip rates referenced are from the Single-Family Detached, Residential Condominium/ Townhouse, and Senior Adult Detached housing land use sections of the ITE manual.

The trip generation analysis for the PM peak hour condition reveals that the full-build out of the Queen's Court development will result in 130 vehicle end trips, and the Village at Bay Moorings Phase 2, 3, and 4 developments will produce an additional 67 trips, for a total of 197 new vehicle end trips (121 entering, 76 exiting).

A detailed trip generation analysis spreadsheet is located in **Appendix B** for reference.

3.3 Trip Distribution

From an analysis of the existing road network, typical travel routes, and likely destinations, trip distribution patterns have been estimated to determine the total 'development' traffic impact within the study area and at each critical intersection.

Based on this analysis, it is assumed that 60% of the Queen's Court Development traffic originates from (enters), or departs (exits) south to the Hunter Rd. / Fox St. intersection. Likewise, 40% of this traffic is assumed to enter or exit north to the Broad St. / Beck Boulevard intersection. It is assumed that 80% of the Village at Bay Moorings Development traffic enters or exits south to the Hunter Rd. / Fox St. Intersection. 20% of this traffic is assumed to enter or exit north to the Broad St. / Beck Boulevard intersection.

At the Beck Boulevard / Broad Street intersection, it is assumed that 90% of total development traffic enters / exits east, and 10% enters / exits west. At the Hunter Road / Fox Street intersection, it is assumed that 90% of total development traffic enters / exits south, and 10% enters / exits north.

From these estimates of trip distribution and trip generation, an overall development traffic impact sketch for the weekday PM peak hour condition has been prepared. This sketch, Figure 4, is contained in **Appendix A** for reference.

The overall future traffic impact, which analyses total development traffic in addition to future background traffic impacts for the weekday PM peak hour condition, is illustrated in Figure 5 contained in **Appendix A** for reference. In summary, the overall future traffic impact condition will see a 30% increase in traffic compared to projected future background traffic at the Broad Street / Beck Boulevard intersection, and an increase of 49% over the projected future background traffic at the Fox Street / Hunter Road Intersection.

4.0 Warrant Analyses

Warrant analyses have been done for traffic signals and all-way stop controls using the overall future traffic impact scenario (as per Figure 5) at the critical intersections. The following sections provide specific information on the warrant analyses considered, and note the specific intersections where signalization or all way stop control should be considered.

4.1 All Way Stop

A review of all-way stop minimum volume warrants has been done as per the guidelines of the Ministry of Transportation's OTM Book 5, for the critical intersections of Hunter Road / Fox Street and Broad Street / Beck Boulevard.

At both locations, the all-way stop minimum volume warrants for arterial / major road intersections have not been met, except it should be noted that the Hunter Road / Fox Street intersection comes close to meeting the warrant criteria. Specifically, the total vehicular volume at the intersection during the PM peak hour is calculated to be 414 vehicles per hour (minimum warrant for an all-way stop is 500 veh/hr), and the combined pedestrian + vehicular volume on the minor street, Hunter Road, is calculated to be 184 per hour (minimum warrant for an all-way stop is 200/hr).

The traffic distribution patterns utilized for the all-way stop (and signal warrant analyses contained herein) assumes that all development traffic exiting / entering south will utilize Hunter Road. In actual fact, some of this traffic would utilize the private road access to Fox Street (Bay Mooring Blvd.) within the Village at Bay Moorings property to the south, thus diluting the actual volume of traffic that would utilize the Hunter Road / Fox Street intersection, and further negating the need for an all-way stop controlled intersection.

The All Way Stop Warrant Calculation Spreadsheet is contained in Appendix B for reference.

4.2 Signal Warrants

A signal warrant analysis has been done for critical intersections as per the guidelines of Ministry of Transportation's Ontario Traffic Manual (OTM) Book 12. Using Justification #7 (signal warrants for projected volumes), Warrants 1A & 1B, and 2A & 2B indicate that signals are not required.

Refer to the Signal Warrant Calculation for Forecasted Volumes spreadsheet contained in **Appendix B**.

5.0 Sight-Distance Geometry

Ontario's Ministry of Transportation (MTO) outlines specific sight-distance geometry criteria to ensure safe vehicular movement to and from intersecting roadways and to ensure that through traffic on the adjacent roadway will have adequate time and space for manoeuvrability and braking.

5.1 External / Critical Intersections

From a field review of existing site conditions and sight-lines from the vantage point of the proposed Broad Street / Beck Boulevard and Hunter Road / Fox Street intersections, visibility is noted as being adequate since there are no vertical or horizontal curves present on the collector roads (Broad Street and Fox Street) to impede visibility. Based on these observations, there are no sight-distance concerns in this direction.

5.2 Internal Intersections

The critical internal roadway where adequate sight-lines are to be maintained is on Beck Boulevard, since this section of the roadway will function as a collector road. Considering an assumed design speed (and posted speed) of 50km/hr, the sight-distance required along the major roadway at each intersecting minor road is 130m. This critical sight-distance has been determined from Figure E3-6 from the MTO manual, which is contained in **Appendix B** for reference.

The numerous horizontal curves within the proposed Beck Boulevard alignment within the Queen's Court development have been designed to meet this sight-distance target. Furthermore, there are no significant vertical curves proposed within the road which would present a sight-distance concern. Therefore, the road / site access design within the Queen's Court development is geometrically adequate with respect to sight-distance.

6.0 Conclusion

This Traffic Impact Assessment demonstrates how the traffic impacts of the Queen's Court development can be integrated into the existing road network, without imposing adverse effects. Specifically, we note the following:

- The overall future traffic impact condition (total development traffic + future background traffic) will see an increase of 30% in total traffic compared to future background traffic at the Beck Boulevard / Broad Street intersection, and an increase of 49% over anticipated future background traffic at the Hunter Road / Fox Street Intersection.
- Warrant analyses completed reveal that the critical intersections of Beck Boulevard / Broad Street and Hunter Road / Fox Street will function adequately without the need for traffic signals or all way stop control.
- Based on field review, sight-distance at the critical existing Hunter Road / Fox Street intersection and proposed Beck Boulevard / Broad Street is adequate. Furthermore, sightlines along the proposed stretch of Beck Boulevard within the Queen's Court Development are adequate, as the design of the internal road has accounted for MTO sight-distance constraints.

Based on the information presented in this report, please accept this Traffic Impact Assessment in support of planning level approvals.

Yours truly,

WMI & Associates Limited

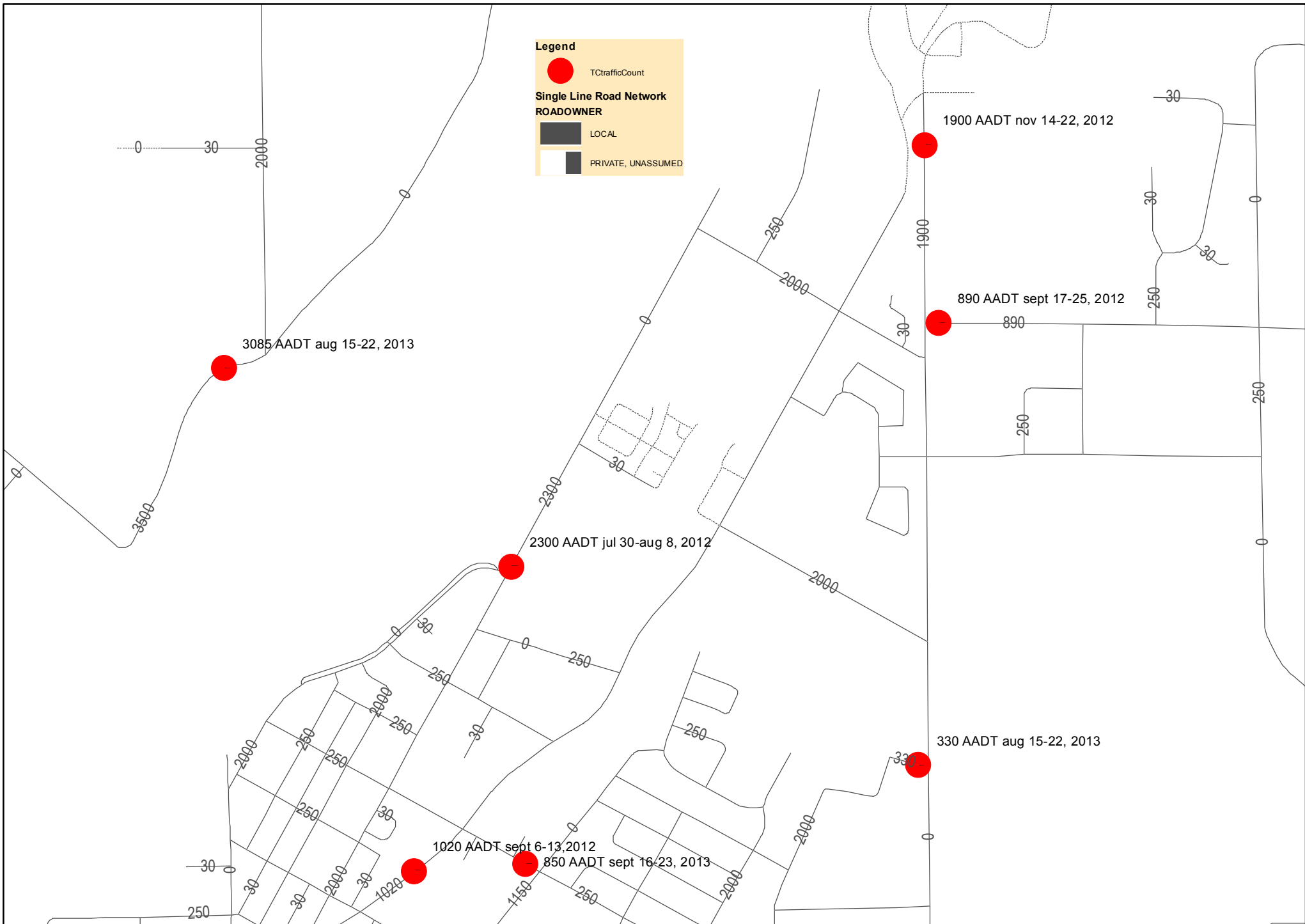


Jonathan Reimer, P.Eng.

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APPENDIX A

Figures



1:15,000
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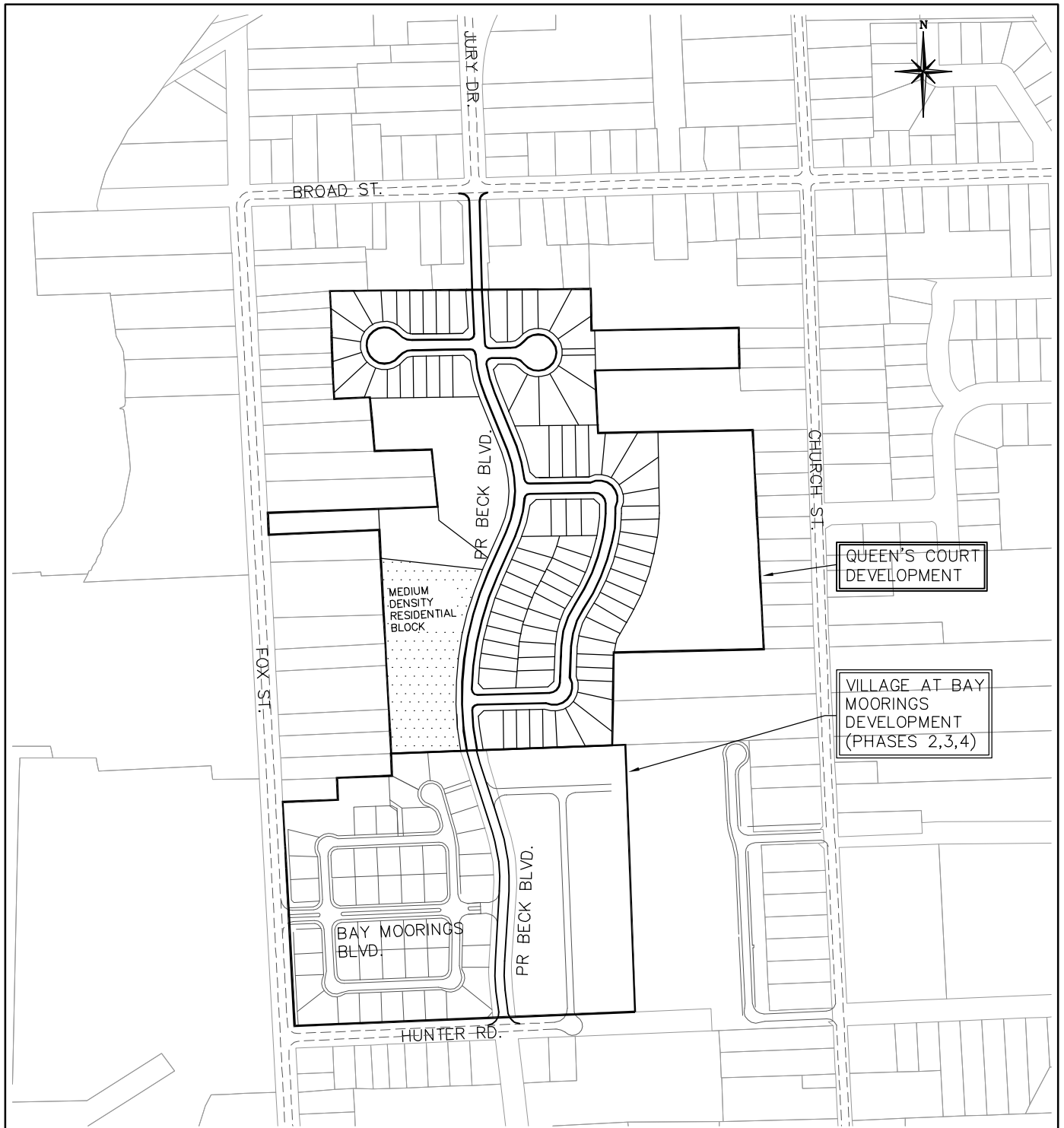


AADT & Traffic Counts

prepared 4/14/2014 by: gis@pw.penetanguishene.ca



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Drawing Title

SITE LOCATION PLAN

Project Title

QUEEN'S COURT DEVELOPMENT



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 119 Collier Street
 Barrie, Ontario
 L4M 1H5
 705-797-2027
 www.wmiengineering.ca

Drawn By
 JR

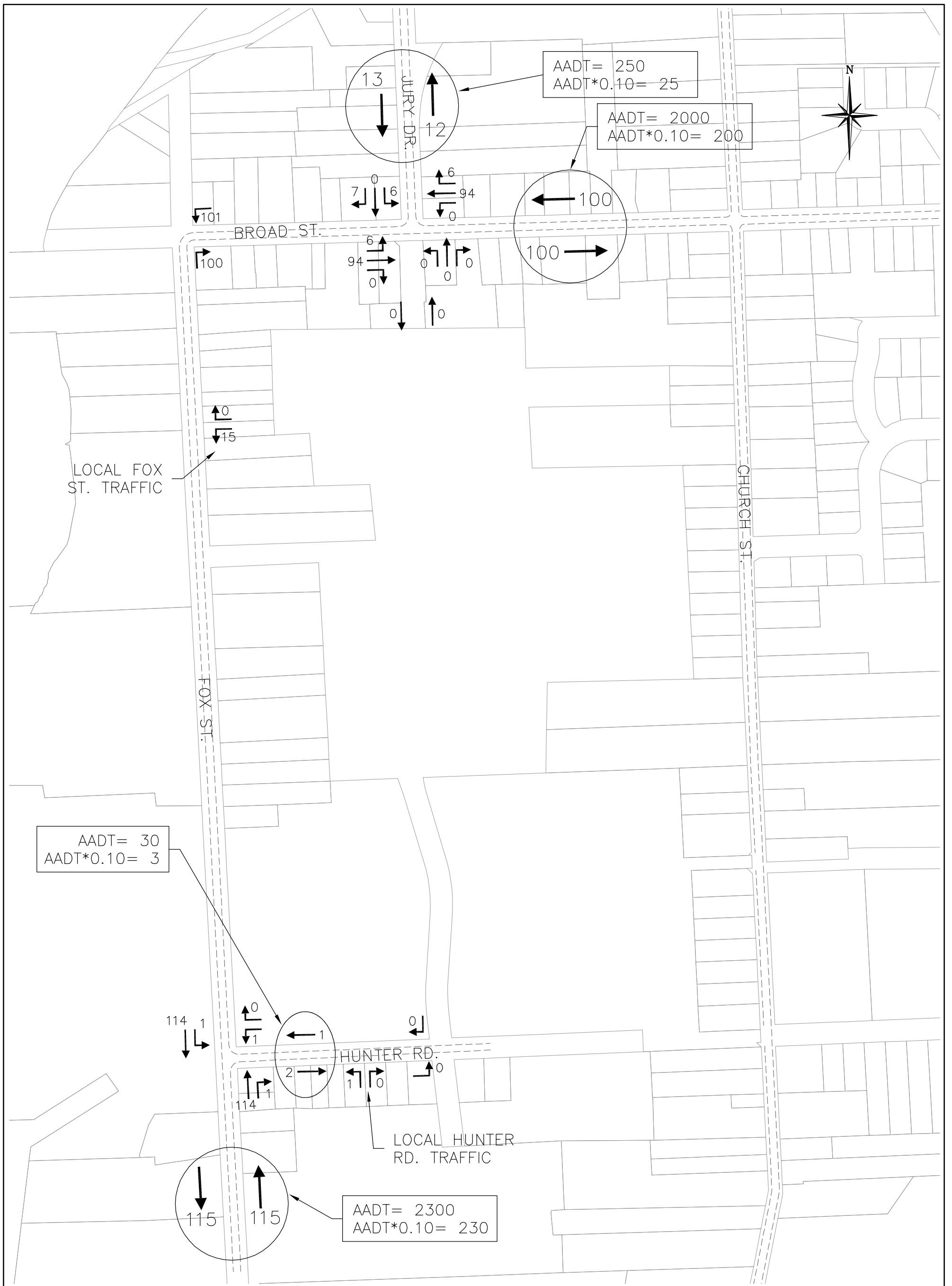
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 RDW


Figure No.

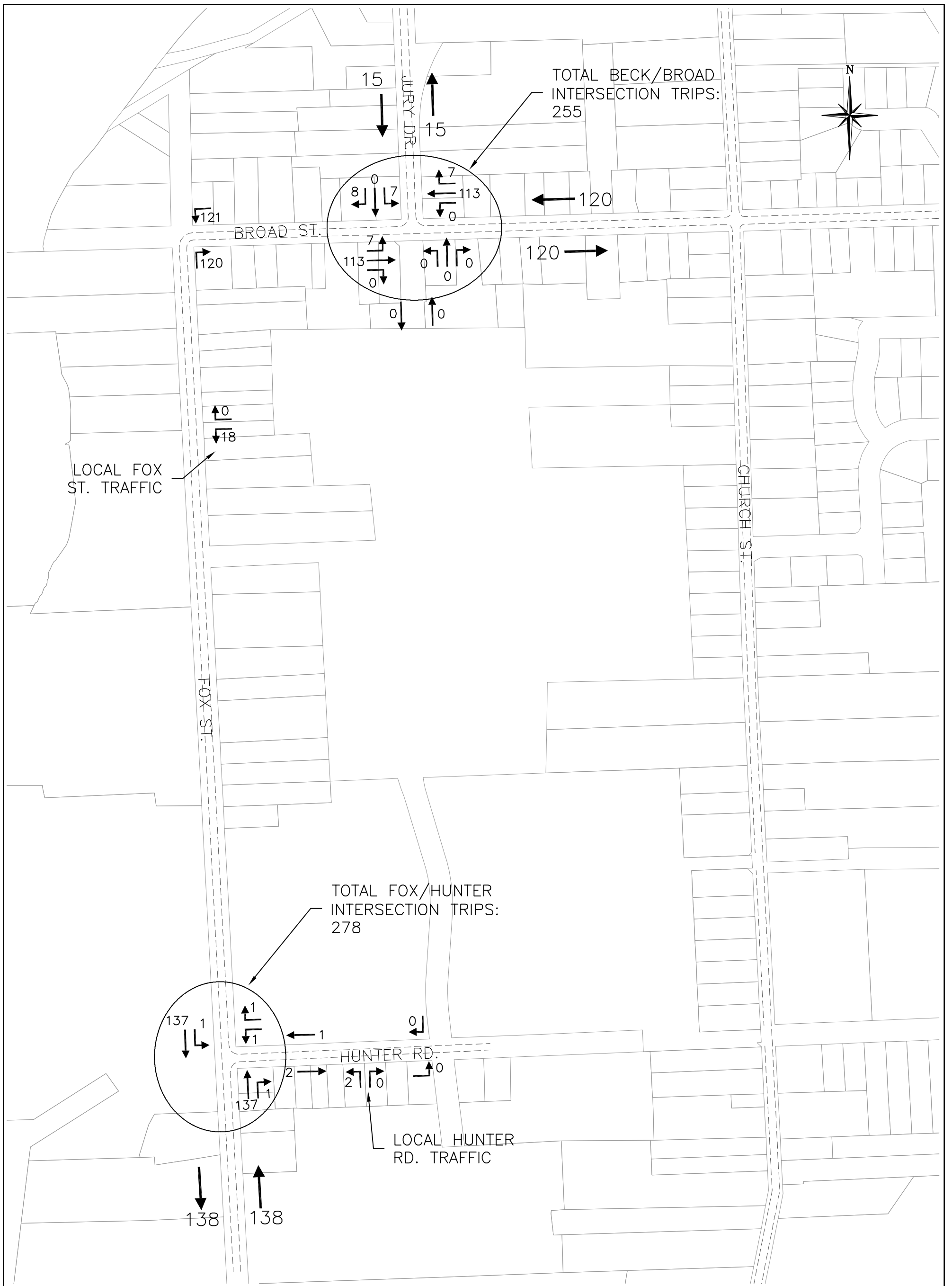
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Project No.
 09-062

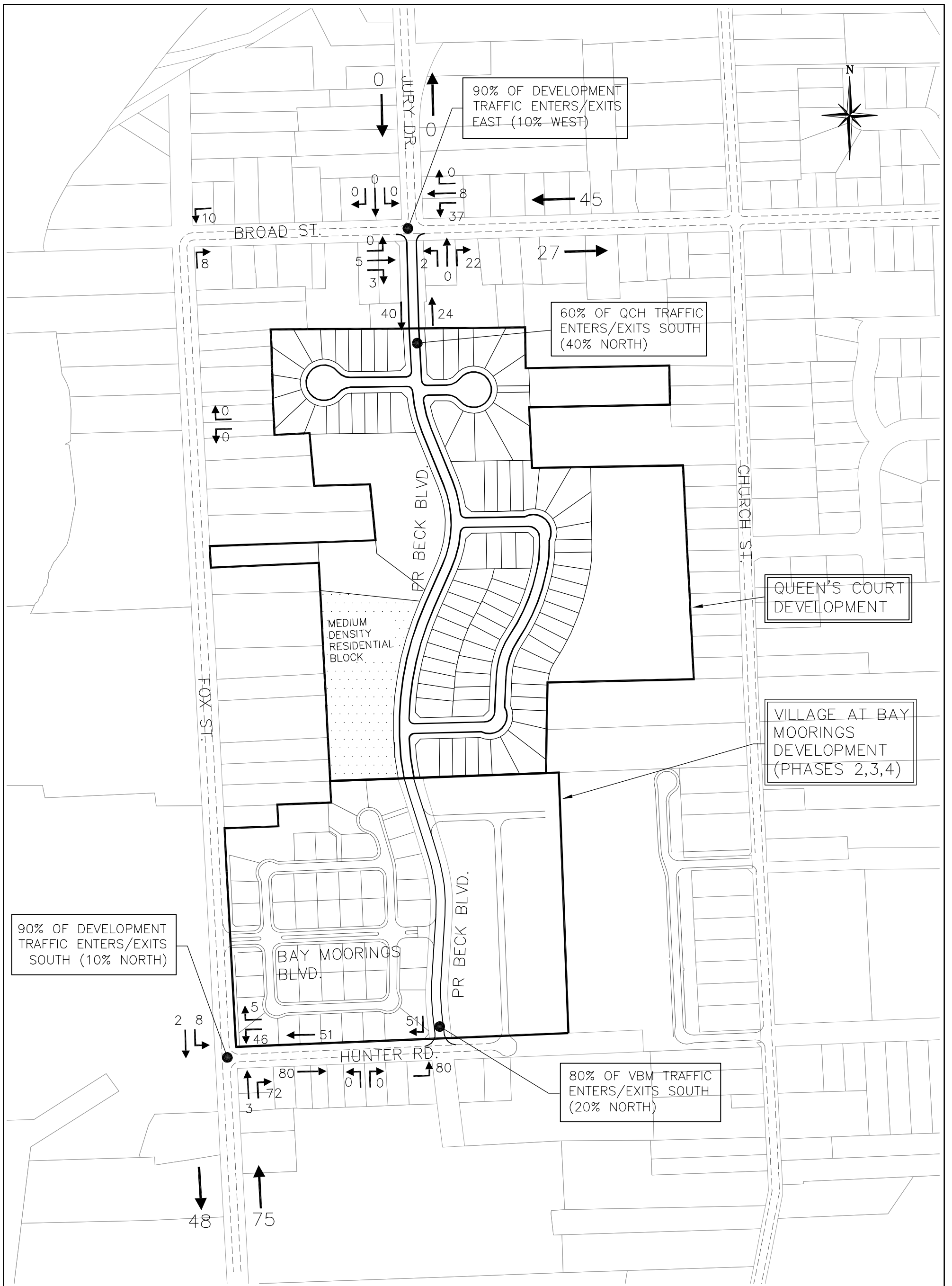
FIG1



Drawing Title BACKGROUND TRAFFIC IMPACT WEEKDAY PM PEAK HOUR		 WMI & Associates Limited 119 Collier Street Barrie, Ontario L4M 1H5 705-797-2027 www.wmiengineering.ca
Project Title QUEEN'S COURT DEVELOPMENT		
Drawn By JR	Checked By RDW	Figure No. FIG2
Scale N.T.S.	Project No. 09-062	



Drawing Title FUTURE BACKGROUND TRAFFIC IMPACT (+20%) WEEKDAY PM PEAK HOUR		 WMI & Associates Limited 119 Collier Street Barrie, Ontario L4M 1H5 705-797-2027 www.wmiengineering.ca
Project Title QUEEN'S COURT DEVELOPMENT		
Drawn By JR	Checked By RDW	Figure No. FIG3
Scale N.T.S.	Project No. 09-062	



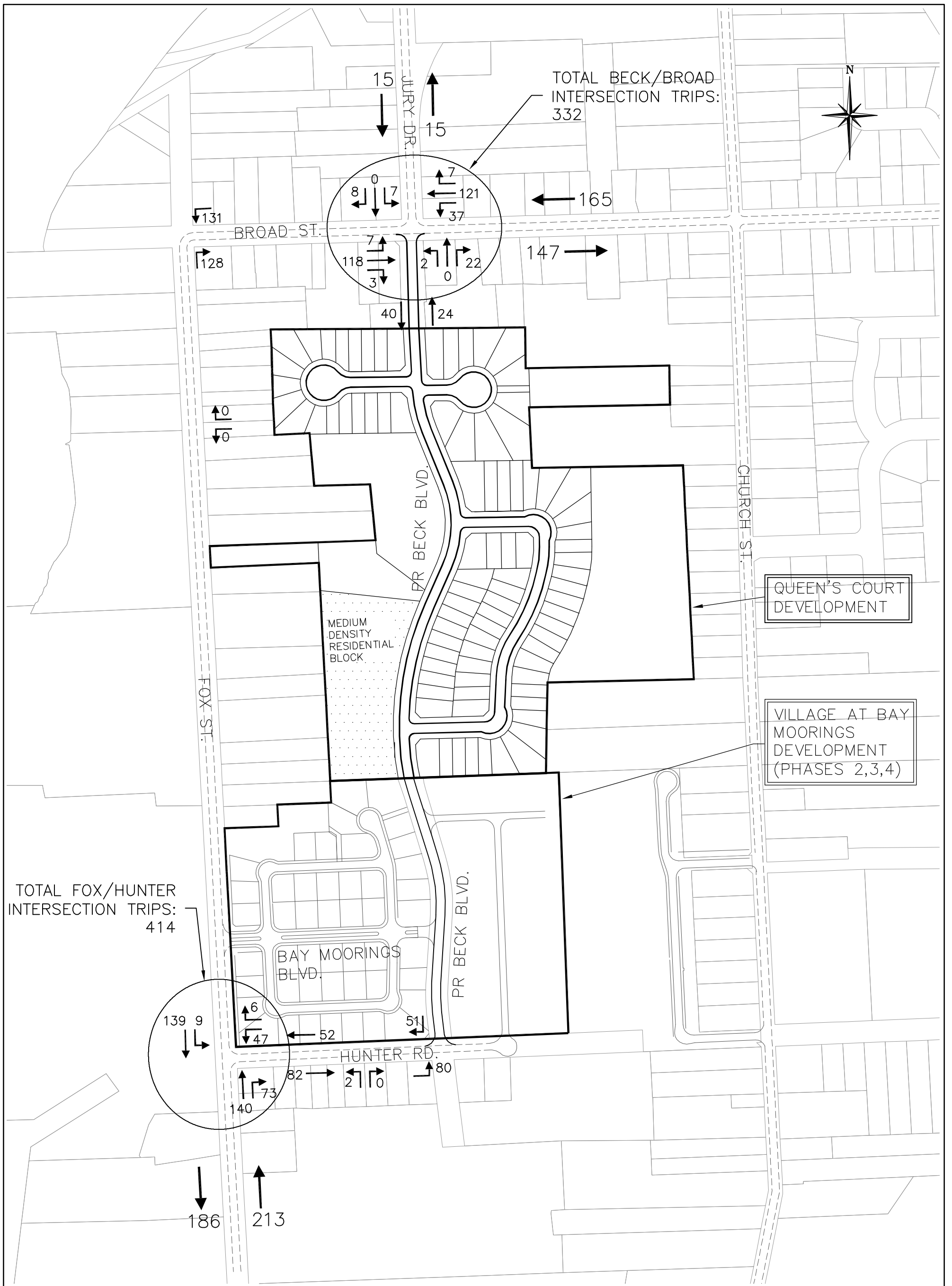
Drawing Title
 FUTURE DEVELOPMENT TRAFFIC IMPACT
 WEEKDAY PM PEAK HOUR

Project Title
 QUEEN'S COURT DEVELOPMENT



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Drawn By JR	Checked By RDW	Figure No. FIG4
Scale N.T.S.	Project No. 09-062	



Drawing Title
 FUTURE DEVELOPMENT + BACKGROUND TRAFFIC IMPACT WEEKDAY PM PEAK HOUR

Project Title
 QUEEN'S COURT DEVELOPMENT



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Scale N.T.S.	Project No. 09-062	

APPENDIX B

Traffic Calculations



TRIP GENERATION SPREADSHEET
 WEEKDAY PM PEAK HOUR AVERAGE VEHICLE TRIP ENDS

Date: 22-Apr-14

Project No.: 09-062

Project: 221 Fox. St.

Prepared By: JR

References: Institute of Transportation Engineers (ITE) Trip Generation Manual, 8th edition

Development	ITE Code & Land Use	Entering / Exiting Ratio	A	B	C	D	Vehicle End Trips*			
			Independent Variable	Trip Generation Rate*	Fitted Curve Total Trips ⁶	Internal Trip Reduction Factor (1.0 if no reduction)	Total (A+B)*D or C*D	Entering	Exiting	
221 Fox St. (Queen's Court)	SFD lots 210: Single-Family Detached Housing	64%	87 units	1.02	94.63	1.00	[C*D] =	95	61	34
221 Fox St. (Queen's Court)	Condominium Town house Units 230: Residential Condominium / Townhouse	64%	28 units	1.24	45.39	1.00	[(A+B)*D] =	35	22	12
Village at Bay Moorings Phases 2, 3, 4 **	SFD lots / building units 251: Senior Adult Housing (Detached)	56%	97 units	0.34	66.62	1.00	[C*D] =	67	37	29

TOTAL: **196** 120 76

Note: The number of units within the Queen's Court development was referenced from the Draft Plan of Subdivision prepared by Lucas & Associates, dated July 30, 2013.

* The governing total vehicle trip ends calculation is based on an interpretation of the data within the relevant ITE trip generation rate reports, with respect to the specific # of Units, persons, sqft, etc. (whatever the independent variable quantity is). For independent variable numbers that are below the range of data in the data range cluster shown on the ITE trip generation rate reports, an interpolated 'trip generation rate' was used. For independent variable quantities that are within the range of the data cluster, the fitted curve equation rates were used to determine total trip generation.

** There is insufficient ITE trip generation data for 'Attached' Senior Adult Housing (code 252), so to simplify the calculation, all units were considered to be in the 'detached' senior adult housing category.



ALL WAY STOP WARRANT CALCULATION- MAJOR ROADS
 (OTM Book 5)

Date: 23-Apr-14

Project No.: 09-062

Project: Queen's Court Homes - 221 Fox St.

Prepared By: JR

Intersection:	Fox St. / Hunter Rd.
---------------	----------------------

Total vehicle volume (all intersections):	414
Total vehicle volume on minor road:	134
*Total pedestrian volume (minor road):	50

Arterial & Major Roads Warrant:

All-way stop control must be considered where the following conditions are met:	Value		Condition Met?
Total vehicle volume on all intersection approaches >500 veh/hr for each of any 8 hours of the day	414 (veh)		No
Combined vehicle + peds volume on the minor street >200 per hr (all vehicles + pedestrians wishing to enter to intersection) for each of the same 8 hours, with an average delay to traffic on the minor street > 30s	134 (veh)	50 (peds)	No
Volume split < 70/30 (major road volume <2.33x minor road volume) (Major road volume = vehicles only, minor road volume = vehicles + pedestrians wanting to cross the major roadway)	1.52		Yes

All-way Stop Warranted? No

Warrant Result: Since all conditions are not met for all-way stop control, all way stop control is not recommended.

Note: *total pedestrian volume is an estimate.



ALL WAY STOP WARRANT CALCULATION- MAJOR ROADS
 (OTM Book 5)

Date: 23-Apr-14

Project No.: 09-062

Project: Queen's Court Homes - 221 Fox St.

Prepared By: JR

Intersection:	Broad St. / Beck Blvd.
---------------	------------------------

Total vehicle volume (all intersections):	332
Total vehicle volume on minor road:	64
*Total pedestrian volume (minor road):	50

Arterial & Major Roads Warrant:

All-way stop control must be considered where the following conditions are met:	Value		Condition Met?
Total vehicle volume on all intersection approaches >500 veh/hr for each of any 8 hours of the day	332 (veh)		No
Combined vehicle + peds volume on the minor street >200 per hr (all vehicles + pedestrians wishing to enter to intersection) for each of the same 8 hours, with an average delay to traffic on the minor street > 30s	64 (veh)	50 (peds)	No
Volume split < 70/30 (major road volume <2.33x minor road volume) (Major road volume = vehicles only, minor road volume = vehicles + pedestrians wanting to cross the major roadway)	2.35		No

All-way Stop Warranted? No

Warrant Result: Since all conditions are not met for all-way stop control, all way stop control is not recommended.

Note: *total pedestrian volume is an estimate.



SIGNAL WARRANT CALCULATION FOR FORECASTED VOLUMES
 (OTM Book 12 - Justification 7)

Date: 23-Apr-14

Project Number: 09-062

Project: Queen's Court Homes - 221 Fox St.

Prepared By: JR

Horizon Year: -
 Region/City/Township: Penetanguishere

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

Major Street: Fox
 Minor Street: Hunter

PM Forecast Only? Y

Time Period	Major Street						Minor Street					
	Northbound			Southbound			Eastbound			Westbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
PM Peak Hour	0	140	73	9	139	0	0	0	0	47	0	6

Average Hourly Volumes				
Volume	PM	AHV	Peds*	
1A-All	414	207	0	
1B-Minor	53	26.5	50	
2A-Major	361	180.5	0	
2B-Cross	0	0	25	

*Pedestrian crossing volumes estimated

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume	A or B % Fulfilled
		Free	Restricted	Free	Restricted		
1A	Flow Conditions	x					
		480	720	600	900	207	
	All Approaches	% Fulfilled				43.1%	
1B	Approach Lanes	1		2 or more		Average Hourly Volume	42.5%
	Flow Conditions	Free	Restricted	Free	Restricted		
	Minor Street Approaches*	180	255	180	255	76.5	
		% Fulfilled				42.5%	

*note: for tee intersections, the value for warrant should be increased by 50%.

Warrant 2 - Delay To Crossing Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume	A or B % Fulfilled
		Free	Restricted	Free	Restricted		
2A	Flow Conditions	x					
		480	720	600	900	180.5	
	Major Street Approaches	% Fulfilled				37.6%	
2B	Approach Lanes	1		2 or more		Average Hourly Volume	37.6%
	Flow Conditions	Free	Restricted	Free	Restricted		
	Traffic Crossing Major Street	50	75	50	75	25	
		% Fulfilled				50.0%	

**Vehicular + pedestrian crossing traffic

Warrant Results: Since Warrants #1 and #2 are not in excess of 120% fulfilled for an existing intersection, signalization is not warranted.

- A - Minimum Stopping Sight Distance, Table E3-1.
- A₁ - Distance travelled in 3 s, Table E3-2.
- B - Safe Sight Distance for P vehicle, crossing 2-lane highway from stop.
- C - Safe Sight Distance for P vehicle, turning left into 2-lane highway across P vehicle approaching from left.
- D - Safe Sight Distance for P vehicle to turn left into 2-lane highway and attain assumed operating speed before being overtaken by P vehicle approaching in same direction at design speed.
- E - Safe Sight Distance for P vehicle to turn right into 2-lane highway and attain assumed operating speed before being overtaken by P vehicle approaching in same direction at design speed.

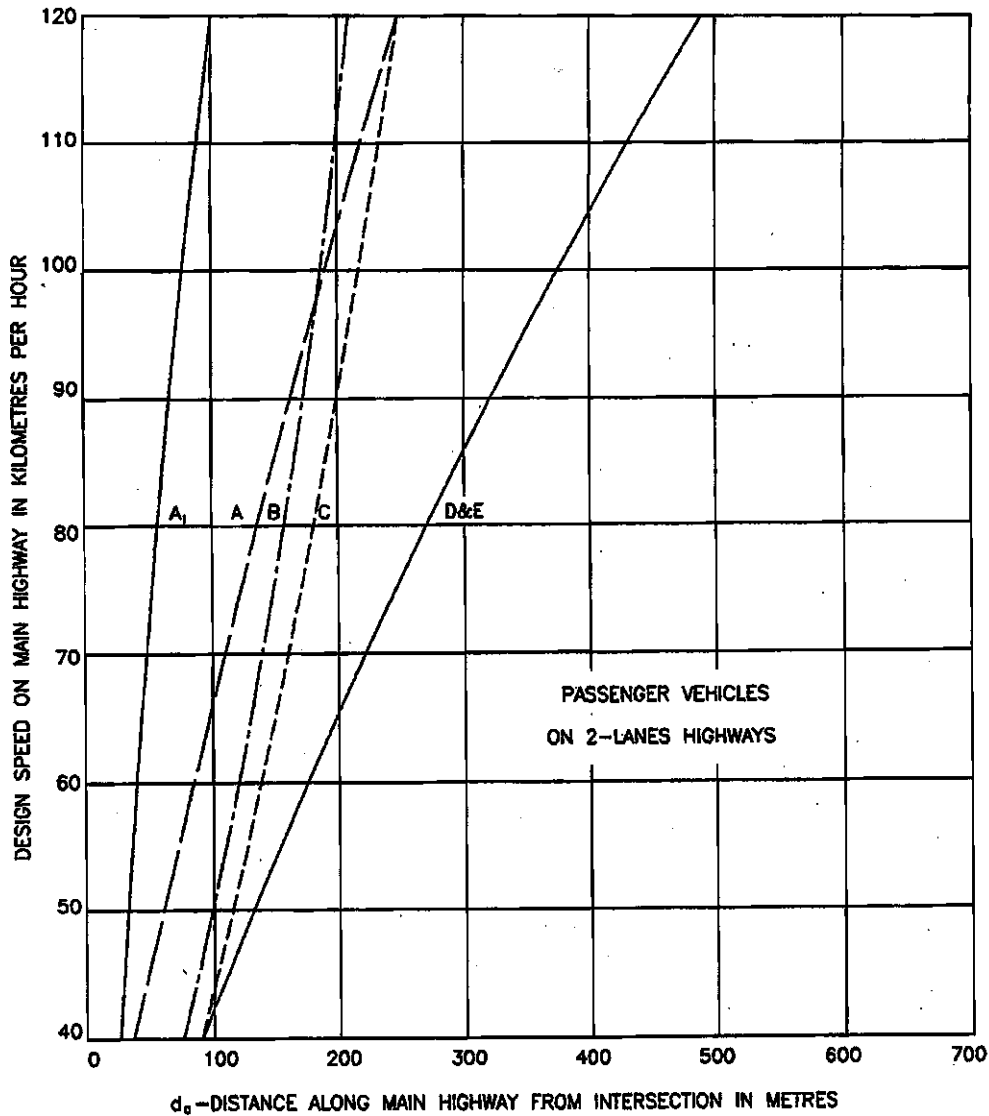


Figure E3-6

Sight Distance Requirements for Stopping
Crossing and Turning Movements