



APPENDIX C10

Noise

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Environmental Noise Assessment Class Environmental Assessment for Kirby Road from Dufferin Street (Y.R.53) to Bathurst Street (Y.R.38), City of Vaughan

Novus Reference No. 17-0271

Draft Version 2.0

April 23, 2019

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1.0 INTRODUCTION

Novus Environmental Inc. (Novus) was retained by Schaeffers Consulting Engineers (Schaeffers) to conduct an environmental noise impact assessment for the proposed Kirby Road Extension between Dufferin Street and Bathurst Street in the City of Vaughan, Ontario.

The objectives of this study are as follows:

- to assess future “build” and “no-build” sound levels from road traffic noise sources in the area (i.e., noise levels with and without the proposed project taking place);
- to use these predictions to assess potential impacts according to the applicable guidelines;
- to specify mitigation measures where required; and,
- to assess the potential for construction noise and provide a Code of Practice to minimize potential impacts.

A glossary of common terms and a description of transportation sound basics can be found in **Appendix A**.

1.1 Project Description (Nature of the Undertaking)

The proposed roadway improvements are in the City of Vaughan and are related to the Road Network Phasing plans included in the updated Regional Municipality of York Transportation Master Plan (TMP) 2016. Kirby Road is identified as a Special Study Area in *Section 9.3 – Road Network Phasing* of the TMP, which includes the following text on page 150:

“Kirby Road. Kirby Road is currently a two-lane rural local municipal road providing east-west access through North Vaughan. It forms the northern boundary of the Block 41 and Block 27 expansion areas and, as a result, is part of the future urban area. While Kirby Road is largely continuous, there is a missing link between Bathurst Street and Dufferin Street.

Various plans, including the City of Vaughan Transportation Master Plan, have identified the Kirby Road missing link as a deficiency. This deficiency is related to both capacity and connectivity. The impact of the Kirby missing link on connectivity will increase over time as development in northern Vaughan proceeds. Kirby Road is also part of an emerging east-west link comprised of Donald Cousens Parkway, 19th Avenue, Gamble Road and the potential GTA West corridor. There is also a potential future GO Station at Keele Street.

Despite the growing importance of Kirby Road, it is also recognized that the missing link traverses largely undeveloped lands including an Environmentally Significant Area and an Area of Natural and Scientific Interest. As such, it is proposed that this area be identified for a special study to further evaluate potential solutions to address transportation needs in the context of environmental protection.”

Additionally, page 78 of the TMP recommends the following:

Missing links. The Regional road network is set on a grid with several missing links, leading to circuitous routing by users and contributing to more congestion. This TMP strives to fix the gaps and complete the grid network by planning for construction of the following Regional road connections:

- Kirby Road (Dufferin Street to Bathurst Street)
- Langstaff Road (Jane Street to Keele Street)
- Teston Road (west of Dufferin Street)
- 15th Sideroad (east of Jane Street)

The study area and the overall location of the noise receptors used for this noise assessment are shown in **Figure 1**.

2.0 ROAD TRAFFIC NOISE IMPACTS (OPERATIONAL NOISE)

For roadway projects, operational noise is of primary importance. This section of the report provides an analysis of operational noise impacts from road traffic noise related to this undertaking.

2.1 Applicable Guidelines

There are several transportation noise guidelines that are applicable to this project. Ontario provincial policies and guidelines from the Ministry of Transportation, Ontario (MTO) and the Ministry of the Environment, Conservation and Parks, Ontario (MECP) are directly applicable under the Municipal Class EA process for transportation projects and are discussed in detail in this report. The City of Vaughan does not have a specific noise policy that addresses how noise is considered when undertaking an environmental assessment for an expanded or new roadway under its jurisdiction.

In addition to provincial policies and guidelines, the Regional Municipality of York (York Region) has its own policy and operating procedure that applies to roadways under its jurisdiction.

2.1.1 Ontario Provincial and York Region Guidelines and Policies

Ontario has several guidelines and documents related to assessing road traffic noise impacts. The document most applicable to municipal roadway projects is:

- Ontario MECP/MTO, “Joint Protocol”, *A Protocol for Dealing with Noise concerns during the Preparation, Review and Evaluation of Provincial Highway’s Environmental Assessments* (MTO & MECP, 1986)

In the absence of a specific City of Vaughan noise policy, the York Region policy and operating procedure has been applied to this project because it is more stringent than the Joint Protocol. Following are the policy and operating procedure that are applied to this project:

- Regional Municipality of York, *York Region Traffic Noise Mitigation Policy for Regional Roads*, (March 23, 2006) (York Policy).
- Regional Municipality of York, *Standard Operating Procedures (SOP's) for Traffic Noise Mitigation on Regional Roads*, (July 2010) (York SOP's).

York Policy

York Region has a roadway noise mitigation policy (York Policy) that specifies where noise mitigation is to be built on York Regional Roads. The York Policy sets out the following criteria to determine if noise mitigation is required with the implementation of capital road projects:

- a) For projected noise level increases from 0 - 5 dBA on adjacent residential properties, no mitigation be considered unless projected noise levels are greater than 60 dBA (either at the start of construction or at the mature state of development); and,
- b) For projected sound levels at the start of construction greater than 55 dBA, and projected future noise level increases greater than 5 dBA, the feasibility of noise reduction measures shall be investigated where a minimum attenuation of 6 dBA can be achieved.

As per the York Policy, if noise mitigation is required, the following guidelines apply:

- c) If it is deemed that noise mitigation is to be implemented, York Region shall assume the full cost of implementing the noise control measures;
- d) York Region shall assume the ownership and maintenance of any noise control measures when constructed under the Capital Program;
- e) Noise mitigation implemented as part of capital road projects will only be permitted along the property line at the extreme outer edge of York Region's ultimate right-of-way or along the flanking ends of the subdivision where required; and,
- f) When noise mitigation is not warranted on the basis of projected noise levels not exceeding 60 dBA, the mitigation may be deferred until noise levels exceed 60 dBA.

Additionally, mitigation should reduce noise levels as much as is technically and economically practicable towards the 60 dBA. Mitigation measures are restricted to within the transportation

corridor right-of-way. Off right-of-way noise mitigation, such as window upgrades and air conditioning are not considered. Noise mitigation requirements specified under the York Policy are summarized in **Table 1**.

Table 1: Summary of Mitigation Efforts Under the York Policy

Future Sound Levels	Change in Noise Level Above “No-Build” Ambient (dBA)	Mitigation Effort Required
< 55 dBA	Any	None
55 dBA to 60 dBA	0 to 5	
		> 5
> 60 dBA	Any	

Notes: Values are overall daytime energy equivalent sound levels, L_{eq} (16h) in dBA, between 7 am and 11 pm.

In summary, noise mitigation is warranted when increases in sound level over the “no-build” ambient are greater than 5 dBA or sound levels are greater than 60 dBA with the new project in place. Mitigation measures can include changes in vertical profiles and horizontal alignments and noise barriers. Noise mitigation, where applied, must be administratively, economically, and technically feasible, and must provide at least 6 dBA of reduction averaged over the first row of noise-sensitive receptors. Mitigation measures are restricted to within the roadway right-of-way. Off right-of-way noise mitigation, such as window upgrades and air conditioning, is not considered.

The evaluation of noise impacts is determined by the change in cumulative sound levels from the 2031 “no-build” scenario to the future “build” scenario. Assessments are based on a mature state of development or at the start of construction. Accordingly, a design year of 2031 applies to this project, corresponding to the traffic forecasts provided by Poulos & Chung Limited.

The York Policy requires that the higher of the posted speed limit and actual driving speed (based on the 85th percentile) shall be used in the calculation of the sound levels. Given that the proposed Kirby Road Extension is a new road, the 85th percentile speeds were not available for this study, thus posted speed limits were used in this assessment.

2.2 Location of Noise Sensitive Areas Within the Study Area

2.2.1 Definition of Outdoor Living Areas and Noise Sensitive Areas

Outdoor Living Area (OLA) under the York SOP’s is the part of an outdoor amenity area provided for the quiet enjoyment of the outdoor environment. The OLA is typically an area at ground level accommodating outdoor living activities. For environmental assessment purposes, the usual distance from the dwelling unit wall up to 4 m and the vertical height is 1.5

metres above the ground level. Where unknown, the side closest to the source of noise should be assumed. Paved areas for multiple dwelling residential units may not be defined as OLA. The OLA may include private areas used by individual dwelling occupants or “common” areas used by multi-tenant dwelling occupants. OLA is also the part of an outdoor area easily accessible from the building and designed for the quiet enjoyment of the outdoor environment. OLA’s include, but are not limited to, the following:

- Backyards, front yards, gardens, terraces or patios;
- Balconies, provided they are the only OLA’s for the occupant and meet the following conditions; minimum depth of 4 m, outside the exterior building facade,
- Unenclosed common OLA’s associated with multi-storey apartment buildings or condominiums; and,
- Passive recreational areas such as parks if identified by the City for such use.

Noise impacts from transportation projects are evaluated at noise sensitive receptors commonly referred to as Noise Sensitive Areas (NSAs). Under the York Policy, NSAs include the following land uses, provided they have an OLA associated with them:

- private homes such as single and semi-detached family residences;
- seasonal residential developments;
- townhouses; multiple unit buildings such as apartments with OLA's for use by all occupants; and
- hospitals or nursing homes where there are OLA's for the patients and day care facilities.

The following land uses are generally not considered to qualify as NSAs:

- Apartment balconies less than 4 m, outside the exterior building facade;
- Cemeteries;
- Parks and picnic areas not part of a defined OLA;
- All commercial; and,
- All industrial.

2.2.2 Representative NSAs for Analysis

Several NSAs have been used in the analysis to represent worst-case potential noise impacts at all nearby noise sensitive land uses within the study area. NSAs were picked to assess areas with similar overall noise levels and similar changes in noise (“build” versus “no-build”). These NSAs and modelled receptor locations are described in **Table 2**.

Figure 2 shows the City of Vaughan zoning within the study area. All areas zoned for residential uses between Dufferin Street and Bathurst Street were included in this study.

Table 2: Representative NSAs Considered in Analysis

Receptor Location	Description	Distance to Kirby/Gamble Rd. Centreline (m)	Approximate Number of NSAs Represented
Receptor 1	25 Laurentian Boulevard	107	3
Receptor 2	11,641 Dufferin Street	389	1
Receptor 3	64 Silver Fox Place	476	5
Receptor 4	Home in Southwest Corner of Bathurst Street and Kirby Road Extension	35	1
Receptor 5	64 Jenny Thompson Court	36	4

The OLA may be situated on any side of the receptor but is generally taken to be in the back yard. For assessment purposes, the OLA is taken as a point 3 m from the facade of the receptor, and 1.5 m (approximate head-height) above the ground surface to be consistent with MECP policy. The locations of the representative noise receptors used in the analysis are shown in **Figure 3** to **Figure 6**.

2.3 Study Horizons

Under the York Policy a “noise impact” is defined as the difference in projected noise levels at the start of construction “no-build” and the projected noise levels at the Mature State of Development “build”. The year 2031 is the best available traffic volume to model the future “no-build” scenario and for the future “build” condition to assess possible noise impacts.

2.4 Study Scenarios

As mentioned above, the “noise impact” for the study area is defined as the difference in projected noise levels between the “no-build” and “build” scenarios.

2.5 Road Traffic Data

Traffic volumes for the 2031 “no-build” and “build” scenarios for multiple roadways were provided by Poulos & Chung Limited and are found in **Appendix B**. The data is further summarized in **Table 3** and **Table 4**. Traffic data was provided in the form of Annual Average Daily Traffic (AADT), percentage of commercial vehicles and day/night traffic split.

Table 3: “No-Build” 2031 Traffic Data

Road	2031 AADT	Day / Night Split ^[1]	Overall % Commercial Vehicles	Medium / Heavy Truck Split ^[2]
Dufferin St. North of Kirby Rd.	13,700	90/10	5	2.5/2.5
Dufferin St. South of Kirby Rd.	14,800	90/10	5	2.5/2.5
Bathurst St. North of Kirby Road/Gamble Rd.	37,600	90/10	5	2.5/2.5
Bathurst St. South of Kirby Road/Gamble Rd.	48,200	90/10	5	2.5/2.5
Kirby Rd. West of Dufferin St.	20,300	90/10	5	2.5/2.5
Gamble Rd East of Bathurst St.	23,000	90/10	5	2.5/2.5

Notes: [1] XX / YY is the percentage of vehicle traffic in the 16-hour daytime and 8-hour night-time respectively based on historical information for this class of roadway.
 [2] MM / HH is the percentage of medium trucks and heavy trucks used in the analysis, respectively. The splits between truck types are based upon historical information for this class of roadway.

Table 4: “Build” 2031 Traffic Data

Road	2031 AADT	Day / Night Split ^[1]	Overall % Commercial Vehicles ^[2]	Medium / Heavy Truck Split ^[3]
Dufferin St. North of Kirby Rd.	10,500	90/10	5	2.5/2.5
Dufferin St. South of Kirby Rd.	11,300	90/10	5	2.5/2.5
Bathurst St. North of Kirby Road/Gamble Rd.	34,100	90/10	5	2.5/2.5
Bathurst St. South of Kirby Road/Gamble Rd.	34,700	90/10	5	2.5/2.5
Kirby Rd. West of Dufferin St.	21,400	90/10	20	10.0/10.0
Kirby Rd. Dufferin St. to Bathurst St	23,700	90/10	20	10.0/10.0
Gamble Rd East of Bathurst St.	22,800	90/10	20	10.0/10.0

Notes: [1] XX / YY is the percentage of vehicle traffic in the 16-hour daytime and 8-hour night-time respectively based on historical information for this class of roadway.
 [2] Kirby Road is anticipated to be designated as a Truck Route in the future. Such a designation implies commercial vehicle composition can range from 15-20% of total peak hour traffic flow forecasts. To be conservative, the higher value was used in the noise analysis.
 [3] MM / HH is the percentage of medium trucks and heavy trucks used in the analysis, respectively, for roads included in this assessment other than Kirby Road. The splits between truck types are based upon historical information for this class of roadway.

2.6 Noise Models Used

Road traffic noise levels were modelled at Receptor 2 using the “Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT)” (MECP 1989). The STAMSON v5.04 computer program produced by the MECP (MECP 2000) was used for this receptor for comparison purposes. Results from the STAMSON and STAMINA 2.0 calculations are equivalent and produced an identical sound level for the 2031 “no-build” scenario for this receptor.

Due to the complexity of the terrain, and the number of noise barriers used in the analysis, the United States Federal Highway Administration Method was used as the highway noise prediction model for the remainder of the modelling. The STAMINA 2.0 highway noise prediction model is a computerized version of this method. This model is jointly approved by the MTO and the MECP.

The noise prediction model relies on the use of vehicle noise emission levels to generate a noise source that can then be assessed at the noise receptors based on the following factors:

- Speeds for the roadways in the area used in the noise analysis;
- pavement surface used for construction of the roadway (i.e. hot mix asphaltic pavement);
- elevations, contours and locations of all the NSA's near the right-of-way;
- roadway grades;
- intervening rows of homes and barriers;
- type of ground cover, soft or hard ground;
- percentage of commercial traffic; and,
- distance from the roadway.

The model uses the following vehicle classifications:

Automobiles -	Two axles and four wheels designed primarily for the transportation of nine or fewer passengers, or transportation of cargo (light trucks). This classification includes motorcycles. Generally, the gross vehicle weight is less than 4,500 kilograms.
Medium trucks -	Two axles and six wheels designed for the transportation of cargo. Generally, the gross vehicle weight is greater than 4,500 kilograms but less than 12,000 kilograms.
Heavy trucks -	Three or more axles designed for the transportation of cargo. Generally, the gross vehicle weight is greater than 12,000 kilograms.

Distances, roadway heights and receptor locations were obtained from plan drawings supplied by Schaeffers as well as from aerial photographs.

2.7 Detailed Modelling

Table 5 presents a comparison of “no-build” versus future “build” sound levels at receptors in the study area during the 16-hour day. The STAMINA 2.0 input information and results as well as a sample of the Stamson input information for Receptor 2 and results used for comparison purpose can be found in **Appendix C**.

Table 5: “No-Build” and “Build” 2031 Noise Levels

Receptor Location	“No-Build” Leq (16h) ^[1]	“Build” Leq (16h) ^[1]	Change (“Build” minus “No-Build”)	“Build” Sound Levels >60 dBA	Increase Above 5 dBA
Receptor 1	54.6	59.3	4.7	No	No
Receptor 2	56.2	55.6	-0.6	No	No
Receptor 3	50	50	0	No	No
Receptor 4	50	59.6	9.6	No	Yes
Receptor 5	56.2	60.3	4.1	Yes	No

Notes: [1] Predicted sound levels less than 50 dBA were set to 50 dBA which is the assumed background sound levels for a Class 1 area as set out in NPC-300.

2.8 Discussion of Impacts and Investigation of Noise Mitigation

Receptor 2 on Dufferin Street, north of Kirby Road, will see a very slight decrease in sound levels as a result of this project, due to a projected decrease in traffic on Dufferin Street north of Kirby Road with the new road in operation. Road traffic on Dufferin Street remains the dominant noise source even with the Kirby Road Extension in operation.

There will also be noticeable changes in sound levels resulting from the proposed project both east of Bathurst Street near Gamble Road (Receptor 5) and near existing Kirby Road west of Dufferin Street (Receptor 1). There is no change in the footprint of either of these roadways as a result of the construction of the Kirby Road Extension. The noise impacts at these locations is as a result of increasing traffic volumes as well as an increase in the percentage of trucks from 5% to 20% once the new roadway is in operation.

The homes represented by Receptor 3 will not have a noticeable change in sound levels as a result of the construction of this undertaking. The homes are located over 475 m from the new Kirby Road Extension.

The noise analysis shows that there will be a significant increase for Receptor 4 located in the southwest quadrant of Bathurst Street and the Kirby Road Extension. **Table 6** shows the sound levels with noise mitigation in place. **Table 7** outlines the recommended noise barrier design showing a 4 m high noise barrier that is approximately 44 m long. The estimated additional cost for this wall is approximately \$88,000, assuming a cost of \$500/m². It is recommended that the noise barrier be located either directly behind the proposed retaining wall or on top of it. The exact design of the noise barrier can be determined in detail design, provided the building remains a home. This proposed noise barrier reduces the noise impact at this home from just under 10 dBA with no mitigation to just under 4 dBA with mitigation. This is a significant noise reduction.

Table 6: “No-Build” and “Build with Mitigation” 2031 Noise Levels

Receptor Location	“No-Build” Leq (16h) ^[1]	“Build with Mitigation” Leq (16h) ^[1]	Change (“Build” minus “No-Build”)	“Build” Sound Levels >60 dBA	Increase Above 5 dBA
Receptor 1	54.6	59.3	4.7	No	No
Receptor 2	56.2	55.6	-0.6	No	No
Receptor 3	50	50	0	No	No
Receptor 4	50	53.7	3.7	No	No
Receptor 5	56.2	60.3	4.1	Yes	No

Notes: [1] Predicted sound levels less than 50 dBA were set to 50 dBA which is the assumed background sound levels for a Class 1 area as set out in NPC-300.

Table 7: Details of Proposed Noise Barrier for Receptor 4

Noise Barrier Height (m)	Noise Wall Length (m)	Square Metres of Noise Barrier	Approximate Noise Barrier Cost at \$500/m ²
4.0	44	176	\$88,000

The area shown in **Figures 1** and **Figure 2** and labelled as Future Residential Development will experience a significant increase in noise levels. The exact layout and design of this development is still under design and has yet to be finalized partially due the need to finish the design of the Kirby Road Extension prior to the subdivision. It is recommended that a requirement is placed on the developer of this property to meet the subdivision acoustical requirements set out in NPC-300 with the Kirby Road Extension in place.

There are two options for noise mitigation in this area:

- **Option One:** The developer of the lands in the southwestern quadrant of the Dufferin Street and Kirby Road intersection incorporate appropriate mitigation within their property to meet the sound level limits set out in NPC-300 with the Kirby Road Extension in place.
- **Option Two:** Include on right-of-way noise mitigation running along the Kirby Road Extension to mitigate noise impacts once the roadway and the subdivision are designed. (This option was not analysed as part of this effort because the design of both the roadway and the future subdivision have not been finalized.)

As per MECP Publication NPC-300, the lands within the study area shown in **Figure 1** are in a Class 1 area. As outlined in the extracted **Table B-1** below, exclusion limits of sound levels permitted for outdoor points of reception for a Class 1 area are 50 dBA for the daytime and evening periods.

Table B-1 is an excerpt from the MECP Publication NPC-300, *Environmental Noise Guideline, Stationary and Transportation Sources –Approval and Planning*, August 2013.

Table B-1
Exclusion Limit Values of One-Hour Equivalent Sound Level (L_{eq} , dBA)
Outdoor Points of Reception

Time of Day	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 19:00	50	50	45	55
19:00 – 23:00	50	45	40	55

“Class 1 area”

means an area with an acoustical environment typical of a major population centre, where the background sound level is dominated by the activities of people, usually road traffic, often referred to as “urban hum.”

“Class 2 area”

means an area with an acoustical environment that has qualities representative of both Class 1 and Class 3 areas:

- sound levels characteristic of Class 1 during daytime (07:00 to 19:00 or to 23:00 hours); and
- low evening and night background sound level defined by natural environment and infrequent human activity starting as early as 19:00 hours (19:00 or 23:00 to 07:00 hours).

“Class 3 area”

means a rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic, such as:

- a small community;
- an agricultural area;
- a rural recreational area such as a cottage or a resort area; or
- a wilderness area.

“Class 4 area”

means an area or specific site that would otherwise be defined as Class 1 or 2 and which:

- is an area intended for development with new noise sensitive land use(s) that are not yet built;
- is in proximity to existing, lawfully established stationary source(s); and
- has formal confirmation from the land use planning authority with the Class 4 area classification which is determined during the land use planning process.

Additionally, areas with existing noise sensitive land use(s) cannot be classified as Class 4 areas.

3.0 CONSTRUCTION NOISE IMPACTS

Construction noise impacts are temporary in nature, and largely unavoidable. Although for some periods and types of work, construction noise will be noticeable, with adequate controls, impacts can be minimized. This section of the report provides an examination of the City of Vaughan noise bylaw and recommends a Code of Practice to minimize impacts.

3.1 Construction Noise Guidelines

3.1.1 Local Noise Control Bylaw

The proposed project lies within the local jurisdiction of the City of Vaughan and a bylaw restricting noise from construction activities. The applicable bylaw requirements are summarized below in **Table 8**. A copy of the bylaw can be found in **Appendix D**.

Under the provisions of the City of Vaughan bylaw 062-2018 work required outside the normal times outlined in **Table 8** is allowed. Notwithstanding this provision of the bylaw only work required to minimize disruptions to traffic should be done during times when construction is normally prohibited.

Table 8: Applicable Local Noise Control Bylaw

Jurisdiction	Bylaw Number	Bylaw Provision
City of Vaughan	Bylaw 062-2018	<p>"Necessary Municipal Work" means work being undertaken by the <i>City</i>, the Region, Transit Authority, or any other level of government, and its agents, and includes but is not limited to any rehabilitation or require maintenance processes and activities within the Public Right of Way or any Highway as defined by the Highway Traffic Act (HTA) of Ontario, using of Construction Equipment that requires work must be performed at times that minimize traffic disruption, including minimizing lane closures or lane restrictions, or both, and includes any works undertaken on Property owned or under the control of the <i>City</i>, Region, or any other level of government. Without forgoing the generality rehabilitation or maintenance processes and activities include but are not limited to:</p> <ul style="list-style-type: none"> • Deck Removal of any Highway; • Intersection rehabilitation and all related work; • All Transit Authority work, including any ancillary Property or facilities and infrastructure; • All other work as determined necessary by the <i>Director of Enforcement</i>, or delegate; <p>10. CONSTRUCTION</p> <ul style="list-style-type: none"> • No person shall, between 1900 hours of one day and 0700 hours of the next day operate or cause to be operated, any <i>Construction Vehicle</i> or <i>Construction Equipment</i> in connection with the <i>Construction</i> of any building or structure, <i>Highway</i>, motor car, steam boiler or other engine or machine; • Despite Subsection (1), no person shall operate or cause to be operated any <i>Construction Vehicle</i> or <i>Construction Equipment</i> before 0700 hours and no later than 1900 hours on any Saturday and not at all on Sunday or statutory holidays; Subsection 10. (1) and (2) does not apply to <i>Necessary Municipal Work</i> and <i>Emergency Work</i> as defined by this By-law.

3.2 Anticipated Construction Activities

The following construction activities are anticipated as part of this project:

- Removing existing surface pavements
- Earth grading
- Construction and rehabilitation of the base course
- Paving (and repaving) of the roadway surfaces
- Culvert construction or extensions
- Construction of new roadway including removal of overburden

3.3 Construction Code of Practice Requirements (Mitigation)

To minimize the potential for construction noise impacts, it is recommended that provisions be written into the contract documentation for the contractor, as outlined below:

- Where possible construction should be carried out during the hours the normally allowed hours specified in the bylaw found in **Appendix D**. If construction activities are required outside of these hours, the Contractor should minimize the amount of noise being generated to not be audible in any noise sensitive areas if possible.
- There should be explicit indication that Contractors are expected to comply with all applicable requirements of the contract.
- All equipment should be properly maintained to limit noise emissions. As such, all construction equipment should be operated with effective muffling devices that are in good working order.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The potential environmental noise impacts of the proposed undertaking have been assessed. Both operational and construction noise impacts have been considered. The conclusions and recommendations are as follows:

- The results show that changes in sound levels resulting from the proposed project are expected to be no higher than 4.7 dBA with mitigation in place.
- Noise mitigation will be required for the area in the southwest quadrant of Dufferin Street and Kirby Road if residential units are to be constructed here. It can either be incorporated into the subdivision by the developer at the time of the construction of the homes or constructed on the new Kirby Road Extension right-of-way at the time of construction of the roadway. No noise analysis of this area was included in this project impact analysis.
- Additional acoustical analysis will need to occur by either the subdivision developer or the constructor of the roadway. Who will do the analysis and construct the noise barriers will

depend upon the final location of the noise barriers.

- Receptors 2 and 3 will have no noise impacts as a result of this project.
- Receptor 4 will have a significant increase in sound levels of approximately 10 dBA. Noise mitigation at this location should be constructed as is outlined in **Table 7**. The exact and design of the noise barrier can be determined in detail design, provided the building remains a home. If the proposed noise mitigation is constructed, noise impacts can be reduced to under 4 dBA.
- Construction noise impacts are temporary in nature but will be noticeable at times at residential NSAs. Methods to minimize construction noise impacts should be included in the Construction Code of Practice, as outlined in **Section 3.3**. It is unlikely that the construction of the Kirby Road Extension would need to occur at times not allowed in the City of Vaughan By-law. Some construction operations will need to occur during night-time hours on Dufferin Street and Bathurst Street to minimize unreasonable disruptions to traffic.

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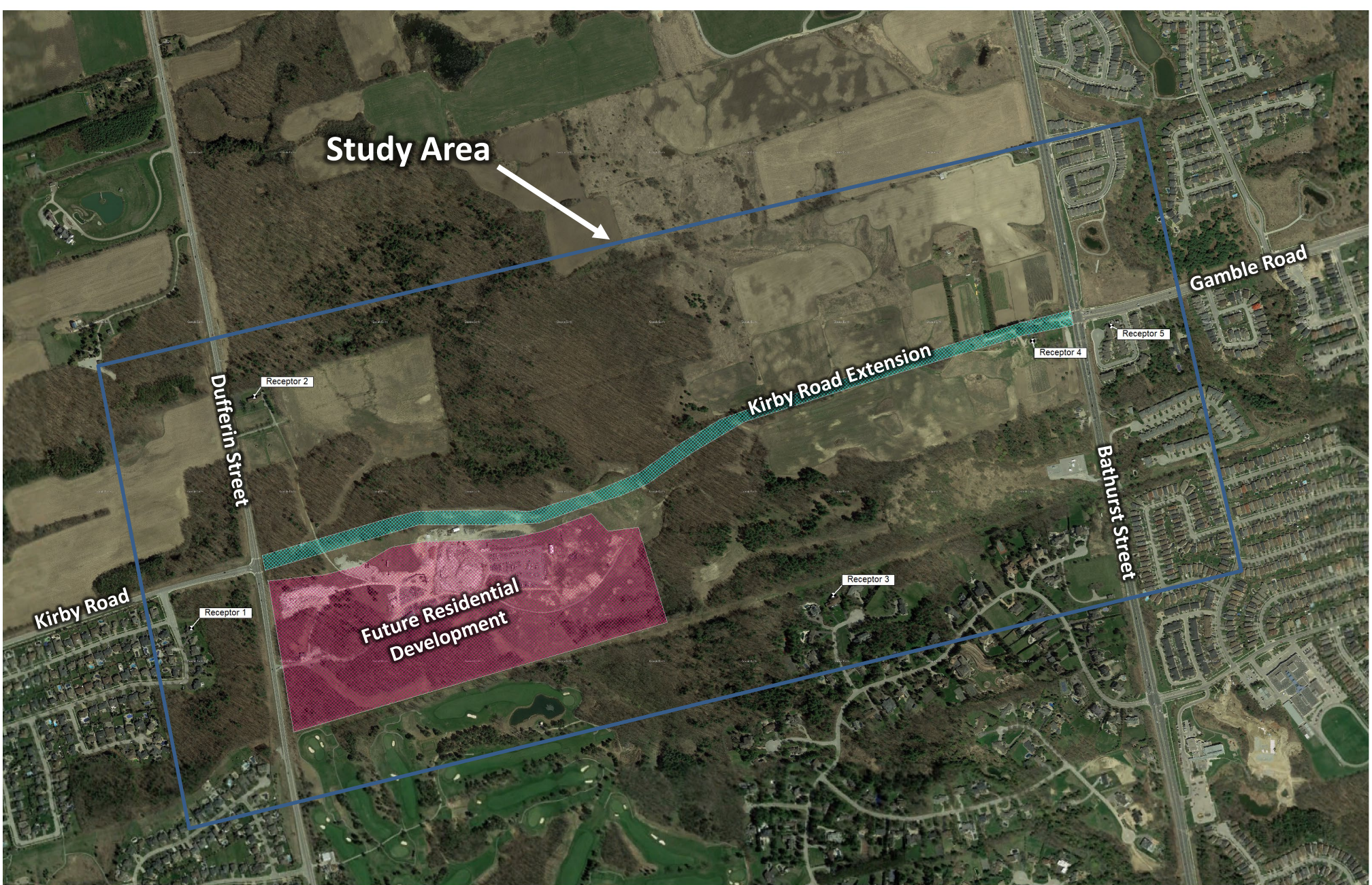


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Figure No. 1
Study Area and Overall Location of Receptors

Kirby Road Noise Assessment
 Vaughan, Ontario



Scale: 1:12,000
 Date: 19/04/23
 File No.: 17-0271
 Drawn By: CTB



- Legend**
- City Boundary
 - Zones
 - Oak Ridges Moraine Area
 - Greenbelt Area
 - Agricultural

Open Space

Oak Ridges Moraine

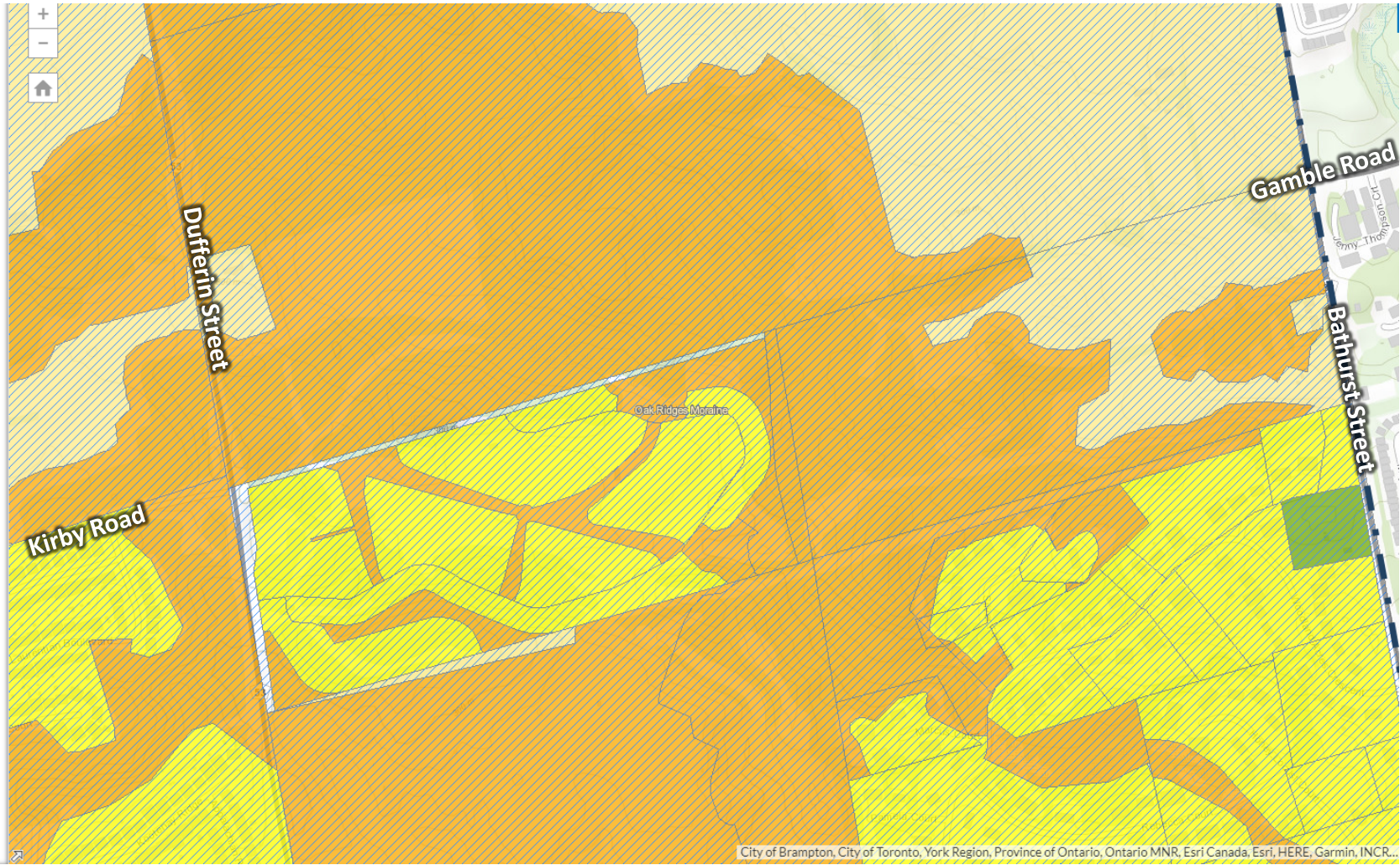
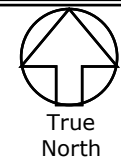


Figure No. 2
City of Vaughan Zoning Within Study Area

Kirby Road Noise Assessment
 Vaughan, Ontario



Scale: 1:10,000
 Date: 19/04/23
 File No.: 17-0271
 Drawn By: CTB

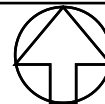




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Figure No. 3
Location of Representative Noise Receptor 1

Kirby Road Noise Assessment
Vaughan, Ontario



True
North

Scale: 1:2,000
Date: 19/04/23
File No.: 17-0271
Drawn By: CTB

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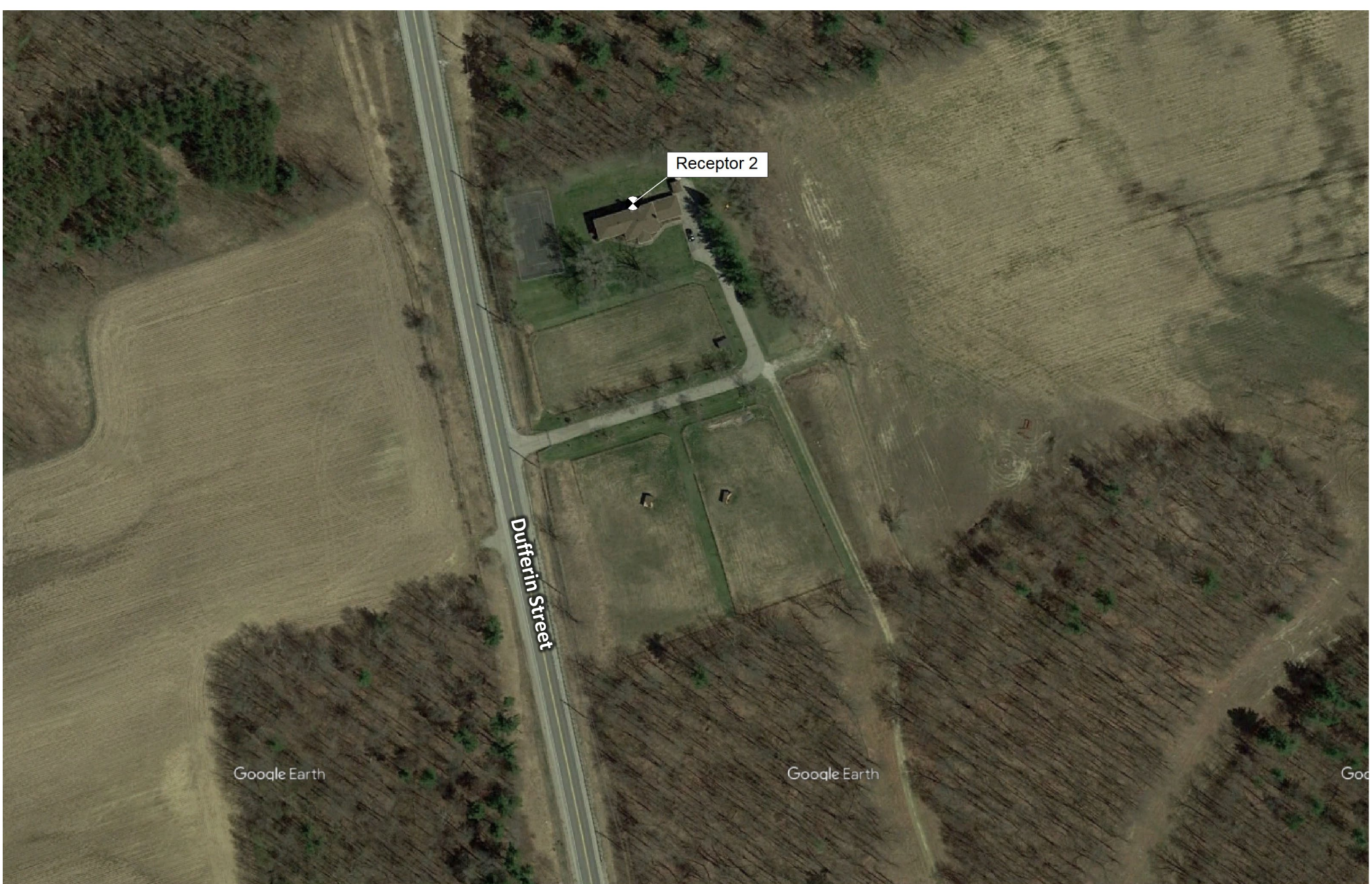


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Figure No. 4
Location of Representative Noise Receptor 2

Kirby Road Noise Assessment
Vaughan, Ontario



True
North

Scale: 1:2,000
Date: 19/04/23
File No.: 17-0271
Drawn By: CTB

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Figure No. **5**
Location of Representative Noise Receptor 3

Kirby Road Noise Assessment
Vaughan, Ontario



True
North

Scale: 1:2,000
Date: 19/04/23
File No.: 17-0271
Drawn By: CTB

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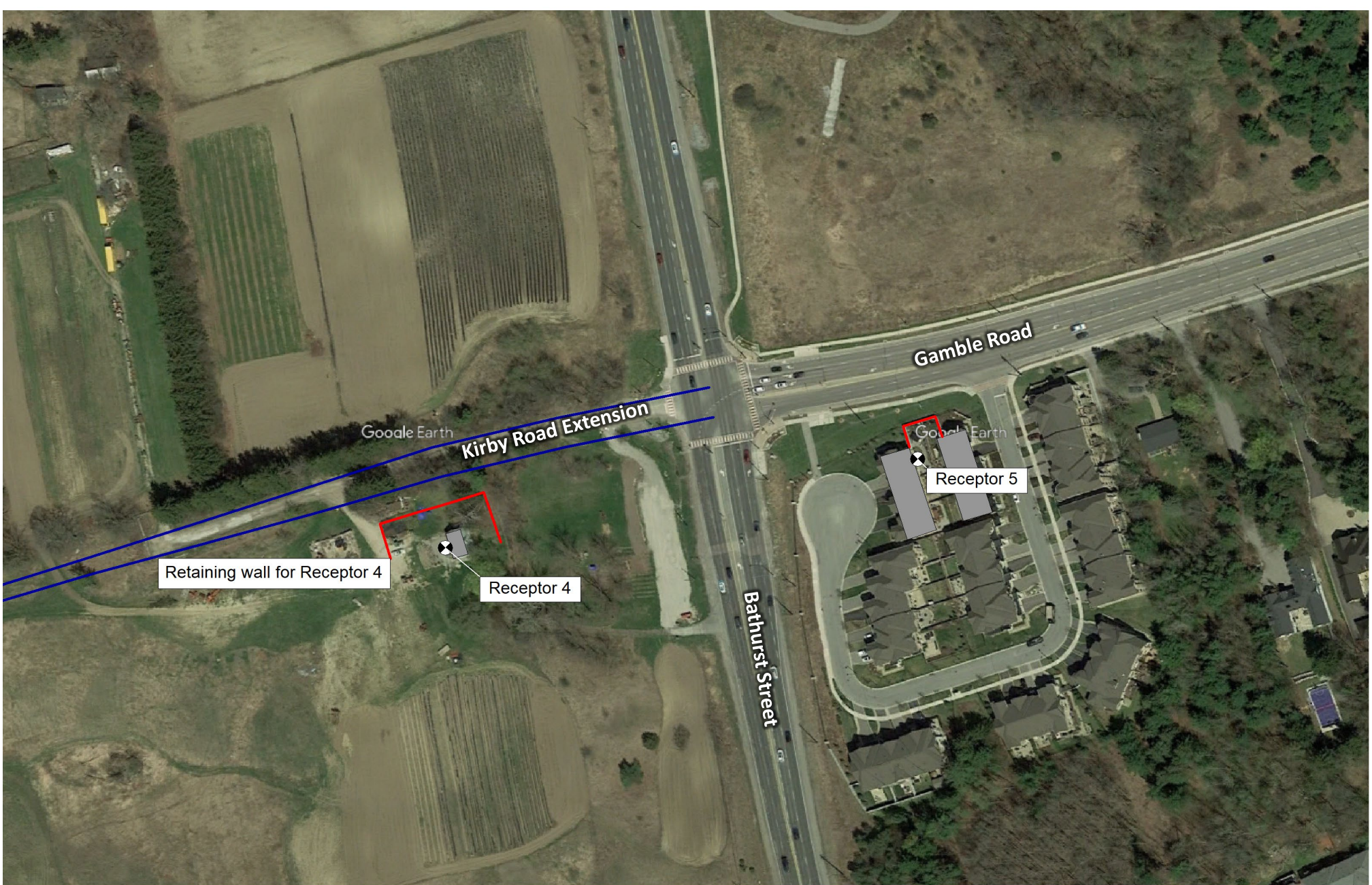


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Figure No. 6

Location of Representative Noise Receptors 4 & 5

Kirby Road Noise Assessment
Vaughan, Ontario



True
North

Scale: 1:2,000

Date: 19/04/23

File No.: 17-0271

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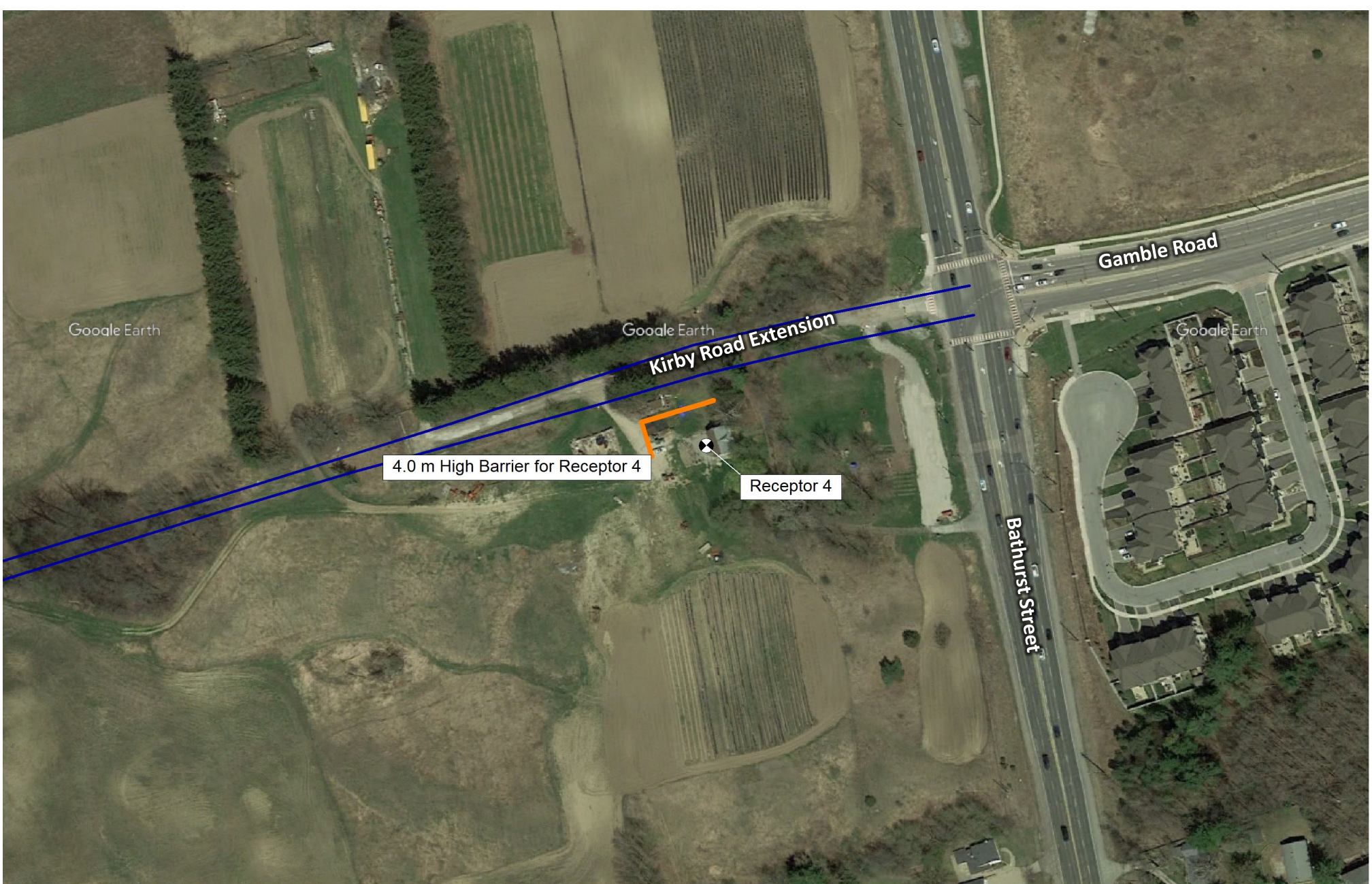


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Figure No. **7**

Location of Recommended Noise Barrier for Receptor 4

Kirby Road Noise Assessment
Vaughan, Ontario



True
North

Scale: 1:2,000

Date: 19/04/23

File No.: 17-0271

Drawn By: CTB

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Appendix A

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Glossary of Commonly Used Noise Terminology

Airborne Sound*: Sound that reaches the point of interest by propagation through air.

Ambient or Background Noise: The ambient noise from all sources other than the sound of interest (i.e. sound other than that being measured). Under most MOE guidelines, aircraft overflights and train noise, due to their transient nature, are normally excluded from measurements of background noise.

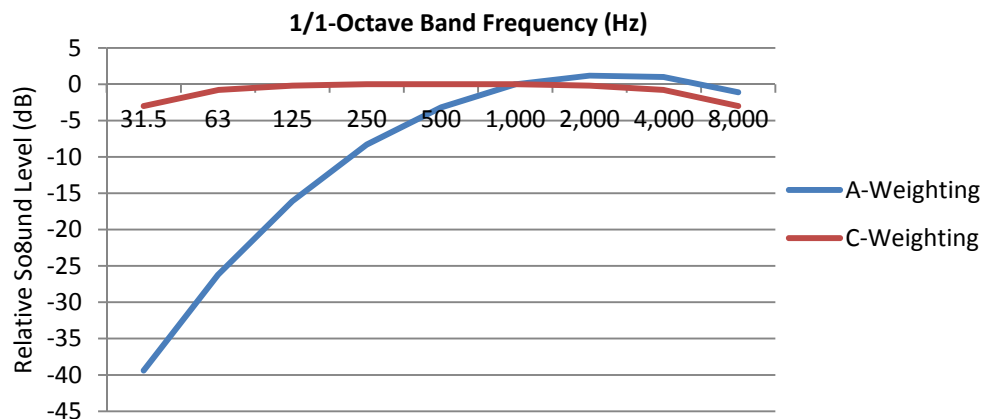
Articulation Index (AI)*: A numerically calculated measure of the intelligibility of transmitted or processed speech. It takes into account the limitations of the transmission path and the background noise. The articulation index can range in magnitude between 0 and 1.0. If the AI is less than 0.1, speech intelligibility is generally low. If it is above 0.6, speech intelligibility is generally high.

Attenuation*: The reduction of sound intensity by various means (e.g., air, humidity, porous materials, etc.).

dB -Decibel: The logarithmic units associated with sound pressure level, sound power level, or acceleration level. See sound pressure level, for example.

dB_A -Decibel, A-Weighted: The logarithmic units associated with a sound pressure level, where the sound pressure signal has been filtered using a frequency weighting that mimics the response of the human ear to quiet sound levels. The resultant sound pressure level is therefore representative of the subjective response of the human ear. A-weighted sound pressure levels are denoted by the suffix 'A' (ie. dB_A), and the term pressure is normally omitted from the description (i.e., sound level or noise level).

dB_C -Decibel, C-Weighted: The logarithmic units associated with a sound pressure level, where the sound pressure signal has been filtered using a frequency weighting that mimics the response of the human ear to loud sound levels. C-weighted sound pressure levels are denoted by the suffix 'C' (ie dB_C). C-weighted levels are often used in low-frequency noise analysis, as the filtering effect is nearly flat at lower frequencies.



dB_L or dB_{Lin} -Decibel, Linear: The logarithmic units associated with a sound pressure level, where the sound pressure signal is unfiltered, and represents the full spectrum of incoming noise.

Calibrator (Acoustical)*: A device which produces a known sound pressure on the microphone of a sound level measurement system, and is used to adjust the system to standard specifications.

Definitions with a "*" marker originally from "Noise Control Terms Made Somewhat Easier", by David Kelso (Minnesota Pollution Control Agency), and Al Perez (Northern Sound), Minneapolis, Minnesota May, 1983, as modified on the Noise Pollution Clearinghouse website www.nonoise.org.

Directivity Factor (Q) (also, **Directional** or **Directionality Factor**): A factor mathematically related to Directivity Index, used in calculating propagated sound levels to account for the effect of reflecting surfaces near to the source. For example, for a source in free space where the sound is radiating spherically, $Q = 1$. For a source located on or very near to a surface (such as the ground, a wall, rooftop, etc.), where the sound is radiating hemispherically, $Q = 2$. This accounts for the additional sound energy reflecting off the surface, and translates into a +3 dB add.

Directivity Index*: In a given direction from a sound source, the difference in decibels between (a) the sound pressure level produced by the source in that direction, and (b) the space-average sound pressure level of that source, measured at the same distance.

Energy Equivalent Sound Level (L_{eq}): An energy-average sound level taken over a specified period of time. It represents the average sound pressure encountered for the period. The time period is often added as a suffix to the label (i.e., $L_{eq}(24)$ for the 24-hour equivalent sound level). L_{eq} is usually A-weighted. An L_{eq} value expressed in dBA is a good, single value descriptor of the annoyance of noise.

Exceedance Noise Level (L_N): The noise level exceeded N% of the time. It is a statistical measure of the noise level. For highly varying sounds, the L_{90} represents the background noise level, L_{50} represents the median or typical noise level, and L_{10} represents the short term peak noise levels, such as those due to occasional traffic or a barking dog.

Far Field*: Describes a region in free space where the sound pressure level from a source obeys the inverse-square law (the sound pressure level decreases 6 dB with each doubling of distance from the source). Also, in this region the sound particle velocity is in phase with the sound pressure. Closer to the source where these two conditions do not hold constitutes the “near field” region.

Free Sound Field (Free Field)*: A sound field in which the effects of obstacles or boundaries on sound propagated in that field are negligible.

Frequency*: The number of times per second that the sine wave of sound or of a vibrating object repeats itself. Now expressed in hertz (Hz), formerly in cycles per second (cps).

Hertz (Hz)*: Unit of measurement of frequency, numerically equal to cycles per second.

Human Perception of Sound: The human perception of noise impact is an important consideration in qualifying the noise effects caused by projects. The following table presents a general guideline.

Subjective Human Perception of Changes in Sound Levels

Change in Broadband Sound Level (dB)	Human Perception of Change
<3	Imperceptible change
3	Just-perceptible change
4 to 5	Clearly noticeable change
6 to 9	Substantial change
>10 and more	Very substantial change (half or twice as loud)
>20 and more	Very substantial change (much quieter or louder)

Notes:

Adapted from Bies and Hansen, p53, and MOE Noise Guidelines for Landfill Sites, 1998. Applies to changes in broadband noise sources only (i.e., increases or decreases in the same noise or same type of noise only). Changes in frequency content or the addition of tonal or temporal changes would affect the perception of the change.

Impact Insulation Class (IC)*: A single-figure rating that compares the impact sound insulating capabilities of floor-ceiling assemblies to a reference contour.

Impact Sound*: The sound produced by the collision of two solid objects, e.g., footsteps, dropped objects, etc., on an interior surface (wall, floor, or ceiling) of a building. Typical industrial sources include punch presses, forging hammers, etc.

Impulsive Noise*: a) Single or multiple sound pressure peak(s) (with either a rise time less than 200 milliseconds or total duration less than 200 milliseconds) spaced at least by 500 millisecond pauses, b) A sharp sound pressure peak occurring in a short interval of time.

Infrasonic*: Sounds of a frequency lower than 20 hertz.

Insertion Loss (IL): The arithmetic difference between the sound level from a source before and after the installation of a noise mitigation measure, at the same location. Insertion loss is typically presented as a positive number, i.e., the post-mitigation sound level is lower than the pre-mitigation level. Insertion loss is expressed in dB and is usually specified per 1/1 octave band, per 1/3 octave band, or overall.

Intensity*: The sound energy flow through a unit area in a unit time.

Low Frequency Noise (LFN): Noise in the low frequency range, from infrasonic sounds (<20 Hz) up to 100 Hz.

Masking*: a) The process by which the threshold of audibility for a sound is raised by the presence of another (masking) sound, or b) The amount by which the threshold of audibility of a sound is raised by the presence of another (masking) sound.

Near Field*: The sound field very near to a source, where sound pressure does not obey the inverse-square law and the particle velocity is not in phase with the sound pressure.

Noise: Unwanted sound.

Noise Criteria (NC) Curves: A single number rating for noise in 1/1-octave frequency bands which is sensitive to the relative loudness and speech interference properties of a given sound spectrum. The method consists of a family of criteria curves extending from 63 Hz to 8000 Hz, and a tangency rating procedure. Originally proposed by Bernanek in 1957. While other more modern criteria curve rating schemes exist (NCB, RC, RC Mark II, RNC, etc.), NC curves are still widely used in determining acceptability of noise levels within spaces. Level of NC 25 to NC 35 are usually considered acceptable for residences, private offices, and schools.

Noise Isolation Class (NIC)*: A single number rating derived in a prescribed manner from the measured values of noise reduction between two areas or rooms. It provides an evaluation of the sound isolation between two enclosed spaces that are acoustically connected by one or more paths.

Noise Reduction (NR)*: The numerical difference, in decibels, of the average sound pressure levels in two areas or rooms. A measurement of "noise reduction" combines the effect of the sound transmission loss performance of structures separating the two areas or rooms, plus the effect of acoustic absorption present in the receiving room.

Noise Reduction Coefficient (NRC)*: A measure of the acoustical absorption performance of a material, calculated by averaging its sound absorption coefficients at 250, 500, 1000 and 2000 Hz, expressed to the nearest multiple of 0.05.

Noise Level: Same as Sound Level, except applied to unwanted sounds.

Noise Exposure Forecast (NEF): A calculated measure of aircraft noise based on the type of aircraft in use, the take-off and landing patterns of the aircraft, and times of operation. It represents the noise exposure over a typical 24 hour period. A penalty is applied to nighttime operation.

Harmonizing the Built and Natural Environments

Peak Sound Pressure Level: Same as Sound Pressure Level except that peak (not peak-to-peak) sound pressure values are used in place of RMS pressures.

Quasi-Steady Impulsive Noise: Noise composed of a series of short, discrete events, characterized by rapid rise times, but with less than 0.5 seconds elapsing between events.

RMS Sound Pressure: The square-root of the mean-squared pressure of a sound (usually the result of an RMS detector on a microphone signal).

Reverberant Field*: The region in a room where the reflected sound dominates, as opposed to the region close to the noise source where the direct sound dominates.

Reverberation*: The persistence of sound in an enclosed space, as a result of multiple reflections, after the sound source has stopped.

Reverberation Time (RT)*: The reverberation time of a room is the time taken for the sound pressure level to decrease 60 dB from its steady-state value when the source of sound energy is suddenly interrupted. It is a measure of the persistence of an impulsive sound in a room as well as of the amount of acoustical absorption present inside the room. Rooms with long reverberation times are called live rooms.

Sabin*: A measure of the sound absorption of a surface; it is the equivalent of one square metre of a perfectly absorptive surface (or one square foot in imperial units).

Sound: a dynamic (fluctuating) pressure.

Sound Exposure Level (SEL): An L_{eq} referenced to a one second duration. Also known as the Single Event Level. It is a measure of the cumulative noise exposure for a single event. It provides a measure of the accumulation of sound energy over the duration of the event.

Sound Level (SL): The A-weighted Sound Pressure Level expressed in dBA.

Sound Level Meter*: An instrument comprised of a microphone, amplifier, output meter, and frequency-weighting networks which is used for the measurement of noise and sound levels.

Sound Pressure Level (SPL): The logarithmic ratio of the RMS sound pressure to the sound pressure at the threshold of hearing. The sound pressure level is defined by equation (1) where P is the RMS pressure due to a sound and P_0 is the reference pressure. P_0 is usually taken as 2.0×10^{-6} Pascals.

$$(1) \text{ SPL (dB)} = 20 \log(P_{\text{RMS}}/P_0)$$

Sound Power Level (PWL): The logarithmic ratio of the instantaneous sound power (energy) of a noise source to that of an international standard reference power. The sound power level is defined by equation (2) where W is the sound power of the source in watts, and W_0 is the reference power of 10^{-12} watts.

$$(2) \text{ PWL (dB)} = 10 \log(W/W_0)$$

Interrelationships between sound pressure level (SPL) and sound power level (PWL) depend on the location and type of source.

Sound Transmission Class (STC)*: The preferred single figure rating system designed to give an estimate of the sound insulation properties of a structure or a rank ordering of a series of structures.

Sound Transmission Loss (STL)*: A measure of sound insulation provided by a structural configuration. Expressed in decibels, it is 10 times the logarithm to the base 10 of the reciprocal of the sound transmission coefficient of the configuration.

Spectrum*: The description of a sound wave's resolution into its components of frequency and amplitude.

Speech Interference Level (SIL)*: A calculated quantity providing a guide to the interference of a noise with the reception of speech. The speech-interference level is the arithmetic average of the octave band levels of the interfering noise in the most important part of the speech frequency range. The levels in octave bands centered at 500, 1000, and 2000 Hz are commonly averaged to determine the speech-interference level.

Speed (Velocity) of Sound in Air*: 344 m/s (1128 ft/s) at 70°F (21°C) in air at sea level.

Threshold of Audibility (Threshold of Detectability)*: The minimum sound pressure level at which a person can hear a specified frequency of sound over a specified number of trials.

Transmission Loss: A measure of the reduction in sound energy resulting from incident sound waves striking a wall, partition or enclosure, and radiating through to the other side. Mathematically, the transmission coefficient t is the ratio of transmitted acoustic power to the incident acoustic power, and in decibels, the Transmission Loss (TL) of the wall is:

$$(3) TL = 10 \log(1 / t)$$

The TL of a wall varies by frequency. The associated noise reduction (NR) due to the TL of the wall is a function of the TL and the acoustical parameters of the receiving space. For noise radiating from an enclosure into the outdoors, $NR = (TL + 6)$.

TRANSPORTATION SOUND BASICS

Sound Levels

Sound is, in its simplest form, a dynamic, fluctuating pressure, in a fluid medium. That medium can be air, other gases, or liquids such as water. These fluctuations are transmitted by pressure waves through the medium from the source to the receiver. For the majority of transportation engineering purposes, the primary interest is with sound waves in air, with human beings as the receptor. Noise is defined as unwanted sound. The standard practice within the acoustical industry is to use these two terms interchangeably.

Decibels

A decibel (dB) is a logarithmic ratio of a value to a reference level. The general mathematical format is:

$$\text{Level in dB} = 10 \log (\text{Value} / \text{Reference})$$

Any value can be expressed in decibels. Decibels are very, very useful in performing comparisons where there are huge ranges in levels. For example, an acoustical engineer can expect to deal with acoustical energy values ranging from 0.00001 W to 100 W (sound power), and pressures ranging from 0.002 Pa to 200 Pa (sound pressure).¹ For completeness, decibels should always be stated with their reference level (e.g., 20 dB re: 20 μ Pa). However, in practice the reference level is often left out.

Sound Pressure Level

Sound pressure level is what humans experience as sound. Sound waves create small fluctuations around the normal atmospheric pressure. These pressure fluctuations come into contact with eardrums and create the sensation of sound. Sound pressure is measured in decibels, according to the following equation:

$$\text{Sound Pressure Level, dB} = 10 \log (p^2/p_0^2)$$

Where: p = root mean square (r.m.s.) sound pressure, in Pa
 p_0 = reference sound pressure, 20 μ Pa

The reference pressure represents the faintest sound that a “typical” human being can hear. The typical abbreviation for sound pressure level is SPL, although L_p is also often used in equations. “Sound level” or “noise level” are also sometimes used.

Octave Bands

Sounds are composed of varying frequencies or pitches. Human sensitivity to noise varies by frequency, with a greater sensitivity to higher frequency sounds. The propagation of sound also varies by frequency. The unit of frequency is Hertz (Hz), which refers the number of cycles per second (number of wave peaks per second of the propagating sound wave). The typical human hearing response runs from 20 Hz to 20,000 Hz. Frequencies below 20 Hz are generally inaudible, although response is variable, and some individuals may be able to hear or perceive them.

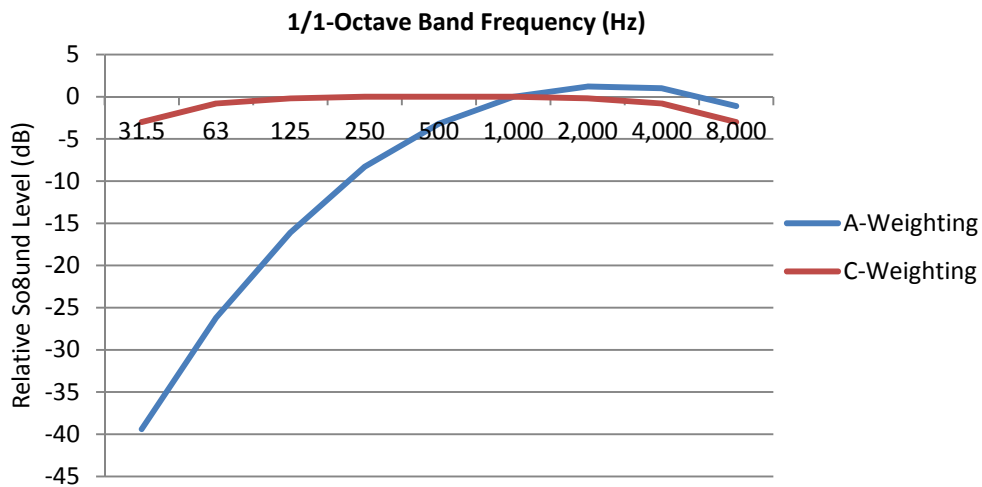
¹ Equivalent to Sound Power Levels ranging from 70 to 140 dB and Sound Pressure Levels ranging from 20 dB to 140 dB

Sound is typically analysed in octave bands or 1/3-octave bands. An octave band is defined as a band or range of sound frequencies where the frequency range doubles for succeeding octave (alternately, the highest frequency in the range is twice the value of the lowest frequency).

A-Weighting

When the overall sound pressure level is expressed as a single value (i.e., not expressed in frequency band levels) the variation in human frequency response must be accounted for. People do not hear low frequency noise as well as noise in mid or high frequencies. To account for this, frequency-weighting networks have been developed to better account for human hearing response. The most frequently used networks are the A-Weighting and C-Weighting.

The A-Weighting network was developed to correspond to how humans hear low to medium levels of noise. The A-Weighting is the most frequently used scheme, and the majority of noise guidelines are expressed in A-Weighted decibel values, denoted as “dBA” levels. C-Weighted “dBC” values are sometimes used in assessing low-frequency noise impacts, which are generally not of concern in transportation noise impact assessment. The A-Weighting and C-Weighting values are shown in the following figure.



A-Weighting and C-Weighting Networks

Ranges of Sound Levels

People experience a wide range of sound levels in their daily activities. The table below presents a graphical comparison of “typical” noise levels which might be encountered, and the general human perception of the level. Sound levels from 40 to 65 dBA are in the faint to moderate range. The vast majority of the outdoor noise environment, even within the busiest city cores, will lie within this area. Sound levels from 65 to 90 are perceived as loud. This area includes very noisy commercial and industrial spaces. Sound levels greater than 90 dB are very loud to deafening, and may result in hearing damage.

Ranges of Sound Levels

Sound Levels		Sources of Noise
Human Perception	SPL in dBA	
Deafening	125	Sonic booms
	120	Threshold of Feeling / Pain
	115	Maximum level, hard rock band concert
	110	Accelerating Motorcycle at a few feet away
Very Loud	105	Loud auto horn at 3 m (10 ft) away
	100	Dance club / maximum human vocal output at 1 m (3 ft) distance
	95	Jack hammer at 15 m (50 ft) distance
	90	Indoors in a noisy factory
Loud	85	Heavy truck pass-by at 15 m (50 ft) distance
	80	School cafeteria / noisy bar; Vacuum cleaner at 1.5 m (5 ft)
	75	Near edge of major highway
	70	Inside automobile at 60 km/h
	65	Normal human speech (unraised voice) at 1 m (3 ft) distance
Moderate	60	Typical background noise levels in a large department store
	55	General objective for outdoor sound levels; typical urban sound level (24h)
	50	Typical suburban / semi-rural sound level (24h)
	45	Typical noise levels in an office due to HVAC; typical rural levels (24h)
Faint	40	Typical background noise levels in a library
	35	
	30	Broadcast Studio
	25	Average whisper
Very Faint	20	Deep woods on a very calm day
	15	
	10	
	5	Human breathing
	0	Quietest sound that can be heard

Transportation noise events, which vary with time, can also be considered in terms of their maximum noise level (L_{max}) during a vehicle pass-by, as shown in the following table:

Typical Pass-By Noise Level at 15 m from Noise Source

Event	Range of Noise Levels (dBA) at 15 m
Semi-Trailer Trucks	75 - 85
Aircraft	69 - 85 [1]
Conventional Light Rapid Transit (Streetcars)	72 - 80 [2]
Large Trucks	71 - 78
Street Motorcycle	76
Diesel or Natural Gas Bus	70 - 78
Trolley Bus	69 - 73
Small Motorcycle	67
General Busy Auto Traffic	66 - 70
Individual Automobiles	63 - 69

Notes: Source: BKL Consultants Ltd.

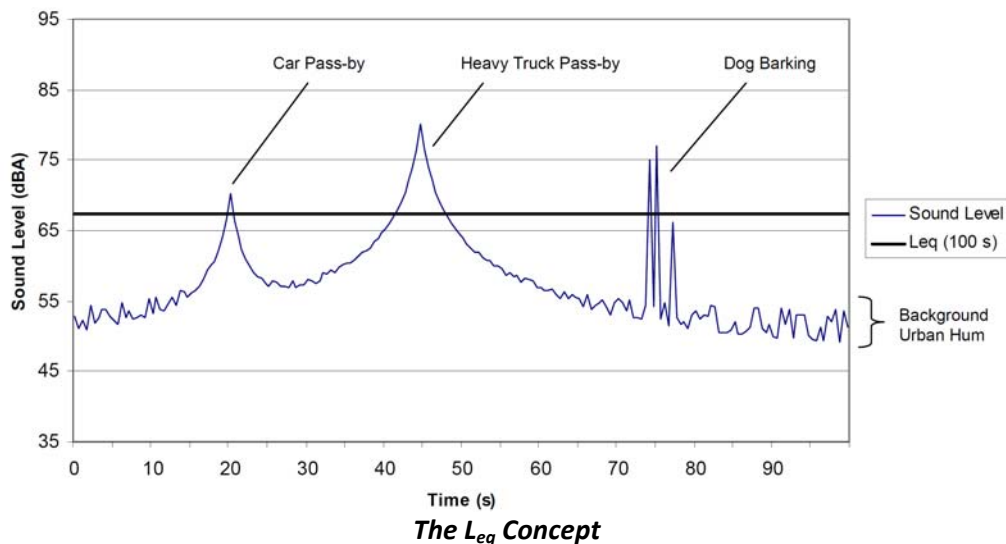
[1] Aircraft flyover not at 15 m distance

[2] Based on data provided for the Calgary, Edmonton and Portland LRT systems.

Noise Descriptors – L_{eq} Values

At this time, the best available research indicates that long-term human responses to noise are best evaluated using energy equivalent sound exposure levels (L_{eq} values), in A-Weighted decibels (L_{eq} values in dBA)^{2,3} including adjustments to account for particularly annoying characteristics of the sounds being analyzed.

Sound levels in the ambient environment vary each instant. In a downtown urban environment, the background noise is formed by an “urban hum”, composed of noise from distant road traffic and from commercial sources. As traffic passes near a noise receptor, the instantaneous sound level may increase as a vehicle approaches, and then decrease as it passes and travels farther away. The energy equivalent sound exposure level L_{eq} is the average sound level over the same period of time with same acoustical energy as the actual environment (i.e., it is the average of the sound energy measured over a time period T). As a time-average, all L_{eq} values must have a time period associated with them. This is typically placed in brackets beside the L_{eq} tag. For example, a thirty-minute L_{eq} measurement would be reported as an L_{eq} (30 min) value. The L_{eq} concept is illustrated in Figure 3, showing noise levels beside a small roadway, over a 100 second time period, with two vehicle pass-bys:



In this example, the background “urban hum” is between 47 and 53 dBA. A car passes by at 20 seconds. As it approaches, the noise level increases to a maximum, and then decreases as it speeds away. At 45 seconds, a heavy truck passes by. Near 75 seconds, a dog barks three times. The maximum sound level (L_{max}) over the period is 80 dBA and the minimum is 47 dBA. For almost 50 % of the time, the sound level is lower than 55 dBA.

The L_{eq} (100s) for the example is 67 dBA, which is much higher than the statistical mean sound level of 55 dBA. This illustrates that the L_{eq} value is very sensitive to loud noise events, which contain much more sound energy (as sound is ranked on a logarithmic scale) than the normal background. It is also sensitive to the number of events during the time period, and the duration of those events. If only the truck had passed by during the measurement (no car and no dog barks), the L_{eq} (100s) would be 66 dBA. If only the car and dog barks had occurred, the L_{eq} (100s) would be 61 dBA. This shows that the truck pass-by is the dominant event in our example, due to its level and duration.

² Berglund and Lindvall, Community Noise, 1995.

³ ISO 1996:2003(E), Acoustics – Description, measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures.

The ability of the L_{eq} metric to account for the three factors of level, duration and frequency of events makes it a robust predictor of human response to noise. It is for this reason that the vast majority of noise standards are based on L_{eq} values.

Typical Durations for L_{eq} Analyses

For transportation noise impact analyses, the following durations are typically used:

L_{eq} (24h)	–	The sound exposure level over then entire 24-hour day
L_{eq} Day	–	Either: Leq (15h), from 7am to 10 pm; or Leq (16h), from 7am to 11 am
L_{eq} Night	–	Either: Leq (9h), from 10 pm to 7 am; or Leq (8h), from 11 pm to 7 am
L_{dn}	–	A special Leq (24h) value with a 10 dB night-time penalty applied to overnight sound levels (10pm to 7am)
L_{eq} (1-h)	–	The sound exposure over a 1-hour time period

L_{eq} (24h) values are appropriate for examining impacts of transportation noise sources with small changes in sound exposure levels over the 24-hour day. For example, freeway noise levels are generally consistent over the 24-hour day. Therefore, for freeways, there is little difference between L_{eq} (24h) values and the corresponding L_{eq} Day and L_{eq} Night values.

L_{eq} Day values, covering off the AM-peak and PM-peak travel periods, are generally appropriate for examining the impacts of non-freeway highways and municipal arterial roadways. The vast majority of noise associated with these sources is concentrated in the daytime hours, where typically, 85% to 90% of the daily road traffic will occur.⁴ Thus, if reasonable sound levels occur during the daytime (and appropriate guideline limits are met), they will also occur (and be met) at night.

To account for increased annoyance with noise overnight in a single value, the U.S. Environmental Protection Agency (U.S. EPA) developed the L_{dn} metric (also known as DNL). It is a special form of the L_{eq} (24h) with a +10 dB night-time penalty. L_{dn} values and a related metric, the day-evening-night level (Lden) are also used in some European guidelines. L_{dn} values are not used in Canadian Provincial jurisdictions in evaluating transportation noise. Instead, guideline limits for separate Leq Day and Leq Night periods are generally used.

L_{eq} (1-h) values are the average sound levels over a one-hour time period. These tend to fluctuate more over the day, as traffic levels can fluctuate significantly hour to hour. L_{eq} (1-h) values are useful in assessing the impact of transportation sources which also vary hourly, and which may vary in a different manner than the background traffic. These values are often used to assess haul route noise impacts, for example.

⁴ Based on research conducted by Ontario Ministry of Transportation, and provided in the *MTO Environmental Office Manual Technical Areas – Noise*. Daytime refers to a 16 hour day from 7am to 11 pm.

Some transportation noise sources may have significant traffic levels occurring overnight. For example, freight rail traffic in heavily used corridors can be shifted to over-night periods, with daytime track use being reserved for freight switcher traffic and passenger traffic. In situations such as this, an assessment of both daytime and night-time noise impacts may be appropriate.

Decibel Addition

Decibels are logarithmic numbers, and therefore have special properties of addition. Decibel values must be added logarithmically. If two sources, each emitting the same amount of sound energy, are placed side-by-side, then the total increase in sound level will only be 3 dB. If the difference in sound energy emitted is greater than 10 dB, then effectively the sound level will be the same as for the loudest unit (i.e., the increase in noise will be less than a decibel).

Decibel Addition Chart

dB Difference Of	dB Value to Add to Highest Number
0	3.0
1	2.5
2	2.1
3	1.8
4	1.5
5	1.2
6	1.0
7	0.8
8	0.6
9	0.5
10	0.4

This affects transportation noise from projects, as noise emission is logarithmically related to traffic volume. Doubling the traffic volume (essentially the same as adding a source with the same sound emission) will only result in a 3 dB increase over the original levels. The decibel increase in noise due to the increase in traffic volume, assuming all other factors remain the same, can be estimated by:

$$\text{dB increase} = 10 \log (\text{new volume} / \text{original volume}).$$

Human Response to Changes in Sound Levels

The human ear does not interpret changes in sound level in a linear manner. The general subjective human perception of changes in sound level is shown in the following table.

Subjective Human Perception of Changes in Sound Levels^{5,6}

Change in Broadband Sound Level (dB)	Human Perception of Change
<3	Imperceptible change
3	Just-perceptible change
4 to 5	Clearly noticeable change
6 to 9	Substantial change
>10 and more	Very substantial change (half or twice as loud)
>20 and more	Very substantial change (much quieter or louder)

Notes:

Adapted from Bies and Hansen, p53, and MOE Noise Guidelines for Landfill Sites, 1998. Applies to changes in broadband noise sources only (i.e., increases or decreases in the same noise or same type of noise only). Changes in frequency content or the addition of tonal or temporal changes would affect the perception of the change.

The above table is directly applicable to changes in sound level where the noise sources are of the same general character. For example, existing road traffic noise levels can be directly compared to future road traffic noise levels, using the above relationships. In comparing road traffic noise to road plus rail traffic noise, the different frequency and temporal nature of the noise means that the rail noise may be more noticeable. Adjustments for the nature of the new sound can be applied to better account for temporal and frequency differences.

For transportation noise sources, research conducted by the U.S. Environmental Protection Agency indicates that a 5 dB change in sound levels is required to trigger a change in large-scale community response to noise. This correlates to a clearly noticeable increase in noise levels.

Decay of Noise with Distance

Noise levels decrease with increasing distance from a source of noise. The rate of decay is partially dependent on the nature of the ground between the source: whether it is hard (acoustically reflective) or soft (acoustically absorptive). Transportation noise sources in general act as *line sources* of sound. For line sources, the rate of decay is approximately:

- Hard ground: 3 dB for each doubling of distance from the source
- Soft ground: 5 dB for each doubling of distance from the source

⁵ Bies, D.A., and C.H Hansen 1988. Engineering Noise – Theory and Practice, 2nd Ed. E & E & FN Spon, London, p 53.

⁶ Ontario Ministry of the Environment 1998. Noise Guidelines for Landfill Sites. Queen’s Printer for Ontario.

Appendix B

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purposes

*Environmental Assessment Study
Kirby Road Extension
(From Dufferin Street to Bathurst Street)
City of Vaughan*

*Transportation, Traffic and Active Transportation
Need and Justification Assessment*

August 2018

Prepared For: Schaeffers Consulting Engineers

Prepared By: Poulos & Chung Limited

*Class Environmental Assessment Study
Kirby Road Extension (From Dufferin Street to Bathurst Street)
City of Vaughan
Transportation, Traffic and Active Transportation
Need and Justification Assessment*

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Appendix A: Excerpts from Transportation Master Plans of City of Vaughan and York Region

Appendix B: Levels of Service Definition

*Environmental Assessment Study
Kirby Road Extension
(From Dufferin Street to Bathurst Street)
City of Vaughan
Transportation, Traffic and Active Transportation
Need and Justification Assessment*

1. Introduction

Poulos & Chung Limited has been retained by Rizmi Holdings LTD. Poulos & Chung Limited is part of a Project Team headed by Schaeffers Consulting Engineers.

The Project Team is to complete an Environmental Assessment Study conducted as a Schedule “C” Municipal Road Project for the Kirby Road Extension (Bathurst Street to Dufferin Street) in the City of Vaughan.

The study area and location of the extension is shown in Figure 1.

Poulos & Chung Limited is responsible to conduct an analysis of options to the undertaking and complete the need and justification component of the assessment work.

This report summarizes the detailed analysis that was undertaken. The information contained in this report will be used by the Project Team to:

- Complete the screening and evaluation of alternatives (road alignments);
- Contribute to the detailed engineering criteria of the alternative alignments;
- Assist in the selection of recommended alternative design concept for the Kirby Road extension.

The following sections present the transportation, traffic, transit and active transportation analysis details. Key conclusions and recommendations provided to the Project Team are also presented.

2. The Undertaking

The City of Vaughan published the Transportation Master Plan (TMP) in 2013.

Appendix I of the Transportation Master Plan presented “Satisfying EA Requirements”. Excerpts from the document are presented in Appendix A.

Appendix A contains:

- Figure A1 which classifies the Kirby Road extension as a Schedule C project;
- Figure A2 which identifies the Kirby Road extension as one of several projects to be completed;
- Figure A3 which details Kirby Road specifics including:
 - A project need from Keele Street to Bathurst Street, of which this project is conducting the Dufferin Street to Bathurst Street segment;
 - A new four (4) lane roadway requirement involving widening the current two lanes west of Dufferin Street and a new road segment between Dufferin Street and Bathurst Street;
 - A proposed timeline of 2021 to 2031;
 - The new Kirby Road extension is to be a part of the York Region arterial road grid.

The 2016 York Region Transportation Master Plan also identified a timeline for proposed improvements and additions to the regional transportation system. Appendix A of the 2016 Transportation Master Plan provided details and summary sheets for the identified road projects. The project sheets pertaining to this Kirby Road segment is also presented in Appendix A:

- Figure A4 identifies the Kirby Road segment between Dufferin Street and Bathurst Street. A brief description of the natural, land use and built environment is provided;
- Figure A5 presents the preliminary problem or opportunity statement. Preliminary alternatives are considered and then a preliminary recommendation and justification is provided. The preliminary recommendation provided is to construct four lane missing link between 2027 and 2031;
- Figure A6 presents an aerial photograph of the existing intersection conditions of Kirby Road with Dufferin Street and Bathurst Street.

The undertaking (or Problem Statement) is very clearly defined in the context of north eastern Vaughan. This is presented in Figure 2. The study focus is solely between Dufferin Street and Bathurst Street. The extension will support development and redevelopment in the area.

The above was taken as direction to complete the transportation, traffic, transit and active transportation assessment.

3. Basis of Analysis

Numerous studies were used for information purposes to ensure that the most up – to –date information was available to complete the assessment and evaluation.

These studies included:

- York Region Transportation Master Plan (TMP) 2016;
- City of Vaughan Transportation Master Plan, 2013 and;
- The relevant Appendices to the Transportation Master Plan;
 - Appendix F Model Development and Application;
 - Appendix I Satisfying EA Requirements;
- City of Vaughan Pedestrian and Bicycle Master Plan Study, January 2007;
- North Vaughan and New Communities Transportation Master Plan Draft Report, HDR Inc. February 2018;
- Relevant Metrolinx Studies including;
 - Mobility Hub Guidelines, September 2011;
 - New Station Analysis, Methodology and Process September 22, 2015.

Additional background information included:

- Current background traffic – Existing vehicle turning movement information was obtained from area intersection turning movement counts conducted by York Region and Poulos & Chung Limited. The date which the intersections were counted is shown in Figure 5;
- Existing lane configurations as recorded by field observations;
- Transportation for Tomorrow Survey 2011 data information. A cooperative effort by local and provincial government agencies to collect information about urban travel in Southern Ontario. Custodian of the data sets is the Data Management Group of the Department of Civil Engineering at the University of Toronto;

- EMME II transportation software model outputs as provided by York Region.

4. Existing Conditions

4.1 Transit

York Region Transit provides extensive transit service throughout York Region.

The York Region Transit map is shown in Figure 3.

Currently transit is available on Kirby Road in a short section at Keele Street and along Bathurst Street.

4.2 Active Transportation

Active transportation infrastructure is limited within the study area.

A sidewalk, path, trail (Multi Use Path) of approximately 2.0 meters in width is available on the south side of Kirby Road west of Dufferin Street.

Exclusive bike lanes are available on both sides of the roadway on Gamble Road.

No other active transportation infrastructure is available within the study area although bicyclist can make use of Dufferin Street and the Bathurst Street road shoulders.

4.3 Roads and Traffic

The existing area roadway network and lane configuration is shown in Figure 4.

Existing intersection vehicle turning movements are shown in:

- Figure 5 - the AM weekday peak hour movements;
- Figure 6 - the PM weekday peak hour movements.

Also shown in Figures 5 and 6 is the resulting vehicle flow pattern (estimated diversion pattern) resulting from the lack of a Kirby Road extension.

It is evident during each typical weekday several of the intersections experience fairly high vehicle turning movements in each of the roadway peak hours. These fairly high vehicle turning movements form a pattern circumventing the unavailable Kirby Road segment. This circuitous vehicle flow in each of the typical weekday roadway peak hours is causing vehicle delay and congestion to all four of the primary intersections studied.

The extent of vehicle delay and congestion was analyzed.

Table 1 summarizes the existing roadway intersection operating conditions and presents overall intersection level of service, vehicle delay and volume to capacity ratio.

**Table 1
Calculated Intersection Performance
Existing Condition**

Performance Measure	Kirby Road and Dufferin Street		Kirby Road and Bathurst Street	
	AM Peak	PM Peak	AM Peak	PM Peak
Overall Level of Service	B	C	B	B
Vehicle Delay (in Seconds)	15	20	14	20

Overall Level of Service is calculated based on the optimum signal timing in the AM and PM peak hour.

Level of Service for signalized intersections is defined in terms of delay, which is measure of driver discomfort and frustration, fuel consumption and lost travel time. Alpha – numeric descriptors are provided to assist in understanding the intersection analysis and outputs normally produced using Highway Capacity Software. (Appendix B). The following table is provided to explain the performance of intersection operations.

Table 2

Highway Capacity Manual (2000) Level of Service Definitions for Intersections

LOS	Signalized Intersection Average Vehicle Control Delay	Unsignalized Intersection Average Vehicle Control Delay	LOS Recommendation
A	<= 10 sec	<= 10 sec	Acceptable
B	10 – 20 sec	10 – 15 sec	Acceptable
C	20 – 35 sec	15 – 25 sec	Acceptable
D	35 – 55 sec	25 – 35 sec	Somewhat Undesirable
E	35 – 80 sec	35 – 50 sec	Undesirable
F	>= 80 sec	>= 50 sec	Undesirable

Upon reviewing the above results it can be concluded that:

- As shown in Figures 5 and 6;

- Kirby Road forms “T” intersections with Dufferin Street and Bathurst Street. Even though the intersections benefit from no east west opposing traffic flows and Kirby Road westbound at Bathurst Street employs a double left turn lane; still in the PM peak hour vehicle delays are reasonable and over capacity condition exist in the PM roadway peak hour at the Kirby Road and Bathurst Street intersection;
- The Kirby Road traffic flows impose increased vehicle demands on Teston Road and the intersections with Dufferin Street and Bathurst Street.

5. Factors Influencing the Undertaking

5.1 Population and Employment Growth

York Region provided currently available information for the forecast growth in population and employment in the immediate vicinity of the study area.

Figure 7 identifies the planned growth in population for four time periods up to 2041.

Figure 8 identifies the planned growth in employment for four time periods up to 2041.

It is evident that population and employment growth will continue in the immediate area surrounding the undertaking, particularly in the area of Kirby Road and Hwy 400 area.

York Region as a whole will continue to experience growth in population and employment.

The following table presents a summary of the population and employment growth within York Region.

Table 3
Growth Plan Schedule 3 Forecasts

York Region	2014	2031	2036	2041
Population	1,133,900	1,590,000	1,700,000	1,790,000
Employment	564,600	790,000	840,000	900,000

Source: Growth Plan for the Greater Golden Horseshoe (2017).

5.2 Planned Transportation System Improvements and Additions

The City of Vaughan and York Region have both identified significant planned improvements and additions to the transportation system.

Of significance to this assessment are the following identified transportation system improvements and additions.

Roads

The City of Vaughan has identified the need for several additions and improvements to roads currently under their jurisdiction. (Source: (City of Vaughan Transportation Master Plan, December, 2012).

The planned improvements and additions are illustrated in Figure 9.

As indicated in Section 1, Kirby Road is one of the identified roads requiring improvement.

Kirby Road although currently under the jurisdiction of the City of Vaughan is contemplated to play an important role and function in the overall York Region road network. As a result York Region may take control of Kirby Road in the future.

Kirby Road is to play a very important role and function in the future. This role and function is illustrated in the following Figures. The Figures are Transportation Schedules excerpted from the 2016 York Region Transportation Master Plan.

Figure 10 illustrates the overall planned long term roadway network for York Region. It is evident that Kirby Road is an integral component of the regional arterial grid in northern Vaughan. Figure 11 shows greater detail of the long term roadway network including a potential Kirby Road interchange with Highway 400. It is also evident that Kirby Road is planned to be improved in years 2027 to 2031. This includes the missing link which is the subject of this Environmental Assessment Study.

Goods Movement

Figure 12 illustrates the long term strategic goods movement network. Kirby Road is identified as a primary arterial goods movement corridor. It is evident that Kirby Road is to play an important role.

Transit

Figure 13 illustrates the Transit Network anticipated in 2027 – 2031. It is evident that Kirby Road will be served by frequent transit service.

Cycling

Figure 14 illustrates the long term cycling network and dedicated cycling facilities between Dufferin Street and Bathurst Street. It is evident that the Kirby Road extension is to contain dedicated bicycle lanes.

5.3 Future Urban Area

Future development is contemplated on lands between Dufferin Street and Bathurst Street. It is likely that development of this land will seek access onto the Kirby Road extension.

The potential development could consist of (Concept Plan by Lucas & Associates dated April 20, 2016):

- 486 townhouse / condominium dwelling units;
- 52,000 square feet of office;
- 30,000 square feet of retail / commercial.

The amount of vehicle flow to be generated by this potential development was estimated. The estimation was conducted using vehicle trip generation rates contained in the Trip Generation Manual (8th Edition) published by the Institute of Transportation Engineers.

The resultant traffic flow generated by this proposed development is presented in Figure 15. Also shown is the directional distribution of these trips. The distribution is general and is based upon Transportation for Tomorrow Survey results.

Figure 16 presents the assignment of the proposed development traffic flow (typical weekday AM and PM peak hour) to Kirby Road and the major intersections.

6. Determining the Need

Section 5 of this assessment identifies the important role and function that Kirby Road is going to provide not only for the City of Vaughan but for York Region as well.

This role and function can be summarized as a solution to serve the need of:

- Goods Movement;
- Transit;
- Active Transportation, and;
- Vehicle Flow.

The vehicle flow need has been further examined.

York Region provided EMME II (Transportation Model) software outputs for horizon years 2021 and 2031.

A specific select link analysis was conducted in order to identify the forecast vehicle flows on Kirby Road. The select link analysis effectively identifies how forecast traffic arrives to and departs from Kirby Road in the AM roadway peak hour. As these vehicle flows complete their direction of travel a total accumulated vehicle flow is given along each segment of Kirby Road.

Figure 17 presents the select link analysis for horizon year 2021. In this horizon year the proposed GTA West freeway is not part of the roadway network.

Figure 18 presents the select link analysis for horizon year 2031. The GTA West freeway is assumed to be a part of the roadway network in this horizon year.

Upon examining the two Figures it is evident that:

- Kirby Road will accommodate significant vehicle flows in both 2021 and 2031;
- The 2031 forecast does not diminish the Kirby Road vehicle flows, it is evident that vehicle flows are still significant but the inclusion of the future GTA West freeway will assist to re – redistribute and reduce north south vehicle flow movements;

A further analysis was done to specifically identify the forecast vehicle flows and vehicle directions of travel on Kirby Road between Dufferin Street and Bathurst Street.

Figure 19 presents the 2021 and 2031 vehicle flows on this segment of Kirby Road.

Several important conclusions can be made upon examining the magnitude of each vehicle flow movement. These conclusions are:

- By 2021 and until 2031 when the GTA West freeway is forecast to be in place, this segment of Kirby Road, between Dufferin Street and Bathurst Street, facilitates the directional distribution of AM peak hour vehicle flows. It provides a link to complete intersection turning movements facilitating vehicles to secure their travel destination;
- The 2021 AM peak hour peak direction of travel (westbound on Kirby Road between Dufferin Street and Bathurst Street) is in excess of 1,400 vehicles. The typical vehicle carrying capacity of a single arterial traffic lane is in the order of 900 to 950 vehicles per hour. As a result it is evident that two (2) traffic lanes will be required in the westbound direction on Kirby Road by 2021;
- The 2021 roadway PM peak hour will accommodate a vehicle flow in the reverse direction (eastbound). The magnitude of this vehicle flow will be equal or greater than the forecast AM roadway peak hour vehicle flow. As a result it is evident that

two (2) traffic lanes will be required in the eastbound direction on Kirby Road by 2021.

- By 2031 the peak hour peak direction vehicle flows on Kirby Road will not diminish. The need for two (2) traffic lanes in each direction of travel is confirmed;
- To satisfy the vehicle turning flows, the Kirby Road intersections with Dufferin Street and Bathurst Street will require exclusive left turn lanes with adequate vehicle storage and taper lengths.

In February 2018 the Ministry of Transportation announced that Ontario will not be proceeding with a proposed highway in the GTA West Corridor and would be moving forward with an assessment of infrastructure needs through the Northwest GTA Corridor Identification Study. As a result of this a further 2031 horizon year analysis was undertaken.

Figure 19A presents the select link analysis for horizon year 2031. In this horizon year the proposed GTA West freeway is not part of the roadway network.

An update to Figure 19 is now presented in Figure 19B.

In Figure 19B the forecast peak hour peak direction vehicle flows on this segment of Kirby Road is presented for:

- Horizon year 2021 (AM peak hour) with no GTA West freeway;
- Horizon year 2031 (AM peak hour) with GTA West Freeway;
- Horizon Year 2031 (AM peak hour) with no GTA West Freeway.

It is evident that by 2031 even without the GTA West freeway that this segment of Kirby Road will require two (2) traffic lanes in each direction of travel to serve the anticipated vehicle demand.

7. Evaluating the Justification

The available EMME II transportation software outputs were evaluated for the roadway AM peak hour in horizon years 2021 and 2031.

Figure 20 summarizes and compares the roadway AM peak hour condition (Volume to capacity ratios by roadway segment) in horizon year 2021. It is evident that:

- The forecast horizon year 2021 operating condition with and without (this can be considered to be the “Do Nothing” option) the Kirby Road segment between Dufferin Street and Bathurst Street indicates:
 - Without the Kirby Road connection the parallel arterial roads north and south of Kirby Road will experience significant delay and congestion. It is evident that the roadway segments have volume to capacity ratios of 1.28 and greater;
 - The introduction of the Kirby Road connection materially benefits the immediate east west arterial roads. The volume to capacity ratios by roadway segment have been reduced to reasonable operating levels.

Figure 21 summarizes and compares the roadway AM peak hour condition (Volume to capacity ratios by roadway segment) in horizon years 2021 and 2031 with the Kirby Road connection in place. It is evident that:

- By 2031 with the GTA West freeway in place and with the Kirby Road connection available the area roads examined secure a more balanced distribution of vehicle flows, and;
- By 2031 the planned connecting link, Teston Road (Keele Street to Yonge Street) is in place.
- Optimum boundary road operations are secured. The volume to capacity ratios by roadway segment have been reduced to reasonable operating levels.

As indicated in Section 6 the GTA West Freeway corridor has been removed by the Ministry of Transportation. The forecast 2031 traffic flows without the GTA West Freeway were examined.

Figure 21A summarizes and compares the roadway AM peak hour condition (Volume to capacity ratios by roadway segment) in horizon years 2021 and 2031 with the Kirby Road connection in place. It is evident that:

- By 2031 with the Kirby Road connection available but excluding the GTA West Freeway the area roads examined secure a more balanced distribution of vehicle flows, and;
- By 2031 the planned connecting link, Teston Road (Keele Street to Yonge Street) is assumed to be in place. It is noted that this connecting link is subject to approval by the Minister of the Environment and Climate Change through the individual EA process. On June 7, 2018 York Region submitted the proposed Terms of Reference for the project to the Ministry of the Environment and Climate Change.
- Optimum boundary road operations are secured. The volume to capacity ratios by roadway segment have been reduced to reasonable operating levels.

The above analyses present link traffic flow volumes. The link traffic flow volumes describe the number of cars that pass through a certain segment (mid – block) of a roadway network over a period of time. This link traffic volume is divided by the capacity of the roadway segment to develop ratios for each roadway link during the AM and PM peak hours. The volume – to – capacity ratio reflects peak hour traffic demand measured against the roadway capacity. A description of the volume – to – capacity ratios is provided in the following table.

Table 4

Link Volume to Capacity Ratios and Operating Condition

Volume to Capacity Ratio	Level of Service (LOS)	Operating Condition
Less than 0.85	LOS A – C	Free Flow Very Little to Moderate Delay
Between 0.85 and 0.99	LOS D – E	Approaching or at Capacity, Users Experience Delays and Queuing
Greater than 1.0	LOS F	Over Capacity, Severe Delays and Queuing

In March 2018 HDR Inc. completed the North Vaughan and New Communities Transportation Master Plan Draft Final Report. This study is a long range plan that recommends policies, programs and infrastructure required to meet existing and future mobility needs and provide context for transportation decisions within North Vaughan. The North Vaughan area (essentially the study area is bounded by King – Vaughan Road to the north, Bathurst Street to the east, Major Mackenzie Drive to the south and Highway 27 to the west.

A key transportation corridor essentially in the middle of the study area is Kirby Road.

The study followed the Transportation Master Plan (TMP) process, an open public process following the Municipal Class Environmental Assessment Guidelines, so that the study results can properly serve as direct input to any subsequent Environmental Assessment (EA) studies for specific infrastructure projects.

The study utilized York Region's updated EMME Transportation software model as the starting point in preparing transportation forecasts and conducting analyses. Poulos & Chung Limited in conducting this Transportation, Traffic and Active Transportation Need & Justification Assessment, Kirby Road (Dufferin Street to Bathurst Street) also used the same transportation model. Poulos & Chung Limited can confirm that the forecast traffic flows on the Kirby Road corridor for each area roadway network and transit condition examined is very comparable and almost identical in both studies.

The North Vaughan and New Communities Transportation Master Plan detailed:

- The transportation system requirements for numerous communities within the study area;
- The operational performance of the study area arterial grid network with and without the GTA Freeway;
- A assessment and evaluation of the missing links in the arterial grid network including the Kirby Road missing link between Dufferin Street and Bathurst Street;
- The active transportation system (bicycles and pedestrian infrastructure including transit services to provide total mobility options;
- A recommended phasing plan to implement the transportation system (roads, transit, pedestrian and bicycle) improvements and additions.

Specific to Kirby Road the North Vaughan and New Communities Transportation Master Plan identified:

- That the addition of the Kirby Road missing link (between Dufferin Street and Bathurst Street helps alleviate traffic from parallel arterial roads,
 - Minimizes the kilometres travelled and hours spent in congestion;
 - Assists to accommodate increased public transit services, and;
 - Facilitates pedestrian and bicycle flows through the inclusion of sidewalks and bicycle lanes;
- The need for York Region to assume jurisdiction of Kirby Road in the City of Vaughan;
- The timing to improve Kirby Road from Highway 27 to Bathurst Street (including elimination of the missing link) is 2017 – 2026.

8. Verifying Travel Demands

8.1 Transit

As shown in Figure 13 Kirby Road will be a component of the overall transit network for York Region.

It's designation as a corridor with frequent transit service requires and justifies the need to incorporate design standards sufficient to accommodate buses in mixed traffic.

The Kirby Road extension will use City of Vaughan, York Region and Transportation Association of Canada standards to provide:

- Appropriate lane widths, curb radii, centre line radius, and;
- Sufficient boulevard dimension to permit the installation and satisfy transit facility requirements.

8.2 Active Transportation

As shown in Figure 14 Kirby Road will be a component of the overall bicycle network for York Region.

In addition following the typical York Region standards for arterial roads sidewalks must be included within the Kirby Road Right – of –Way (R o W).

The design standards employed must follow typical York Region standards for the inclusion of exclusive bike lanes in both directions of travel.

8.3 Goods Movement

As shown in Figure 12 Kirby Road is designated to accommodate goods movement demands.

The design standards employed must follow typical York Region standards to satisfactorily accommodate the geometric requirements of tractor trailer trucks.

8.4 Traffic Flows

The EMME II outputs provided by York Region formed the basis to determine the vehicle turning movements at the intersections of Kirby Road with Dufferin Street and Bathurst Street.

The EMME II select link analysis was used as the basis to calculate forecast turning movements for the roadway AM peak hour in horizon years 2021 and 2031. To calculate the roadway PM peak hour turning movements it was assumed that the magnitude of AM vehicle trips would be reversed. Additional adjustments were introduced reflecting existing turning movement demand.

The resultant calculated 2021 and 2031 vehicle flows and turning movements are shown in Figures 22 and 23. The vehicle turning movements are presented with and without the GTA West freeway.

The potential development traffic flows shown in Figure 16 were added to the above calculated 2021 and 2031 vehicle flows. This resulted in a total 2021 forecast traffic flow and intersection turning movement vehicle demand as shown in the top portion of Figure 24 while the 2031 forecast traffic flows are in the lower part of Figure 24.

It is evident that all left turn movement demands at each Kirby Road intersection will require exclusive left turn lanes.

The analysis technique of the Transportation Association of Canada as contained in the Transportation Geometric Design Guidelines for Canadian Roads was used to calculate left turn storage lengths. This calculation is a direct function of vehicle demand.

The calculated vehicle storage length for the exclusive left turns is shown in Figure 25.

The Synchro Software Program, Version 8 by Trafficware Inc. was used to calculate the performance of the Kirby Road intersections in horizon years 2021 and 2031.

Table 5 presents the overall intersection level of service, vehicle delay and volume to capacity ratio.

Table 5
Calculated Intersection Performance
Horizon Years 2021 and 2031

Performance Measure	Kirby Road and Dufferin Street		Kirby Road and Bathurst Street	
	AM Peak	PM Peak	AM Peak	PM Peak
Year 2021				
Overall Level of Service	D	D	E	D
Vehicle Delay (in Seconds)	48	43	59	52
Year 2031 (with GTA West)				
Overall Level of Service	D	E	F	D
Vehicle Delay (in Seconds)	36	76	82	50
Year 2031 (with no GTA West)				
Overall Level of Service	D	E	F	D
Vehicle Delay (in Seconds)	36	76	86	40

An explanation of the alpha – numeric outputs is provided in Appendix B.

The analysis indicates that very acceptable urban intersection operations can be secured. Vehicle delays are reasonable and the forecast vehicle demand can be satisfactorily accommodated. In the context of an urban environment these intersection operating conditions are deemed to be acceptable and performing very well. The operating conditions are a direct result of the increased traffic flows generated by continued growth in the immediate area and throughout York Region. The forecast traffic flows are much higher than the existing flows hence even with improvements the overall levels of service degrade but still are considered acceptable.

Upon reviewing the role and function of Kirby Road including this assessed segment; it is concluded that a minimum Right – of - Way of 36.0 meters in width is required.

8.5 Summarizing the Need and Justification

As documented in Section 2 of this report considerable work was completed by the City of Vaughan to identify the need and justification of this project. In addition, York Region as documented in Section 5.2 of this report identifies the important role and function that this project is to play in the overall regional roadway, transit and active transportation network.

Notwithstanding the significant amount of analysis completed by York Region and the City of Vaughan this report extracted relevant analysis completed by the authorities and included updated existing roadway / intersection traffic flow information.

Such an approach permitted a detailed examination of all potential “Alternative Solutions” to the undertaking in accordance with Phases 1 and 2 of the Municipal Class Environmental Assessment planning and design process.

Alternative Solutions examined included:

- “Do – Nothing” option;
- Use / Widen Parallel East – West roads;
- Provide Active Transportation Facilities including Travel Demand Management, and;
- Construct new roadway extension.

The detailed evaluation of Alternative Solutions to the undertaking is summarized below.

Examination of “Do – Nothing” Condition

The “Do - Nothing” Condition has severe implications on both existing and future vehicle travel demands. This can be ascertained by examining the following Figures:

- Figures 5 and 6 illustrate the existing roadway AM and PM peak hour area traffic flow patterns. It is very evident that the traffic flows in order to complete their direction of travel causes increased vehicle turning movements at several area intersections. These turning movements today cause increased vehicle delay and congestion. The delay and congestion will continue to increase over time as growth continues in the City of Vaughan and York Region;
- Figures 17 and 18 illustrate the forecast 2031 accumulated AM peak hour traffic flow on this project section with and without the proposed GTA West Freeway. It is evident with or without the GTA West Freeway this project road segment is forecast to carry a significant amount of traffic flow. If this project segment were not available this projected significant traffic flow would have to find alternate routes. The forecast volumes indicate that two lanes of traffic in each direction of travel would have to be found in an adjacent roadway corridor.

It is evident from examining existing roadway and intersection operations and reviewing forecast traffic flow demands that the “Do – Nothing” condition is not a viable option. Attempting to “throw – off” the existing and forecast Kirby Road traffic flow demand will have a detrimental impact on the operations of numerous area roads and intersections.

Examination of Parallel East – West Roads

Figure 20 in this report examines the parallel east – west roads. The analysis was conducted for the roadway AM peak hour in horizon year 2021. The analysis indicates that the King – Vaughan Road to the north and Teston Road to the south would both experience a vehicle demand significantly higher than the available roadway capacity that can be provided. The available capacity on these roads was assumed to be derived by widening each of the parallel roads to four lanes. In effect this assumption is based upon accelerating the timing of the planned Teston Road improvements between Keele Street and Yonge Street which is planned for beyond 2022. As planned growth continues the identified volume to capacity operating deficiency would be much worse in horizon year 2031.

It is evident that the parallel east – west roads cannot provide additional operating capacity to serve increased traffic flow demands resulting from the lack of a continuous Kirby Road condition. It can also be stated that the area intersections serving the disrupted traffic flows would provide degraded operating conditions serving to increase vehicle delay and congestion.

Examination of Transit and Active Transportation to Accommodate Forecast Demand Including Travel Demand Management (TDM)

There is no doubt that transit and active transportation (bicycling and walking) are important modes of transportation and must be available as viable options of travel. The City of Vaughan and York Region have both incorporated standards and on – going facilities, services and infrastructure in their respective jurisdictions to accommodate these modes.

Although it is evident that transit and active transportation will have an on – going important role in serving travel demands it is evident that they cannot satisfy the total travel demands.

Figure 26 illustrates the existing modal characteristics of this area of the City of Vaughan. The statistics are available from the Data Management Group and based upon the 2011 Transportation for Tomorrow Survey results.

The 2016 York Region Transportation Planning Study Update has incorporated an increase in the usage of transit and continued growth in walking and bicycling during the roadway AM peak hour.

As shown in Figure 26 the current uptake of transit and active transportation during the AM peak period is in the order of twenty – four (24) percent of all trips. Even if this percentage of non automobile travel were to double by 2031 over half of all trips will still be taken by the automobile.

It is therefore concluded that increased usage of transit and active transportation, though most welcomed, is not capable of serving the total travel demand needs.

A roadway solution must be a part of the overall transportation system to satisfactorily serve total forecast demands.

TDM will be an important tool to be used by Authorities and interested parties to continue to educate, encourage and incentivize people to use other modes of transportation instead of the single automobile / single driver to complete trips during the typical weekday roadway peak periods. TDM will continue to grow and evolve and will be complimented by the planned infrastructure both within planned communities, municipal and regional transportation systems.

Examination of Construct New Roadway Option

The ability to complete the existing and planned arterial grid system is an important consideration. This project immediately benefits the arterial grid by completing a missing section of Kirby Road.

Such an undertaking not only benefits traffic flows but also permits transit to efficiently implement direct route patterns and allows active transportation infrastructure to be implemented as part of the overall system.

Figure 24 illustrates the forecast traffic flows on this project and this segment of Kirby Road. The new roadway permits organization of traffic flows. The intersections with appropriate lane configuration permits turning movement demand to be organized and accommodated in a balanced and efficient manner.

All critical modes of transportation are accommodated in a safe and efficient manner.

The following Table 6 has been prepared to summarize the evaluation of the alternative solutions considered from a transportation perspective.

Table 6

Evaluation of Alternative Solutions
 Transportation / Technical / Operations
 Kirby Road Extension
 (From Dufferin Street to Bathurst Street
 City of Vaughan

Environmental Factor	Alternative Solution A “Do - Nothing”	Alternative Solution B “Use / Widen Parallel East West Roads”	Alternative Solution C “Provide Active Transportation Facilities including TDM”	Alternative Solution D “Construct New Roadway Extension”
Transportation/ Technical	Not Preferred	Not Preferred	Neutral	Preferred
Advantages and Disadvantages	<ul style="list-style-type: none"> • Does not address the problem • Prevents completion of the arterial grid 	<ul style="list-style-type: none"> • Does not accommodate increased traffic flow demand • Does not support completion of a balanced transportation system 	<ul style="list-style-type: none"> • Does not fully address the problem • Contributes to completion of balanced transportation system 	<ul style="list-style-type: none"> • Provides the additional operating capacity required • Supports connection of Future Urban Area • Incorporates and organizes key modes of transportation • Supports completion of a balanced transportation system
Conclusion	<ul style="list-style-type: none"> • In agreement with Municipal and Regional TMP findings. • Eliminate from further consideration 	<ul style="list-style-type: none"> • In agreement with Municipal and Regional TMP findings. • Eliminate from further consideration 	<ul style="list-style-type: none"> • In agreement with Municipal and Regional TMP findings. • Eliminate from further consideration 	<ul style="list-style-type: none"> • In agreement with Municipal and Regional TMP findings. • Carry forward to Phase 3 and 4 EA Study with elements from Alternative Solution 3

9. Conclusions and Recommendations

The assessment of the Kirby Road segment between Dufferin Street and Bathurst Street permits the following conclusions to be made:

- Both the 2013 City of Vaughan and the 2016 York Region Transportation Master Plans identified the need for the undertaking;
- The North Vaughan and New Communities Transportation Master Plan Draft Report, HDR Inc. dated February 2018 has also confirmed the need for the undertaking;
- The undertaking involved improving Kirby Road easterly from Keele Street to Bathurst Street, including the subject of this detailed assessment from Dufferin Street to Bathurst Street;
- This undertaking resolves the lack of a connection between Dufferin Street and Bathurst Street;
- This detailed assessment verifies the need to construct new roadway extension and confirms that;
- Kirby Road must be connected between Dufferin Street and Bathurst Street by 2021 and that the;
- Kirby Road connection must have two (2) lanes of traffic in each direction of travel;
- The resultant four (4) lanes of traffic on this segment of Kirby Road are sufficient to meet the forecast total modal demands for 2031 as well. The intersections of Dufferin Street and Bathurst Street will require the inclusion of exclusive left turn lanes with satisfactory storage and taper lengths and centre medians to permit installation of traffic signal hardware;
- On Kirby Road at the intersections with Dufferin Street and Bathurst Street, right turn lanes will be required in the eastbound and westbound directions of travel. York Region Transit should determine if bus stops can be located in the right turn lane or if an alternate bus stop location is to be implemented.

The assessment of the Kirby Road segment between Dufferin Street and Bathurst Street permits the following recommendations to be made:

- City of Vaughan, York Region and Transportation Association of Canada design standards can be applied to this segment of Kirby Road permitting the proper operations of:
 - Automobiles;
 - Buses;
 - Trucks;
 - Bicyclists;
 - Pedestrians.

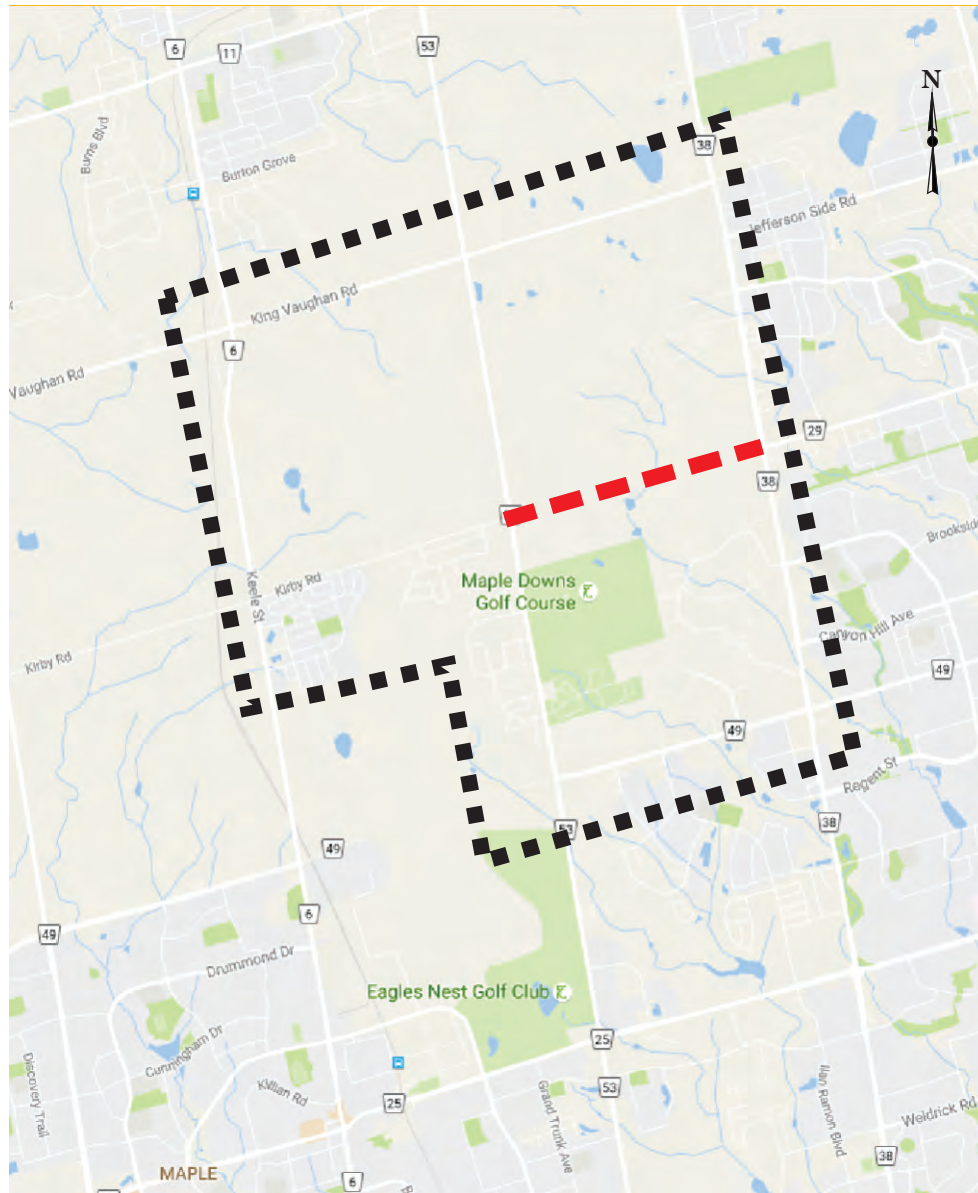
- Exclusive left turn lanes must be provided in all directions of travel at each of the Kirby Road intersections with Dufferin Street and Bathurst Street. The calculated dimensions for vehicle storage and taper lengths at each of the intersection approaches is shown in Figure 22;

- Exclusive bicycle lanes are to be provided in both directions of travel (either on – pavement or in boulevard);

- Sidewalks are to be provided on both sides;

- Provision and satisfactory space must be made available in the boulevards for transit facilities and infrastructure as required by York Region Transit.

List of Figures

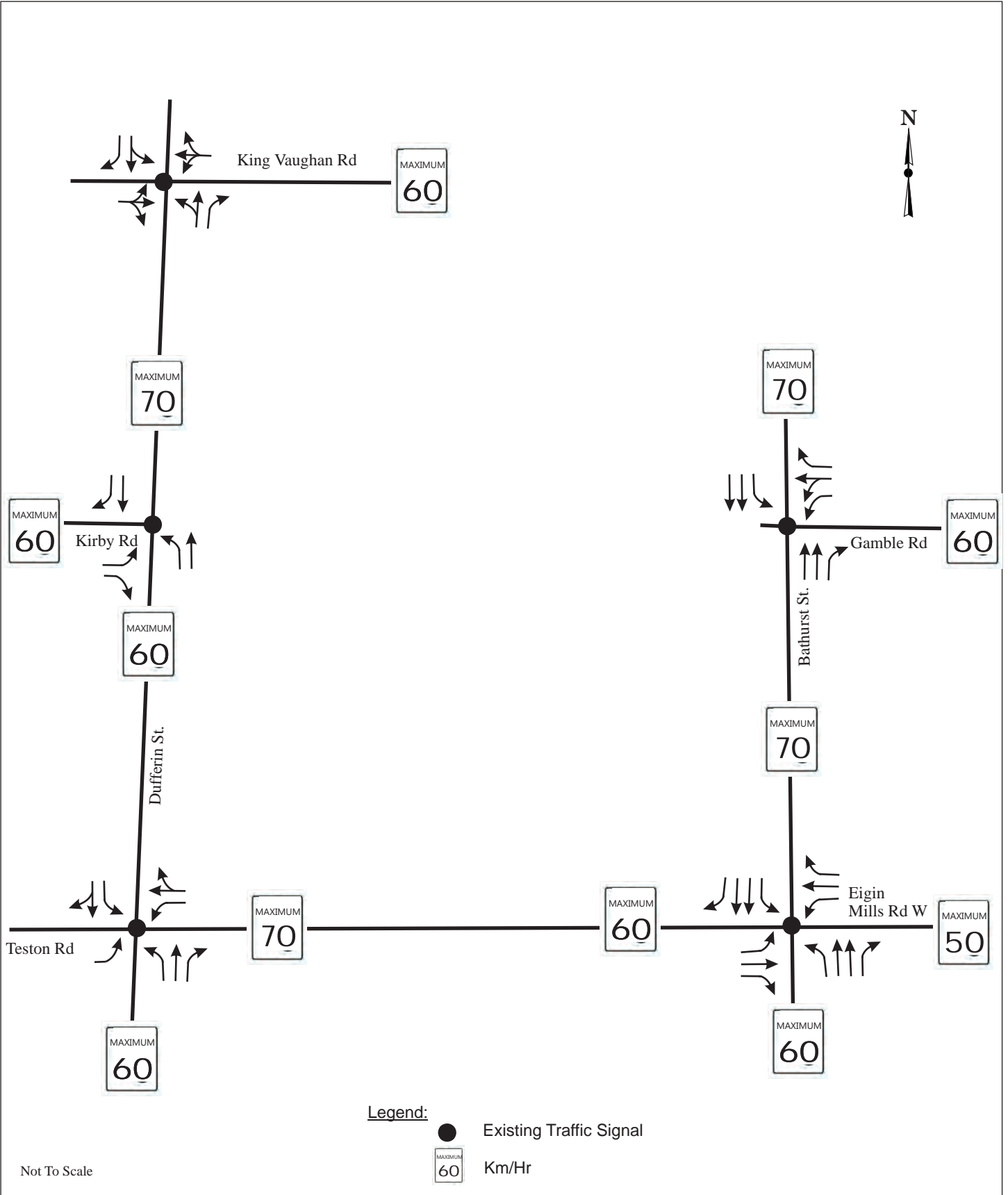


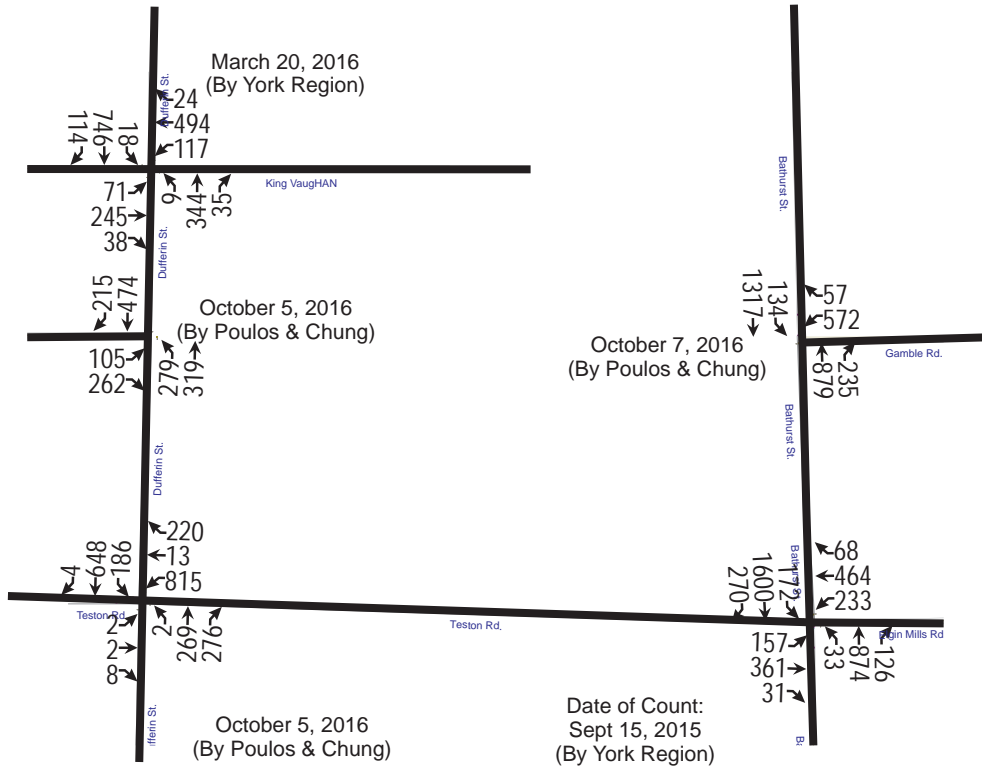
Study Area

Potential Kirby Road Connection

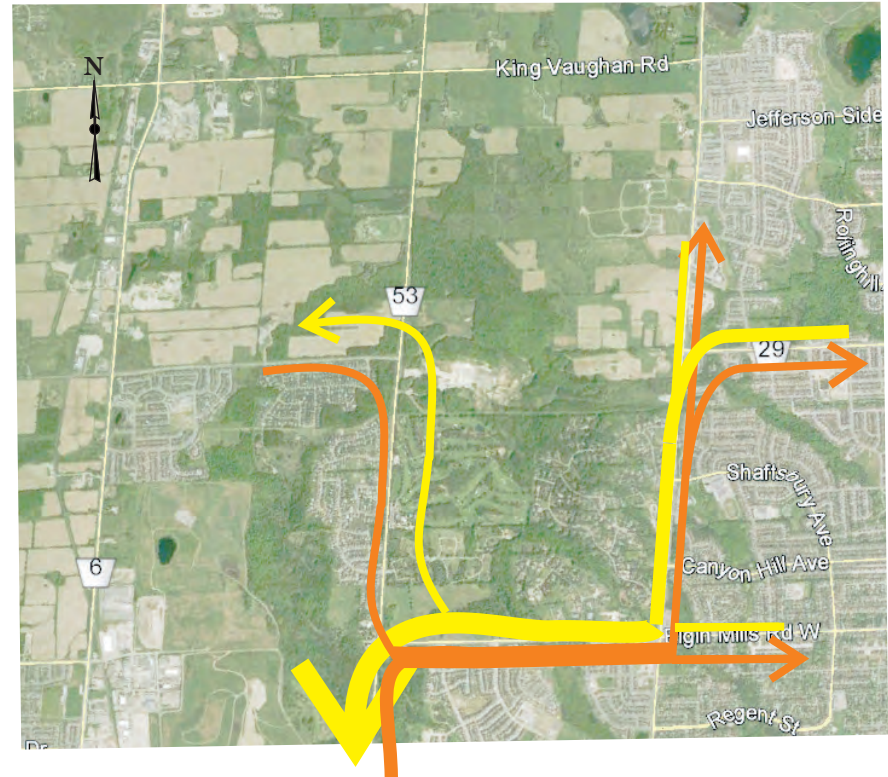
Study Area

Figure 1

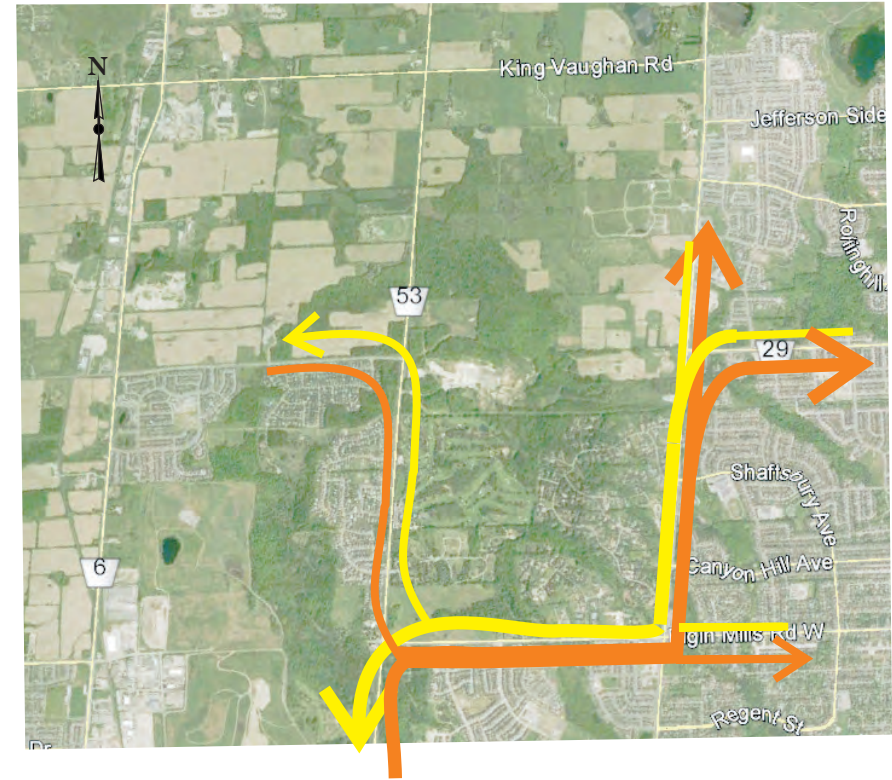
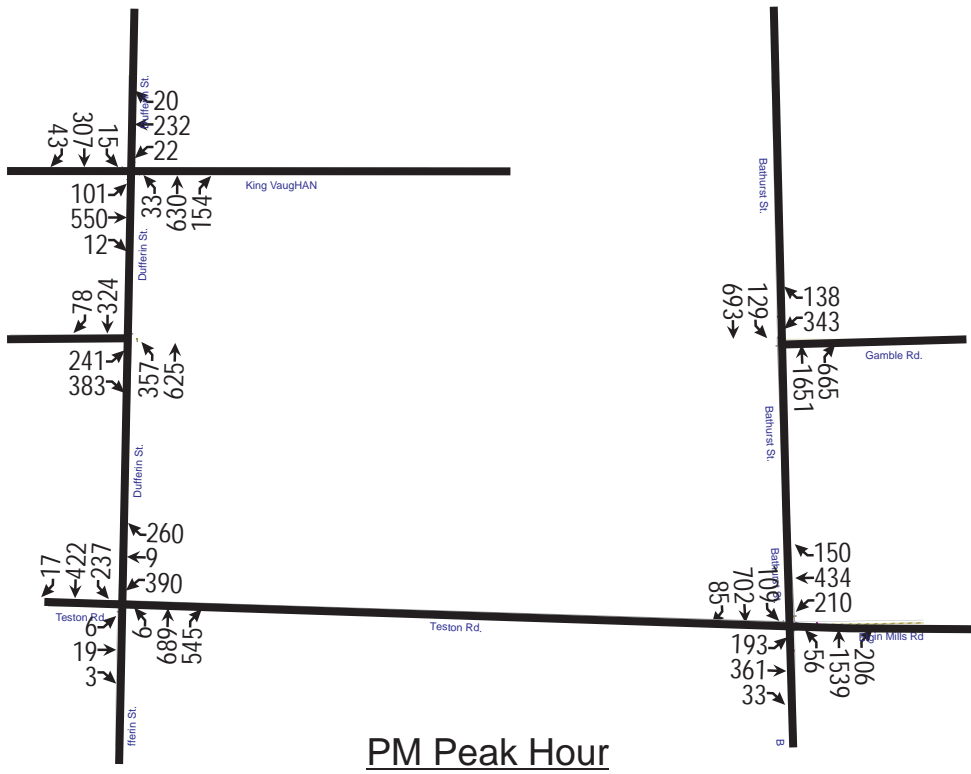




AM Peak Hour
Traffic Volumes



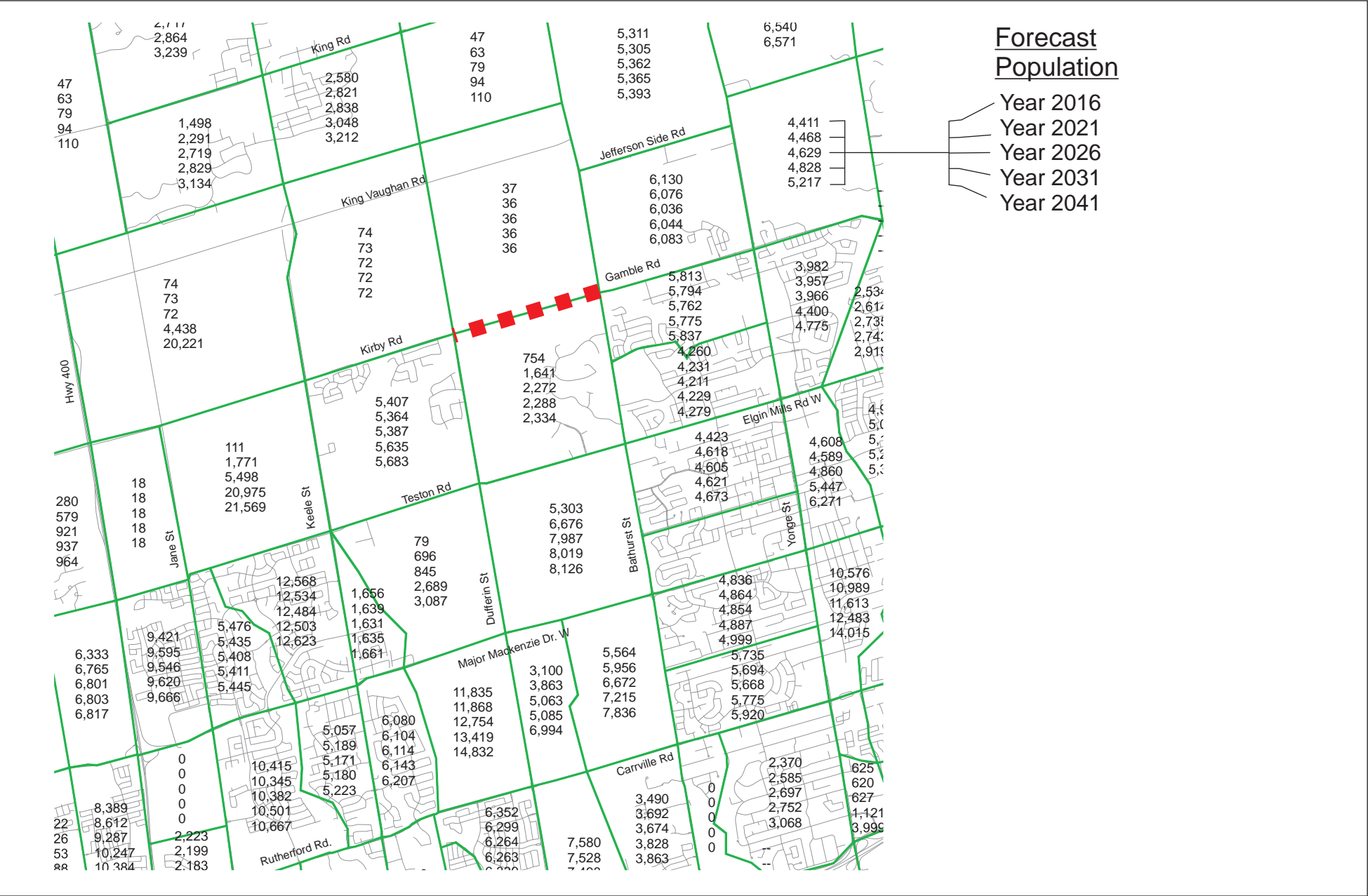
Heavy Traffic Movements
(AM Peak Hour)



Heavy Traffic Movements
(PM Peak Hour)

Existing PM Traffic Volumes

Figure 6



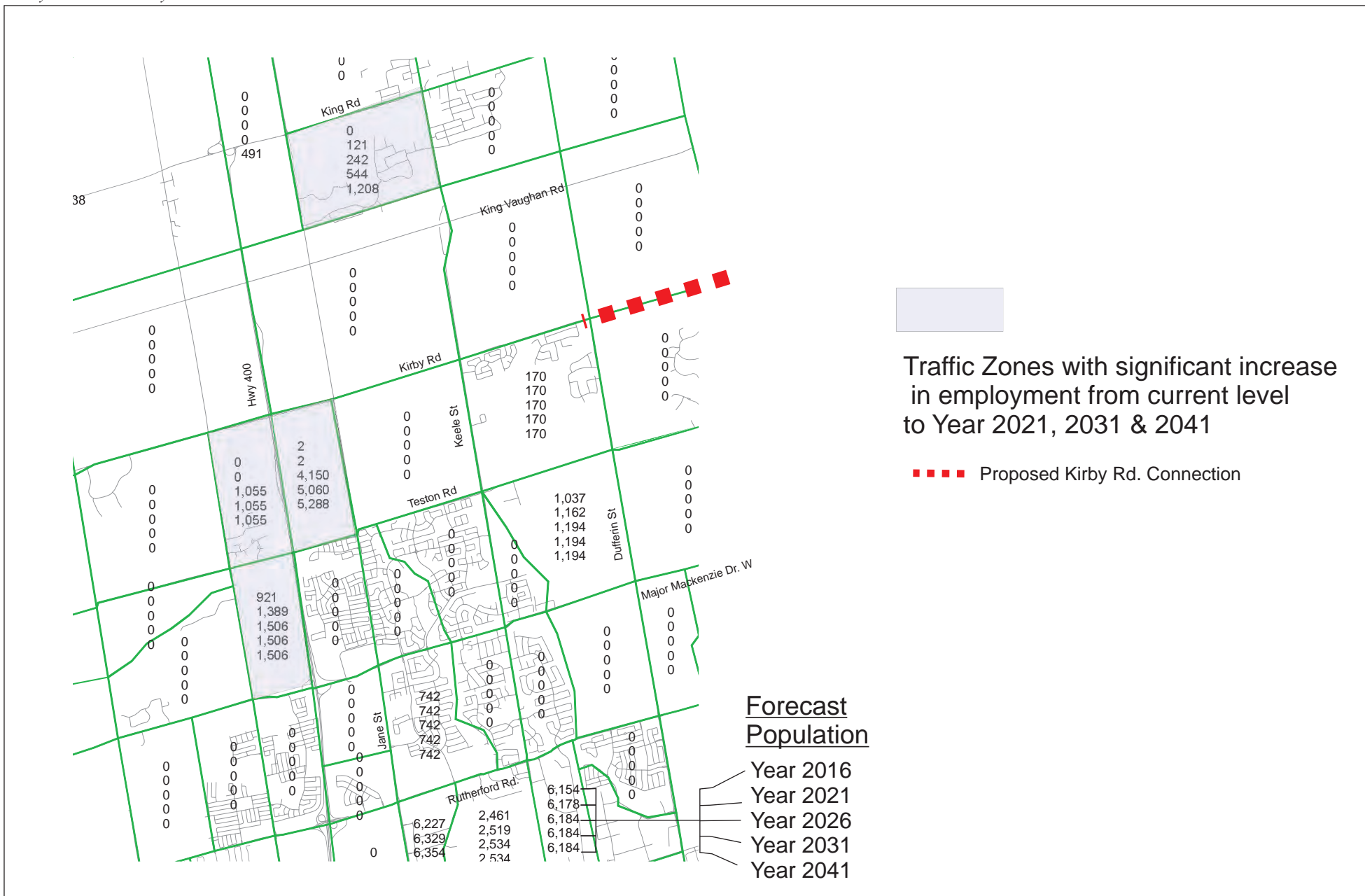
**Forecast
Population**

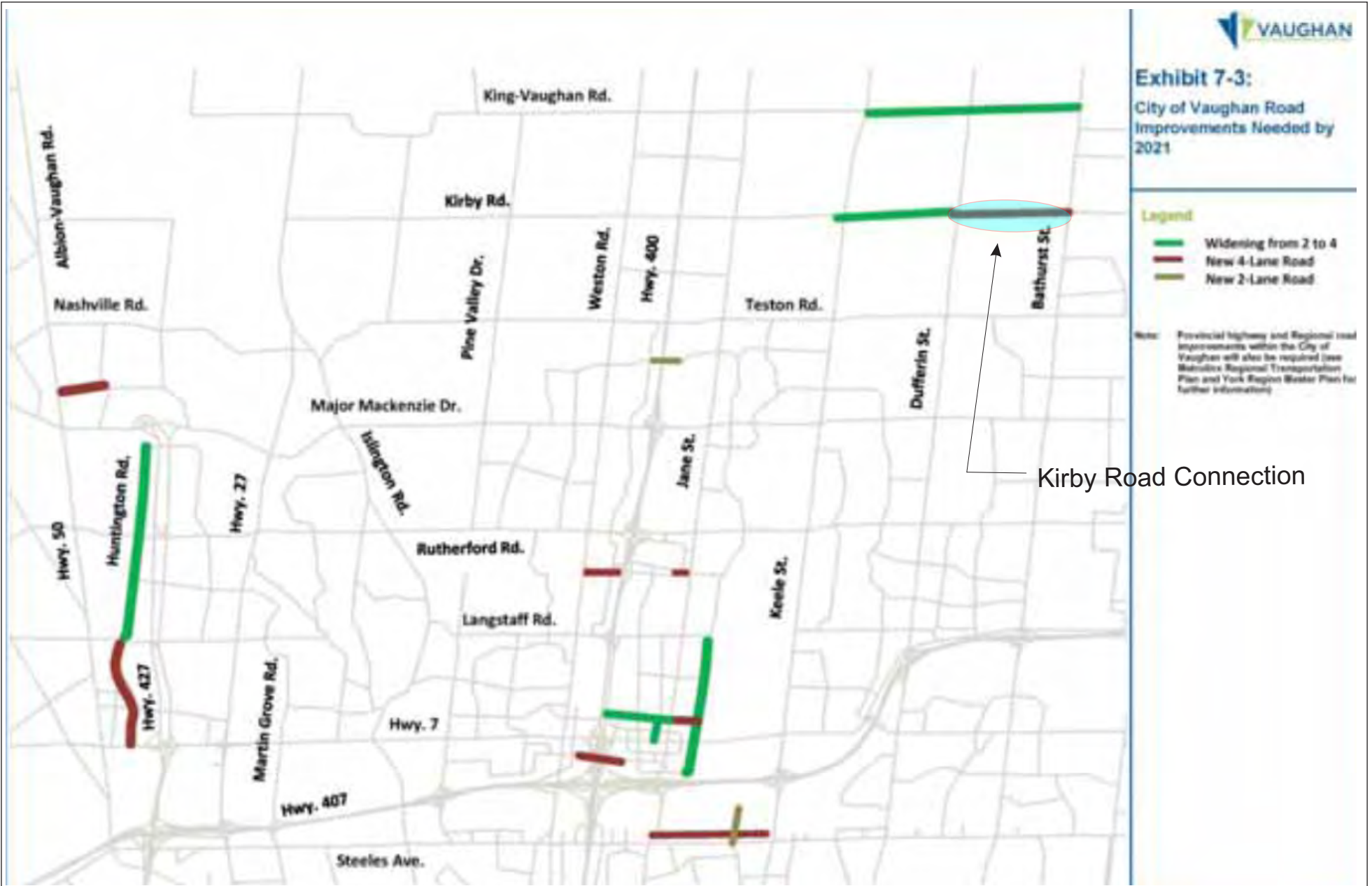
- Year 2016
- Year 2021
- Year 2026
- Year 2031
- Year 2041



■■■■ Proposed Kirby Rd. Connection

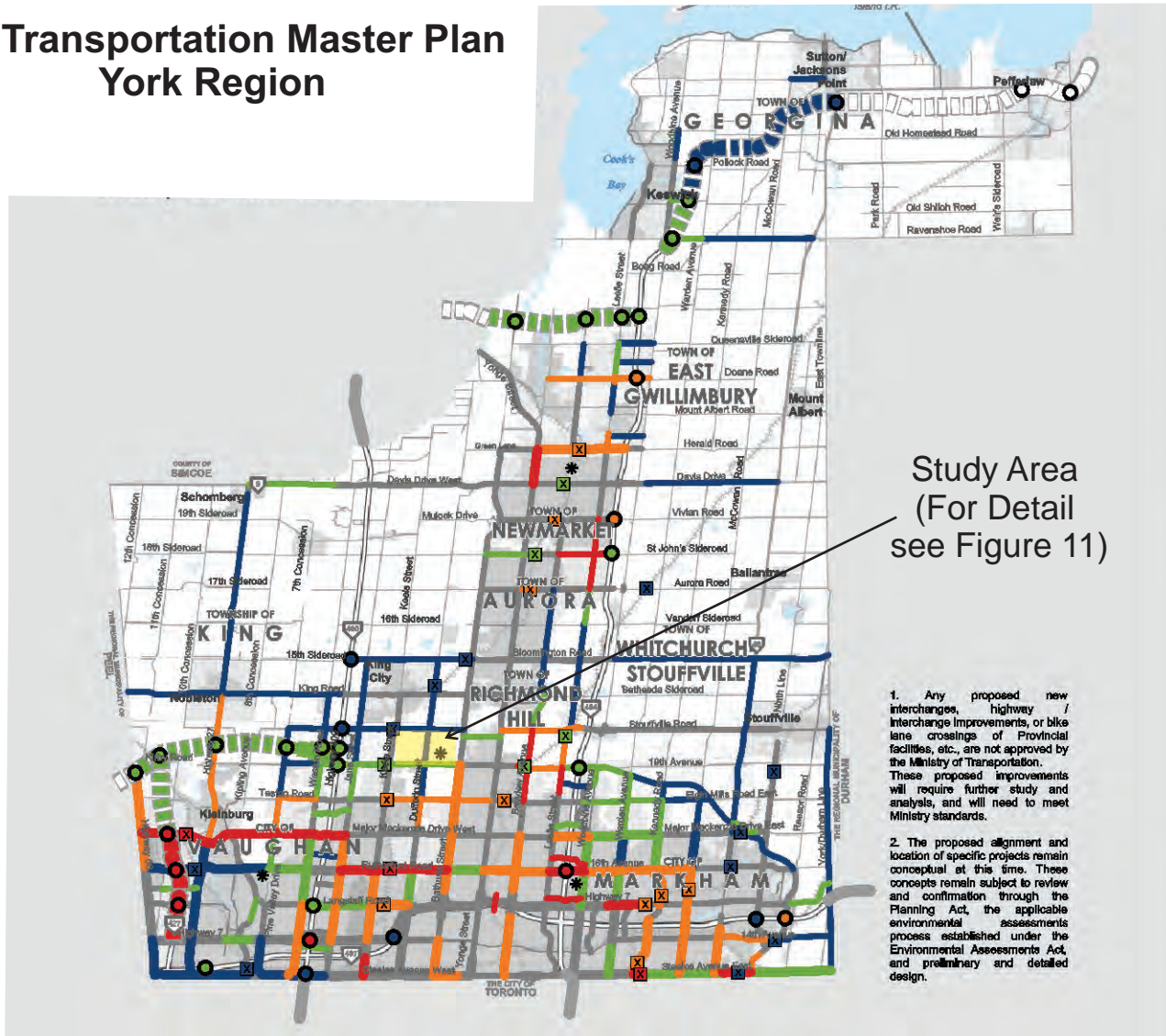
Forecast 2016, 2021, 2026, 2031
and 2041 Population
Figure 7





Transportation Master Plan York Region

Thursday, May 12, 2016



Study Area
(For Detail
see Figure 11)

Road Phasing

- 2017 - 2021
- 2022 - 2026
- 2027 - 2031
- 2032 - 2041

Grade Separations Phasing

- 2017 - 2021
- 2022 - 2026
- 2027 - 2031
- 2032 - 2041

Interchange Improvements Phasing (to be confirmed by MTO)

- 2017 - 2021
- 2022 - 2026
- 2027 - 2031
- 2032 - 2041

Note:

- * Special Study Area

BASE MAP INFORMATION

- Provincial Freeway
- Provincial Highway
- Road
- Railway

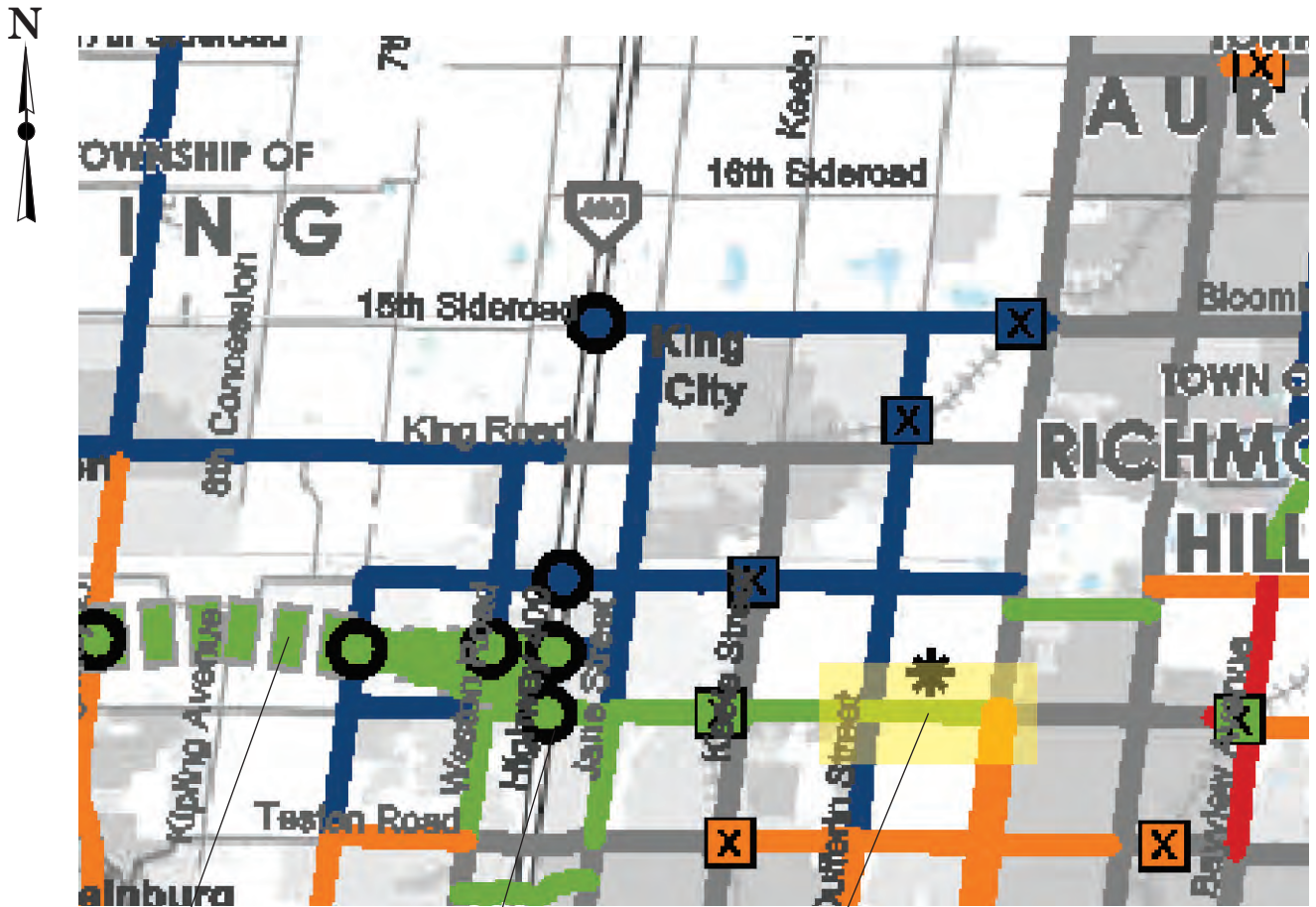


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Includes Greenbelt and Oak Ridge Moraine Boundaries and Water Features

1. Any proposed new interchanges, highway / interchange improvements, or bike lane crossings of Provincial facilities, etc., are not approved by the Ministry of Transportation. These proposed improvements will require further study and analysis, and will need to meet Ministry standards.

2. The proposed alignment and location of specific projects remain conceptual at this time. These concepts remain subject to review and confirmation through the Planning Act, the applicable environmental assessments process established under the Environmental Assessments Act, and preliminary and detailed design.



Thursday, May 12, 2016

Road Phasing

- 2017 - 2021
- 2022 - 2026
- 2027 - 2031
- 2032 - 2041

Grade Separations Phasing

- 2017 - 2021
- 2022 - 2026
- 2027 - 2031
- 2032 - 2041

Interchange Improvements Phasing (to be confirmed by MTO)

- 2017 - 2021
- 2022 - 2026
- 2027 - 2031
- 2032 - 2041

Note:

- Special Study Area

BASE MAP INFORMATION

- Provincial Freeway
- Provincial Highway
- Road
- Railway



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Boundaries and Water Features

GTA West

Kirby Road Connection

Kirby Road Interchange

Study Area

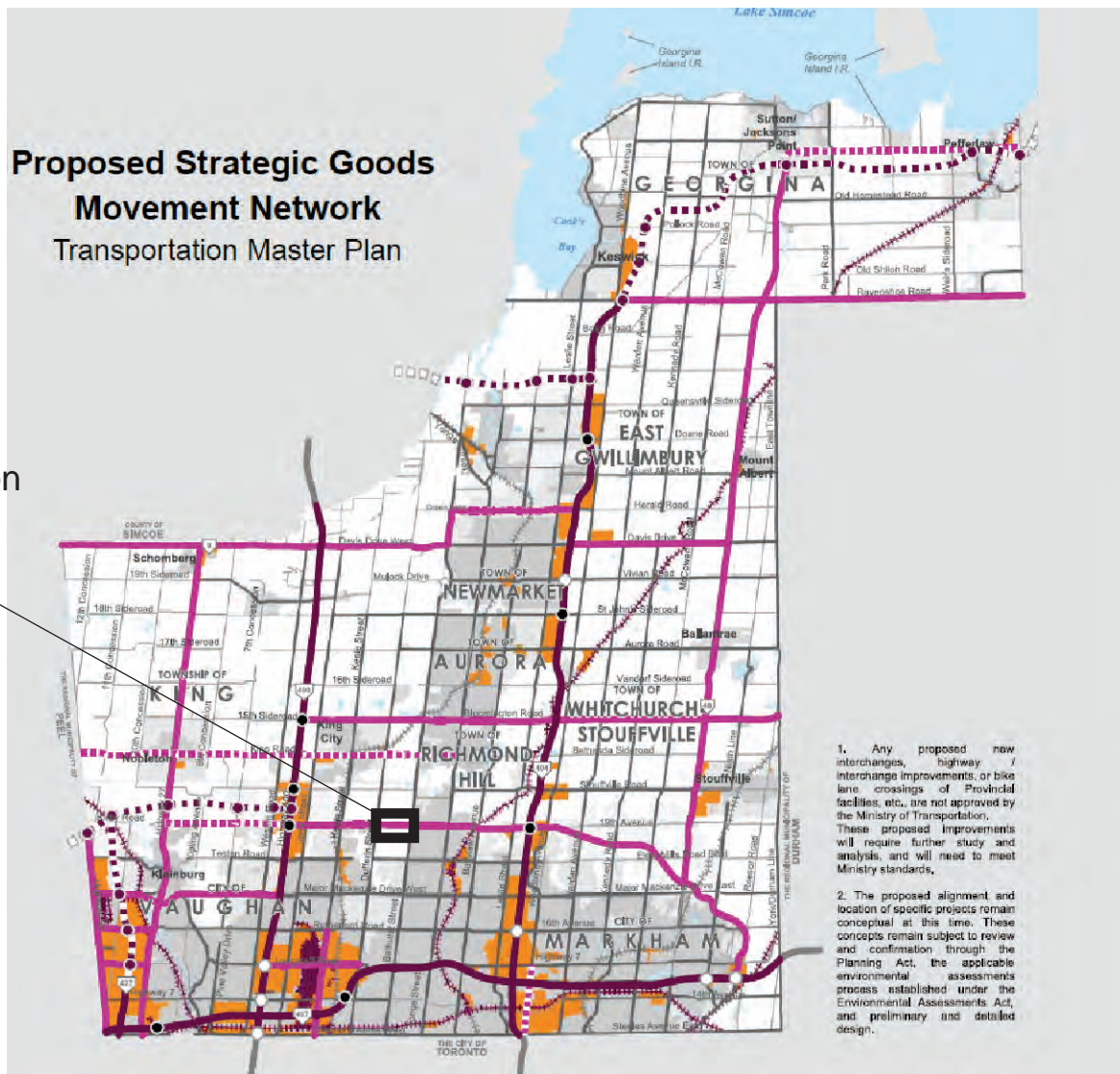


Staging Road Improvements

Figure 11

**Proposed Strategic Goods
Movement Network**
Transportation Master Plan

Kirby Road Connection



MAP 11

Thursday, May 12, 2016

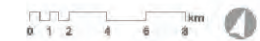
Strategic Goods Movement Corridors

- Tier 1**
- Highway Goods Movement Corridor
 - Future Highway Goods Movement Corridor
- Tier 2**
- Interim Primary Arterial Goods Movement Corridor
 - Primary Arterial Goods Movement Corridor
- Tier 3**
- Secondary Goods Movement Corridor

- Interchange Improvements (to be confirmed by MTO)**
- Future Interchange on Existing Freeway
 - Future Interchange on Future Freeway
 - Other Interchange Improvement
 - Employment Areas (as of mid-2013)

BASE MAP INFORMATION

- Provincial Freeway
- Provincial Highway
- Road
- Railway



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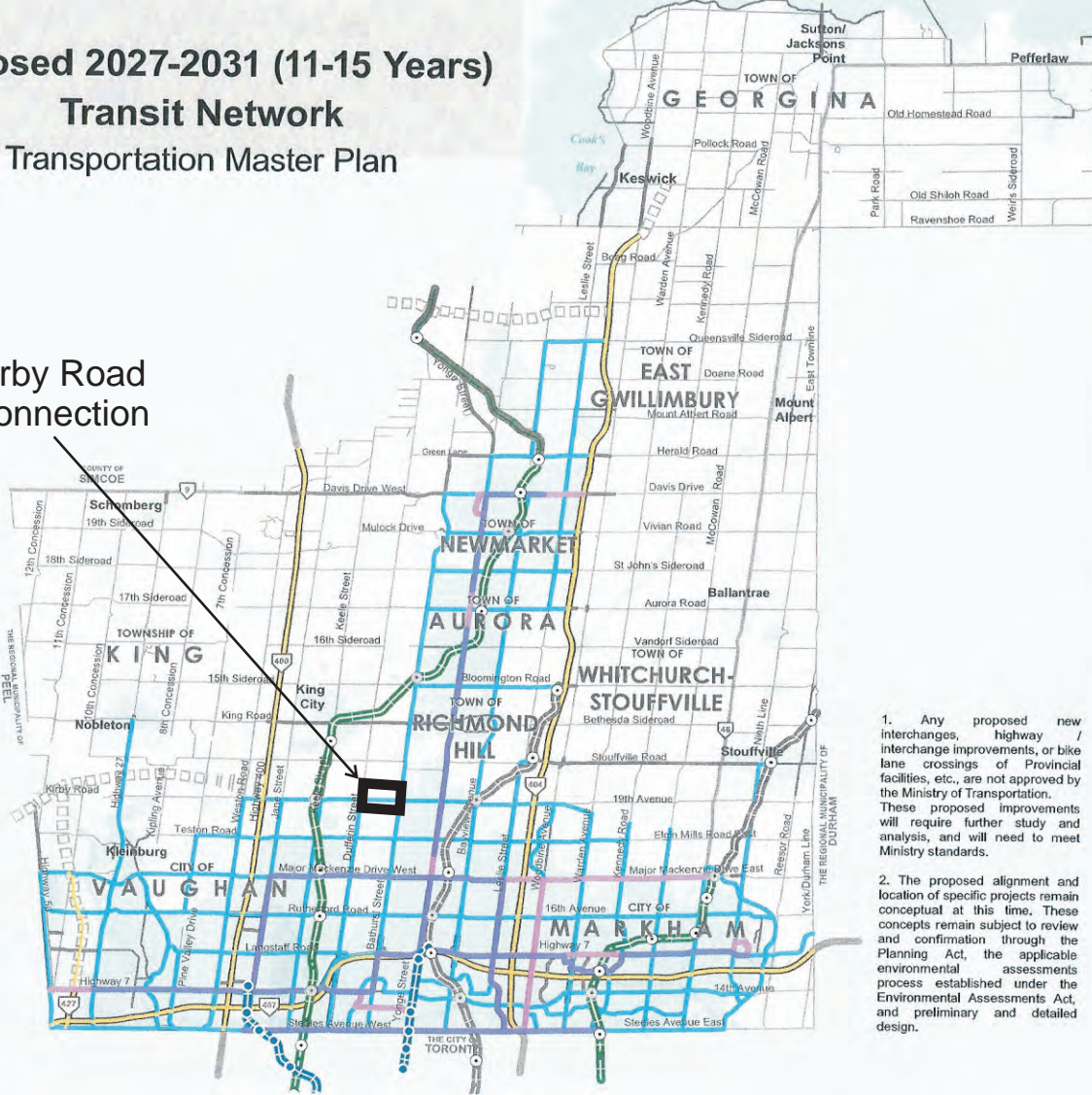
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1. Any proposed new interchanges, highway interchange improvements, or bike lane crossings of Provincial facilities, etc. are not approved by the Ministry of Transportation. These proposed improvements will require further study and analysis, and will need to meet Ministry standards.
2. The proposed alignment and location of specific projects remain conceptual at this time. These concepts remain subject to review and confirmation through the Planning Act, the applicable environmental assessments process established under the Environmental Assessments Act, and preliminary and detailed design.

Kirby Road is a primary arterial Good Movement Corridor as identified in York Region TMP 2016

Proposed 2027-2031 (11-15 Years) Transit Network Transportation Master Plan

Kirby Road Connection



1. Any proposed new interchanges, highway / interchange improvements, or bike lane crossings of Provincial facilities, etc., are not approved by the Ministry of Transportation. These proposed improvements will require further study and analysis, and will need to meet Ministry standards.

2. The proposed alignment and location of specific projects remain conceptual at this time. These concepts remain subject to review and confirmation through the Planning Act, the applicable environmental assessments process established under the Environmental Assessments Act, and preliminary and detailed design.

MAP 14

Thursday, May 12, 2016

2027 - 2031 Transit Network

- Dedicated Rapidway
- VIVA Curbside Service
- Frequent Transit Network
- Highway Bus Service (YRT/Viva, GO)

Subway Extensions

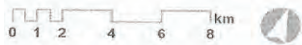
- Subway Extension
- Subway Extension Station

GO Rail

- GO Train, 15-min Two Way All Day Service
- GO Train, Two Way All Day Service
- GO Train, Rush Hour Service
- Existing GO Station
- Potential GO Station

BASE MAP INFORMATION

- Provincial Freeway
- Provincial Highway Road
- Railway



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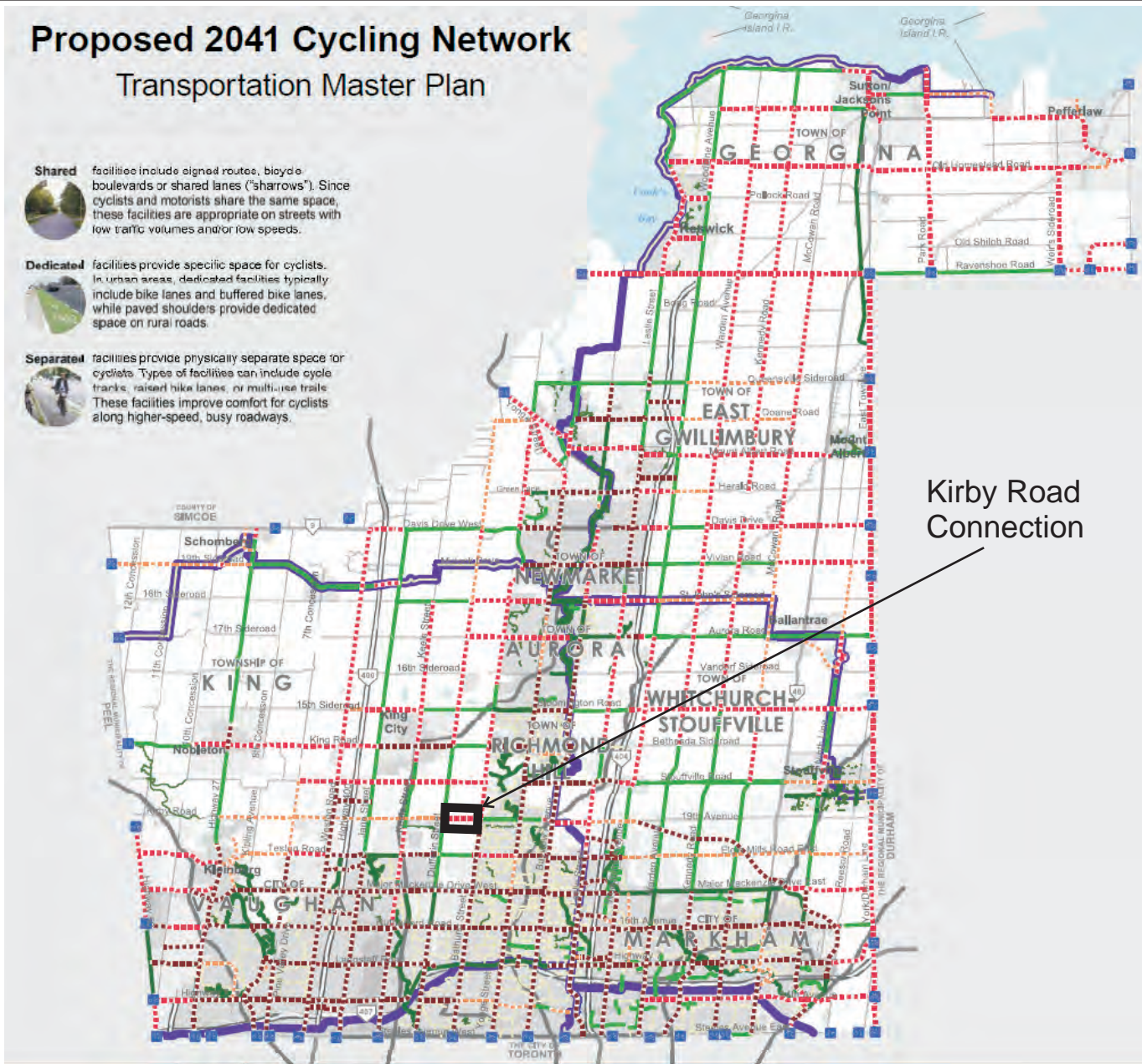
Proposed 2041 Cycling Network

Transportation Master Plan

Shared facilities include signed routes, bicycle boulevards or shared lanes ("sharrows"). Since cyclists and motorists share the same space, these facilities are appropriate on streets with low traffic volumes and/or low speeds.

Dedicated facilities provide specific space for cyclists. In urban areas, dedicated facilities typically include bike lanes and buffered bike lanes, while paved shoulders provide dedicated space on rural roads.

Separated facilities provide physically separate space for cyclists. Types of facilities can include cycle tracks, raised bike lanes, or multi-use trails. These facilities improve comfort for cyclists along higher-speed, busy roadways.



Kirby Road Connection

MAP 9

Thursday, May 12, 2016

Existing Cycling Network

- Shared Facility
- Dedicated Facility
- Separated Facility

Proposed Cycling Facilities

- Local Cycling Route of Regional Significance
- Dedicated
- Separated
- Conceptual Region-Wide Trail System
- External Connection

GO Rail

- Rapid Transit / GO Corridor

BASE MAP INFORMATION

- Provincial Freeway
- Provincial Highway
- Road
- Railway



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ITE Trip Generation Rates (9th Edition)

Land use	Units	ITE code	AM Peak			PM Peak			Saturday Peak		
			IN	OUT	Total	IN	OUT	Total	IN	OUT	Total
Townhouse/condo	Dwellings	230	0.07	0.37	0.44	0.35	0.17	0.52	0.25	0.22	0.47
Office	1000 sqft	710	1.37	0.19	1.56	0.25	1.24	1.49	0.23	0.20	0.43
Shopping Centre	1000 sqft	820	0.60	0.36	0.96	1.63	2.08	3.71	2.41	2.41	4.82

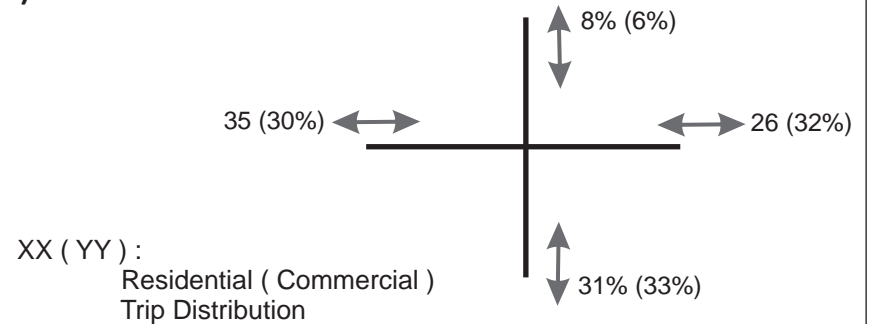
Estimated Vehicle Trips

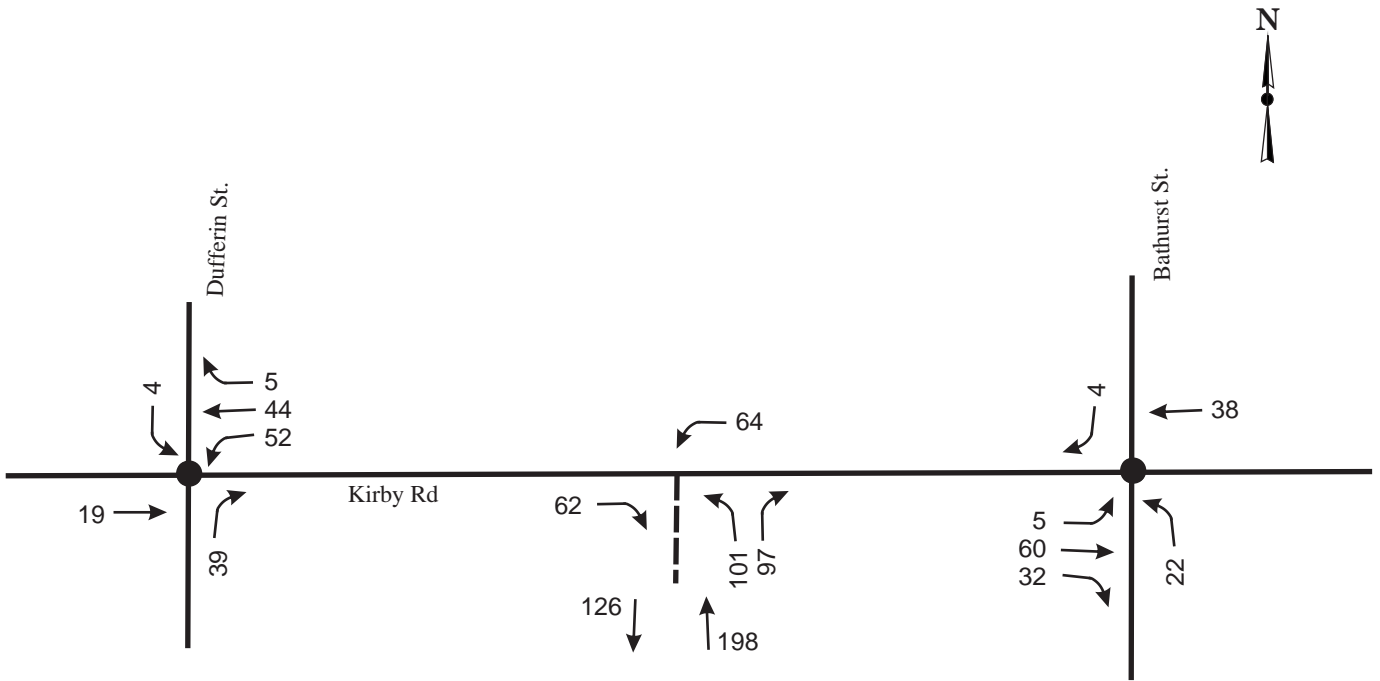
East of Dufferin Street			AM Peak			PM Peak			Saturday Peak		
Land use	Units		IN	OUT	Total	IN	OUT	Total	IN	OUT	Total
Townhouse/condo	486		36	177	214	169	83	253	123	105	228
Office	52.2		72	10	81	13	65	78	12	10	22
Retail	30		18	11	29	49	62	111	72	72	145
TOTAL			126	198	324	232	210	442	208	188	395

Assumption of Office/ Retail Area Calculation

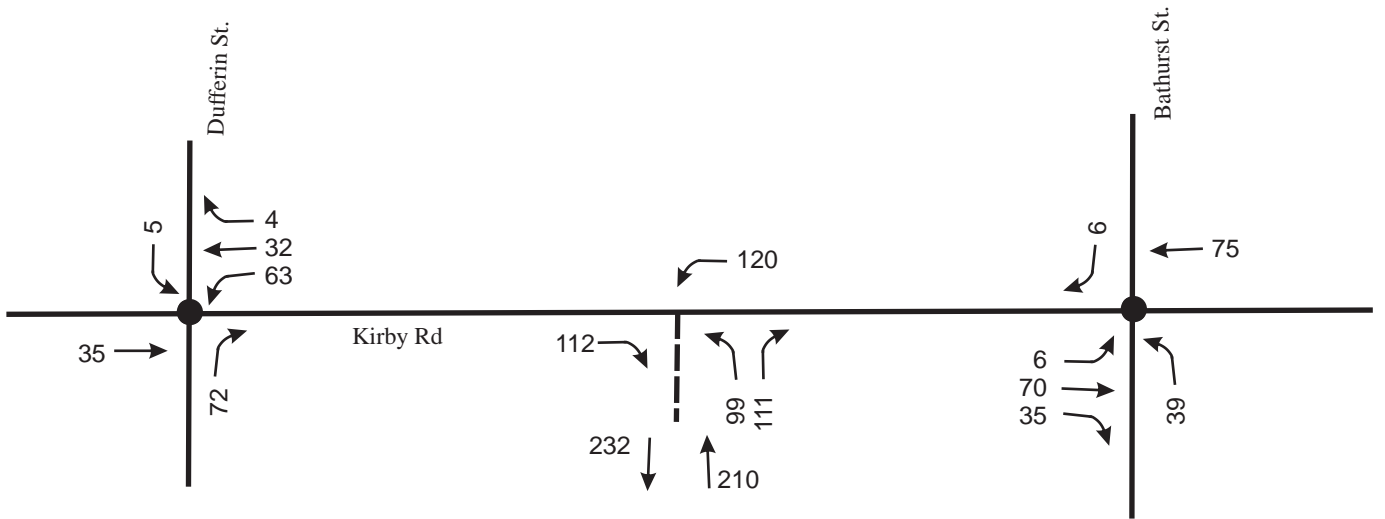
	ha	ac	Sq. Ft	FSI	Area (Sq. Ft)
Office	0.24	0.6	26,136	2	52,272
Retail	0.28	0.69	30,056	1	30,056

Vehicle Trip Distribution



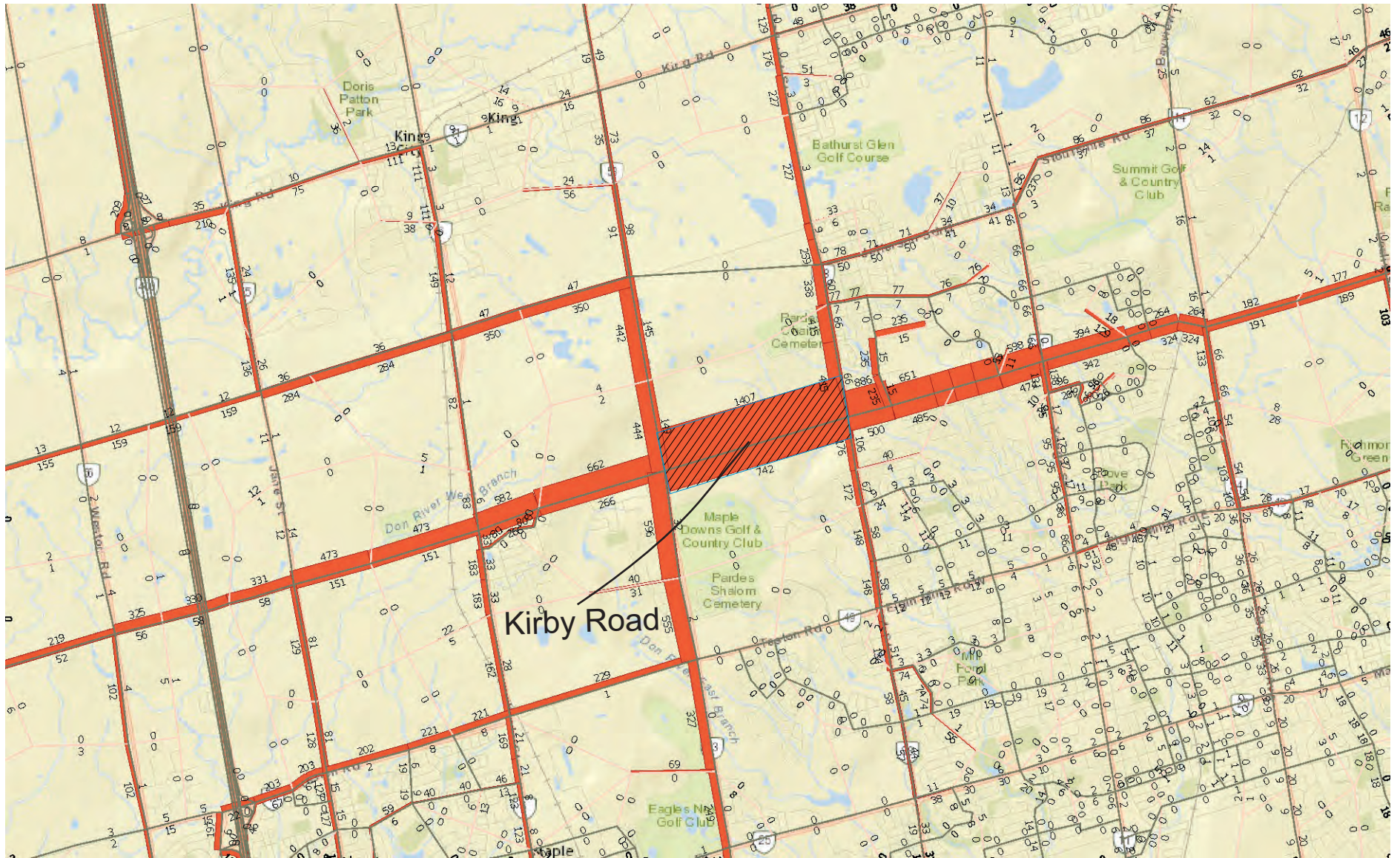


Site Entrance(s) Am Peak Hour

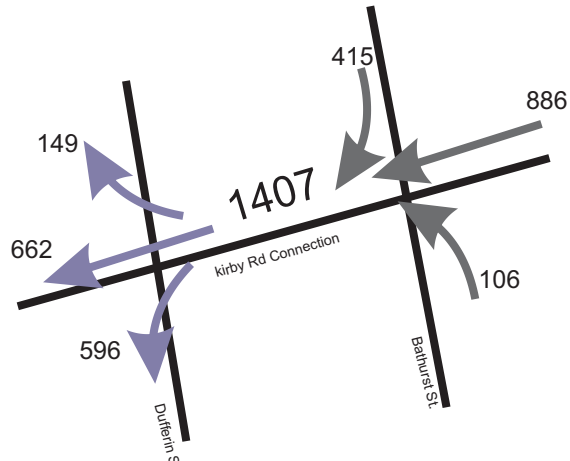


Site Entrance(s) PM Peak Hour

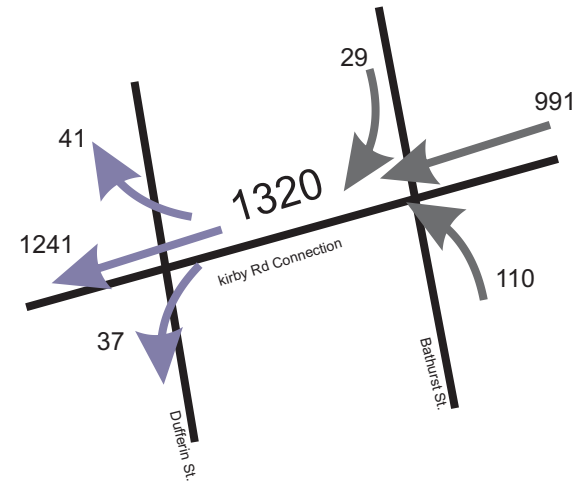
Not To Scale



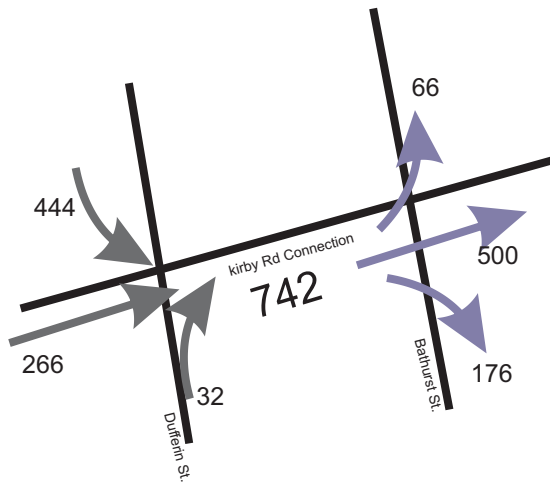
2021 AM Peak Hour Westbound Volumes on Kirby Road Connection



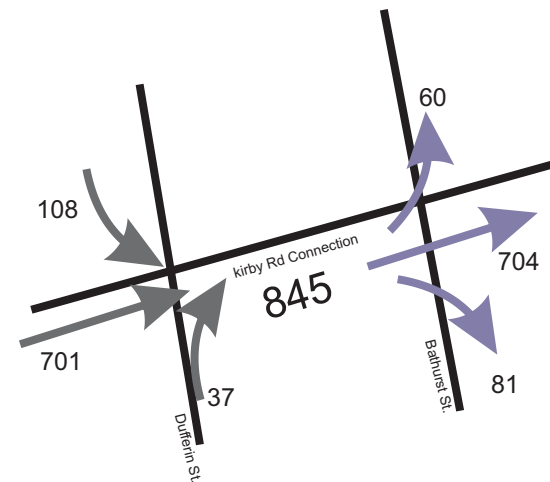
2031 AM Peak Hour Westbound Volumes on Kirby Road Connection (with GTA West)



2021 AM Peak Hour Eastbound Volumes on Kirby Road Connection



2031 AM Peak Hour Eastbound Volumes on Kirby Road Connection (with GTA West)



2031 Kirby Select Link - with Kirby no GTA West



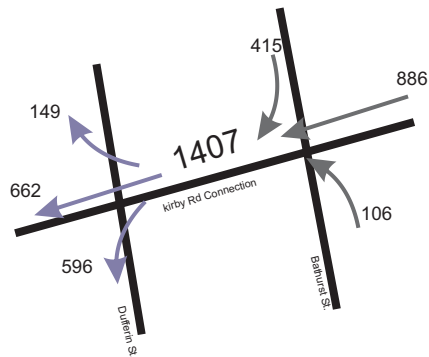
YRTDE Model-2031_Jun-2016 (1./EMME/Projects/DC Study/Model-2031_June-2016/emmebank)
Scenario 3010: cp3000, with Kirby ext. no GTA West
2018-07-26



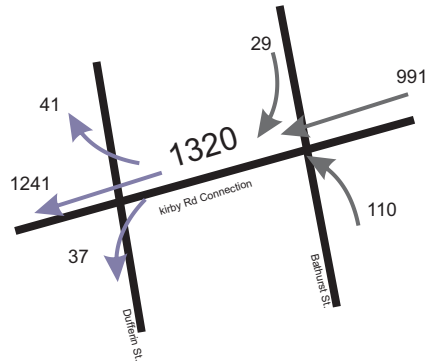
Accumulated
Total Traffic Flow
Am Peak Hour

2031 Selected Link analysis
(Without GTA West Connection)
Figure 19A

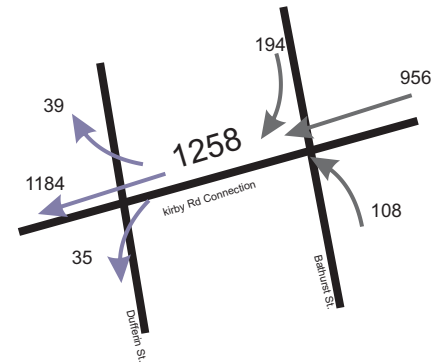
2021 AM Peak Hour Westbound Volumes on Kirby Road Connection



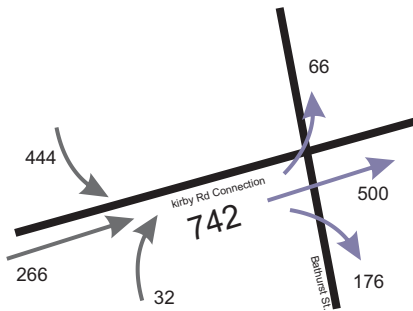
2031 AM Peak Hour Westbound Volumes on Kirby Road Connection (with GTA West)



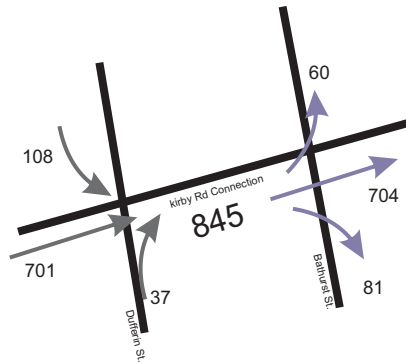
2031 AM Peak Hour Westbound Volumes on Kirby Road Connection (with NO GTA West)



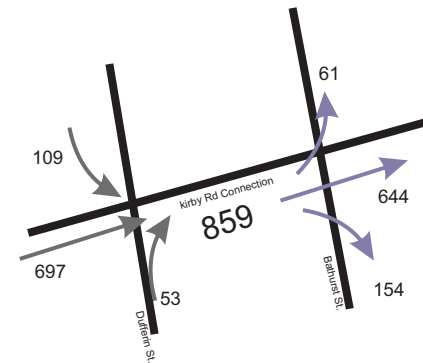
2021 AM Peak Hour Eastbound Volumes on Kirby Road Connection



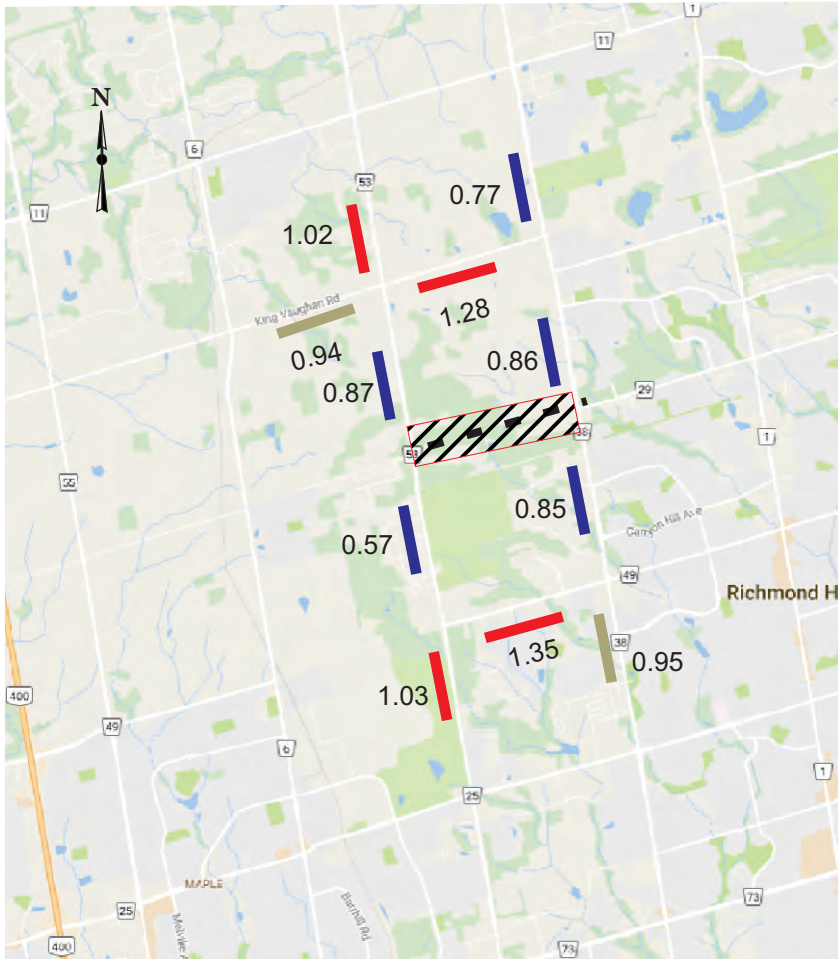
2031 AM Peak Hour Eastbound Volumes on Kirby Road Connection (with GTA West)



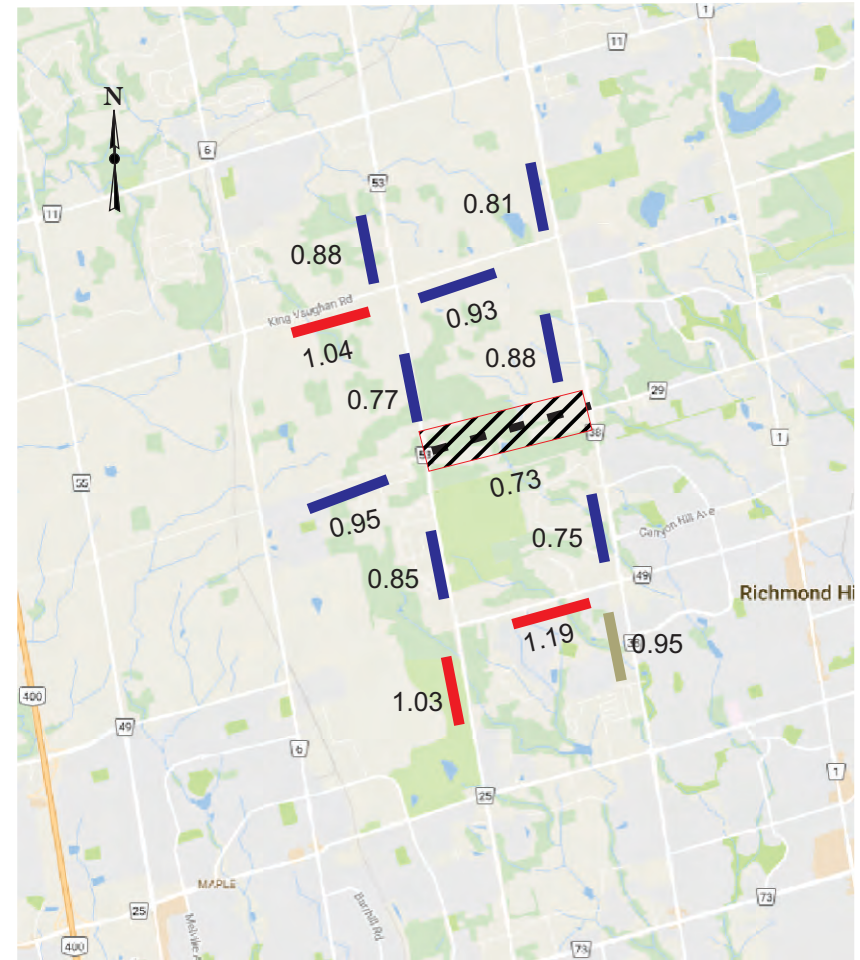
2031 AM Peak Hour Eastbound Volumes on Kirby Road Connection (with NO GTA West)



No Kirby Road Connection



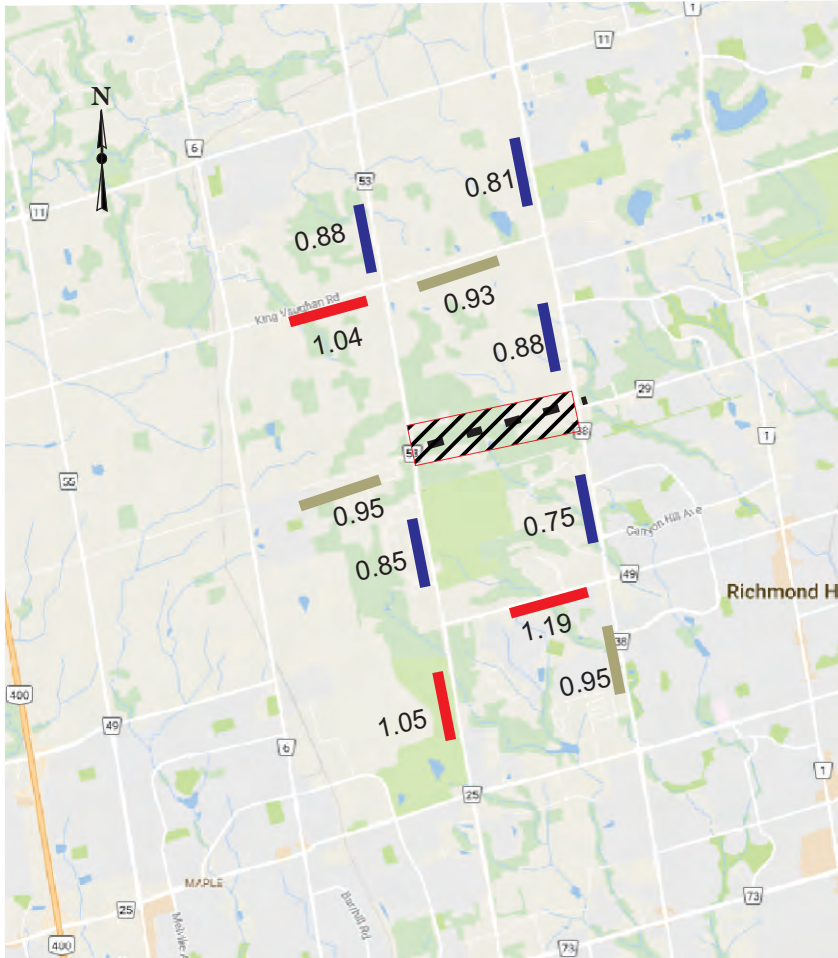
With Kirby Road Connection



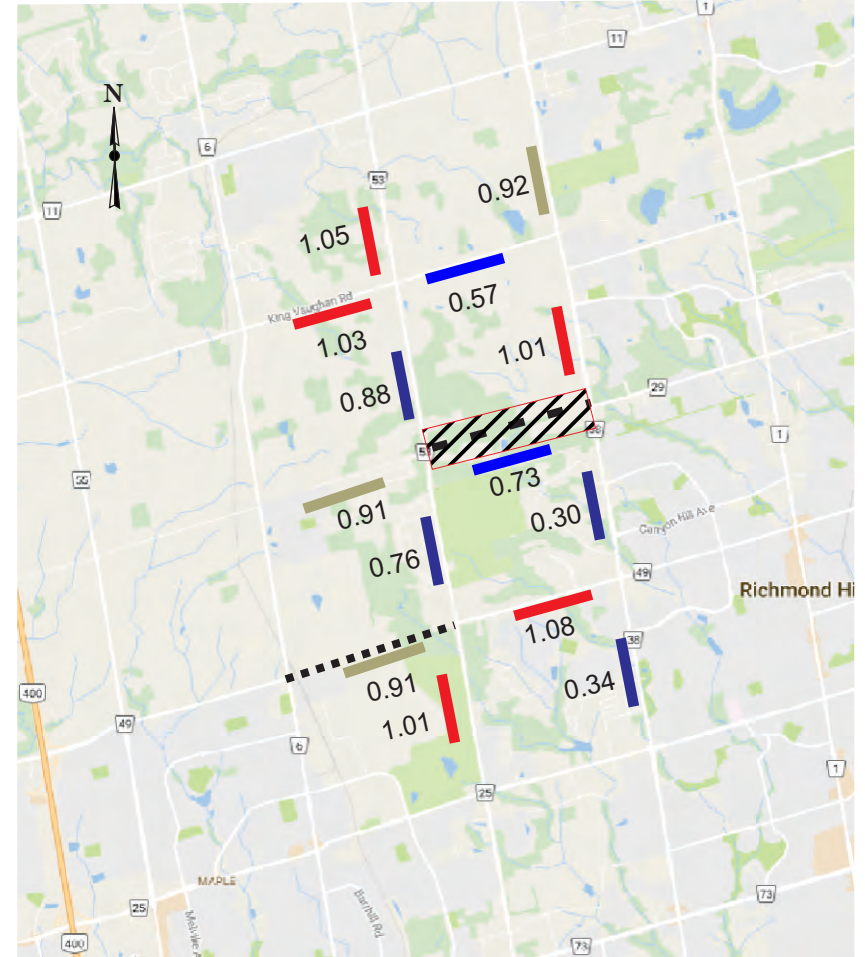
Kirby Road Segment

- 0.00 V/C Ratio
- █ Road Section with Volume/Capacity Ratio Exceeds 1.0
- █ Road Section with Volume/Capacity Ratio Exceeds 0.9 Less than 1.0
- █ Road Section with Volume/Capacity Ratio Less than 0.9

2021 Volume/Capacity With Kirby Road Connection



2031 Volume/Capacity With Kirby Road Connection & GTA West



XX V/C Ratio

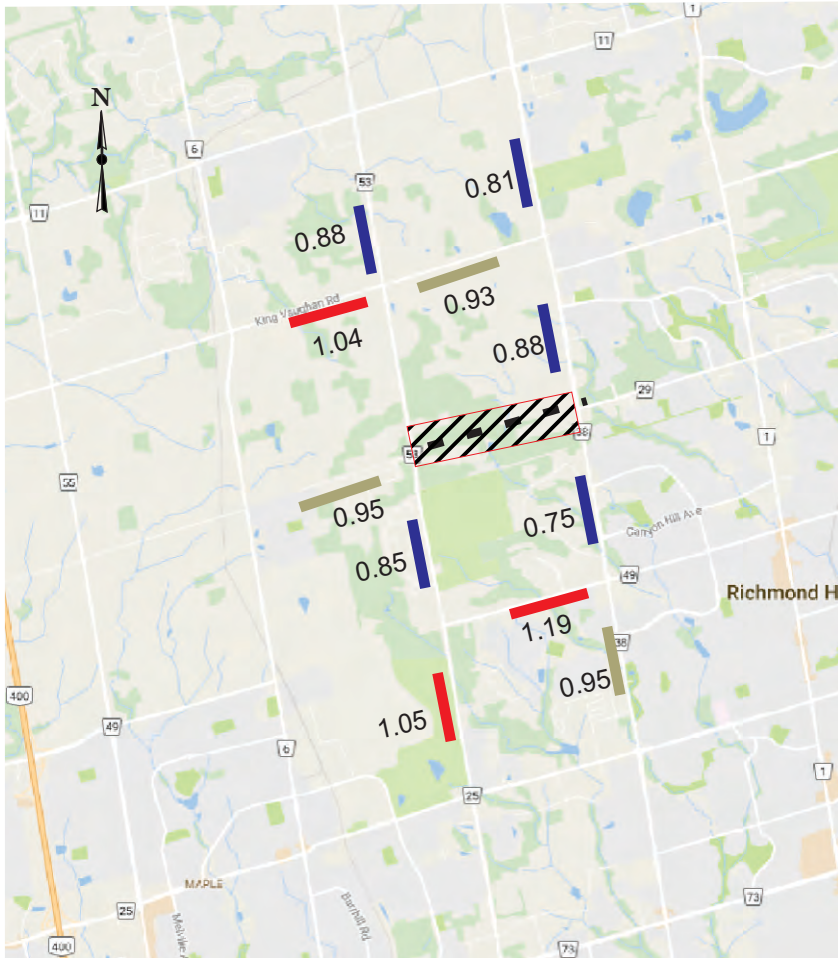


Kirby Road Segment

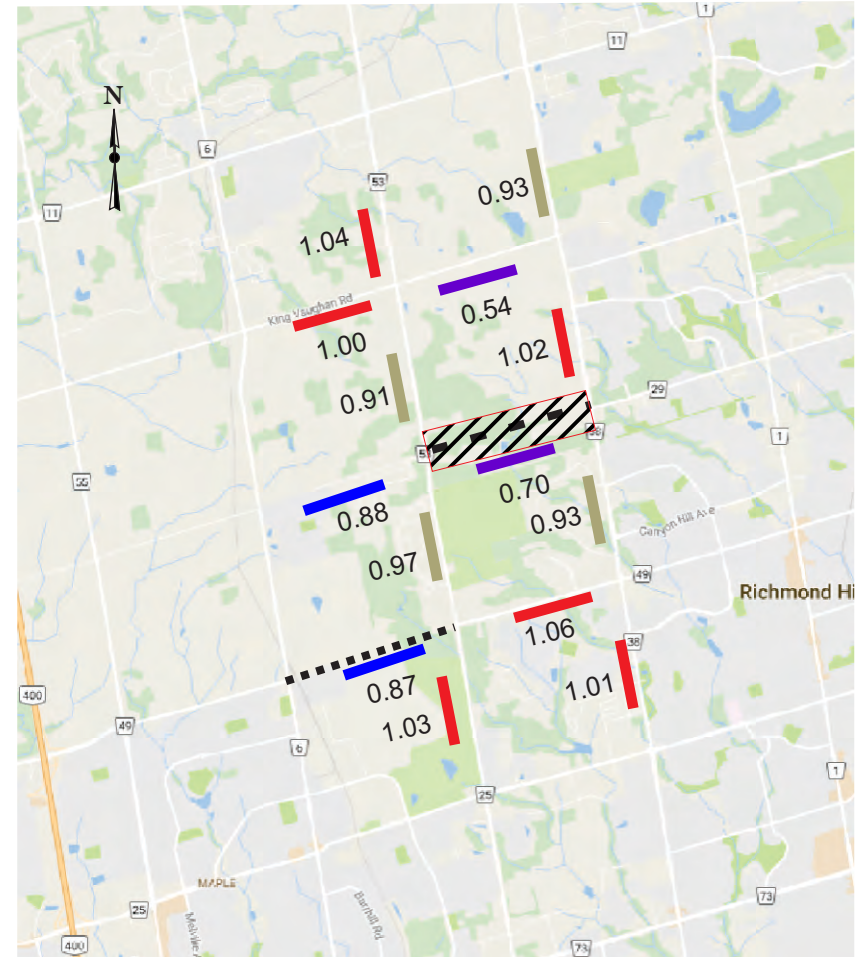
- Planned Connecting Link
- █ Road Section with Volume/Capacity Ratio Exceeds 1.0
- █ Road Section with Volume/Capacity Ratio Exceeds 0.9 Less than 1.0
- █ Road Section with Volume/Capacity Ratio Less than 0.9

Comparison of 2021 and 2031
Volumes/Ratios -Peak Direction
(AM Peak Hour - with GTA West)
Figure 21

2021 Volume/Capacity
With Kirby Road Connection



2031 Volume/Capacity
With Kirby Road Connection & without GTA West



XX V/C Ratio

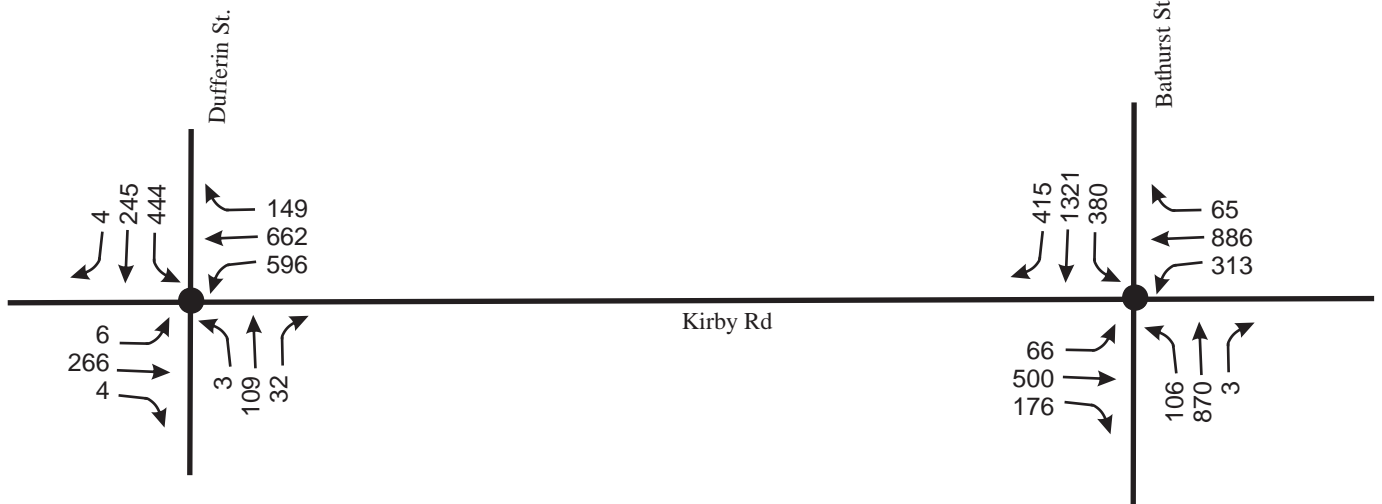


Kirby Road Segment

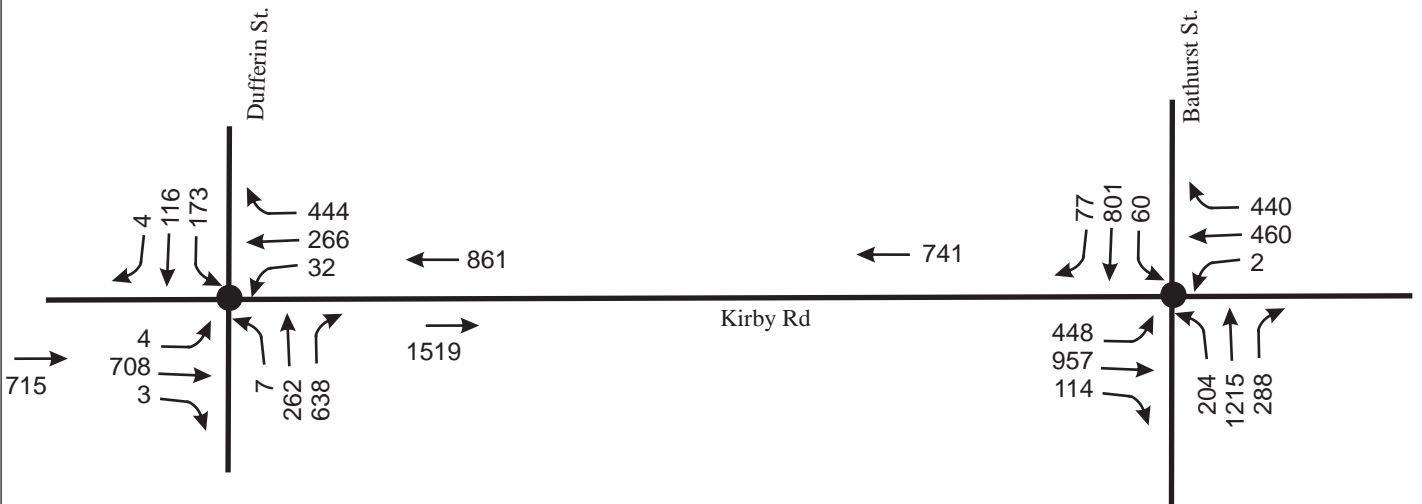
- Planned Connecting Link
- █ Road Section with Volume/Capacity Ratio Exceeds 1.0
- █ Road Section with Volume/Capacity Ratio Exceeds 0.9 Less than 1.0
- █ Road Section with Volume/Capacity Ratio Less than 0.9



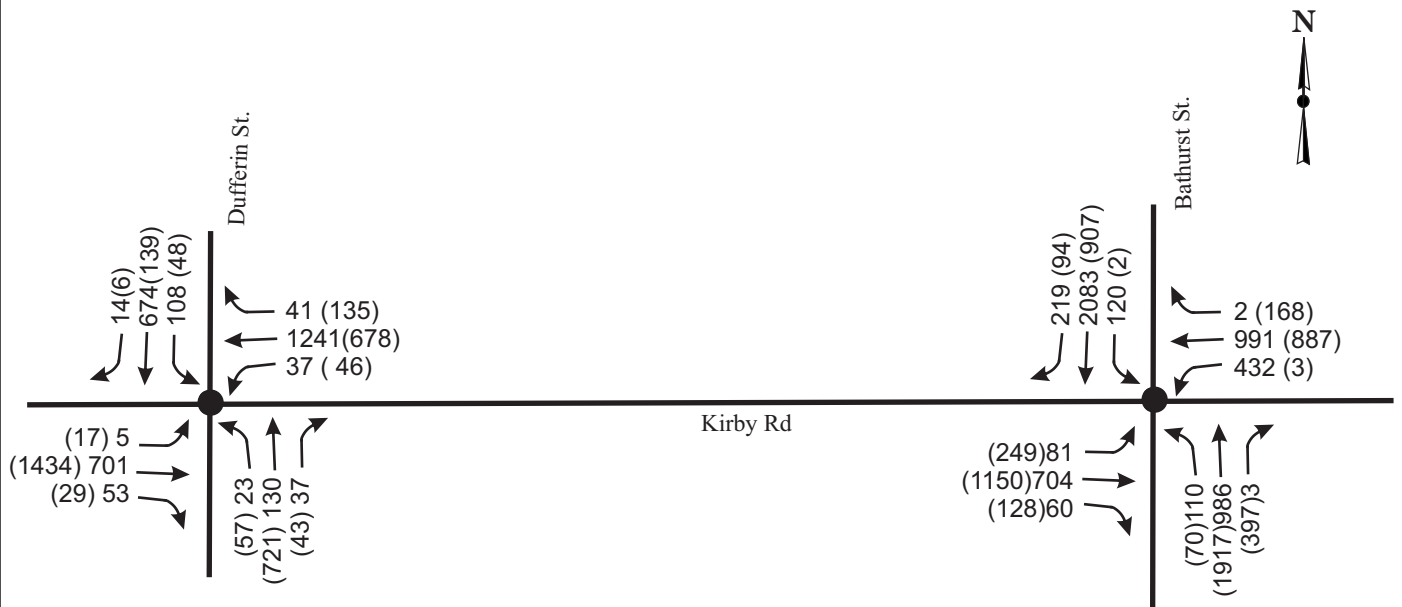
AM



PM

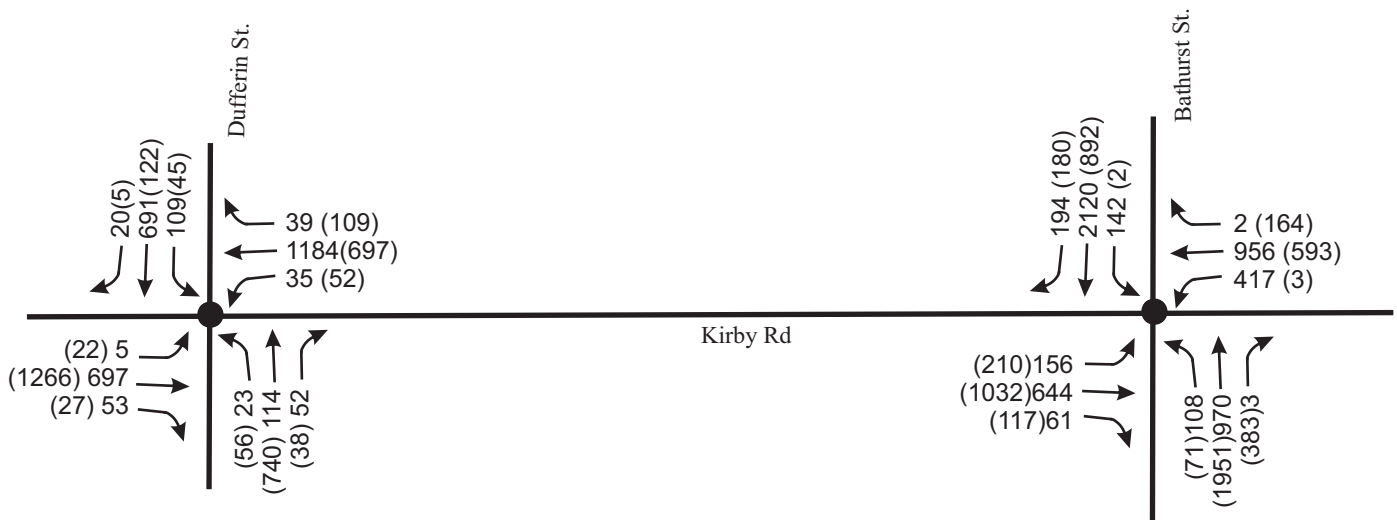


Not To Scale



AM (PM) Turning Volumes - with GTA West

AM Volumes - Derived from EMMII Selected Link 2031 Output
PM Volumes - Derived from AM Reversed Flow adjusted with Existing AM/PM Flow Ratio Where Applicable)



AM (PM) Turning Volumes - without GTA West

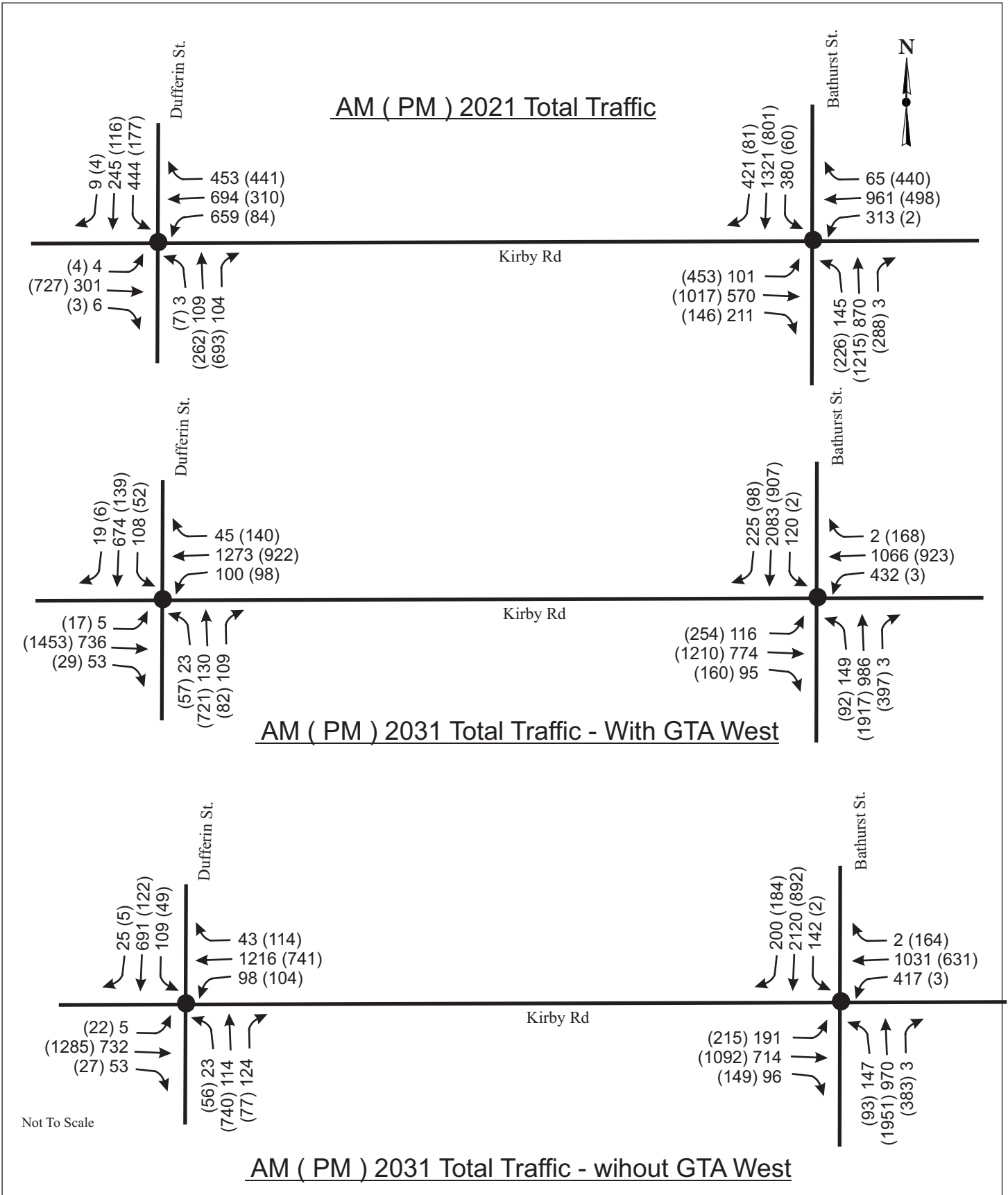
AM Volumes - Derived from EMMII Selected Link 2031 Output
PM Volumes - Derived from AM Reversed Flow adjusted with Existing AM/PM Flow Ratio Where Applicable)

Legend
xx (yy) AM (PM) Traffic Volumes

Not To Scale



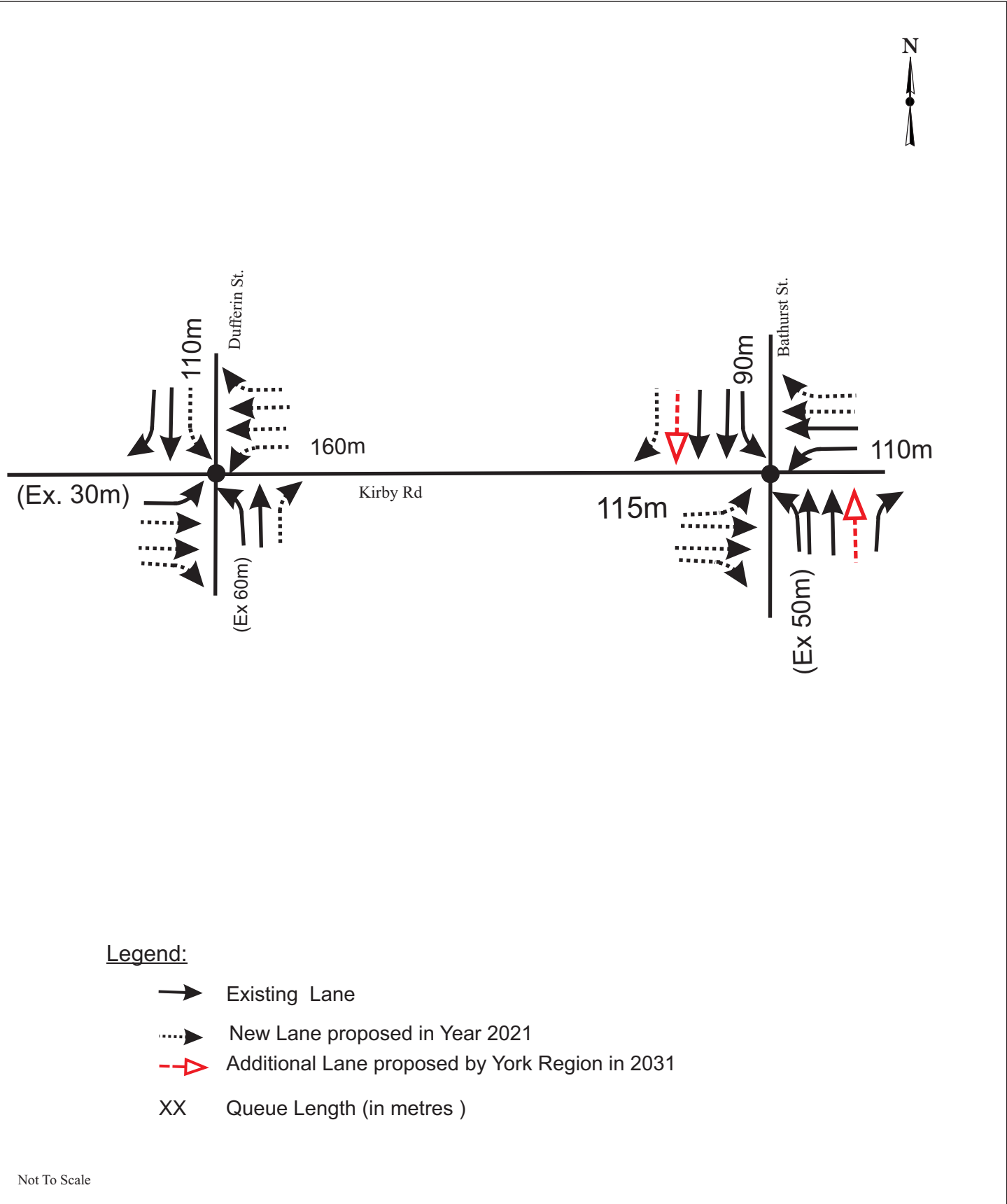
Forecast 2031 Background Vehicle Traffic Flow
with and without GTA West - AM (PM) Peak Hours
Figure 23



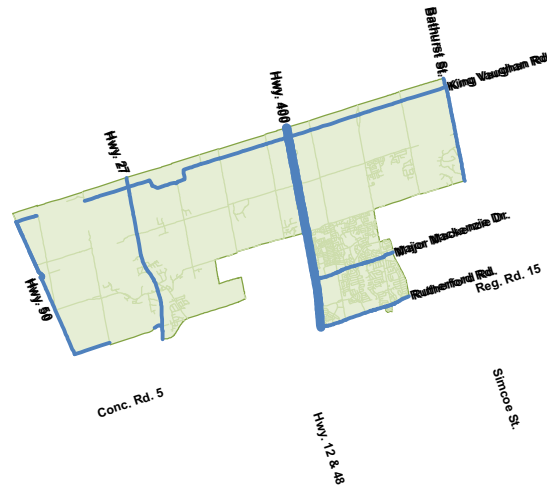
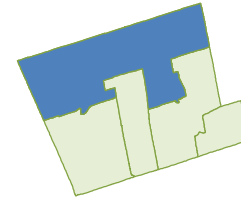
Legend
xx (yy) AM (PM) Traffic Volumes

Total 2021 and 2031 Traffic Volumes

Figure 24



CITY OF VAUGHAN WARD 1



HOUSEHOLD CHARACTERISTICS

Households	Dwelling Type			Household Size					Number of Available vehicles					Household Averages				
	House	Townhouse	Apartment	1	2	3	4	5+	0	1	2	3	4+	Persons	Workers	Drivers	vehicles	Trips/day
18,300	80%	10%	10%	9%	22%	21%	29%	18%	4%	29%	49%	13%	5%	3.3	1.9	2.2	1.9	7.1

POPULATION CHARACTERISTICS

Population	Age							Daily Trips per Person (age 11+)	Daily Work Trips per Worker	Population	Employment Type			Student	Licenced	Transit
	0 - 10	11 - 15	16 - 25	26 - 45	46 - 64	65+	Median				Full Time	Part Time	At Home			
	Male															
	Female															
61,100	13%	9%	15%	28%	25%	10%	37.6	2.5	0.75	29,300	45%	7%	5%	29%	70%	8%
										31,800	33%	12%	3%	28%	64%	7%

TRIPS MADE BY RESIDENTS OF CITY OF VAUGHAN - WARD 1

Time Period	Trips	% 24 hr	Trip Purpose				Mode of Travel						Median Trip Length (km)			
			HB-W	HB-S	HB-D	N-HB	Driver	Pass.	Transit	GO Train	Wlk & Cy	Other	Driver	Pass.	Transit	GO Train
6-9 AM	34,400	26.4%	43%	25%	22%	11%	63%	15%	6%	3%	7%	5%	8.6	3.1	17.5	25.3
24 Hours	130,100		32%	15%	38%	15%	68%	17%	6%	2%	4%	3%	7.4	4.7	11.1	25.1

TRIPS TO CITY OF VAUGHAN - WARD 1

Time Period	Trips	% 24 hr	Trip Purpose				Mode of Travel						Median Trip Length (km)			
			Work	School	Home	Other	Driver	Pass.	Transit	GO Train	Wlk & Cy	Other	Driver	Pass.	Transit	GO Train
6-9 AM	18,600	19.4%	32%	30%	10%	28%	62%	18%	3%	*	11%	6%	3.6	1.7	2.8	*
24 Hours	96,300		10%	6%	57%	27%	68%	18%	5%	1%	6%	3%	6.1	3.7	10.0	25.4

Appendix A

Excerpts from Appendix I of the Transportation Master Plan



Satisfying Municipal Class EA Requirements

An important component of the Vaughan Transportation Master Plan (TMP) is fulfilling the requirements of the Municipal Class Environmental Assessment (EA) process to comply with the Environmental Assessment Act, a provincially legislated document governing all public undertakings that have the potential to affect the environment. The Municipal Class EA master planning process recognizes a framework for planning associated with Master Plans that integrate infrastructure requirements for existing and future land use with environmental assessment planning principles.

The Municipal Class EA process consists of five general phases, depending on the complexities of the undertaking. At a minimum, Master Plans address Phases 1 and 2 of the Municipal Class EA process which comprise:

- ▶ **Phase 1 – Problem or Opportunity:** Identify the problem, deficiency or opportunity and develop a clear statement of the issues that are to be addressed; and,
- ▶ **Phase 2 – Alternative Solutions:** Identify the reasonable alternative solutions that could be implemented to address the issues. Establish the preferred solution based on an assessment of the environmental impact, including consideration of stakeholder input.

Depending on the project timing and the scope and complexity of the related environmental impacts, Phases 1 and 2 may have to be revisited as individual projects are examined.

Projects are categorized into different schedules (A, A+, B or C) based on their level of complexity and anticipated environmental effects. Projects identified in the Vaughan TMP are primarily classified as Schedule B or Schedule C undertakings, described as follows:

1. **Schedule B** projects generally include improvements and minor expansions to existing facilities. These projects have some potential for adverse environmental impacts, and consultation with those who may be affected is required. Examples of Schedule B projects include the installation of traffic control devices, or smaller road-related projects. These kinds of projects require only the completion of Phases 1 and 2 of the Class EA process.
2. **Schedule C** projects have the potential for significant environmental effects and must proceed under the full planning and documentation procedures specified in the Class EA document. Examples of Schedule C projects typically include new roads or road-widenings. In addition to fulfilling the requirements of the first two phases of the Municipal Class EA process, Schedule C undertakings also require the need to complete:
 - ▶ **Phase 3 – Alternative Design Concepts for the Preferred Solution:** Identify alternative designs for the preferred solution and their potential effects on the environment, evaluate the alternative designs and select and confirm a preferred solution.



- ▶ **Phase 4 – Environmental Study Report (ESR):**
Complete the ESR which documents the study process.
- ▶ **Phase 5 – Implementation:**
Complete the contract drawings, proceed to construction and operation and monitor for environmental provisions and commitments.

It is within this master planning context that the Vaughan TMP addresses Phases 1 and 2 of the Municipal Class EA requirements of identified individual and/or grouped local road improvement projects. These projects will improve connections to local and Regional infrastructure, improve access to future residential developments, support transit-oriented nodes and corridors, and enhance transit ridership, cycling and walking. **Exhibit 1** illustrates these individual and/or grouped projects and is followed by a summary of each outlining the project purpose, description, justification, potential effects, alternatives considered and conclusions. Cost estimates are approximate only based on similar projects elsewhere or per unit averages.

Generally all projects are growth-related and will be eligible for Development Charge funding. A more detailed review of development charge funding eligibility will be completed as part of the City's Development Charges Update / Background Study.

Summaries for the following projects, for which the City of Vaughan has some or all responsibility and for which environmental studies have not already begun, are included in this appendix:

List of Project EA Summaries

1. Highway 7/Highway 400 Interchange Modifications
2. Creditstone Road Widening
3. Colossus Drive Extension Across Highway 400
4. Portage Parkway Widening and Easterly Extension to Creditstone Road
5. Vaughan Metropolitan Centre Collector Road Network
6. Huntington Road Improvements
7. McGillivray Road Improvements
8. West Vaughan Employment Area Collector Road Improvements
9. Highway 400 North Employment Lands Collector Road Network
10. Kleinburg/Nashville Focus Area Collector Roads
11. Kirby Road Improvements (Bathurst Street to Keele Street)
12. King-Vaughan Road Widening
13. Snidercroft Road Extension and Railway Grade Separation
14. Jog Elimination at Pine Valley Drive and Kirby Road Intersection

Figure A 2

Kirby Road Improvements

Purpose: To serve future Highway 400 North employment area and support provision of enhanced pedestrian / cycling infrastructure; improve network continuity and the effectiveness of the existing network.

Project Description

Name	• Kirby Road Extension/Widening
Project Limits	• West of Keele Street to Bathurst Street
Length	• 4.5 km
Project Type	• New 4-lane roadway between Bathurst and Dufferin Streets; Roadway widening to 4 lanes between Dufferin and Keele Streets; railway grade separation west of Keele Street
Proposed Phasing	• 2021 – 2031
Cost	• \$19.5 M, including railway grade separation west of Keele Street

Project Location and Environmental Features



Justification:

- These are strategic road improvements needed to enhance network connectivity and the effectiveness of existing network, including for pedestrian and cycling modes. Corridor deficiency analysis indicates that the Kirby Road corridor will be approaching capacity and will need to be improved given its proximity to the urbanized area and its potential to serve east-west travel oriented to the future Highway 400 North employment area.

Alternatives Considered

- | | |
|----------------|---|
| Transit | • Improved transit services in the Kirby Road corridor are not warranted given that the immediate area is not being proposed for urbanization. |
| Roads | • Regional road improvements along King Vaughan Road and Teston Road were considered in the corridor needs analysis, and have also been incorporated into the recommended TMP road network. |

Potential Socio-economic and Environmental Impacts: This project is within the Green Belt, and will therefore impact portions of the natural heritage network, requiring further environmental assessment and appropriate mitigation measures. Also, the residential areas located south of Kirby Road may be impacted by adverse effects from increased traffic flow requiring suitable mitigation measures to be considered.

Conclusion: This and other corridor improvements will be required by 2031, with some being required by 2021. Further study with the Region is needed to determine the sequence of corridor improvements. The requirement for additional improvements to Highway 400 should be assessed in the context of the Region's Mid York East-West study and the GTA West Corridor in the vicinity of Highway 400. Recommended for Phase 3 and 4 EA Study.

Appendix B

Levels Service Definition

Highway Capacity Manual, 2000

Signalized intersection level of service (LOS) is defined in terms of the average total vehicle delay of all movements through an intersection. Vehicle delay is a method of quantifying several intangible factors, including driver discomfort, frustration, and lost travel time. Specifically, LOS criteria are stated in terms of average delay per vehicle during a specified time period (for example, the PM peak hour). Vehicle delay is a complex measure based on many variables, including signal phasing (i.e., progression of movements through the intersection), signal cycle length, and traffic volumes with respect to intersection capacity. Table 1 shows LOS criteria for signalized intersections, as described in the *Highway Capacity Manual* (Transportation Research Board, Special Report 209, 2000).

Table 1. Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (sec/veh)	General Description (Signalized Intersections)
A	≤10	Free Flow
B	>10 - 20	Stable Flow (slight delays)
C	>20 - 35	Stable flow (acceptable delays)
D	>35 - 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 - 80	Unstable flow (intolerable delay)
F	>80	Forced flow (jammed)

Unsignalized intersection LOS criteria can be further reduced into two intersection types: all-way stop-controlled and two-way stop-controlled. All-way, stop-controlled intersection LOS is expressed in terms of the average vehicle delay of all of the movements, much like that of a signalized intersection. Two-way, stop-controlled intersection LOS is defined in terms of the average vehicle delay of an individual movement(s). This is because the performance of a two-way, stop-controlled intersection is more closely reflected in terms of its individual movements, rather than its performance overall. For this reason, LOS for a two-way, stop-controlled intersection is defined in terms of its individual movements. With this in mind, total average vehicle delay (i.e., average delay of all movements) for a two-way, stop-controlled intersection should be viewed with discretion. Table 2 shows LOS criteria for unsignalized intersections (both all-way and two-way, stop-controlled).

Table 2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (sec/veh)
A	0 - 10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

From: [Norman Chung](#)
To: [Tahrana Lovlin](#); "[Leonid Groysman](#)"
Cc: "[Koryun Shahbikian](#)"; "[Al Steedman](#)"; [Jenny Vesely](#); "[Nelson Lee](#)"; [Chris Blaney](#); "[Cam Milani](#)"; "[Nick Poulos](#)"
Subject: RE: 4339 RE: Air Quality, Climate Change and Noise Assessments for Kirby Road
Date: September 14, 2018 2:03:00 PM
Attachments: [2031 forecast traffic no kirby.pdf](#)

H Tahrana

Attached please find the forecast AM and PM peak hour volumes for the no Kirby road condition.

The forecast traffic volumes are base on the Region EMME model runs as well as the existing travel pattern in the area.

As mentioned in Nick's email below, AADT is approximately 10% to 12% of the PM peak hour volumes.

Should you require additional information, please let us know.

Regards

Norman Q. Chung, P. Eng.
535 Bur Oak Avenue
Markham, On , L6C 2S5
Tel : 905-479-7942
nchung@pouloschung.com

From: Nick Poulos [<mailto:npoulos@pouloschung.com>]
Sent: Wednesday, September 05, 2018 3:26 PM
To: 'Tahrana Lovlin'; 'Leonid Groysman'
Cc: 'Koryun Shahbikian'; 'Al Steedman'; 'Jenny Vesely'; 'Nelson Lee'; 'Chris Blaney'; Norman Chung; 'Cam Milani '
Subject: RE: 4339 RE: Air Quality, Climate Change and Noise Assessments for Kirby Road

Hi Tahrana

I will try and answer some of you questions below for both emails (see red text).

Please note that we need to quickly pull ups data and run some analysis to complete the response.

We will have all responses back to you next week.

Regards

Nick G. Poulos, P. Eng.
Partner
Poulos & Chung Limited

535 Bur Oak Avenue
Markham, Ontario
L6C 2S5
(905) 479 - 7942
npoulos@pouloschung.com

From: Tahrana Lovlin [<mailto:tahrana@novusenv.com>]
Sent: Wednesday, September 05, 2018 2:12 PM
To: Nick Poulos; 'Leonid Groysman'
Cc: 'Koryun Shahbikian'; 'Al Steedman'; Jenny Vesely; 'Nelson Lee'; Chris Blaney; Norman Chung
Subject: RE: 4339 RE: Air Quality, Climate Change and Noise Assessments for Kirby Road

Nick,

Also, one more question that we just realized. Can you please send along the traffic data for the future without Kirby Road running between Dufferin Street and Bathurst Street? This scenario is called the future “do nothing” and is used to calculate project impacts. We essentially need Figure 6 from the Poulos and Chung Report projected to 2031.

Figures 20 and 21 begin to provide the base for the information you need. We have the numbers (without Kirby Road) for 2021. We have to now extrapolate for 2031. We did not project the 2031 condition without Kirby Road because the 2021 condition justified Kirby Road.

We will have the estimated flows for you next week.

Thank you.

Tahrana Lovlin, MAES, P.Eng.
Microclimate Specialist
t 226.706.8080 x 224 | tahrana@novusenv.com



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From: Tahrana Lovlin

Sent: September 4, 2018 2:49 PM

To: Nick Poulos <npoulos@pouloschung.com>; 'Leonid Groysman' <LGroysman@schaeffers.com>

Cc: 'Koryun Shahbikian' <kshahbikian@schaeffers.com>; 'Al Steedman' <asteedman@schaeffers.com>; Jenny Vesely <jennyv@novusenv.com>; 'Nelson Lee' <nlee@schaeffers.com>; Chris Blaney <chrisb@novusenv.com>; 'Norman Chung' <nchung@pouloschung.com>

Subject: RE: 4339 RE: Air Quality, Climate Change and Noise Assessments for Kirby Road

Nick,

Thanks for sending the traffic information along. We've gone through it and have the following questions.

- Please confirm the design year. We are required to use traffic ten years after completion (therefore 2031 volumes).

Our assessment, the City of Vaughan Transportation Master Plan and the North Vaughan and New Communities Transportation Master Plan all confirmed that the Kirby Road connection needs to be in place by year 2021.

So if you need a 10 year horizon period it would be 2031.

- Could we get the medium/heavy truck split, in addition to the percentages?

Our best response to you earlier was - The model does not separate out heavy vehicle percentages within the forecast link traffic flows. We suggest the following based upon typical ratios observed on York Region arterial roads. For most arterial roads such as Bathurst Street and Dufferin Street the heavy duty vehicle percentage would be approximately 4 - 5 % of the roadway peak hour traffic flow. (Existing percentage is approximately 3 – 4 percent). Kirby Road however is in a unique circumstance. Typically it would exhibit the same ratio as the other arterials. However Kirby Road is anticipated to be designated as a "Truck Route". Such a designation implies that heavy duty vehicle composition could rise to an approximate 15 – 20% of the total peak hour traffic flow forecasts.

In terms of trying to determine split between medium and heavy trucks we offer the following:

- Today and prior to operating as a designated truck route the split would be approximately 75% medium trucks and 25% heavy trucks;

- In the future with a truck route designation the split would be equal between the truck types 50 – 50.

It is very difficult to try and ascertain truck splits

The indicated link may have some more refined information:

<https://www.york.ca/wps/wcm/connect/yorkpublic/520a6d51-bfcd-460d-befa-bad562f89aca/2015+Transportation+Fact+Book+Accessible.pdf?MOD=AJPERES>

- We require the posted speed limits for 2031 as well as the 85th percentile road traffic speeds for:
 - Kirby Road
 - Gamble Road
 - Bathurst Street
 - Dufferin Street

The above link and referred document will identify the posted speed limit for the roads.

Please note that we have not conducted speed and delay surveys in order to define the average speed or the 85th percentile speed. York Region tends to place a posted speed limit which covers the 85th percentile especially in rural settings. We would say that during the roadway peak periods that the posted speed limit would represent the 85th percentile while outside of the roadway peak periods the 85th percentile vehicle speed could be 5 to 10 kilometres per hour higher.

However we would say the following as these roads begin to urbanize the Region will likely reduce the posted speed limit down to 60 kilometres per hour. This seems to be the direction throughout the Region.

See this link

<https://www.york.ca/wps/wcm/connect/yorkpublic/43c38bcc-55e9-4c9c-bc91-93a443fc84d6/apr+6+speed+ex.pdf?MOD=AJPERES>

Hope the responses help.

Thank you.

Tahrana Lovlin, MAES, P.Eng.

Microclimate Specialist

t 226.706.8080 x 224 | tahranal@novusenv.com



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From: Nick Poulos <npoulos@pouloschung.com>

Sent: August 29, 2018 2:40 PM

To: 'Leonid Groysman' <LGroysman@schaeffers.com>; Tahrana Lovlin <tahranal@novusenv.com>

Cc: 'Koryun Shahbikian' <kshahbikian@schaeffers.com>; 'Al Steedman' <asteedman@schaeffers.com>; Jenny Vesely <jennyv@novusenv.com>; 'Nelson Lee' <nlee@schaeffers.com>; Chris Blaney <chrisb@novusenv.com>; Tahrana Lovlin <tahranal@novusenv.com>; 'Norman Chung' <nchung@pouloschung.com>

Subject: RE: 4339 RE: Air Quality, Climate Change and Noise Assessments for Kirby Road

Hi Leonid & Tahrana

As per your request we are pleased to attach the update transportation assessment for the Kirby EA.

We also provide specific responses to your questions below.

Please do not hesitate to contact us should you have questions or further clarification.

Regards

Nick G. Poulos, P. Eng.
Partner

Poulos & Chung Limited
535 Bur Oak Avenue
Markham, Ontario
L6C 2S5
(905) 479 - 7942
npoulos@pouloschung.com

From: Leonid Groysman [<mailto:LGroysman@schaeffers.com>]
Sent: Wednesday, August 29, 2018 10:01 AM
To: Nick Poulos; Norman Chung
Cc: Koryun Shahbikian; Al Steedman; Jenny Vesely; Nelson Lee; Chris Blaney; Tahrana Lovlin
Subject: 4339 RE: Air Quality, Climate Change and Noise Assessments for Kirby Road

Good Morning Nick and Norman,

Further to the request below and as discussed over the phone with Norm today, please provide Tahrana with traffic data for the air quality/climate change/noise assessments.

Thanks in advance,
Leonid

From: Tahrana Lovlin [<mailto:tahrana@novusenv.com>]
Sent: Wednesday, August 29, 2018 9:08 AM
To: Leonid Groysman
Cc: Koryun Shahbikian; Al Steedman; Jenny Vesely; Nelson Lee; Dorin Lazus; Chris Blaney
Subject: RE: Proposal for Air Quality, Climate Change and Noise Assessments for Kirby Road

Leonid,

Thanks for sending those along. We also require the following information to conduct the assessments:

- Existing & Future horizon AADT's for study road + arterial roads (Bathurst St and Dufferin St)

The transportation assessment is based upon forecast link volume flows as provided by the York Region EMME II transportation model. This model provides forecast link volume traffic flows for the horizon year roadway AM peak hour. Poulos & Chung Limited then applied adjustment techniques to estimate forecast intersection turning volumes and traffic flows for the roadway PM peak hour. The forecasts do not contain AADT's. We suggest for AADT's that it reflects approximately 10 to 12 % of the forecast roadway PM peak hour.

- Heavy duty vehicle percentages

The model does not separate out heavy vehicle percentages within the forecast link traffic flows. We

suggest the following based upon typical ratios observed on York Region arterial roads. For most arterial roads such as Bathurst Street and Dufferin Street the heavy duty vehicle percentage would be approximately 4 - 5 % of the roadway peak hour traffic flow. (Existing percentage is approximately 3 – 4 percent). Kirby Road however is in a unique circumstance. Typically it would exhibit the same ratio as the other arterials. However Kirby Road is anticipated to be designated as a “Truck Route”. Such a designation implies that heavy duty vehicle composition could rise to an approximate 15 – 20% of the total peak hour traffic flow forecasts.

- Hourly vehicle distribution (if available)

Please see the attached data package which contains existing 6 hour traffic counts. Again the forecast traffic flows were only given for roadway AM peak hour. However, we would anticipate that the existing hourly variation percentages will not materially change going forward.

- Light cycle timing for any traffic signals within the study area

Please see the attached Synchro software output sheets which contain intersection analyses for the forecast traffic flows in select horizon years.

- Geo-referenced aerial imagery (if available)

It is likely that Leonid has aerial imagery.

We also require information on any approved developments within 500m of the roadway.

We are not aware of any approved developments within 500 metres. Our report does contain development traffic flows for the lands south of Kirby Road between Dufferin Street and Bathurst Street. The “North West Vaughan and Communities Transportation Master Plan identifies and evaluates all planned development in this area of the City of Vaughan. It is a good reference document and may have further data that could be of use to you.

Also, if there are approved developments within 500m, are we assessing the impacts of this road on those developments?

Please note that since we are using York Region EMME II model outputs, all planned development in the immediate vicinity as well as all of York Region has been accounted for in the forecast traffic flows. (There are several Figures in our report which document the change in population and employment by traffic zone.

Once we have all of the above information/answers, we require 3 weeks to complete both the air quality assessment and the noise assessment.

Regards,

Tahrana Lovlin, MAES, P.Eng.

Microclimate Specialist

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Novus West Inc. | 906 – 12 Avenue SW, Suite 600 | Calgary, AB Canada, T2R 1K7 | t 403.990.5947

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From: Leonid Groysman <LGroysman@schaeffers.com>

Sent: August 27, 2018 5:37 PM

To: Tahrana Lovlin <tahranal@novusenv.com>

Cc: Koryun Shahbikian <kshahbikian@schaeffers.com>; Al Steedman <asteedman@schaeffers.com>; Jenny Vesely <jennyv@novusenv.com>; Nelson Lee <nlee@schaeffers.com>; Dorin Lazu <dlazu@schaeffers.com>

Subject: RE: Proposal for Air Quality, Climate Change and Noise Assessments for Kirby Road

Hi Tahrana,

Further to the note below, a link to download our latest design for Alignment 5 can be found in the attached email.

From: Leonid Groysman

Sent: Monday, August 27, 2018 11:48 AM

To: 'Tahrana Lovlin'

Cc: Koryun Shahbikian; Al Steedman; lucrezia.milani@milanigroup.ca; 'Cam'; 'Jenny Vesely'; Nick Poulos; 'Norman Chung'

Subject: RE: Proposal for Air Quality, Climate Change and Noise Assessments for Kirby Road

Hi Tahrana,

Thank you for the note.

Just for clarity, Schaeffers staff takes care of all technical aspects of the EAS. The three matters to be

addressed by your firm for the preferred road Alignment #5 are: **air, noise and climate change** impact assessments. As earlier confirmed with Jenny, the climate change is included in your scope under the air quality impact assessment.

At the moment, we are falling behind schedule about one month with the detailed studies. Your immediate involvement and delivering the reports within shortest possible timeframe would be highly appreciated. I will send you the latest design drawings later on today. Traffic data will be provided by our transportation sub-consultant Poulos&Chung Ltd., who are copied on this email.

Please feel free to call me if you have any further questions.

Kind regards,
Leonid

From: Cam [<mailto:cam.milani@milanigroup.ca>]
Sent: Monday, August 27, 2018 11:24 AM
To: 'Tahrana Lovlin'; 'Jenny Vesely'; Leonid Groysman
Cc: Koryun Shahbikian; Al Steedman; lucrezia.milani@milanigroup.ca
Subject: RE: Proposal for Air Quality, Climate Change and Noise Assessments for Kirby Road

That arrangement works.

Leonid, can you answer the balance of the questions on timing?

Thanks.

Cam

From: Tahrana Lovlin [<mailto:tahranal@novusenv.com>]
Sent: Monday, August 27, 2018 11:13 AM
To: Cam; Jenny Vesely; 'Leonid Groysman'
Cc: 'Koryun Shahbikian'; 'Al Steedman'; lucrezia.milani@milanigroup.ca
Subject: RE: Proposal for Air Quality, Climate Change and Noise Assessments for Kirby Road

Cam,

Just stepping back in as PM for this project for Novus. We will accept waiting for payment until Q1 2019, but we will be issuing the invoice once the work is complete. On that note, just to confirm things, you require both the Air Quality Assessment and the Noise Assessment?

Other questions:

When do you anticipate requiring our involvement?

What is the deadline for our two reports?

Regards,

Tahrana Lovlin, MAES, P.Eng.

Microclimate Specialist

t 226.706.8080 x 224 | tahranal@novusenv.com



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www.novusenv.com

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From: Cam <cam.milani@milanigroup.ca>

Sent: August 24, 2018 3:07 PM

To: Jenny Vesely <jennyv@novusenv.com>; 'Leonid Groysman' <LGroysman@schaeffers.com>

Cc: Tahrana Lovlin <tahranal@novusenv.com>; 'Koryun Shahbikian' <kshahbikian@schaeffers.com>;

'Al Steedman' <asteedman@schaeffers.com>; lucrezia.milani@milanigroup.ca

Subject: RE: Proposal for Air Quality, Climate Change and Noise Assessments for Kirby Road

Hi jenny,

See attached authorization form. We are also requesting our consulting team to agree to wait for payment on invoicing until Q1 2019, which is when we expect to be reimbursed for the Environmental Assessment costs from the City of Vaughan. Please confirm that arrangement is acceptable.

Thanks.

Cam Milani

From: Jenny Vesely [<mailto:jennyv@novusenv.com>]

Sent: Friday, August 24, 2018 11:06 AM

To: Leonid Groysman; Cam Milani

Cc: Tahrana Lovlin; Koryun Shahbikian; Al Steedman; lucrezia.milani@milanigroup.ca

Subject: RE: Proposal for Air Quality, Climate Change and Noise Assessments for Kirby Road

Hi Cam,

Please see attached our authorization form. If you would like Novus to proceed with the scope provided in my previous email for the Kirby Road EA, please sign the attached form and return to us with billing information for the work. Once received, we can get started on the assessments.

Thanks,

Jenny Vesely, P.Eng.

Air Quality Engineer

☎ 226.706.8080 x 216 | ☎ 519.400.8591 | jennyv@novusenv.com | [LinkedIn](#)



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From: Leonid Groysman <LGroysman@schaeffers.com>

Sent: August 24, 2018 10:20 AM

To: Jenny Vesely <jennyv@novusenv.com>

Cc: Tahrana Lovlin <tahrana@novusenv.com>; Koryun Shahbikian <kshahbikian@schaeffers.com>; Al Steedman <asteedman@schaeffers.com>; Cam Milani <cam.milani@milanigroup.ca>; lucrezia.milani@milanigroup.ca

Subject: RE: Proposal for Air Quality, Climate Change and Noise Assessments for Kirby Road

Importance: High

Good morning Jenny,

As discussed over the phone today, our Client (Proponent of the EA) will retain Novus directly. As further clarified, the climate change assessment is included in your scope. Please re-issue the proposal No. 17-0271 using the following billing info:

Rizmi Holdings Limited
11333 Dufferin Street

P.O. Box 663
Maple, Ontario
L6A 1A1
Attention: Cam Milani

Please send the quote to Cam via the following email address: cam.milani@milanigroup.ca and cc me. Your future invoices will be processed by Rizmi.

Thanks,
Leonid

From: Jenny Vesely [<mailto:jennyv@novusenv.com>]
Sent: Thursday, August 23, 2018 4:40 PM
To: Leonid Groysman
Cc: Tahrana Lovlin; Koryun Shahbikian; Al Steedman
Subject: RE: Proposal for Air Quality and Noise Assessments for Kirby Road

Hi Leonid,

I've reviewed the provided MOECC document, and can confirm we have reviewed this document before. The scope to address GHG emissions in Tahrana's original proposal will be sufficient to meet the MOECC's requirement, and is consistent with what we typically provide to address climate change for these types of projects.

Hope this helps, I don't think we need to adjust the proposal but feel free to give me a call if you have any further questions.

Thanks,

Jenny Vesely, P.Eng.

Air Quality Engineer

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the message.

From: Leonid Groysman <LGroysman@schaeffers.com>
Sent: August 21, 2018 5:43 PM
To: Jenny Vesely <jennyv@novusenv.com>
Cc: Tahrana Lovlin <tahrana@novusenv.com>; Koryun Shahbikian <kshahbikian@schaeffers.com>; Al Steedman <asteedman@schaeffers.com>
Subject: RE: Proposal for Air Quality and Noise Assessments for Kirby Road

Hi Jenny,

As discussed over the phone today, attached is a copy of the proposal for air quality and noise/vibration assessments received from Tahrana for your reference.

The proposed air quality assessment includes a screening level assessment of the GHG emissions, which is directly related to climate change. As clarified, the Kirby EAS is required to include a climate change section in the ESR outlining how climate change was considered. Some clarification can be found in the attached email communication with the MOE. Please also check the MOE's guide: "Consideration of Climate Change in Environmental Assessment in Ontario" for further details. Looks like the 2017 version is available online only at: <https://www.ontario.ca/page/considering-climate-change-environmental-assessment-process>

Please ensure that the climate change assessment included in your scope (second last bullet on p.2) is reflective of the guide's requirements to the most possible extent. As a minimum, please include in your scope a discussion of the GHG emissions in consideration of future provincial GHG targets and Ontario's Climate Action Plan and Adaptation Strategy.

Your prompt action and response would be highly appreciated.

Thanks in advance,

Leonid Groysman, M.Sc.
Class EA Lead,
Schaeffers Consulting Engineers
6 Ronrose Drive,
Concord, Ontario L4K 4R3
Tel. 905-738-6100 x 245

From: Tahrana Lovlin [<mailto:tahrana@novusenv.com>]
Sent: Monday, September 25, 2017 10:06 AM
To: Leonid Groysman
Cc: Jenny Vesely
Subject: Proposal for Air Quality and Noise Assessments for Kirby Road

Leonid,

Please find attached Novus' proposal for an Air Quality assessment, as well as a noise and vibration assessment for the extension of Kirby Road in Vaughan. If you have any questions, please do not hesitate to contact myself or Jenny Vesely.

Regards,

Tahrana Lovlin, MAES, P.Eng.

Microclimate Specialist

☎ 226.706.8080 x 224 | tahrana@novusenv.com



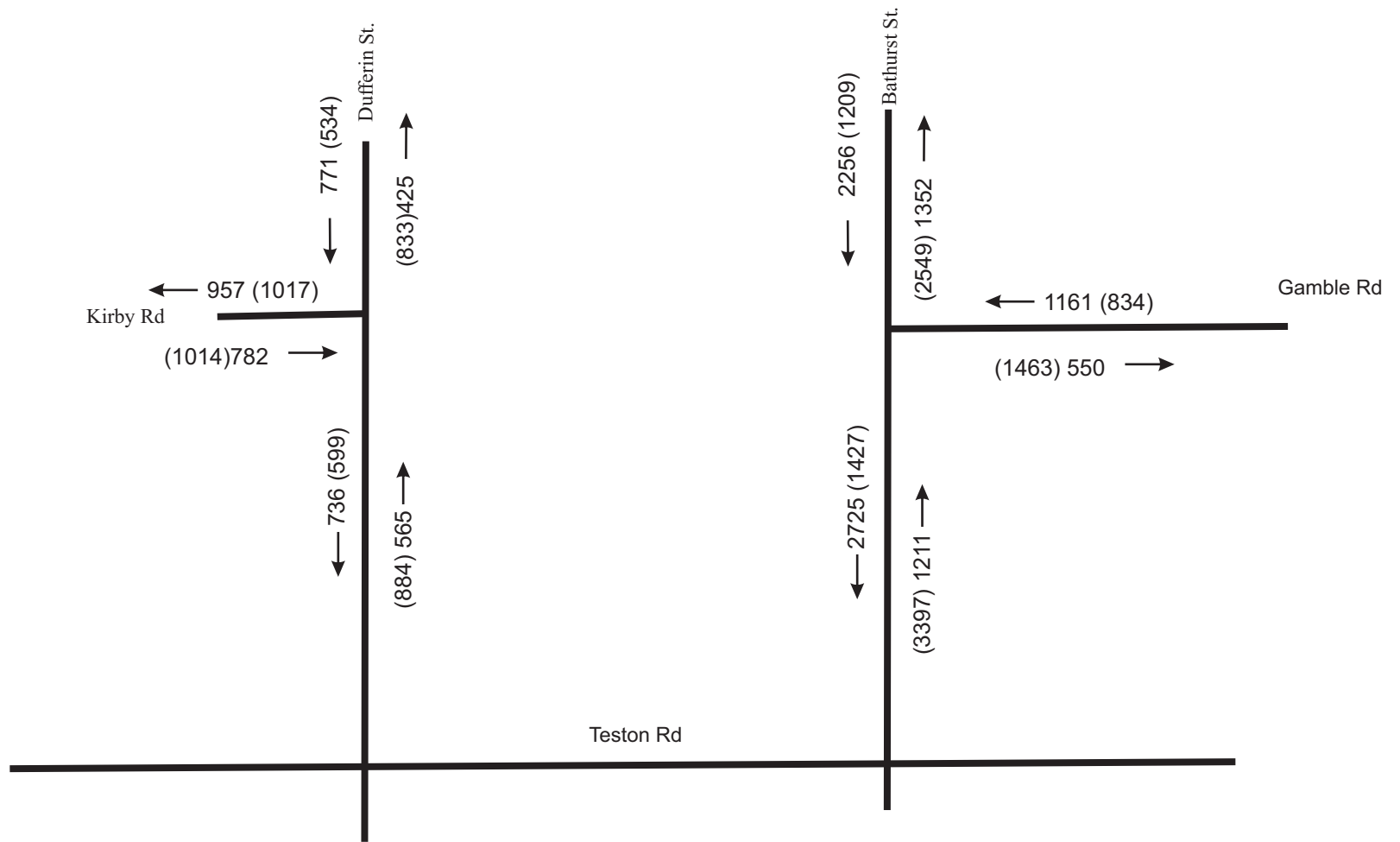
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AM (PM) 2031 Background Traffic

Note:
 Forecast traffic is based on York Region emme Model and the existing travel pattern

Not To Scale



Legend:
 ● Existing Traffic Signal
 XX (YY) AM (PM) Peak Hour Traffic

Forecast 2031 AM and PM Background Traffic Volumes
 without Kirby Connection
 Figure 1

From: [Tahrana Lovlin](#)
To: [Nick Poulos](#); [gilucas@rogers.com](#); "Leonid Groysman"
Cc: [Chris Blaney](#); [Jenny Vesely](#)
Subject: RE: Kirby Road - Air and Noise Studies
Date: September 26, 2018 11:50:05 AM

Nick,

Alright. We'll work with what we have. 20% commercial trucks.

Cheers,

Tahrana Lovlin, MAES, P.Eng.

Microclimate Specialist

t 226.706.8080 x 224 | tahranal@novusenv.com



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From: Nick Poulos <npoulos@pouloschung.com>
Sent: September 26, 2018 11:48 AM
To: Tahrana Lovlin <tahranal@novusenv.com>; gilucas@rogers.com; 'Leonid Groysman' <LGroysman@schaeffers.com>
Cc: Chris Blaney <chrisb@novusenv.com>; Jenny Vesely <jennyv@novusenv.com>
Subject: RE: Kirby Road - Air and Noise Studies

Hi Tahrana

I wish I could give you more information but we do not have it. All of our work is peak hour based.

We sometimes use dta from link below,

http://www.york.ca/wps/portal/yorkhome/yorkregion/yr/statisticsanddata/transportationfactbook/lut/p/a1/jzDNTsMwEISfpYccibehbSxuVhA4CVV6q-sLctL8WKR2ZC9F4ukxERckoOxtV99oZpZllog06k33CrU1avzc5e45Z4855yUU1YzmwKBiRZJSoGUagFMA4JdhcE1f_MMgcfts3xM5KRxutOksER5DQo-68cqcZwoVFeiU8ZN1uGTvVIO1tS_kSORikSSbHV9nUACvKQOP6WF7T_kasu0VoEy-gD9Khhb9aOvIYSdm6lsa4rq2a13r4lcXzgPi5O8iiGce57i3th_buFER_KQYrEcivoFkuoj3Jw76cDlSz1arD3nU1tY!dl5/d5/L2dBISevZ0FBIS9nQSEh/#.W6uplXtKlRY

I think we sent you excerpts from it previously.

Otherwise we do not have speed information, nor truck splits.

I don't know whether to accept 30% trucks when and if the truck route designation comes into effect. Perhaps it is based on another similar truck route designation.

Regards

Nick G. Poulos, P. Eng.
Partner
Poulos & Chung Limited
535 Bur Oak Avenue
Markham, Ontario
L6C 2S5
(905) 479 - 7942

npoulos@pouloschung.com

From: Tahrana Lovlin [<mailto:tahrana@novusenv.com>]
Sent: Tuesday, September 25, 2018 1:19 PM
To: gilucas@rogers.com; Leonid Groysman; Nick Poulos
Cc: Chris Blaney; Jenny Vesely
Subject: RE: Kirby Road - Air and Noise Studies

Hey,

I just wanted to follow up on our questions from last week. We've prepped everything we can, but currently being held up by the following questions:

1. 20% commercial trucks = are we using this? Can we get the split?
2. Do you have the 85th percentile speeds on the roadways?
3. We also need the day/night splits for the roadways?

Cheers,

Tahrana Lovlin, MAES, P.Eng.
Microclimate Specialist
t 226.706.8080 x 224 | tahrana@novusenv.com



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From: Tahrana Lovlin
Sent: September 18, 2018 1:50 PM
To: 'gilucas@rogers.com' <gilucas@rogers.com>
Cc: Chris Blaney <chrisb@novusenv.com>; Jenny Vesely <jennyv@novusenv.com>
Subject: RE: Kirby Road - Air and Noise Studies

Glenn,

I just wanted to follow up on our call from last week, with regards to the percentage of truck traffic on Kirby. We got all the information, thanks, and have begun putting things together. But that one piece of information, of whether to follow through on the 20ish % for commercial trucks still requires confirmation on your part. As Chris pointed out in the call, that percentage of truck traffic will require a considerable investment in noise mitigation.

Thank you.

Cheers,

Tahrana Lovlin, MAES, P.Eng.
Microclimate Specialist
t 226.706.8080 x 224 | tahrana@novusenv.com



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From: gilucas@rogers.com <gilucas@rogers.com>
Sent: September 7, 2018 3:56 PM
To: Cam <cam.milani@milanigroup.ca>; Jenny Vesely <jennyv@novusenv.com>
Cc: Chris Blaney <chrisb@novusenv.com>; Tahrana Lovlin <tahranal@novusenv.com>
Subject: Re: Kirby Road - Air and Noise Studies

Jenny,

Lets do it on Tuesday Sept 11 at 2:00 pm. Please provide me with call-in information.

Regards,
Glenn

From: Cam
Sent: Friday, September 07, 2018 3:27 PM
To: 'Jenny Vesely'
Cc: 'Chris Blaney'; 'Tahrana Lovlin'; gilucas@rogers.com
Subject: RE: Kirby Road - Air and Noise Studies

Hi,

I am copying Glenn on this email to respond and set up a call as needed.

Thanks.

Cam

From: Jenny Vesely [<mailto:jennyv@novusenv.com>]
Sent: Friday, September 7, 2018 3:16 PM
To: Cam Milani ; Leonid Groysman; Al Steedman
Cc: Chris Blaney; Tahrana Lovlin
Subject: Kirby Road - Air and Noise Studies

Hi Cam,

Are you available next Tuesday (September 11) for a brief call regarding the air and noise studies for this project and whether or not we should include the proposed development at the southwest corner of the study area? I've discussed with Leonid but think its important to discuss with you and get everyone on board before we move forward with our studies. We are available Tuesday between 1-4pm. If afternoon doesn't work we could try for between 9am-10am.

We'd like to get a better understanding of the development application and any work (mainly in relation to noise) which has previously been done for the development. Typically we would not include a new development unless it has City approval, however, given the proximity of your proposed development to the new Kirby Road, it will need to be considered at some point. We were going to contact the Ministry of the Environment to discuss, however, would like to get the team on the same page internally prior to asking any question to the Ministry.

Let me know if there's a time that works on Tuesday, and we will provide call-in information.

Thanks,

Jenny Vesely, P.Eng.
Air Quality Engineer

t 226.706.8080 x 216 | c 519.400.8591 | jennyv@novusenv.com | [LinkedIn](#)



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Appendix C

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blank for 2-sided printing
purposes

Filename: dufferin.te Time Period: 16 hours
Description:

Road data, segment # 1: Dufferin

Car traffic volume : 11714 veh/TimePeriod
Medium truck volume : 308 veh/TimePeriod
Heavy truck volume : 308 veh/TimePeriod
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Dufferin

Angle1 Angle2 : -85.00 deg 85.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 66.50 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Dufferin

Source height = 1.26 m

ROAD (0.00 + 56.39 + 0.00) = 56.39 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-85	85	0.66	68.62	0.00	-10.74	-1.50	0.00	0.00	0.00	56.39

Segment Leq : 56.39 dBA

Total Leq All Segments: 56.39 dBA

TOTAL Leq FROM ALL SOURCES: 56.39

*YYN

Kirby Rd EA, 2031 Traffic,16 hr day, Future Cond "Do-Nothing", April 18,2019

1,3

2,14

RDWY 1 Kirby Rd EB West of Dufferin

'CARS' 542 60
'MT' 14 60
'HT' 14 60

'L' /

'Seg 1' 620064.0 4861353.8 282.1 0
'Seg 2' 620200.7 4861399.1 281.9 0
'Seg 3' 620330.3 4861443.2 282.9 1
'Seg 4' 620550.8 4861519.5 286.8 1
'Seg 5' 620651.8 4861544.8 291.3 1
'Seg 6' 620691.1 4861553.6 294.0 1
'Seg 7' 620738.0 4861565.5 297.9 1
'Seg 8' 620771.7 4861573.1 299.1 1

'L' /

RDWY 2 Gamble Rd EB East of Bathurst St

'CARS' 615 60
'MT' 16 60
'HT' 16 60

'L' /

'Seg 1' 622723.8 4862165.5 287.0 0
'Seg 2' 622756.5 4862171.5 286.0 0
'Seg 3' 622794.9 4862178.8 284.8 0
'Seg 4' 622823.8 4862185.5 283.7 0
'Seg 5' 622862.6 4862197.0 282.1 0
'Seg 6' 622908.9 4862211.8 280.8 0
'Seg 7' 622955.8 4862226.7 280.8 0
'Seg 8' 623005.1 4862242.1 282.9 1
'Seg 9' 623076.7 4862265.5 287.0 1
'Seg 10' 623137.0 4862284.9 292.0 1

'L' /

RDWY 3 Gamble Rd WB East of Bathurst St

'CARS' 615 60
'MT' 16 60
'HT' 16 60

'L' /

'Seg 1' 623131.3 4862293.6 291.4 0
'Seg 2' 623073.2 4862272.0 287.1 0
'Seg 3' 623001.4 4862247.5 283.1 0
'Seg 4' 622952.4 4862232.5 281.2 0
'Seg 5' 622907.0 4862218.7 281.0 0
'Seg 6' 622857.9 4862205.1 282.3 0
'Seg 7' 622825.5 4862196.7 283.5 0
'Seg 8' 622791.1 4862189.0 284.8 1
'Seg 9' 622753.8 4862183.1 286.0 1
'Seg 10' 622722.7 4862177.2 287.0 0

'L' /

RDWY 4 Kirby Rd WB West of Dufferin

'CARS' 542 60
'MT' 14 60
'HT' 14 60

'L' /

'Seg 1' 620771.0 4861582.2 299.1 0
'Seg 2' 620733.3 4861569.7 297.6 0
'Seg 3' 620687.6 4861557.5 294.8 0
'Seg 4' 620547.5 4861521.9 286.8 0
'Seg 5' 620327.7 4861447.8 283.0 0
'Seg 6' 620197.3 4861405.1 281.6 0
'Seg 7' 620061.9 4861360.6 282.2 0

'L' /

RDWY 5 Dufferin Street NB South of Kirby Rd

'CARS' 395 60
'MT' 10 60
'HT' 10 60

'L' /

'Seg 1' 620899.7 4860864.1 291.7 0
'Seg 2' 620882.1 4860958.0 296.5 1
'Seg 3' 620861.8 4861060.4 299.1 1
'Seg 4' 620849.0 4861120.2 298.4 0
'Seg 5' 620832.5 4861228.4 297.8 0
'Seg 6' 620813.8 4861337.2 300.3 1
'Seg 7' 620795.7 4861465.3 298.0 0
'Seg 8' 620777.3 4861580.9 299.4 0

'L' /

RDWY 6 Dufferin Street NB North of Kirby Rd

'CARS' 366 70
'MT' 10 70
'HT' 10 70

'L' /

'Seg 1' 620777.4 4861581.0 299.4 0
'Seg 2' 620763.6 4861657.0 299.1 0
'Seg 3' 620744.8 4861747.4 297.5 0
'Seg 4' 620718.3 4861876.0 297.0 0
'Seg 5' 620705.2 4861938.3 299.0 1

'Seg 6' 620686.8 4862033.1 301.3 1
'Seg 7' 620670.1 4862119.3 305.1 1
'Seg 8' 620651.8 4862212.2 311.3 1

'L' /

RDWY 7 Dufferin Street SB North of Kirby Rd

'CARS' 366 70
'MT' 10 70
'HT' 10 70

'L' /

'Seg 1' 620647.7 4862212.0 312.1 0
'Seg 2' 620666.0 4862118.7 306.0 0
'Seg 3' 620683.1 4862033.1 302.0 0
'Seg 4' 620701.5 4861938.9 299.0 0
'Seg 5' 620713.9 4861877.0 297.0 0
'Seg 6' 620741.0 4861748.3 297.8 1
'Seg 7' 620758.6 4861657.0 299.0 0
'Seg 8' 620772.0 4861579.3 299.2 0

'L' /

RDWY 8 Dufferin Street SB South of Kirby Rd

'CARS' 395 60
'MT' 10 60
'HT' 10 60

'L' /

'Seg 1' 620771.9 4861579.3 299.2 0
'Seg 2' 620790.5 4861463.8 298.0 0
'Seg 3' 620810.4 4861335.5 300.4 0
'Seg 4' 620826.9 4861227.1 298.6 0
'Seg 5' 620840.9 4861118.3 299.6 0
'Seg 6' 620852.8 4861056.5 299.3 0
'Seg 7' 620871.4 4860956.2 296.2 0
'Seg 8' 620890.0 4860858.8 291.7 0

'L' /

RDWY 9 Bathurst Street NB South of Kirby Rd

'CARS' 1288 70
'MT' 34 70
'HT' 34 70

'L' /

'Seg 1' 622980.6 4860942.6 269.9 0
'Seg 2' 622966.2 4861007.8 272.8 1
'Seg 3' 622953.1 4861070.9 274.8 1
'Seg 4' 622936.7 4861154.7 276.2 1
'Seg 5' 622923.2 4861218.7 277.0 1
'Seg 6' 622910.3 4861276.2 277.0 1
'Seg 7' 622877.3 4861432.2 281.9 1
'Seg 8' 622857.0 4861519.5 286.7 1
'Seg 9' 622836.1 4861620.3 292.0 1
'Seg 10' 622818.6 4861702.4 295.6 1
'Seg 12' 622799.3 4861794.9 297.0 1
'Seg 13' 622783.3 4861871.3 295.4 0
'Seg 14' 622770.9 4861941.3 293.6 0
'Seg 15' 622753.7 4862025.2 289.8 0

'L' /

RDWY 10 Bathurst Street NB South of Kirby Rd (continued)

'CARS' 1288 70
'MT' 34 70
'HT' 34 70

'L' /

'Seg 1' 622753.7 4862025.2 289.8 0
'Seg 2' 622741.1 4862099.7 287.2 0
'Seg 3' 622728.5 4862173.1 286.8 0

'L' /

RDWY 11 Bathurst Street NB North of Kirby Rd

'CARS' 1005 70
'MT' 26 70
'HT' 26 70

'L' /

'Seg 1' 622728.6 4862172.8 286.8 0
'Seg 2' 622717.1 4862225.4 286.8 0
'Seg 3' 622705.1 4862284.0 289.0 1
'Seg 4' 622694.1 4862339.6 292.1 1
'Seg 5' 622681.8 4862400.4 294.5 1
'Seg 6' 622669.7 4862463.3 297.3 1
'Seg 7' 622659.1 4862530.5 299.0 1
'Seg 8' 622646.8 4862594.3 300.2 1
'Seg 9' 622624.9 4862694.5 301.2 1
'Seg 10' 622609.8 4862776.1 302.0 1
'Seg 12' 622588.9 4862879.8 303.0 1
'Seg 13' 622569.1 4862983.2 304.0 1

'L' /

RDWY 12 Bathurst Street SB North of Kirby Rd

'CARS' 1005 70
'MT' 26 70
'HT' 26 70

'L' /

'Seg 1' 622559.0 4862982.2 304.1 0
'Seg 2' 622583.0 4862862.2 303.0 0
'Seg 3' 622599.6 4862777.1 302.0 0

'Seg 4'	622614.4	4862693.1	301.4	0
'Seg 5'	622634.3	4862592.0	300.5	0
'Seg 6'	622646.4	4862529.3	299.1	0
'Seg 7'	622660.4	4862462.2	297.0	0
'Seg 8'	622674.4	4862400.1	294.3	0
'Seg 9'	622685.1	4862339.4	291.9	0
'Seg 10'	622694.7	4862283.3	289.2	0
'Seg 12'	622706.3	4862222.4	287.4	0
'Seg 13'	622715.7	4862172.1	287.0	0

'L' /

RDWY 13 Bathurst Street SB South of Kirby Rd

'CARS'	1288	70
'MT'	34	70
'HT'	34	70

'L' /

'Seg 1'	622715.5	4862172.5	287.0	0
'Seg 2'	622730.0	4862097.8	287.5	1
'Seg 3'	622745.5	4862025.2	290.1	1
'Seg 4'	622763.6	4861939.4	294.0	1
'Seg 5'	622775.9	4861870.0	295.5	1
'Seg 6'	622791.7	4861794.4	296.6	1
'Seg 7'	622811.9	4861701.0	295.6	0
'Seg 8'	622828.7	4861620.8	292.3	0
'Seg 9'	622849.5	4861519.1	286.8	0
'Seg 10'	622868.2	4861432.3	282.0	0
'Seg 12'	622898.6	4861277.8	277.1	0
'Seg 13'	622911.2	4861216.9	277.3	0
'Seg 14'	622925.0	4861152.6	276.4	0
'Seg 15'	622941.0	4861070.0	274.9	0

'L' /

RDWY 14 Bathurst Street SB South of Kirby Rd (continued)

'CARS'	1288	70
'MT'	34	70
'HT'	34	70

'L' /

'Seg 1'	622941.0	4861070.0	274.9	0
'Seg 2'	622952.1	4861006.5	272.7	0
'Seg 3'	622964.8	4860941.3	269.7	0

'L' /

3,5

Barrier 1 Barrier for Receptor 5

'Bar 1'	622802.3	4862153.5	286.8	284.3	0.0	0
'Bar 2'	622799.8	4862161.9	287.1	284.6		
'Bar 3'	622812.5	4862165.7	286.6	284.1		
'Bar 4'	622813.0	4862120.6	286.4	283.8		

'A' /

Barrier 2 Houses West of Receptor 5

'Bar 1'	622802.1	4862153.1	293.4	284.4	0.0	0
'Bar 2'	622790.6	4862149.9	293.4	284.8		
'Bar 3'	622801.4	4862116.7	293.4	283.9		
'Bar 4'	622813.0	4862120.6	293.4	283.8		

'A' /

Barrier 3 Houses East of Receptor 5

'Bar 1'	622813.1	4862156.9	293.0	284.0	0.0	0
'Bar 2'	622823.6	4862124.2	293.0	283.6		
'Bar 3'	622835.1	4862127.6	293.0	283.5		
'Bar 4'	622824.4	4862160.4	293.0	283.8		

'A' /

Barrier 4 House as Barrier for Receptor 4

'Bar 1'	622624.1	4862120.9	302.5	297.5	0.0	0
'Bar 2'	622627.2	4862111.0	302.5	296.3		
'Bar 3'	622621.4	4862109.4	302.5	297.5		
'Bar 4'	622618.3	4862119.2	302.5	298.2		

'A' /

Barrier 5 Retaining Wall near Receptor 4

'Bar 1'	622596.6	4862109.2	299.3	299.0	0.0	0
'Bar 2'	622592.3	4862123.1	299.3	299.0		
'Bar 3'	622600.6	4862125.6	299.3	299.0		
'Bar 4'	622607.8	4862127.8	298.8	298.5		
'Bar 5'	622616.5	4862130.4	298.3	298.0		
'Bar 6'	622623.2	4862132.5	297.3	297.0		
'Bar 7'	622627.6	4862133.8	296.3	296.0		
'Bar 8'	622633.5	4862135.6	295.1	294.8		
'Bar 9'	622638.4	4862121.2	294.3	294.0		
'Bar 10'	622640.2	4862115.7	293.9	293.6		

'A' /

5,5

Receivers

'Rec 1'	620617.3	4861429.7	287.6
'Rec 2'	620766.8	4861981.7	303.7
'Rec 3'	622144.2	4861508.2	276.8
'Rec 4'	622618.2	4862113.7	299.7
'Rec 5'	622805.5	4862148.8	285.6

6,1

ALPHA FACTORS

0.66 0.66 0.66 0.66 0.66
0.66 0.66 0.66 0.66 0.66

Seg 10 622723. 4862177. 287. 0

ROADWAY 4 RDWY 4 Kirby Rd WB West of Dufferin

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	542.	60.
HT	14.	60.
MT	14.	60.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	620771.	4861582.	299.	0
Seg 2	620733.	4861570.	298.	0
Seg 3	620688.	4861558.	295.	0
Seg 4	620548.	4861522.	287.	0
Seg 5	620328.	4861448.	283.	0
Seg 6	620197.	4861405.	282.	0
Seg 7	620062.	4861361.	282.	0

ROADWAY 5 RDWY 5 Dufferin Street NB South of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	395.	60.
HT	10.	60.
MT	10.	60.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	620900.	4860864.	292.	0
Seg 2	620882.	4860958.	297.	1
Seg 3	620862.	4861060.	299.	1
Seg 4	620849.	4861120.	298.	0
Seg 5	620833.	4861228.	298.	0
Seg 6	620814.	4861337.	300.	1
Seg 7	620796.	4861465.	298.	0
Seg 8	620777.	4861581.	299.	0

ROADWAY 6 RDWY 6 Dufferin Street NB North of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	366.	70.
HT	10.	70.
MT	10.	70.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	620777.	4861581.	299.	0
Seg 2	620764.	4861657.	299.	0
Seg 3	620745.	4861747.	298.	0
Seg 4	620718.	4861876.	297.	0
Seg 5	620705.	4861938.	299.	1
Seg 6	620687.	4862033.	301.	1
Seg 7	620670.	4862119.	305.	1
Seg 8	620652.	4862212.	311.	1

ROADWAY 7 RDWY 7 Dufferin Street SB North of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	366.	70.
HT	10.	70.
MT	10.	70.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	620648.	4862212.	312.	0
Seg 2	620666.	4862119.	306.	0
Seg 3	620683.	4862033.	302.	0
Seg 4	620702.	4861939.	299.	0
Seg 5	620714.	4861877.	297.	0
Seg 6	620741.	4861748.	298.	1
Seg 7	620759.	4861657.	299.	0
Seg 8	620772.	4861579.	299.	0

ROADWAY 8 RDWY 8 Dufferin Street SB South of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	395.	60.
HT	10.	60.
MT	10.	60.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	620772.	4861579.	299.	0
Seg 2	620791.	4861464.	298.	0
Seg 3	620810.	4861336.	300.	0
Seg 4	620827.	4861227.	299.	0
Seg 5	620841.	4861118.	300.	0
Seg 6	620853.	4861057.	299.	0
Seg 7	620871.	4860956.	296.	0
Seg 8	620890.	4860859.	292.	0

ROADWAY 9 RDWY 9 Bathurst Street NB South of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	1288.	70.
HT	34.	70.
MT	34.	70.

-----COORDINATES-----				
	X	Y	Z	GRADE
Seg 1	622981.	4860943.	270.	0
Seg 2	622966.	4861008.	273.	1
Seg 3	622953.	4861071.	275.	1
Seg 4	622937.	4861155.	276.	1
Seg 5	622923.	4861219.	277.	1
Seg 6	622910.	4861276.	277.	1
Seg 7	622877.	4861432.	282.	1
Seg 8	622857.	4861520.	287.	1
Seg 9	622836.	4861620.	292.	1
Seg 10	622819.	4861702.	296.	1
Seg 12	622799.	4861795.	297.	1
Seg 13	622783.	4861871.	295.	0
Seg 14	622771.	4861941.	294.	0
Seg 15	622754.	4862025.	290.	0

ROADWAY	10	RDWY 10 Bathurst Street NB South of Kirby Rd (continued)	
	VEHICLE TYPE	VEHICLES/HOUR	SPEED
	CARS	1288.	70.
	HT	34.	70.
	MT	34.	70.

-----COORDINATES-----				
	X	Y	Z	GRADE
Seg 1	622754.	4862025.	290.	0
Seg 2	622741.	4862100.	287.	0
Seg 3	622729.	4862173.	287.	0

ROADWAY	11	RDWY 11 Bathurst Street NB North of Kirby Rd	
	VEHICLE TYPE	VEHICLES/HOUR	SPEED
	CARS	1005.	70.
	HT	26.	70.
	MT	26.	70.

-----COORDINATES-----				
	X	Y	Z	GRADE
Seg 1	622729.	4862173.	287.	0
Seg 2	622717.	4862225.	287.	0
Seg 3	622705.	4862284.	289.	1
Seg 4	622694.	4862340.	292.	1
Seg 5	622682.	4862400.	295.	1
Seg 6	622670.	4862463.	297.	1
Seg 7	622659.	4862531.	299.	1
Seg 8	622647.	4862594.	300.	1
Seg 9	622625.	4862695.	301.	1
Seg 10	622610.	4862776.	302.	1
Seg 12	622589.	4862880.	303.	1
Seg 13	622569.	4862983.	304.	1

ROADWAY	12	RDWY 12 Bathurst Street SB North of Kirby Rd	
	VEHICLE TYPE	VEHICLES/HOUR	SPEED
	CARS	1005.	70.
	HT	26.	70.
	MT	26.	70.

-----COORDINATES-----				
	X	Y	Z	GRADE
Seg 1	622559.	4862982.	304.	0
Seg 2	622583.	4862862.	303.	0
Seg 3	622600.	4862777.	302.	0
Seg 4	622614.	4862693.	301.	0
Seg 5	622634.	4862592.	301.	0
Seg 6	622646.	4862529.	299.	0
Seg 7	622660.	4862462.	297.	0
Seg 8	622674.	4862400.	294.	0
Seg 9	622685.	4862339.	292.	0
Seg 10	622695.	4862283.	289.	0
Seg 12	622706.	4862222.	287.	0
Seg 13	622716.	4862172.	287.	0

ROADWAY	13	RDWY 13 Bathurst Street SB South of Kirby Rd	
	VEHICLE TYPE	VEHICLES/HOUR	SPEED
	CARS	1288.	70.
	HT	34.	70.
	MT	34.	70.

-----COORDINATES-----				
	X	Y	Z	GRADE
Seg 1	622716.	4862173.	287.	0
Seg 2	622730.	4862098.	288.	1
Seg 3	622746.	4862025.	290.	1
Seg 4	622764.	4861939.	294.	1
Seg 5	622776.	4861870.	296.	1
Seg 6	622792.	4861794.	297.	1
Seg 7	622812.	4861701.	296.	0
Seg 8	622829.	4861621.	292.	0
Seg 9	622850.	4861519.	287.	0
Seg 10	622868.	4861432.	282.	0
Seg 12	622899.	4861278.	277.	0
Seg 13	622911.	4861217.	277.	0

Seg 14	622925.	4861153.	276.	0
Seg 15	622941.	4861070.	275.	0

ROADWAY 14 RDWY 14 Bathurst Street SB South of Kirby Rd (continued)

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	1288.	70.
HT	34.	70.
MT	34.	70.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	622941.	4861070.	275.	0
Seg 2	622952.	4861007.	273.	0
Seg 3	622965.	4860941.	270.	0

BARRIER 1 TYPE(A) Barrier 1 Barrier for Receptor 5

-----COORDINATES-----

	X	Y	Z	Z0	DELZ	P
Bar 1	622802.	4862154.	287.	284.	0.	0
Bar 2	622800.	4862162.	287.	285.		
Bar 3	622813.	4862166.	287.	284.		
Bar 4	622813.	4862121.	286.	284.		

BARRIER 2 TYPE(A) Barrier 2 Houses West of Receptor 5

-----COORDINATES-----

	X	Y	Z	Z0	DELZ	P
Bar 1	622802.	4862153.	293.	284.	0.	0
Bar 2	622791.	4862150.	293.	285.		
Bar 3	622801.	4862117.	293.	284.		
Bar 4	622813.	4862121.	293.	284.		

BARRIER 3 TYPE(A) Barrier 3 Houses East of Receptor 5

-----COORDINATES-----

	X	Y	Z	Z0	DELZ	P
Bar 1	622813.	4862157.	293.	284.	0.	0
Bar 2	622824.	4862124.	293.	284.		
Bar 3	622835.	4862128.	293.	284.		
Bar 4	622824.	4862160.	293.	284.		

BARRIER 4 TYPE(A) Barrier 4 House as Barrier for Receptor 4

-----COORDINATES-----

	X	Y	Z	Z0	DELZ	P
Bar 1	622624.	4862121.	303.	298.	0.	0
Bar 2	622627.	4862111.	303.	296.		
Bar 3	622621.	4862109.	303.	298.		
Bar 4	622618.	4862119.	303.	298.		

BARRIER 5 TYPE(A) Barrier 5 Retaining Wall near Receptor 4

-----COORDINATES-----

	X	Y	Z	Z0	DELZ	P
Bar 1	622597.	4862109.	299.	299.	0.	0
Bar 2	622592.	4862123.	299.	299.		
Bar 3	622601.	4862126.	299.	299.		
Bar 4	622608.	4862128.	299.	299.		
Bar 5	622617.	4862130.	298.	298.		
Bar 6	622623.	4862133.	297.	297.		
Bar 7	622628.	4862134.	296.	296.		
Bar 8	622634.	4862136.	295.	295.		
Bar 9	622638.	4862121.	294.	294.		
Bar 10	622640.	4862116.	294.	294.		

Receivers

-----COORDINATES-----

	X	Y	Z
Rec 1	620617.	4861430.	288.
Rec 2	620767.	4861982.	304.
Rec 3	622144.	4861508.	277.
Rec 4	622618.	4862114.	300.
Rec 5	622806.	4862149.	286.

ALPHA FACTORS - RECEIVER ACROSS, ROADWAY DOWN

1 *	.7	.7	.7	.7	.7
2 *	.7	.7	.7	.7	.7
3 *	.7	.7	.7	.7	.7
4 *	.7	.7	.7	.7	.7
5 *	.7	.7	.7	.7	.7
6 *	.7	.7	.7	.7	.7
7 *	.7	.7	.7	.7	.7
8 *	.7	.7	.7	.7	.7
9 *	.7	.7	.7	.7	.7
10 *	.7	.7	.7	.7	.7
11 *	.7	.7	.7	.7	.7
12 *	.7	.7	.7	.7	.7
13 *	.7	.7	.7	.7	.7
14 *	.7	.7	.7	.7	.7

SHIELDING FACTORS - RECEIVER ACROSS, ROADWAY DOWN

1 * .0 .0 .0 .0 .0
 2 * .0 .0 .0 .0 .0
 3 * .0 .0 .0 .0 .0
 4 * .0 .0 .0 .0 .0
 5 * .0 .0 .0 .0 .0
 6 * .0 .0 .0 .0 .0
 7 * .0 .0 .0 .0 .0
 8 * .0 .0 .0 .0 .0
 9 * .0 .0 .0 .0 .0
 10 * .0 .0 .0 .0 .0
 11 * .0 .0 .0 .0 .0
 12 * .0 .0 .0 .0 .0
 13 * .0 .0 .0 .0 .0
 14 * .0 .0 .0 .0 .0

RECEIVER LEQ(H) L10
 Rec 1 54.6 58.1
 ROADWAY SEGMENT SOUND LEVEL CONTRIBUTIONS EXCEEDING 40.0 DBA
 ROADWAY SEGMENT
 1 3 4 5 6
 45.1 47.7 42.9 41.5
 4 3 4
 47.1 44.8

RECEIVER LEQ(H) L10
 Rec 2 56.2 59.7
 ROADWAY SEGMENT SOUND LEVEL CONTRIBUTIONS EXCEEDING 40.0 DBA
 ROADWAY SEGMENT
 6 3 4 5 6 7
 42.6 46.1 50.4 45.2 40.8
 7 2 3 4 5
 43.7 49.7 45.8 42.6

RECEIVER LEQ(H) L10
 Rec 3 42.9 45.1
 NO ROADWAY SEGMENTS EXCEED 40.0 DBA

RECEIVER LEQ(H) L10
 Rec 4 49.0 51.5
 NO ROADWAY SEGMENTS EXCEED 40.0 DBA

RECEIVER LEQ(H) L10
 Rec 5 56.2 59.5
 ROADWAY SEGMENT SOUND LEVEL CONTRIBUTIONS EXCEEDING 40.0 DBA
 ROADWAY SEGMENT
 2 2 3 4
 47.2 49.0 45.3
 3 6 7 8
 44.8 47.3 46.2
 11 3
 42.3

*YYN

Kirby Rd EA, 2031 Traffic,16 hr day, Future Cond With Kirby Extension, April 18,2019

1,3

2,20

RDWY 1 Kirby Rd EB West of Dufferin

'CARS' 482 60
'MT' 60 60
'HT' 66 60

'L' /

'Seg 1' 620064.0 4861353.8 282.1 0
'Seg 2' 620200.7 4861399.1 281.9 0
'Seg 3' 620330.3 4861443.2 282.9 1
'Seg 4' 620550.8 4861519.5 286.8 1
'Seg 5' 620651.8 4861544.8 291.3 1
'Seg 6' 620691.1 4861553.6 294.0 1
'Seg 7' 620738.0 4861565.5 297.9 1
'Seg 8' 620771.7 4861573.1 299.1 1

'L' /

RDWY 2 Kirby Rd EB East of Dufferin

'CARS' 533 60
'MT' 67 60
'HT' 67 60

'L' /

'0+0' 620771.6 4861573.1 299.4 0
'0+50' 620824.6 4861586.9 299.9 1
'0+100' 620872.5 4861601.5 300.9 1
'0+150' 620921.1 4861617.2 301.9 1
'0+200' 620968.7 4861633.6 302.6 1
'0+250' 621015.2 4861648.5 302.8 1
'0+300' 621062.4 4861663.9 302.3 1
'0+350' 621110.9 4861678.7 301.1 0
'0+400' 621157.2 4861689.1 299.2 0
'0+450' 621208.4 4861691.6 297.0 0
'0+500' 621261.0 4861689.4 294.7 0
'0+550' 621309.0 4861688.9 292.5 0
'0+600' 621357.9 4861686.8 290.2 0
'0+650' 621407.0 4861687.4 288.0 0
'0+700' 621457.2 4861696.5 285.7 0

'L' /

RDWY 3 Kirby Rd EB East of Dufferin (Section 2)

'CARS' 533 60
'MT' 67 60
'HT' 67 60

'L' /

'0+700' 621457.2 4861696.5 285.7 0
'0+750' 621504.7 4861712.0 283.8 0
'0+800' 621552.7 4861728.3 282.6 0
'0+850' 621599.7 4861743.6 282.1 0
'0+900' 621647.5 4861760.5 283.3 1
'0+950' 621692.7 4861782.7 283.2 0
'1+000' 621734.1 4861810.5 284.1 1
'1+050' 621775.5 4861839.1 285.0 1
'1+100' 621816.9 4861867.4 286.0 1
'1+150' 621857.9 4861895.8 286.9 1
'1+200' 621901.0 4861920.5 287.1 1
'1+250' 621946.8 4861938.3 288.3 1
'1+300' 621994.6 4861953.1 289.0 1
'1+350' 622042.7 4861968.5 289.7 1
'1+400' 622090.1 4861982.9 290.3 1

'L' /

RDWY 4 Kirby Rd EB East of Dufferin (Section 3)

'CARS' 533 60
'MT' 67 60
'HT' 67 60

'L' /

'1+400' 622090.1 4861982.9 290.3 1
'1+450' 622138.0 4861997.6 291.0 1
'1+500' 622186.1 4862012.9 291.7 1
'1+550' 622233.0 4862027.4 292.4 1
'1+600' 622280.8 4862042.3 293.0 1
'1+650' 622331.1 4862057.8 294.0 1
'1+700' 622376.3 4862071.9 294.6 1
'1+750' 622424.4 4862087.1 295.0 1
'1+800' 622477.1 4862102.8 295.0 1
'1+850' 622521.0 4862114.8 294.3 0
'1+900' 622569.1 4862128.0 292.7 0
'1+950' 622616.9 4862141.9 290.8 0
'2+000' 622665.8 4862153.6 288.7 0
'2+050' 622724.5 4862165.5 287.0 0

'L' /

RDWY 5 Gamble Rd EB East of Bathurst St

'CARS' 513 60
'MT' 64 60
'HT' 64 60

'L' /

'Seg 1' 622723.8 4862165.5 287.0 0
'Seg 2' 622756.5 4862171.5 286.0 0

'Seg 3' 622794.9 4862178.8 284.8 0
'Seg 4' 622823.8 4862185.5 283.7 0
'Seg 5' 622862.6 4862197.0 282.1 0
'Seg 6' 622908.9 4862211.8 280.8 0
'Seg 7' 622955.8 4862226.7 280.8 0
'Seg 8' 623005.1 4862242.1 282.9 1
'Seg 9' 623076.7 4862265.5 287.0 1
'Seg 10' 623137.0 4862284.9 292.0 1

'L' /

RDWY 6 Gamble Rd WB East of Bathurst St

'CARS' 513 60
'MT' 64 60
'HT' 64 60

'L' /

'Seg 1' 623131.3 4862293.6 291.4 0
'Seg 2' 623073.2 4862272.0 287.1 0
'Seg 3' 623001.4 4862247.5 283.1 0
'Seg 4' 622952.4 4862232.5 281.2 0
'Seg 5' 622907.0 4862218.7 281.0 0
'Seg 6' 622857.9 4862205.1 282.3 0
'Seg 7' 622825.5 4862196.7 283.5 0
'Seg 8' 622791.1 4862189.0 284.8 1
'Seg 9' 622753.8 4862183.1 286.0 1
'Seg 10' 622722.7 4862177.2 287.0 0

'L' /

RDWY 7 Kirby Rd WB West of Bathurst St

'CARS' 533 60
'MT' 67 60
'HT' 67 60

'L' /

'2+050' 622722.8 4862177.2 287.5 0
'2+000' 622662.2 4862165.1 288.7 1
'1+950' 622612.8 4862153.4 290.3 1
'1+900' 622567.7 4862138.9 292.7 1
'1+850' 622517.8 4862122.7 294.3 1
'1+800' 622471.0 4862107.9 294.7 1
'1+750' 622422.2 4862092.6 295.0 1
'1+700' 622373.9 4862078.4 294.4 0
'1+650' 622328.3 4862064.5 294.0 0
'1+600' 622278.7 4862048.5 293.0 0
'1+550' 622230.9 4862033.9 292.4 0
'1+500' 622183.9 4862019.2 291.7 0
'1+450' 622135.6 4862004.2 291.0 0
'1+400' 622090.5 4861989.5 290.3 0
'1+350' 622043.4 4861975.1 289.7 1

'L' /

RDWY 8 Kirby Rd WB West of Bathurst St (Section 2)

'CARS' 533 60
'MT' 67 60
'HT' 67 60

'L' /

'1+350' 622043.4 4861975.1 289.7 1
'1+300' 621995.3 4861959.7 289.0 1
'1+250' 621947.0 4861945.6 288.3 0
'1+200' 621901.5 4861929.5 287.1 0
'1+150' 621856.8 4861903.0 286.8 0
'1+100' 621814.5 4861875.2 286.0 0
'1+050' 621770.5 4861845.7 285.0 0
'1+000' 621729.1 4861816.3 284.1 0
'0+950' 621688.8 4861789.3 283.2 0
'0+900' 621647.5 4861767.7 282.0 0
'0+850' 621598.5 4861752.0 282.1 0
'0+800' 621551.6 4861735.5 282.6 0
'0+750' 621503.1 4861719.3 283.8 1
'0+700' 621454.3 4861702.9 285.7 1
'0+650' 621404.8 4861694.4 288.0 1

'L' /

RDWY 9 Kirby Rd WB West of Bathurst St (Section 3)

'CARS' 533 60
'MT' 67 60
'HT' 67 60

'L' /

'0+650' 621404.8 4861694.4 288.0 1
'0+600' 621355.9 4861694.8 290.2 1
'0+550' 621307.4 4861695.7 292.5 1
'0+500' 621255.2 4861697.5 294.7 1
'0+450' 621205.4 4861699.5 296.9 1
'0+400' 621155.0 4861696.7 299.1 1
'0+350' 621104.9 4861685.2 301.1 1
'0+300' 621056.5 4861670.8 302.8 1
'0+250' 621008.7 4861656.2 302.8 0
'0+200' 620961.9 4861641.7 302.7 0
'0+150' 620914.1 4861627.7 301.9 0
'0+100' 620866.3 4861612.1 300.9 0
'0+050' 620808.2 4861594.7 299.9 0
'0+000' 620770.8 4861582.4 299.4 0

'L' /

RDWY 10 Kirby Rd WB West of Dufferin
'CARS' 482 60
'MT' 60 60
'HT' 60 60
'L' /
'Seg 1' 620771.0 4861582.2 299.1 0
'Seg 2' 620733.3 4861569.7 297.6 0
'Seg 3' 620687.6 4861557.5 294.8 0
'Seg 4' 620547.5 4861521.9 286.8 0
'Seg 5' 620327.7 4861447.8 283.0 0
'Seg 6' 620197.3 4861405.1 281.6 0
'Seg 7' 620061.9 4861360.6 282.2 0
'L' /

RDWY 11 Dufferin Street NB South of Kirby Rd
'CARS' 302 60
'MT' 8 60
'HT' 8 60
'L' /
'Seg 1' 620899.7 4860864.1 291.7 0
'Seg 2' 620882.1 4860958.0 296.5 1
'Seg 3' 620861.8 4861060.4 299.1 1
'Seg 4' 620849.0 4861120.2 298.4 0
'Seg 5' 620832.5 4861228.4 297.8 0
'Seg 6' 620813.8 4861337.2 300.3 1
'Seg 7' 620795.7 4861465.3 298.0 0
'Seg 8' 620777.3 4861580.9 299.4 0
'L' /

RDWY 12 Dufferin Street NB North of Kirby Rd
'CARS' 281 70
'MT' 7 70
'HT' 7 70
'L' /
'Seg 1' 620777.4 4861581.0 299.4 0
'Seg 2' 620763.6 4861657.0 299.1 0
'Seg 3' 620744.8 4861747.4 297.5 0
'Seg 4' 620718.3 4861876.0 297.0 0
'Seg 5' 620705.2 4861938.3 299.0 1
'Seg 6' 620686.8 4862033.1 301.3 1
'Seg 7' 620670.1 4862119.3 305.1 1
'Seg 8' 620651.8 4862212.2 311.3 1
'L' /

RDWY 13 Dufferin Street SB North of Kirby Rd
'CARS' 281 70
'MT' 7 70
'HT' 7 70
'L' /
'Seg 1' 620647.7 4862212.0 312.1 0
'Seg 2' 620666.0 4862118.7 306.0 0
'Seg 3' 620683.1 4862033.1 302.0 0
'Seg 4' 620701.5 4861938.9 299.0 0
'Seg 5' 620713.9 4861877.0 297.0 0
'Seg 6' 620741.0 4861748.3 297.8 1
'Seg 7' 620758.6 4861657.0 299.0 0
'Seg 8' 620772.0 4861579.3 299.2 0
'L' /

RDWY 14 Dufferin Street SB South of Kirby Rd
'CARS' 302 60
'MT' 8 60
'HT' 8 60
'L' /
'Seg 1' 620771.9 4861579.3 299.2 0
'Seg 2' 620790.5 4861463.8 298.0 0
'Seg 3' 620810.4 4861335.5 300.4 0
'Seg 4' 620826.9 4861227.1 298.6 0
'Seg 5' 620840.9 4861118.3 299.6 0
'Seg 6' 620852.8 4861056.5 299.3 0
'Seg 7' 620871.4 4860956.2 296.2 0
'Seg 8' 620890.0 4860858.8 291.7 0
'L' /

RDWY 15 Bathurst Street NB South of Kirby Rd
'CARS' 927 70
'MT' 24 70
'HT' 24 70
'L' /
'Seg 1' 622980.6 4860942.6 269.9 0
'Seg 2' 622966.2 4861007.8 272.8 1
'Seg 3' 622953.1 4861070.9 274.8 1
'Seg 4' 622936.7 4861154.7 276.2 1
'Seg 5' 622923.2 4861218.7 277.0 1
'Seg 6' 622910.3 4861276.2 277.0 1
'Seg 7' 622877.3 4861432.2 281.9 1
'Seg 8' 622857.0 4861519.5 286.7 1
'Seg 9' 622836.1 4861620.3 292.0 1
'Seg 10' 622818.6 4861702.4 295.6 1
'Seg 12' 622799.3 4861794.9 297.0 1
'Seg 13' 622783.3 4861871.3 295.4 0
'Seg 14' 622770.9 4861941.3 293.6 0

'Seg 15'	622753.7	4862025.2	289.8	0
'L' /				
RDWY 16 Bathurst Street NB South of Kirby Rd (continued)				
'CARS'	927	70		
'MT'	24	70		
'HT'	24	70		
'L' /				
'Seg 1'	622753.7	4862025.2	289.8	0
'Seg 2'	622741.1	4862099.7	287.2	0
'Seg 3'	622728.5	4862173.1	286.8	0
'L' /				
RDWY 17 Bathurst Street NB North of Kirby Rd				
'CARS'	911	70		
'MT'	24	70		
'HT'	24	70		
'L' /				
'Seg 1'	622728.6	4862172.8	286.8	0
'Seg 2'	622717.1	4862225.4	286.8	0
'Seg 3'	622705.1	4862284.0	289.0	1
'Seg 4'	622694.1	4862339.6	292.1	1
'Seg 5'	622681.8	4862400.4	294.5	1
'Seg 6'	622669.7	4862463.3	297.3	1
'Seg 7'	622659.1	4862530.5	299.0	1
'Seg 8'	622646.8	4862594.3	300.2	1
'Seg 9'	622624.9	4862694.5	301.2	1
'Seg 10'	622609.8	4862776.1	302.0	1
'Seg 12'	622588.9	4862879.8	303.0	1
'Seg 13'	622569.1	4862983.2	304.0	1
'L' /				
RDWY 18 Bathurst Street SB North of Kirby Rd				
'CARS'	911	70		
'MT'	24	70		
'HT'	24	70		
'L' /				
'Seg 1'	622559.0	4862982.2	304.1	0
'Seg 2'	622583.0	4862862.2	303.0	0
'Seg 3'	622599.6	4862777.1	302.0	0
'Seg 4'	622614.4	4862693.1	301.4	0
'Seg 5'	622634.3	4862592.0	300.5	0
'Seg 6'	622646.4	4862529.3	299.1	0
'Seg 7'	622660.4	4862462.2	297.0	0
'Seg 8'	622674.4	4862400.1	294.3	0
'Seg 9'	622685.1	4862339.4	291.9	0
'Seg 10'	622694.7	4862283.3	289.2	0
'Seg 12'	622706.3	4862222.4	287.4	0
'Seg 13'	622715.7	4862172.1	287.0	0
'L' /				
RDWY 19 Bathurst Street SB South of Kirby Rd				
'CARS'	911	70		
'MT'	24	70		
'HT'	24	70		
'L' /				
'Seg 1'	622715.5	4862172.5	287.0	0
'Seg 2'	622730.0	4862097.8	287.5	1
'Seg 3'	622745.5	4862025.2	290.1	1
'Seg 4'	622763.6	4861939.4	294.0	1
'Seg 5'	622775.9	4861870.0	295.5	1
'Seg 6'	622791.7	4861794.4	296.6	1
'Seg 7'	622811.9	4861701.0	295.6	0
'Seg 8'	622828.7	4861620.8	292.3	0
'Seg 9'	622849.5	4861519.1	286.8	0
'Seg 10'	622868.2	4861432.3	282.0	0
'Seg 12'	622898.6	4861277.8	277.1	0
'Seg 13'	622911.2	4861216.9	277.3	0
'Seg 14'	622925.0	4861152.6	276.4	0
'Seg 15'	622941.0	4861070.0	274.9	0
'L' /				
RDWY 20 Bathurst Street SB South of Kirby Rd (continued)				
'CARS'	911	70		
'MT'	24	70		
'HT'	24	70		
'L' /				
'Seg 1'	622941.0	4861070.0	274.9	0
'Seg 2'	622952.1	4861006.5	272.7	0
'Seg 3'	622964.8	4860941.3	269.7	0
'L' /				
3,5				
Barrier 1 Barrier for Receptor 5				
'Bar 1'	622802.3	4862153.5	286.8	284.3 0.0 0
'Bar 2'	622799.8	4862161.9	287.1	284.6
'Bar 3'	622812.5	4862165.7	286.6	284.1
'Bar 4'	622813.0	4862120.6	286.4	283.8
'A' /				
Barrier 2 Houses West of Receptor 5				
'Bar 1'	622802.1	4862153.1	293.4	284.4 0.0 0
'Bar 2'	622790.6	4862149.9	293.4	284.8
'Bar 3'	622801.4	4862116.7	293.4	283.9

Seg 8 620772. 4861573. 299. 1

ROADWAY 2 RDWY 2 Kirby Rd EB East of Dufferin

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	533.	60.
HT	67.	60.
MT	67.	60.

-----COORDINATES-----

	X	Y	Z	GRADE
0+0	620772.	4861573.	299.	0
0+50	620825.	4861587.	300.	1
0+100	620873.	4861602.	301.	1
0+150	620921.	4861617.	302.	1
0+200	620969.	4861634.	303.	1
0+250	621015.	4861649.	303.	1
0+300	621062.	4861664.	302.	1
0+350	621111.	4861679.	301.	0
0+400	621157.	4861689.	299.	0
0+450	621208.	4861692.	297.	0
0+500	621261.	4861689.	295.	0
0+550	621309.	4861689.	293.	0
0+600	621358.	4861687.	290.	0
0+650	621407.	4861687.	288.	0
0+700	621457.	4861697.	286.	0

ROADWAY 3 RDWY 3 Kirby Rd EB East of Dufferin (Section 2)

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	533.	60.
HT	67.	60.
MT	67.	60.

-----COORDINATES-----

	X	Y	Z	GRADE
0+700	621457.	4861697.	286.	0
0+750	621505.	4861712.	284.	0
0+800	621553.	4861728.	283.	0
0+850	621600.	4861744.	282.	0
0+900	621648.	4861761.	283.	1
0+950	621693.	4861783.	283.	0
1+000	621734.	4861811.	284.	1
1+050	621776.	4861839.	285.	1
1+100	621817.	4861867.	286.	1
1+150	621858.	4861896.	287.	1
1+200	621901.	4861921.	287.	1
1+250	621947.	4861938.	288.	1
1+300	621995.	4861953.	289.	1
1+350	622043.	4861969.	290.	1
1+400	622090.	4861983.	290.	1

ROADWAY 4 RDWY 4 Kirby Rd EB East of Dufferin (Section 3)

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	533.	60.
HT	67.	60.
MT	67.	60.

-----COORDINATES-----

	X	Y	Z	GRADE
1+400	622090.	4861983.	290.	1
1+450	622138.	4861998.	291.	1
1+500	622186.	4862013.	292.	1
1+550	622233.	4862027.	292.	1
1+600	622281.	4862042.	293.	1
1+650	622331.	4862058.	294.	1
1+700	622376.	4862072.	295.	1
1+750	622424.	4862087.	295.	1
1+800	622477.	4862103.	295.	1
1+850	622521.	4862115.	294.	0
1+900	622569.	4862128.	293.	0
1+950	622617.	4862142.	291.	0
2+000	622666.	4862154.	289.	0
2+050	622725.	4862166.	287.	0

ROADWAY 5 RDWY 5 Gamble Rd EB East of Bathurst St

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	513.	60.
HT	64.	60.
MT	64.	60.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	622724.	4862166.	287.	0
Seg 2	622757.	4862172.	286.	0
Seg 3	622795.	4862179.	285.	0
Seg 4	622824.	4862186.	284.	0
Seg 5	622863.	4862197.	282.	0
Seg 6	622909.	4862212.	281.	0
Seg 7	622956.	4862227.	281.	0
Seg 8	623005.	4862242.	283.	1

Seg 9	623077.	4862266.	287.	1
Seg 10	623137.	4862285.	292.	1

ROADWAY	6	RDWY 6 Gamble Rd WB East of Bathurst St
		VEHICLE TYPE VEHICLES/HOUR SPEED
		CARS 513. 60.
		HT 64. 60.
		MT 64. 60.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	623131.	4862294.	291.	0
Seg 2	623073.	4862272.	287.	0
Seg 3	623001.	4862248.	283.	0
Seg 4	622952.	4862233.	281.	0
Seg 5	622907.	4862219.	281.	0
Seg 6	622858.	4862205.	282.	0
Seg 7	622826.	4862197.	284.	0
Seg 8	622791.	4862189.	285.	1
Seg 9	622754.	4862183.	286.	1
Seg 10	622723.	4862177.	287.	0

ROADWAY	7	RDWY 7 Kirby Rd WB West of Bathurst St
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	VEHICLE TYPE	VEHICLES/HOUR	SPEED
	CARS	533.	60.
	HT	67.	60.
	MT	67.	60.

-----COORDINATES-----

	X	Y	Z	GRADE
2+050	622723.	4862177.	288.	0
2+000	622662.	4862165.	289.	1
1+950	622613.	4862153.	290.	1
1+900	622568.	4862139.	293.	1
1+850	622518.	4862123.	294.	1
1+800	622471.	4862108.	295.	1
1+750	622422.	4862093.	295.	1
1+700	622374.	4862078.	294.	0
1+650	622328.	4862065.	294.	0
1+600	622279.	4862049.	293.	0
1+550	622231.	4862034.	292.	0
1+500	622184.	4862019.	292.	0
1+450	622136.	4862004.	291.	0
1+400	622091.	4861990.	290.	0
1+350	622043.	4861975.	290.	1

ROADWAY	8	RDWY 8 Kirby Rd WB West of Bathurst St (Section 2)
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	VEHICLE TYPE	VEHICLES/HOUR	SPEED
	CARS	533.	60.
	HT	67.	60.
	MT	67.	60.

-----COORDINATES-----

	X	Y	Z	GRADE
1+350	622043.	4861975.	290.	1
1+300	621995.	4861960.	289.	1
1+250	621947.	4861946.	288.	0
1+200	621902.	4861930.	287.	0
1+150	621857.	4861903.	287.	0
1+100	621815.	4861875.	286.	0
1+050	621771.	4861846.	285.	0
1+000	621729.	4861816.	284.	0
0+950	621689.	4861789.	283.	0
0+900	621648.	4861768.	282.	0
0+850	621599.	4861752.	282.	0
0+800	621552.	4861736.	283.	0
0+750	621503.	4861719.	284.	1
0+700	621454.	4861703.	286.	1
0+650	621405.	4861694.	288.	1

ROADWAY	9	RDWY 9 Kirby Rd WB West of Bathurst St (Section 3)
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	VEHICLE TYPE	VEHICLES/HOUR	SPEED
	CARS	533.	60.
	HT	67.	60.
	MT	67.	60.

-----COORDINATES-----

	X	Y	Z	GRADE
0+650	621405.	4861694.	288.	1
0+600	621356.	4861695.	290.	1
0+550	621307.	4861696.	293.	1
0+500	621255.	4861698.	295.	1
0+450	621205.	4861700.	297.	1
0+400	621155.	4861697.	299.	1
0+350	621105.	4861685.	301.	1
0+300	621057.	4861671.	303.	1
0+250	621009.	4861656.	303.	0
0+200	620962.	4861642.	303.	0
0+150	620914.	4861628.	302.	0
0+100	620866.	4861612.	301.	0
0+050	620808.	4861595.	300.	0

0+000 620771. 4861582. 299. 0

ROADWAY 10 RDWY 10 Kirby Rd WB West of Dufferin

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	482.	60.
HT	60.	60.
MT	60.	60.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	620771.	4861582.	299.	0
Seg 2	620733.	4861570.	298.	0
Seg 3	620688.	4861558.	295.	0
Seg 4	620548.	4861522.	287.	0
Seg 5	620328.	4861448.	283.	0
Seg 6	620197.	4861405.	282.	0
Seg 7	620062.	4861361.	282.	0

ROADWAY 11 RDWY 11 Dufferin Street NB South of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	302.	60.
HT	8.	60.
MT	8.	60.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	620900.	4860864.	292.	0
Seg 2	620882.	4860958.	297.	1
Seg 3	620862.	4861060.	299.	1
Seg 4	620849.	4861120.	298.	0
Seg 5	620833.	4861228.	298.	0
Seg 6	620814.	4861337.	300.	1
Seg 7	620796.	4861465.	298.	0
Seg 8	620777.	4861581.	299.	0

ROADWAY 12 RDWY 12 Dufferin Street NB North of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	281.	70.
HT	7.	70.
MT	7.	70.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	620777.	4861581.	299.	0
Seg 2	620764.	4861657.	299.	0
Seg 3	620745.	4861747.	298.	0
Seg 4	620718.	4861876.	297.	0
Seg 5	620705.	4861938.	299.	1
Seg 6	620687.	4862033.	301.	1
Seg 7	620670.	4862119.	305.	1
Seg 8	620652.	4862212.	311.	1

ROADWAY 13 RDWY 13 Dufferin Street SB North of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	281.	70.
HT	7.	70.
MT	7.	70.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	620648.	4862212.	312.	0
Seg 2	620666.	4862119.	306.	0
Seg 3	620683.	4862033.	302.	0
Seg 4	620702.	4861939.	299.	0
Seg 5	620714.	4861877.	297.	0
Seg 6	620741.	4861748.	298.	1
Seg 7	620759.	4861657.	299.	0
Seg 8	620772.	4861579.	299.	0

ROADWAY 14 RDWY 14 Dufferin Street SB South of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	302.	60.
HT	8.	60.
MT	8.	60.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	620772.	4861579.	299.	0
Seg 2	620791.	4861464.	298.	0
Seg 3	620810.	4861336.	300.	0
Seg 4	620827.	4861227.	299.	0
Seg 5	620841.	4861118.	300.	0
Seg 6	620853.	4861057.	299.	0
Seg 7	620871.	4860956.	296.	0
Seg 8	620890.	4860859.	292.	0

ROADWAY 15 RDWY 15 Bathurst Street NB South of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	927.	70.
HT	24.	70.
MT	24.	70.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	622981.	4860943.	270.	0
Seg 2	622966.	4861008.	273.	1
Seg 3	622953.	4861071.	275.	1
Seg 4	622937.	4861155.	276.	1
Seg 5	622923.	4861219.	277.	1
Seg 6	622910.	4861276.	277.	1
Seg 7	622877.	4861432.	282.	1
Seg 8	622857.	4861520.	287.	1
Seg 9	622836.	4861620.	292.	1
Seg 10	622819.	4861702.	296.	1
Seg 12	622799.	4861795.	297.	1
Seg 13	622783.	4861871.	295.	0
Seg 14	622771.	4861941.	294.	0
Seg 15	622754.	4862025.	290.	0

ROADWAY 16 RDWY 16 Bathurst Street NB South of Kirby Rd (continued)

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	927.	70.
HT	24.	70.
MT	24.	70.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	622754.	4862025.	290.	0
Seg 2	622741.	4862100.	287.	0
Seg 3	622729.	4862173.	287.	0

ROADWAY 17 RDWY 17 Bathurst Street NB North of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	911.	70.
HT	24.	70.
MT	24.	70.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	622729.	4862173.	287.	0
Seg 2	622717.	4862225.	287.	0
Seg 3	622705.	4862284.	289.	1
Seg 4	622694.	4862340.	292.	1
Seg 5	622682.	4862400.	295.	1
Seg 6	622670.	4862463.	297.	1
Seg 7	622659.	4862531.	299.	1
Seg 8	622647.	4862594.	300.	1
Seg 9	622625.	4862695.	301.	1
Seg 10	622610.	4862776.	302.	1
Seg 12	622589.	4862880.	303.	1
Seg 13	622569.	4862983.	304.	1

ROADWAY 18 RDWY 18 Bathurst Street SB North of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	911.	70.
HT	24.	70.
MT	24.	70.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	622559.	4862982.	304.	0
Seg 2	622583.	4862862.	303.	0
Seg 3	622600.	4862777.	302.	0
Seg 4	622614.	4862693.	301.	0
Seg 5	622634.	4862592.	301.	0
Seg 6	622646.	4862529.	299.	0
Seg 7	622660.	4862462.	297.	0
Seg 8	622674.	4862400.	294.	0
Seg 9	622685.	4862339.	292.	0
Seg 10	622695.	4862283.	289.	0
Seg 12	622706.	4862222.	287.	0
Seg 13	622716.	4862172.	287.	0

ROADWAY 19 RDWY 19 Bathurst Street SB South of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	911.	70.
HT	24.	70.
MT	24.	70.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	622716.	4862173.	287.	0
Seg 2	622730.	4862098.	288.	1
Seg 3	622746.	4862025.	290.	1
Seg 4	622764.	4861939.	294.	1
Seg 5	622776.	4861870.	296.	1
Seg 6	622792.	4861794.	297.	1
Seg 7	622812.	4861701.	296.	0
Seg 8	622829.	4861621.	292.	0
Seg 9	622850.	4861519.	287.	0
Seg 10	622868.	4861432.	282.	0
Seg 12	622899.	4861278.	277.	0
Seg 13	622911.	4861217.	277.	0
Seg 14	622925.	4861153.	276.	0

Seg 15 622941. 4861070. 275. 0

ROADWAY 20 RDWY 20 Bathurst Street SB South of Kirby Rd (continued)

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	911.	70.
HT	24.	70.
MT	24.	70.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	622941.	4861070.	275.	0
Seg 2	622952.	4861007.	273.	0
Seg 3	622965.	4860941.	270.	0

BARRIER 1 TYPE(A) Barrier 1 Barrier for Receptor 5

-----COORDINATES-----

	X	Y	Z	Z0	DELZ	P
Bar 1	622802.	4862154.	287.	284.	0.	0
Bar 2	622800.	4862162.	287.	285.		
Bar 3	622813.	4862166.	287.	284.		
Bar 4	622813.	4862121.	286.	284.		

BARRIER 2 TYPE(A) Barrier 2 Houses West of Receptor 5

-----COORDINATES-----

	X	Y	Z	Z0	DELZ	P
Bar 1	622802.	4862153.	293.	284.	0.	0
Bar 2	622791.	4862150.	293.	285.		
Bar 3	622801.	4862117.	293.	284.		
Bar 4	622813.	4862121.	293.	284.		

BARRIER 3 TYPE(A) Barrier 3 Houses East of Receptor 5

-----COORDINATES-----

	X	Y	Z	Z0	DELZ	P
Bar 1	622813.	4862157.	293.	284.	0.	0
Bar 2	622824.	4862124.	293.	284.		
Bar 3	622835.	4862128.	293.	284.		
Bar 4	622824.	4862160.	293.	284.		

BARRIER 4 TYPE(A) Barrier 4 House as Barrier for Receptor 4

-----COORDINATES-----

	X	Y	Z	Z0	DELZ	P
Bar 1	622624.	4862121.	303.	298.	0.	0
Bar 2	622627.	4862111.	303.	296.		
Bar 3	622621.	4862109.	303.	298.		
Bar 4	622618.	4862119.	303.	298.		

BARRIER 5 TYPE(A) Barrier 5 Retaining Wall near Receptor 4

-----COORDINATES-----

	X	Y	Z	Z0	DELZ	P
Bar 1	622597.	4862109.	299.	299.	0.	0
Bar 2	622592.	4862123.	299.	299.		
Bar 3	622601.	4862126.	299.	299.		
Bar 4	622608.	4862128.	299.	299.		
Bar 5	622617.	4862130.	298.	298.		
Bar 6	622623.	4862133.	297.	297.		
Bar 7	622628.	4862134.	296.	296.		
Bar 8	622634.	4862136.	295.	295.		
Bar 9	622638.	4862121.	294.	294.		
Bar 10	622640.	4862116.	294.	294.		

Receivers

-----COORDINATES-----

	X	Y	Z
Rec 1	620617.	4861430.	288.
Rec 2	620767.	4861982.	304.
Rec 3	622144.	4861508.	277.
Rec 4	622618.	4862114.	300.
Rec 5	622806.	4862149.	286.

ALPHA FACTORS - RECEIVER ACROSS,ROADWAY DOWN

1 *	.7	.7	.7	.7	.7
2 *	.7	.7	.7	.7	.7
3 *	.7	.7	.7	.7	.7
4 *	.7	.7	.7	.7	.7
5 *	.7	.7	.7	.7	.7
6 *	.7	.7	.7	.7	.7
7 *	.7	.7	.7	.7	.7
8 *	.7	.7	.7	.7	.7
9 *	.7	.7	.7	.7	.7
10 *	.7	.7	.7	.7	.7
11 *	.7	.7	.7	.7	.7
12 *	.7	.7	.7	.7	.7
13 *	.7	.7	.7	.7	.7
14 *	.7	.7	.7	.7	.7
15 *	.7	.7	.7	.7	.7
16 *	.7	.7	.7	.7	.7
17 *	.7	.7	.7	.7	.7
18 *	.7	.7	.7	.7	.7

19 * .7 .7 .7 .7 .7
 20 * .7 .7 .7 .7 .7

SHIELDING FACTORS - RECEIVER ACROSS, ROADWAY DOWN

1 * .0 .0 .0 .0 .0
 2 * .0 .0 .0 .0 .0
 3 * .0 .0 .0 .0 .0
 4 * .0 .0 .0 .0 .0
 5 * .0 .0 .0 .0 .0
 6 * .0 .0 .0 .0 .0
 7 * .0 .0 .0 .0 .0
 8 * .0 .0 .0 .0 .0
 9 * .0 .0 .0 .0 .0
 10 * .0 .0 .0 .0 .0
 11 * .0 .0 .0 .0 .0
 12 * .0 .0 .0 .0 .0
 13 * .0 .0 .0 .0 .0
 14 * .0 .0 .0 .0 .0
 15 * .0 .0 .0 .0 .0
 16 * .0 .0 .0 .0 .0
 17 * .0 .0 .0 .0 .0
 18 * .0 .0 .0 .0 .0
 19 * .0 .0 .0 .0 .0
 20 * .0 .0 .0 .0 .0

RECEIVER LEQ(H) L10
 Rec 1 59.3 62.6

ROADWAY SEGMENT SOUND LEVEL CONTRIBUTIONS EXCEEDING 40.0 DBA

ROADWAY SEGMENT
 1 3 4 5 6 7
 50.1 53.3 48.8 47.5 40.7
 10 2 3 4
 42.9 51.8 49.5

RECEIVER LEQ(H) L10
 Rec 2 55.6 59.2

ROADWAY SEGMENT SOUND LEVEL CONTRIBUTIONS EXCEEDING 40.0 DBA

ROADWAY SEGMENT
 12 3 4 5 6
 41.2 44.8 49.0 43.7
 13 2 3 4 5
 42.3 48.3 44.5 41.2

RECEIVER LEQ(H) L10
 Rec 3 47.9 49.7

NO ROADWAY SEGMENTS EXCEED 40.0 DBA

RECEIVER LEQ(H) L10
 Rec 4 59.6 63.2

ROADWAY SEGMENT SOUND LEVEL CONTRIBUTIONS EXCEEDING 40.0 DBA

ROADWAY SEGMENT
 4 7 8 9 10 11 12
 40.2 43.8 47.1 50.1 49.5 43.3
 7 2 3 4 5 6 7
 46.1 54.1 50.9 47.0 43.2 40.1

RECEIVER LEQ(H) L10
 Rec 5 60.3 63.8

ROADWAY SEGMENT SOUND LEVEL CONTRIBUTIONS EXCEEDING 40.0 DBA

ROADWAY SEGMENT
 5 2 3 4
 52.0 54.3 50.4
 6 6 7 8
 49.8 52.4 51.2
 17 3
 41.9

*YYN

Kirby Rd EA, 2031 Traffic,16 hr day, Future Cond With Kirby Extension, April 18,2019

1,3

2,20

RDWY 1 Kirby Rd EB West of Dufferin

'CARS' 482 60
'MT' 60 60
'HT' 66 60

'L' /

'Seg 1' 620064.0 4861353.8 282.1 0
'Seg 2' 620200.7 4861399.1 281.9 0
'Seg 3' 620330.3 4861443.2 282.9 1
'Seg 4' 620550.8 4861519.5 286.8 1
'Seg 5' 620651.8 4861544.8 291.3 1
'Seg 6' 620691.1 4861553.6 294.0 1
'Seg 7' 620738.0 4861565.5 297.9 1
'Seg 8' 620771.7 4861573.1 299.1 1

'L' /

RDWY 2 Kirby Rd EB East of Dufferin

'CARS' 533 60
'MT' 67 60
'HT' 67 60

'L' /

'0+0' 620771.6 4861573.1 299.4 0
'0+50' 620824.6 4861586.9 299.9 1
'0+100' 620872.5 4861601.5 300.9 1
'0+150' 620921.1 4861617.2 301.9 1
'0+200' 620968.7 4861633.6 302.6 1
'0+250' 621015.2 4861648.5 302.8 1
'0+300' 621062.4 4861663.9 302.3 1
'0+350' 621110.9 4861678.7 301.1 0
'0+400' 621157.2 4861689.1 299.2 0
'0+450' 621208.4 4861691.6 297.0 0
'0+500' 621261.0 4861689.4 294.7 0
'0+550' 621309.0 4861688.9 292.5 0
'0+600' 621357.9 4861686.8 290.2 0
'0+650' 621407.0 4861687.4 288.0 0
'0+700' 621457.2 4861696.5 285.7 0

'L' /

RDWY 3 Kirby Rd EB East of Dufferin (Section 2)

'CARS' 533 60
'MT' 67 60
'HT' 67 60

'L' /

'0+700' 621457.2 4861696.5 285.7 0
'0+750' 621504.7 4861712.0 283.8 0
'0+800' 621552.7 4861728.3 282.6 0
'0+850' 621599.7 4861743.6 282.1 0
'0+900' 621647.5 4861760.5 283.3 1
'0+950' 621692.7 4861782.7 283.2 0
'1+000' 621734.1 4861810.5 284.1 1
'1+050' 621775.5 4861839.1 285.0 1
'1+100' 621816.9 4861867.4 286.0 1
'1+150' 621857.9 4861895.8 286.9 1
'1+200' 621901.0 4861920.5 287.1 1
'1+250' 621946.8 4861938.3 288.3 1
'1+300' 621994.6 4861953.1 289.0 1
'1+350' 622042.7 4861968.5 289.7 1
'1+400' 622090.1 4861982.9 290.3 1

'L' /

RDWY 4 Kirby Rd EB East of Dufferin (Section 3)

'CARS' 533 60
'MT' 67 60
'HT' 67 60

'L' /

'1+400' 622090.1 4861982.9 290.3 1
'1+450' 622138.0 4861997.6 291.0 1
'1+500' 622186.1 4862012.9 291.7 1
'1+550' 622233.0 4862027.4 292.4 1
'1+600' 622280.8 4862042.3 293.0 1
'1+650' 622331.1 4862057.8 294.0 1
'1+700' 622376.3 4862071.9 294.6 1
'1+750' 622424.4 4862087.1 295.0 1
'1+800' 622477.1 4862102.8 295.0 1
'1+850' 622521.0 4862114.8 294.3 0
'1+900' 622569.1 4862128.0 292.7 0
'1+950' 622616.9 4862141.9 290.8 0
'2+000' 622665.8 4862153.6 288.7 0
'2+050' 622724.5 4862165.5 287.0 0

'L' /

RDWY 5 Gamble Rd EB East of Bathurst St

'CARS' 513 60
'MT' 64 60
'HT' 64 60

'L' /

'Seg 1' 622723.8 4862165.5 287.0 0
'Seg 2' 622756.5 4862171.5 286.0 0

'Seg 3' 622794.9 4862178.8 284.8 0
'Seg 4' 622823.8 4862185.5 283.7 0
'Seg 5' 622862.6 4862197.0 282.1 0
'Seg 6' 622908.9 4862211.8 280.8 0
'Seg 7' 622955.8 4862226.7 280.8 0
'Seg 8' 623005.1 4862242.1 282.9 1
'Seg 9' 623076.7 4862265.5 287.0 1
'Seg 10' 623137.0 4862284.9 292.0 1

'L' /

RDWY 6 Gamble Rd WB East of Bathurst St

'CARS' 513 60
'MT' 64 60
'HT' 64 60

'L' /

'Seg 1' 623131.3 4862293.6 291.4 0
'Seg 2' 623073.2 4862272.0 287.1 0
'Seg 3' 623001.4 4862247.5 283.1 0
'Seg 4' 622952.4 4862232.5 281.2 0
'Seg 5' 622907.0 4862218.7 281.0 0
'Seg 6' 622857.9 4862205.1 282.3 0
'Seg 7' 622825.5 4862196.7 283.5 0
'Seg 8' 622791.1 4862189.0 284.8 1
'Seg 9' 622753.8 4862183.1 286.0 1
'Seg 10' 622722.7 4862177.2 287.0 0

'L' /

RDWY 7 Kirby Rd WB West of Bathurst St

'CARS' 533 60
'MT' 67 60
'HT' 67 60

'L' /

'2+050' 622722.8 4862177.2 287.5 0
'2+000' 622662.2 4862165.1 288.7 1
'1+950' 622612.8 4862153.4 290.3 1
'1+900' 622567.7 4862138.9 292.7 1
'1+850' 622517.8 4862122.7 294.3 1
'1+800' 622471.0 4862107.9 294.7 1
'1+750' 622422.2 4862092.6 295.0 1
'1+700' 622373.9 4862078.4 294.4 0
'1+650' 622328.3 4862064.5 294.0 0
'1+600' 622278.7 4862048.5 293.0 0
'1+550' 622230.9 4862033.9 292.4 0
'1+500' 622183.9 4862019.2 291.7 0
'1+450' 622135.6 4862004.2 291.0 0
'1+400' 622090.5 4861989.5 290.3 0
'1+350' 622043.4 4861975.1 289.7 1

'L' /

RDWY 8 Kirby Rd WB West of Bathurst St (Section 2)

'CARS' 533 60
'MT' 67 60
'HT' 67 60

'L' /

'1+350' 622043.4 4861975.1 289.7 1
'1+300' 621995.3 4861959.7 289.0 1
'1+250' 621947.0 4861945.6 288.3 0
'1+200' 621901.5 4861929.5 287.1 0
'1+150' 621856.8 4861903.0 286.8 0
'1+100' 621814.5 4861875.2 286.0 0
'1+050' 621770.5 4861845.7 285.0 0
'1+000' 621729.1 4861816.3 284.1 0
'0+950' 621688.8 4861789.3 283.2 0
'0+900' 621647.5 4861767.7 282.0 0
'0+850' 621598.5 4861752.0 282.1 0
'0+800' 621551.6 4861735.5 282.6 0
'0+750' 621503.1 4861719.3 283.8 1
'0+700' 621454.3 4861702.9 285.7 1
'0+650' 621404.8 4861694.4 288.0 1

'L' /

RDWY 9 Kirby Rd WB West of Bathurst St (Section 3)

'CARS' 533 60
'MT' 67 60
'HT' 67 60

'L' /

'0+650' 621404.8 4861694.4 288.0 1
'0+600' 621355.9 4861694.8 290.2 1
'0+550' 621307.4 4861695.7 292.5 1
'0+500' 621255.2 4861697.5 294.7 1
'0+450' 621205.4 4861699.5 296.9 1
'0+400' 621155.0 4861696.7 299.1 1
'0+350' 621104.9 4861685.2 301.1 1
'0+300' 621056.5 4861670.8 302.8 1
'0+250' 621008.7 4861656.2 302.8 0
'0+200' 620961.9 4861641.7 302.7 0
'0+150' 620914.1 4861627.7 301.9 0
'0+100' 620866.3 4861612.1 300.9 0
'0+050' 620808.2 4861594.7 299.9 0
'0+000' 620770.8 4861582.4 299.4 0

'L' /

RDWY 10 Kirby Rd WB West of Dufferin
'CARS' 482 60
'MT' 60 60
'HT' 60 60
'L' /
'Seg 1' 620771.0 4861582.2 299.1 0
'Seg 2' 620733.3 4861569.7 297.6 0
'Seg 3' 620687.6 4861557.5 294.8 0
'Seg 4' 620547.5 4861521.9 286.8 0
'Seg 5' 620327.7 4861447.8 283.0 0
'Seg 6' 620197.3 4861405.1 281.6 0
'Seg 7' 620061.9 4861360.6 282.2 0
'L' /

RDWY 11 Dufferin Street NB South of Kirby Rd
'CARS' 302 60
'MT' 8 60
'HT' 8 60
'L' /
'Seg 1' 620899.7 4860864.1 291.7 0
'Seg 2' 620882.1 4860958.0 296.5 1
'Seg 3' 620861.8 4861060.4 299.1 1
'Seg 4' 620849.0 4861120.2 298.4 0
'Seg 5' 620832.5 4861228.4 297.8 0
'Seg 6' 620813.8 4861337.2 300.3 1
'Seg 7' 620795.7 4861465.3 298.0 0
'Seg 8' 620777.3 4861580.9 299.4 0
'L' /

RDWY 12 Dufferin Street NB North of Kirby Rd
'CARS' 281 70
'MT' 7 70
'HT' 7 70
'L' /
'Seg 1' 620777.4 4861581.0 299.4 0
'Seg 2' 620763.6 4861657.0 299.1 0
'Seg 3' 620744.8 4861747.4 297.5 0
'Seg 4' 620718.3 4861876.0 297.0 0
'Seg 5' 620705.2 4861938.3 299.0 1
'Seg 6' 620686.8 4862033.1 301.3 1
'Seg 7' 620670.1 4862119.3 305.1 1
'Seg 8' 620651.8 4862212.2 311.3 1
'L' /

RDWY 13 Dufferin Street SB North of Kirby Rd
'CARS' 281 70
'MT' 7 70
'HT' 7 70
'L' /
'Seg 1' 620647.7 4862212.0 312.1 0
'Seg 2' 620666.0 4862118.7 306.0 0
'Seg 3' 620683.1 4862033.1 302.0 0
'Seg 4' 620701.5 4861938.9 299.0 0
'Seg 5' 620713.9 4861877.0 297.0 0
'Seg 6' 620741.0 4861748.3 297.8 1
'Seg 7' 620758.6 4861657.0 299.0 0
'Seg 8' 620772.0 4861579.3 299.2 0
'L' /

RDWY 14 Dufferin Street SB South of Kirby Rd
'CARS' 302 60
'MT' 8 60
'HT' 8 60
'L' /
'Seg 1' 620771.9 4861579.3 299.2 0
'Seg 2' 620790.5 4861463.8 298.0 0
'Seg 3' 620810.4 4861335.5 300.4 0
'Seg 4' 620826.9 4861227.1 298.6 0
'Seg 5' 620840.9 4861118.3 299.6 0
'Seg 6' 620852.8 4861056.5 299.3 0
'Seg 7' 620871.4 4860956.2 296.2 0
'Seg 8' 620890.0 4860858.8 291.7 0
'L' /

RDWY 15 Bathurst Street NB South of Kirby Rd
'CARS' 927 70
'MT' 24 70
'HT' 24 70
'L' /
'Seg 1' 622980.6 4860942.6 269.9 0
'Seg 2' 622966.2 4861007.8 272.8 1
'Seg 3' 622953.1 4861070.9 274.8 1
'Seg 4' 622936.7 4861154.7 276.2 1
'Seg 5' 622923.2 4861218.7 277.0 1
'Seg 6' 622910.3 4861276.2 277.0 1
'Seg 7' 622877.3 4861432.2 281.9 1
'Seg 8' 622857.0 4861519.5 286.7 1
'Seg 9' 622836.1 4861620.3 292.0 1
'Seg 10' 622818.6 4861702.4 295.6 1
'Seg 12' 622799.3 4861794.9 297.0 1
'Seg 13' 622783.3 4861871.3 295.4 0
'Seg 14' 622770.9 4861941.3 293.6 0

'Seg 15'	622753.7	4862025.2	289.8	0
'L' /				
RDWY 16 Bathurst Street NB South of Kirby Rd (continued)				
'CARS'	927	70		
'MT'	24	70		
'HT'	24	70		
'L' /				
'Seg 1'	622753.7	4862025.2	289.8	0
'Seg 2'	622741.1	4862099.7	287.2	0
'Seg 3'	622728.5	4862173.1	286.8	0
'L' /				
RDWY 17 Bathurst Street NB North of Kirby Rd				
'CARS'	911	70		
'MT'	24	70		
'HT'	24	70		
'L' /				
'Seg 1'	622728.6	4862172.8	286.8	0
'Seg 2'	622717.1	4862225.4	286.8	0
'Seg 3'	622705.1	4862284.0	289.0	1
'Seg 4'	622694.1	4862339.6	292.1	1
'Seg 5'	622681.8	4862400.4	294.5	1
'Seg 6'	622669.7	4862463.3	297.3	1
'Seg 7'	622659.1	4862530.5	299.0	1
'Seg 8'	622646.8	4862594.3	300.2	1
'Seg 9'	622624.9	4862694.5	301.2	1
'Seg 10'	622609.8	4862776.1	302.0	1
'Seg 12'	622588.9	4862879.8	303.0	1
'Seg 13'	622569.1	4862983.2	304.0	1
'L' /				
RDWY 18 Bathurst Street SB North of Kirby Rd				
'CARS'	911	70		
'MT'	24	70		
'HT'	24	70		
'L' /				
'Seg 1'	622559.0	4862982.2	304.1	0
'Seg 2'	622583.0	4862862.2	303.0	0
'Seg 3'	622599.6	4862777.1	302.0	0
'Seg 4'	622614.4	4862693.1	301.4	0
'Seg 5'	622634.3	4862592.0	300.5	0
'Seg 6'	622646.4	4862529.3	299.1	0
'Seg 7'	622660.4	4862462.2	297.0	0
'Seg 8'	622674.4	4862400.1	294.3	0
'Seg 9'	622685.1	4862339.4	291.9	0
'Seg 10'	622694.7	4862283.3	289.2	0
'Seg 12'	622706.3	4862222.4	287.4	0
'Seg 13'	622715.7	4862172.1	287.0	0
'L' /				
RDWY 19 Bathurst Street SB South of Kirby Rd				
'CARS'	911	70		
'MT'	24	70		
'HT'	24	70		
'L' /				
'Seg 1'	622715.5	4862172.5	287.0	0
'Seg 2'	622730.0	4862097.8	287.5	1
'Seg 3'	622745.5	4862025.2	290.1	1
'Seg 4'	622763.6	4861939.4	294.0	1
'Seg 5'	622775.9	4861870.0	295.5	1
'Seg 6'	622791.7	4861794.4	296.6	1
'Seg 7'	622811.9	4861701.0	295.6	0
'Seg 8'	622828.7	4861620.8	292.3	0
'Seg 9'	622849.5	4861519.1	286.8	0
'Seg 10'	622868.2	4861432.3	282.0	0
'Seg 12'	622898.6	4861277.8	277.1	0
'Seg 13'	622911.2	4861216.9	277.3	0
'Seg 14'	622925.0	4861152.6	276.4	0
'Seg 15'	622941.0	4861070.0	274.9	0
'L' /				
RDWY 20 Bathurst Street SB South of Kirby Rd (continued)				
'CARS'	911	70		
'MT'	24	70		
'HT'	24	70		
'L' /				
'Seg 1'	622941.0	4861070.0	274.9	0
'Seg 2'	622952.1	4861006.5	272.7	0
'Seg 3'	622964.8	4860941.3	269.7	0
'L' /				
3,6				
Barrier 1 Barrier for Receptor 5				
'Bar 1'	622802.3	4862153.5	286.8	284.3 0.0 0
'Bar 2'	622799.8	4862161.9	287.1	284.6
'Bar 3'	622812.5	4862165.7	286.6	284.1
'Bar 4'	622813.0	4862120.6	286.4	283.8
'A' /				
Barrier 2 Houses West of Receptor 5				
'Bar 1'	622802.1	4862153.1	293.4	284.4 0.0 0
'Bar 2'	622790.6	4862149.9	293.4	284.8
'Bar 3'	622801.4	4862116.7	293.4	283.9

-----COORDINATES-----				
	X	Y	Z	GRADE
Seg 1	620064.	4861354.	282.	0
Seg 2	620201.	4861399.	282.	0
Seg 3	620330.	4861443.	283.	1
Seg 4	620551.	4861520.	287.	1
Seg 5	620652.	4861545.	291.	1
Seg 6	620691.	4861554.	294.	1
Seg 7	620738.	4861566.	298.	1
Seg 8	620772.	4861573.	299.	1

ROADWAY	2	RDWY 2 Kirby Rd EB East of Dufferin	VEHICLE TYPE	VEHICLES/HOUR	SPEED
			CARS	533.	60.
			HT	67.	60.
			MT	67.	60.

-----COORDINATES-----				
	X	Y	Z	GRADE
0+0	620772.	4861573.	299.	0
0+50	620825.	4861587.	300.	1
0+100	620873.	4861602.	301.	1
0+150	620921.	4861617.	302.	1
0+200	620969.	4861634.	303.	1
0+250	621015.	4861649.	303.	1
0+300	621062.	4861664.	302.	1
0+350	621111.	4861679.	301.	0
0+400	621157.	4861689.	299.	0
0+450	621208.	4861692.	297.	0
0+500	621261.	4861689.	295.	0
0+550	621309.	4861689.	293.	0
0+600	621358.	4861687.	290.	0
0+650	621407.	4861687.	288.	0
0+700	621457.	4861697.	286.	0

ROADWAY	3	RDWY 3 Kirby Rd EB East of Dufferin (Section 2)	VEHICLE TYPE	VEHICLES/HOUR	SPEED
			CARS	533.	60.
			HT	67.	60.
			MT	67.	60.

-----COORDINATES-----				
	X	Y	Z	GRADE
0+700	621457.	4861697.	286.	0
0+750	621505.	4861712.	284.	0
0+800	621553.	4861728.	283.	0
0+850	621600.	4861744.	282.	0
0+900	621648.	4861761.	283.	1
0+950	621693.	4861783.	283.	0
1+000	621734.	4861811.	284.	1
1+050	621776.	4861839.	285.	1
1+100	621817.	4861867.	286.	1
1+150	621858.	4861896.	287.	1
1+200	621901.	4861921.	287.	1
1+250	621947.	4861938.	288.	1
1+300	621995.	4861953.	289.	1
1+350	622043.	4861969.	290.	1
1+400	622090.	4861983.	290.	1

ROADWAY	4	RDWY 4 Kirby Rd EB East of Dufferin (Section 3)	VEHICLE TYPE	VEHICLES/HOUR	SPEED
			CARS	533.	60.
			HT	67.	60.
			MT	67.	60.

-----COORDINATES-----				
	X	Y	Z	GRADE
1+400	622090.	4861983.	290.	1
1+450	622138.	4861998.	291.	1
1+500	622186.	4862013.	292.	1
1+550	622233.	4862027.	292.	1
1+600	622281.	4862042.	293.	1
1+650	622331.	4862058.	294.	1
1+700	622376.	4862072.	295.	1
1+750	622424.	4862087.	295.	1
1+800	622477.	4862103.	295.	1
1+850	622521.	4862115.	294.	0
1+900	622569.	4862128.	293.	0
1+950	622617.	4862142.	291.	0
2+000	622666.	4862154.	289.	0
2+050	622725.	4862166.	287.	0

ROADWAY	5	RDWY 5 Gamble Rd EB East of Bathurst St	VEHICLE TYPE	VEHICLES/HOUR	SPEED
			CARS	513.	60.
			HT	64.	60.
			MT	64.	60.

-----COORDINATES-----				
	X	Y	Z	GRADE
Seg 1	622724.	4862166.	287.	0

Seg 2	622757.	4862172.	286.	0
Seg 3	622795.	4862179.	285.	0
Seg 4	622824.	4862186.	284.	0
Seg 5	622863.	4862197.	282.	0
Seg 6	622909.	4862212.	281.	0
Seg 7	622956.	4862227.	281.	0
Seg 8	623005.	4862242.	283.	1
Seg 9	623077.	4862266.	287.	1
Seg 10	623137.	4862285.	292.	1

ROADWAY	6	RDWY 6 Gamble Rd WB East of Bathurst St
		VEHICLE TYPE VEHICLES/HOUR SPEED
		CARS 513. 60.
		HT 64. 60.
		MT 64. 60.

-----COORDINATES-----				
	X	Y	Z	GRADE
Seg 1	623131.	4862294.	291.	0
Seg 2	623073.	4862272.	287.	0
Seg 3	623001.	4862248.	283.	0
Seg 4	622952.	4862233.	281.	0
Seg 5	622907.	4862219.	281.	0
Seg 6	622858.	4862205.	282.	0
Seg 7	622826.	4862197.	284.	0
Seg 8	622791.	4862189.	285.	1
Seg 9	622754.	4862183.	286.	1
Seg 10	622723.	4862177.	287.	0

ROADWAY	7	RDWY 7 Kirby Rd WB West of Bathurst St
		VEHICLE TYPE VEHICLES/HOUR SPEED
		CARS 533. 60.
		HT 67. 60.
		MT 67. 60.

-----COORDINATES-----				
	X	Y	Z	GRADE
2+050	622723.	4862177.	288.	0
2+000	622662.	4862165.	289.	1
1+950	622613.	4862153.	290.	1
1+900	622568.	4862139.	293.	1
1+850	622518.	4862123.	294.	1
1+800	622471.	4862108.	295.	1
1+750	622422.	4862093.	295.	1
1+700	622374.	4862078.	294.	0
1+650	622328.	4862065.	294.	0
1+600	622279.	4862049.	293.	0
1+550	622231.	4862034.	292.	0
1+500	622184.	4862019.	292.	0
1+450	622136.	4862004.	291.	0
1+400	622091.	4861990.	290.	0
1+350	622043.	4861975.	290.	1

ROADWAY	8	RDWY 8 Kirby Rd WB West of Bathurst St (Section 2)
		VEHICLE TYPE VEHICLES/HOUR SPEED
		CARS 533. 60.
		HT 67. 60.
		MT 67. 60.

-----COORDINATES-----				
	X	Y	Z	GRADE
1+350	622043.	4861975.	290.	1
1+300	621995.	4861960.	289.	1
1+250	621947.	4861946.	288.	0
1+200	621902.	4861930.	287.	0
1+150	621857.	4861903.	287.	0
1+100	621815.	4861875.	286.	0
1+050	621771.	4861846.	285.	0
1+000	621729.	4861816.	284.	0
0+950	621689.	4861789.	283.	0
0+900	621648.	4861768.	282.	0
0+850	621599.	4861752.	282.	0
0+800	621552.	4861736.	283.	0
0+750	621503.	4861719.	284.	1
0+700	621454.	4861703.	286.	1
0+650	621405.	4861694.	288.	1

ROADWAY	9	RDWY 9 Kirby Rd WB West of Bathurst St (Section 3)
		VEHICLE TYPE VEHICLES/HOUR SPEED
		CARS 533. 60.
		HT 67. 60.
		MT 67. 60.

-----COORDINATES-----				
	X	Y	Z	GRADE
0+650	621405.	4861694.	288.	1
0+600	621356.	4861695.	290.	1
0+550	621307.	4861696.	293.	1
0+500	621255.	4861698.	295.	1
0+450	621205.	4861700.	297.	1
0+400	621155.	4861697.	299.	1

0+350	621105.	4861685.	301.	1
0+300	621057.	4861671.	303.	1
0+250	621009.	4861656.	303.	0
0+200	620962.	4861642.	303.	0
0+150	620914.	4861628.	302.	0
0+100	620866.	4861612.	301.	0
0+050	620808.	4861595.	300.	0
0+000	620771.	4861582.	299.	0

ROADWAY 10 RDWY 10 Kirby Rd WB West of Dufferin

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	482.	60.
HT	60.	60.
MT	60.	60.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	620771.	4861582.	299.	0
Seg 2	620733.	4861570.	298.	0
Seg 3	620688.	4861558.	295.	0
Seg 4	620548.	4861522.	287.	0
Seg 5	620328.	4861448.	283.	0
Seg 6	620197.	4861405.	282.	0
Seg 7	620062.	4861361.	282.	0

ROADWAY 11 RDWY 11 Dufferin Street NB South of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	302.	60.
HT	8.	60.
MT	8.	60.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	620900.	4860864.	292.	0
Seg 2	620882.	4860958.	297.	1
Seg 3	620862.	4861060.	299.	1
Seg 4	620849.	4861120.	298.	0
Seg 5	620833.	4861228.	298.	0
Seg 6	620814.	4861337.	300.	1
Seg 7	620796.	4861465.	298.	0
Seg 8	620777.	4861581.	299.	0

ROADWAY 12 RDWY 12 Dufferin Street NB North of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	281.	70.
HT	7.	70.
MT	7.	70.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	620777.	4861581.	299.	0
Seg 2	620764.	4861657.	299.	0
Seg 3	620745.	4861747.	298.	0
Seg 4	620718.	4861876.	297.	0
Seg 5	620705.	4861938.	299.	1
Seg 6	620687.	4862033.	301.	1
Seg 7	620670.	4862119.	305.	1
Seg 8	620652.	4862212.	311.	1

ROADWAY 13 RDWY 13 Dufferin Street SB North of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	281.	70.
HT	7.	70.
MT	7.	70.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	620648.	4862212.	312.	0
Seg 2	620666.	4862119.	306.	0
Seg 3	620683.	4862033.	302.	0
Seg 4	620702.	4861939.	299.	0
Seg 5	620714.	4861877.	297.	0
Seg 6	620741.	4861748.	298.	1
Seg 7	620759.	4861657.	299.	0
Seg 8	620772.	4861579.	299.	0

ROADWAY 14 RDWY 14 Dufferin Street SB South of Kirby Rd

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	302.	60.
HT	8.	60.
MT	8.	60.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	620772.	4861579.	299.	0
Seg 2	620791.	4861464.	298.	0
Seg 3	620810.	4861336.	300.	0
Seg 4	620827.	4861227.	299.	0
Seg 5	620841.	4861118.	300.	0
Seg 6	620853.	4861057.	299.	0
Seg 7	620871.	4860956.	296.	0
Seg 8	620890.	4860859.	292.	0

ROADWAY	15	RDWY 15 Bathurst Street NB South of Kirby Rd	VEHICLE TYPE	VEHICLES/HOUR	SPEED
			CARS	927.	70.
			HT	24.	70.
			MT	24.	70.
-----COORDINATES-----					
			X	Y	Z GRADE
Seg 1			622981.	4860943.	270. 0
Seg 2			622966.	4861008.	273. 1
Seg 3			622953.	4861071.	275. 1
Seg 4			622937.	4861155.	276. 1
Seg 5			622923.	4861219.	277. 1
Seg 6			622910.	4861276.	277. 1
Seg 7			622877.	4861432.	282. 1
Seg 8			622857.	4861520.	287. 1
Seg 9			622836.	4861620.	292. 1
Seg 10			622819.	4861702.	296. 1
Seg 12			622799.	4861795.	297. 1
Seg 13			622783.	4861871.	295. 0
Seg 14			622771.	4861941.	294. 0
Seg 15			622754.	4862025.	290. 0

ROADWAY	16	RDWY 16 Bathurst Street NB South of Kirby Rd (continued)	VEHICLE TYPE	VEHICLES/HOUR	SPEED
			CARS	927.	70.
			HT	24.	70.
			MT	24.	70.
-----COORDINATES-----					
			X	Y	Z GRADE
Seg 1			622754.	4862025.	290. 0
Seg 2			622741.	4862100.	287. 0
Seg 3			622729.	4862173.	287. 0

ROADWAY	17	RDWY 17 Bathurst Street NB North of Kirby Rd	VEHICLE TYPE	VEHICLES/HOUR	SPEED
			CARS	911.	70.
			HT	24.	70.
			MT	24.	70.
-----COORDINATES-----					
			X	Y	Z GRADE
Seg 1			622729.	4862173.	287. 0
Seg 2			622717.	4862225.	287. 0
Seg 3			622705.	4862284.	289. 1
Seg 4			622694.	4862340.	292. 1
Seg 5			622682.	4862400.	295. 1
Seg 6			622670.	4862463.	297. 1
Seg 7			622659.	4862531.	299. 1
Seg 8			622647.	4862594.	300. 1
Seg 9			622625.	4862695.	301. 1
Seg 10			622610.	4862776.	302. 1
Seg 12			622589.	4862880.	303. 1
Seg 13			622569.	4862983.	304. 1

ROADWAY	18	RDWY 18 Bathurst Street SB North of Kirby Rd	VEHICLE TYPE	VEHICLES/HOUR	SPEED
			CARS	911.	70.
			HT	24.	70.
			MT	24.	70.
-----COORDINATES-----					
			X	Y	Z GRADE
Seg 1			622559.	4862982.	304. 0
Seg 2			622583.	4862862.	303. 0
Seg 3			622600.	4862777.	302. 0
Seg 4			622614.	4862693.	301. 0
Seg 5			622634.	4862592.	301. 0
Seg 6			622646.	4862529.	299. 0
Seg 7			622660.	4862462.	297. 0
Seg 8			622674.	4862400.	294. 0
Seg 9			622685.	4862339.	292. 0
Seg 10			622695.	4862283.	289. 0
Seg 12			622706.	4862222.	287. 0
Seg 13			622716.	4862172.	287. 0

ROADWAY	19	RDWY 19 Bathurst Street SB South of Kirby Rd	VEHICLE TYPE	VEHICLES/HOUR	SPEED
			CARS	911.	70.
			HT	24.	70.
			MT	24.	70.
-----COORDINATES-----					
			X	Y	Z GRADE
Seg 1			622716.	4862173.	287. 0
Seg 2			622730.	4862098.	288. 1
Seg 3			622746.	4862025.	290. 1
Seg 4			622764.	4861939.	294. 1
Seg 5			622776.	4861870.	296. 1
Seg 6			622792.	4861794.	297. 1
Seg 7			622812.	4861701.	296. 0

Seg 8	622829.	4861621.	292.	0
Seg 9	622850.	4861519.	287.	0
Seg 10	622868.	4861432.	282.	0
Seg 12	622899.	4861278.	277.	0
Seg 13	622911.	4861217.	277.	0
Seg 14	622925.	4861153.	276.	0
Seg 15	622941.	4861070.	275.	0

ROADWAY 20 RDWY 20 Bathurst Street SB South of Kirby Rd (continued)

VEHICLE TYPE	VEHICLES/HOUR	SPEED
CARS	911.	70.
HT	24.	70.
MT	24.	70.

-----COORDINATES-----

	X	Y	Z	GRADE
Seg 1	622941.	4861070.	275.	0
Seg 2	622952.	4861007.	273.	0
Seg 3	622965.	4860941.	270.	0

BARRIER 1 TYPE(A) Barrier 1 Barrier for Receptor 5

-----COORDINATES-----

	X	Y	Z	Z0	DELZ	P
Bar 1	622802.	4862154.	287.	284.	0.	0
Bar 2	622800.	4862162.	287.	285.		
Bar 3	622813.	4862166.	287.	284.		
Bar 4	622813.	4862121.	286.	284.		

BARRIER 2 TYPE(A) Barrier 2 Houses West of Receptor 5

-----COORDINATES-----

	X	Y	Z	Z0	DELZ	P
Bar 1	622802.	4862153.	293.	284.	0.	0
Bar 2	622791.	4862150.	293.	285.		
Bar 3	622801.	4862117.	293.	284.		
Bar 4	622813.	4862121.	293.	284.		

BARRIER 3 TYPE(A) Barrier 3 Houses East of Receptor 5

-----COORDINATES-----

	X	Y	Z	Z0	DELZ	P
Bar 1	622813.	4862157.	293.	284.	0.	0
Bar 2	622824.	4862124.	293.	284.		
Bar 3	622835.	4862128.	293.	284.		
Bar 4	622824.	4862160.	293.	284.		

BARRIER 4 TYPE(A) Barrier 4 House as Barrier for Receptor 4

-----COORDINATES-----

	X	Y	Z	Z0	DELZ	P
Bar 1	622624.	4862121.	303.	298.	0.	0
Bar 2	622627.	4862111.	303.	296.		
Bar 3	622621.	4862109.	303.	298.		
Bar 4	622618.	4862119.	303.	298.		

BARRIER 5 TYPE(A) Barrier 5 Retaining Wall near Receptor 4

-----COORDINATES-----

	X	Y	Z	Z0	DELZ	P
Bar 1	622597.	4862109.	299.	299.	0.	0
Bar 2	622592.	4862123.	299.	299.		
Bar 3	622601.	4862126.	299.	299.		
Bar 4	622608.	4862128.	299.	299.		
Bar 5	622617.	4862130.	298.	298.		
Bar 6	622623.	4862133.	297.	297.		
Bar 7	622628.	4862134.	296.	296.		
Bar 8	622634.	4862136.	295.	295.		
Bar 9	622638.	4862121.	294.	294.		
Bar 10	622640.	4862116.	294.	294.		

BARRIER 6 TYPE(A) Barrier 6 4.0m Noise Barrier near Receptor 4 for 44 m

-----COORDINATES-----

	X	Y	Z	Z0	DELZ	P
Bar 1	622597.	4862109.	303.	299.	0.	0
Bar 2	622593.	4862123.	303.	299.		
Bar 3	622601.	4862125.	303.	299.		
Bar 4	622607.	4862127.	303.	299.		
Bar 5	622611.	4862128.	303.	298.		
Bar 6	622617.	4862130.	302.	298.		
Bar 7	622621.	4862132.	302.	298.		

Receivers

-----COORDINATES-----

	X	Y	Z
Rec 1	620617.	4861430.	288.
Rec 2	620767.	4861982.	304.
Rec 3	622144.	4861508.	277.
Rec 4	622618.	4862114.	300.
Rec 5	622806.	4862149.	286.

ALPHA FACTORS - RECEIVER ACROSS, ROADWAY DOWN

1 * .7 .7 .7 .7 .7

2 * .7 .7 .7 .7 .7
 3 * .7 .7 .7 .7 .7
 4 * .7 .7 .7 .7 .7
 5 * .7 .7 .7 .7 .7
 6 * .7 .7 .7 .7 .7
 7 * .7 .7 .7 .7 .7
 8 * .7 .7 .7 .7 .7
 9 * .7 .7 .7 .7 .7
 10 * .7 .7 .7 .7 .7
 11 * .7 .7 .7 .7 .7
 12 * .7 .7 .7 .7 .7
 13 * .7 .7 .7 .7 .7
 14 * .7 .7 .7 .7 .7
 15 * .7 .7 .7 .7 .7
 16 * .7 .7 .7 .7 .7
 17 * .7 .7 .7 .7 .7
 18 * .7 .7 .7 .7 .7
 19 * .7 .7 .7 .7 .7
 20 * .7 .7 .7 .7 .7

SHIELDING FACTORS - RECEIVER ACROSS, ROADWAY DOWN

1 * .0 .0 .0 .0 .0
 2 * .0 .0 .0 .0 .0
 3 * .0 .0 .0 .0 .0
 4 * .0 .0 .0 .0 .0
 5 * .0 .0 .0 .0 .0
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 7 * .0 .0 .0 .0 .0
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 9 * .0 .0 .0 .0 .0
 10 * .0 .0 .0 .0 .0
 11 * .0 .0 .0 .0 .0
 12 * .0 .0 .0 .0 .0
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 19 * .0 .0 .0 .0 .0
 20 * .0 .0 .0 .0 .0

RECEIVER LEQ(H) L10
 Rec 1 59.3 62.6

ROADWAY SEGMENT SOUND LEVEL CONTRIBUTIONS EXCEEDING 40.0 DBA

ROADWAY SEGMENT
 1 3 4 5 6 7
 50.1 53.3 48.8 47.5 40.7
 10 2 3 4
 42.9 51.8 49.5

RECEIVER LEQ(H) L10
 Rec 2 55.6 59.2

ROADWAY SEGMENT SOUND LEVEL CONTRIBUTIONS EXCEEDING 40.0 DBA

ROADWAY SEGMENT
 12 3 4 5 6
 41.2 44.8 49.0 43.7
 13 2 3 4 5
 42.3 48.3 44.5 41.2

RECEIVER LEQ(H) L10
 Rec 3 47.9 49.7

NO ROADWAY SEGMENTS EXCEED 40.0 DBA

RECEIVER LEQ(H) L10
 Rec 4 53.7 56.8

ROADWAY SEGMENT SOUND LEVEL CONTRIBUTIONS EXCEEDING 40.0 DBA

ROADWAY SEGMENT
 4 10 11 12
 40.3 43.8 42.5
 7 2 3 4
 42.2 44.3 41.2

RECEIVER LEQ(H) L10
 Rec 5 60.3 63.8

ROADWAY SEGMENT SOUND LEVEL CONTRIBUTIONS EXCEEDING 40.0 DBA

ROADWAY SEGMENT
 5 2 3 4
 52.0 54.3 50.4
 6 6 7 8
 49.8 52.4 51.2
 17 3
 41.9

Appendix D

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THE CITY OF VAUGHAN

BY-LAW

BY-LAW NUMBER 139-2018

A By-law to repeal previous Noise By-laws 96-2006, 207-2007 and 015-2018.

WHEREAS the Municipal Act, R.S.O. 2001, Section 129(1) Paragraphs 1, 2 and 3 authorize municipalities to pass by-laws to prohibit and regulate *Noise*;

AND WHEREAS a new Noise By-law, By-law 062-2018, has recently been adopted and is intended to replace the previous Noise by-laws;

NOW THEREFORE the Council of The Corporation of City of Vaughan enacts as follows:

1. By-laws 96-2006, 207-2007 and 015-2018 are hereby repealed.
2. This By-law shall come into effect on the date it is enacted.

Enacted by City of Vaughan Council this 19rd day of June 2018.

Hon. Maurizio Bevilacqua, Mayor

Todd Coles, City Clerk

THE CITY OF VAUGHAN

BY-LAW

BY-LAW NUMBER 062-2018

A By-law to regulate Noise.

WHEREAS the Municipal Act, R.S.O. 2001, Section 129. (1) Paragraphs 1, 2 and 3 authorize municipalities to pass by-laws to prohibit and regulate *Noise*;

AND WHEREAS a recognized body of scientific and technological knowledge exists by which Sound and vibration may be substantially reduced;

AND WHEREAS it is in the public interest to reduce the *Noise* level in the City of Vaughan, so as to preserve, protect, and promote public health, safety, welfare, and the peace and quiet of the inhabitants of the City;

AND WHEREAS it is the policy of the Council of The Corporation of City of Vaughan to regulate such *Sound* or vibration, or nuisance;

NOW THEREFORE the Council of The Corporation of City of Vaughan enacts as follows:

1. TITLE

This By-law shall be referred to as "The Noise Control By-Law".

2. APPLICABILITY AND SCOPE

Schedule 3 lists *Ministry NPC Publications* that inform various provisions included in this By-law, as well as detail regulation of *Noise* that is outside of City's jurisdiction. This By-law does not apply to *Noise* that falls explicitly under provincial jurisdiction and for which regulation is prescribed by *Ministry NPC Publications*.

3. DEFINITIONS

In this By-Law,

"Applicant" includes any person or persons seeking in writing from the *Director of Enforcement*, an exemption of either a temporary or permanent nature from the provisions and requirements of this By-law;

"City" means the municipal corporation of the City of Vaughan or the geographic area of the City of Vaughan as the context requires;

"Class 4 Area" means a Class 4 area within the meaning of the *Ministry NPC Publication 300-Stationary and Transportation Sources*;

"Construction" includes erection, alteration, repair, dismantling, demolition, structural maintenance, painting, moving, land clearing, earth moving, grading, excavating, the laying of pipe and conduit whether above or below ground level, street and Highway building, concreting, equipment installation and alteration and the structural installation of Construction components and materials in any form or for any purpose, and includes any work in connection therewith;

"Construction Equipment" means any equipment or device designed and intended for use in Construction, or material handling, including but not limited to, air compressors, pile drivers, pneumatic or hydraulic tools, bulldozers, tractors, excavators, trenchers, cranes, derricks, loaders, scrapers, pavers, generators, off Highway haulers or trucks, ditchers, compactors and rollers, pumps, concrete mixers, graders, or other Vehicle intended to haul, move, transport and/or material handling equipment;

"Construction Site" means the area or portion of land used for Construction or any other area used for any purpose related to the Construction or for any related purpose;

"Conveyance" includes a Vehicle and any other device used to transport a person or persons or goods from place to place but does not include any Vehicle or device operated only within the premises of a person;

"Council" means the Council of *City of Vaughan*;

"dBA" means the Sound level in decibels obtained when using a Sound level meter with the A-weighting;

"Director of Enforcement" means the person occupying the position of the Department Head/Director of By- law & Compliance, Licensing & Permit Services of the *City of Vaughan* or authorized delegate;

"Director of Environmental Services" means the person occupying the position of the Department Head/Director of Environmental Services of the *City of Vaughan* or authorized delegate;

“Effective Muffler” means a muffler in good working order and in constant operation to prevent excessive or unusual Noise or excessive smoke but it does not include a cut-out muffler, straight exhaust gutted muffler, Hollywood muffler, by-pass or similar device;

“Emergency Work” means any necessary work, activities or actions to be undertaken by the *City* to address an immediate danger to the health or safety of any person;

"Enforcement Officer" means a person appointed by the Council of the *City* of Vaughan as a Municipal Law Enforcement Officer, pursuant to s.15.2 of the Police Services Act, to enforce the provisions of this By-law or a sworn member of York Regional Police, Ontario Provincial Police, Royal Canadian Mounted Police, or any other person so authorized;

“Environmental Compliance Approval” means a Certificate of Approval issued under section 9 of the Environmental Protection Act, a Renewable Energy Approval issued under section 47.3 of the Environmental Protection Act, a *Ministry* approval issued under Part II.1 of the Environmental Protection Act, or an approval or decision made under the Environmental Assessment Act.

“Exempted Employment Area” means an industrial or commercial location that is adjacent to a *Class 4 Area* and which possesses a *Ministry*-approved *Environmental Compliance Approval* that outlines allowed activities, and is listed under Schedule 5 in this By-law;

"Highway" includes a common and public Highway, as defined under the Highway Traffic Act R.S.O. 1990 and includes any bridge, trestle, viaduct, or other structure forming part of the Highway designed and intended for, or used by, the general public for the passage of Vehicles;

"Ministry" means the Ministry of the Environment and Climate Change;

"Motor Vehicle" means any Motorized Conveyance and includes any automobile, motorcycle and any other Vehicle propelled or driven otherwise than by muscular power, but does not include the cars of electric or steam railways, or other Motor Vehicle running only upon rails, or a motorized snow Vehicle, traction engine, farm tractor, self-propelled implement of husbandry or road building machine;

"Motorized Conveyance" means a Conveyance propelled or driven otherwise than by muscular, gravitational or wind power;

"Municipality" means the land within the geographic limit of *City of Vaughan* and *City* shall have a concurrent meaning;

"Necessary Municipal Work" means work being undertaken by the *City*, the Region, Transit Authority, or any other level of government, and its agents, and includes but is not limited to any rehabilitation or require maintenance processes and activities within the Public Right of Way or any Highway as defined by the Highway Traffic Act (HTA) of Ontario, using of Construction Equipment that requires work must be performed at times that minimize traffic disruption, including minimizing lane closures or lane restrictions, or both, and includes any works undertaken on Property owned or under the control of the *City*, Region, or any other level of government. Without forgoing the generality rehabilitation or maintenance processes and activities include but are not limited to:

- Deck Removal of any Highway;
- Intersection rehabilitation and all related work;
- All Transit Authority work, including any ancillary Property or facilities and infrastructure;
- All other work as determined necessary by the *Director of Enforcement*, or delegate;

"Noise" means unwanted *Sound*;

"Notice" means any notice required to be given by the *City* to the *Owner* with respect to this By-law, such *Notice* shall either be delivered or sent by prepaid registered mail to the *Owner's* address, as provided to the Clerk's Department. A *Notice* includes an order issued under sections 444 and 445 of the Municipal Act, 2001, as amended. In the event such *Notice* is mailed, it is deemed delivered on the third business day after mailing;

"NPC Publication" means a specified publication of the Noise Pollution Control Section of the Pollution Control Branch of the Ministry named in Schedule 3 of this By-Law;

"Owner" means the registered owner of the *Property*;

"Permit" means and includes any *Permit* or written authorization of a temporary or permanent nature, issued by the *Director of Enforcement*, which provides an exemption(s) to specified terms and conditions of this By-law and may prescribe additional required conditions for the *Permit Holder*;

"Permit Holder" means any person or persons to whom the *Director of Enforcement* has been issued a permit;

"Point of Reception" means any point on a *Property* or a location where *Noise* from a *Stationary Source* is received, in accordance with *Ministry NPC Publication-300 - Stationary and Transportation Sources*;

"Property" means a building or structure or part thereof and includes the lands appurtenant thereto and all mobile homes, buildings and/or any mobile or temporary structures and includes all vacant lands;

"Public Right of Way" means any public or common areas which are open to use by members of the general public, including pedestrians or Vehicles, such as, but not limited to a footpath, sidewalk, and Highway as defined by this by-law;

"Quiet Zone" means all lands located within a distance of 250 meters of all exterior walls of a hospital, nursing home, or seniors retirement facility;

"Refuse Compacting Equipment" means a Vehicle fitted in order to compact and transport refuse;

"Residential Area" means an area of the Municipality designated for residential use in *City of Vaughan Zoning By-Law*, which includes land, buildings and structures intended for human habitation;

"Sound Amplifying System" means any system of loudspeakers, amplifiers, microphones or reproducers or any combination of such equipment, including electronic devices or electro-mechanical transducers, used in the reproduction or amplification of music, speech or other Sounds;

"Sound Reproduction Device" means a device intended primarily for the production or reproduction of Sound, including, but not limited to, any musical instrument, radio receiver, television receiver, tape recorder, phonograph, loudspeakers or Sound Amplifying System;

"Source" or "Source of Sound or Vibration" means an activity, matter, thing, or tangible personal *Property* or real *Property*, from which *Sound* or vibration is emitted;

"Sound" is an oscillation in pressure, stress, particle displacement or particle velocity, in a medium with internal forces (e.g. elastic, viscous), or the superposition of such propagated oscillations, which may cause an auditory sensation;

"Special Event" has the same meaning as defined in the *City's Special Event By-law* or successor by-law;

"Stationary Source" means a Source of *Sound* or combination of Sources of *Sound* that are included and normally operated within the *Property* lines of a facility and includes the premises of a person as one *Stationary Source* unless the dominant Source on the premises is *Construction Equipment* or a *Conveyance*. It encompasses all the activities taking place within the *Property* boundary of the facility, including regular on-site traffic and material handling such as on-site movement of trucks and trailers and routine loading and unloading activity.

"Vehicle" includes a *Motor Vehicle*, trailer, traction engine, farm tractor, road-building machine, motorcycle, bicycle and any *Vehicle* drawn, propelled or driven by any kind of power, including muscular power, but does not include a motorized snow *Vehicle* or the cars of electric or steam railways running only upon rails.

4. PROHIBITIONS

(1) No person shall emit or cause to permit the emission of *Sound* resulting:

- (a) from a *Stationary Source* such that the level of resultant *Sound* at a *Point of Reception* located in a *Residential Area* or *Quiet Zone* exceeds the applicable *Sound* level limits prescribed in the applicable *NPC Publications* listed in Schedule 3;
- (b) from any act listed in Schedule 1 - General Prohibitions for which the *Sound* can be heard at a *Point of Reception*;
- (c) from any act listed in Schedule 2 - Prohibitions by Time and Place, if it can be heard at a *Point of Reception* in a *Residential Area* or *Quiet Zone* at a prohibited time, unless the *Sound* is generated in an *Exempted Employment Area* and can be heard in a *Class 4 Area*, and the act(s) in the *Exempted Employment Area* are subject to a valid *Ministry-issued Environmental Compliance Approval* that states that the specific act(s) of Schedule 2 are permitted, and the act(s) being conducted are in compliance with the *Environmental Compliance Approval*.

5. PRE-EMPTION

Where more than one provision in Section 4(1) applies to a *Source of Sound*, the less restrictive provision shall prevail.

6. UNUSUAL NOISE, NOISE LIKELY TO DISTURB

No person shall make any unusual *Noise* or *Noise* likely to disturb the inhabitants of the *City* in a *Residential Area*.

7. BELLS, HORNS, SHOUTING

No person shall ring any bell, *Sound* any horn, or shout in a manner likely to disturb the inhabitants of the *City* provided that nothing herein contained shall prevent:

- (1) the ringing of bells, or electronic reproduction of the *Sound* of bells, in connection with any church, chapel, meeting house or religious service;
- (2) the ringing of fire bells or fire alarms or the making of any other *Noise* for the purpose of giving notice of fire or any other danger or any unlawful act for a continuous period of time of twenty (20) minutes or less.

8. AIR CONDITIONERS, HEAT PUMPS, AND SIMILAR DEVICES

No person shall use or operate or cause to be used or operated any residential air conditioner, heat pump, or similar device, the *Noise* from which has a level greater than 61 *dBA* when measured at the *Point of Reception*.

9. PUMP OR FILTRATION SYSTEMS

No person shall use or operate or cause to be used or operated any pump, filtration system or similar device for an outdoor swimming pool, hot tub, spa, fountain or water feature, the *Noise* from which has a level greater than 55 *dBA* when measured at the *Point of Reception* or in compliance with Schedule 3, *NPC Publication-300 - Stationary and Transportation Sources*.

10. CONSTRUCTION

- (1) No person shall, between 1900 hours of one day and 0700 hours of the next day operate or cause to be operated, any *Construction Vehicle* or *Construction Equipment* in connection with the *Construction* of any building or structure, *Highway*, motor car, steam boiler or other engine or machine;
- (2) Despite Subsection (1), no person shall operate or cause to be operated any *Construction Vehicle* or *Construction Equipment* before 0700 hours and no later than 1900 hours on any Saturday and not at all on Sunday or statutory holidays;

Subsection 10. (1) and (2) does not apply to *Necessary Municipal Work* and *Emergency Work* as defined by this By-law.

11. LOADING AND UNLOADING

- (1) No person shall load or unload any transport truck, commercial *Vehicle*, or any other *Vehicle* used to transport anything whatsoever, including but not limited to goods, materials, fill, debris and waste, between 19:00 of one day and 07:00 of the next day, or at any time on Sundays and Statutory Holidays, so as to make or cause *Noises* that disturb, or tend to disturb the quiet, peace, rest, enjoyment, comfort or convenience of the neighbourhood in a *Residential Area*.
- (2) Subsection 11. (1) does not apply to waste removal operations undertaken by the *City* as authorized by the *Director of Enforcement* or *Director of Environmental Services*.

12. MUFFLERS

No person shall discharge into the open air, on any *Property* other than a *Highway*, the exhaust of any *Motor Vehicle* except through a muffler or other device, which effectively prevents loud or explosive *Noises*.

13. MOTOR SPORTS

- (1) No person shall operate or permit the operation of racing competitions between *Motor Vehicles* on a *Property* other than a *Highway* within the *City*, whether or not an admission fee is charged, unless:
 - (a) the competitions are held at a permanent facility;
 - (b) all *Motor Vehicles* are properly equipped with *Effective Mufflers*; and
 - (c) such competitions are not carried out between 2300 hours of one day and 1000 hours of the next day.
- (2) Subsection (1) shall not apply to permanent go-kart operations on a *Property* other than a *Highway*.

14. GO-KART ACTIVITIES

No person shall operate or permit the operation of go-kart activities on a *Property* other than a *Highway* within the *City*, whether or not an admission fee is charged, unless,

- (1) the activities are held at a permanent go-kart facility;
- (2) all go-karts are equipped with *Effective Mufflers*, and
- (3) such activities are not carried out between 2300 hours of one day and 0700 hours of the next day.

15. UNNECESSARY MOTOR VEHICLE NOISE

No person shall cause or permit unnecessary *Motor Vehicle Noise* such as the *Sounding* of the horn, or revving of engine, or the squealing of tires of any *Motor Vehicle* on any *Property* other than a *Highway*.

16. SOUND REPRODUCTION OR AMPLIFICATION DEVICES

- (1) No person in a *Residential Area* shall operate or use or cause to be operated or used any *Sound Reproduction Device* during any time of day so as to disturb the peace and comfort of any person in any dwelling house, or other type of residence.
- (2) In addition to Subsection (1), *Noise* from a *Sound Reproduction Device*, when measured in any dwelling house, apartment house, or any other type of residence in a *Residential Area*, shall be compliant with the limits set in Schedule 3, *NPC Publication-300 - Stationary and Transportation Sources*.
- (3) No person shall operate or use or cause to be operated or used any *Sound Reproduction Device* on any *Highway* or other public place.
- (4) No person shall operate or use or cause to be operated or used any *Sound Reproduction Device* originating from or in connection with the operation of any commercial establishment at any time.
- (5) Subsections (1) and (3) do not apply to prevent:
 - (a) the use of *Sound Reproduction Devices* in the *City's* parks provided that the user has a *Permit* from or the written permission of the *City* to do so and the user otherwise complies with the provisions of this By-law, including the *Noise* level maximum herein provided;
 - (b) the amplification of the *Sound* of the ringing of bells or the playing of chimes in connection with, any church, chapel, meeting house or religious service, or the City Hall between 0900 hours and 2100 hours of the same day;
 - (c) the use of musical instruments by street musicians on the *Highway* or other public place, provided that it does not disturb the peace, enjoyment and comfort or convenience of individuals or the public.

17. EXEMPTIONS

- (1) The provisions of this By-law shall not apply to the *City* or Regional Municipality of York, the Province of Ontario, the Government of Canada or any of their agents when the emission of *Sound* is in connection with work undertaken for the immediate health, safety or welfare of the inhabitants of the *City*.
- (2) The provisions of this By-law shall not apply to preclude musicians or performers providing outdoor entertainment involving *Sound Reproduction Devices* during *Special Events* that have been granted a *Special Events Permit* by the *City*.
- (3) The provisions of this By-law shall not apply to agricultural operations and agricultural processing activities in areas zoned for agricultural use, as per the Zoning By-law or its successor by-law.
- (4) The provisions of this By-law shall not apply to snow removal activities conducted by the *City*, Regional Municipality of York, or the Province of Ontario.
- (5) Nothing in this By-law shall prevent the clearing of snow from designated fire routes.

18. EXEMPTED EMPLOYMENT AREAS

- (1) The *Director of Enforcement* is delegated the authority to include a location as an *Exempted Employment Area* in Schedule 5, when such location:
 - (a) is a commercial or industrial location adjacent to a *Class 4 Area* that is identified on Schedule 4 of this By-law; and
 - (b) has a *Ministry-approved Environmental Compliance Approval* in good standing that lists the activities that may be performed at that location.
- (2) *Exempted Employment Areas* are permitted to perform activities listed in their *Ministry-approved Environmental Compliance Approval*, including those activities that do not meet the requirements listed in Schedule 2 of this By-law.
- (3) For activities not listed in an *Environmental Compliance Approval*, the other provisions of this By-law continue to apply.
- (4) If, in the opinion of the *Director of Enforcement*, a location designated as an *Exempted Employment Area* no longer meets the conditions of Section 18(1)(a) or (b), the *Director of Enforcement* shall send a *Notice* to the *Owner* of the location designated as an *Exempted Employment Area* advising of their opinion and the basis for it.

- (5) An *Owner* in receipt of a Notice under Section 18(4) shall have 60 days from the date of the Notice to respond to the *Director of Enforcement* and establish how the location meets the conditions of Section 18(1)(a) and (b).
- (6) Failure by the *Owner* in receipt of a *Notice* under Section 18(4) to respond within 60 days of the date of the said *Notice* shall result in the subject location no longer designated an *Exempted Employment Area*, effective immediately.
- (7) If, upon the receipt and review of a response to a Notice under Section 18(4), the *Director of Enforcement* is still of the opinion that the location no longer meets the conditions of Section 18(1)(a) or (b), the *Director of Enforcement* shall bring the matter before Council for a final determination.
- (8) With respect to a matter under Section 18(7), Council may:
 - (a) uphold the determination made by the *Director of Enforcement*;
 - (b) overturn the determination made by the *Director of Enforcement*; and/or
 - (c) establish conditions under which the location may continue to be designated as an *Exempted Employment Area*.

19. DELEGATED AUTHORITY TO GRANT EXEMPTIONS

- (1) The *Director of Enforcement* is delegated the authority to grant an exemption for an event subject to the following conditions:
 - (a) The event relates to live or recorded music or involves the use of a *Sound Amplifying System* or *Sound Reproduction Device* operated in a reasonable manner in the context of the *Special Event*;
 - (b) The event shall not create *Noise* to exceed 55 *dBA* when measured at the *Point of Reception*;
 - (c) Any activity that is lawfully carried out pursuant to a *Special Event Permit* issued by the *City* is subject to any conditions imposed on the *Special Event Permit*. Where there is a conflict between a condition imposed on the *Special Event Permit* and this By-law, the requirements of this By-law shall prevail;
 - (d) The breach of any conditions imposed by this Section shall nullify the *Special Event Permit*;
 - (e) An *Enforcement Officer* may monitor the activity at the *Special Event*, the cost of which will be borne by the *Special Event Permit Holder* at a rate of remuneration established under the *City of Vaughan Fees & Charges By-law*.

20. EXEMPTION - CONSTRUCTION EQUIPMENT

- (1) The *Director of Enforcement* is delegated the authority to grant an exemption to Subsection 7(1) for *Construction Equipment* utilized during prohibited hours subject to the following conditions:
 - (a) the use of Construction Equipment shall not exceed the established Noise levels of Schedule 3, *NPC Publication-115*, Construction Equipment;
 - (b) the duration of the exemption requested shall not exceed 90 days in length;
 - (c) the application for exemption complies with the provisions of s.19 (2).

- (2) An application for exemption from the provisions of the *Noise by-law* for *Construction Equipment* shall be made in writing to the *Director of Enforcement* at least sixty (60) days prior to the commencement of the use of the *Construction Equipment* for which the exemption is sought and shall include the following:
 - (a) the name and address of the *Applicant*;
 - (b) the name and address of the business represented by the *Applicant*, if applicable;
 - (c) the *Source* of the *Sound* or vibration in respect of which the exemption is sought;
 - (d) the provision of this By-law from which the exemption is sought;
 - (e) the date and time of commencement of the *Construction*, for which the exemption is sought;
 - (f) the time of conclusion for each day for the use of the *Construction Equipment* for which the exemption is sought;
 - (g) the duration of the use of the *Construction Equipment*, for which the exemption is sought;
 - (h) the location of the Construction for which the exemption is sought;
 - (i) rationale for granting an exemption;
 - (j) the name of the contact person or persons who will be supervising the use of the *Construction Equipment*, and
 - (k) payment of the application fee as described in the *City of Vaughan Fee Bylaw*.

- (3) The *Director of Enforcement* may require the *Applicant* to provide documentation confirming that notification of the use of *Construction Equipment* has been given to the affected parties including but not limited to community associations, business improvement areas and adjacent residents and businesses.
- (4) Where the *Director of Enforcement* requires monitoring of *Sound* levels resulting from the *Construction*, the monitoring shall be conducted at the *Applicant's* expense as outlined in the *City of Vaughan Fees & Charges By-law*.

21. EXEMPTION - TEMPORARY MOTOR RACING COMPETITIONS

- (1) The *Director of Enforcement* is delegated the authority to grant an exemption for motor racing competitions at temporary venues subject to the following conditions:
 - (a) the competition does not exceed three (3) days in length; and
 - (b) the event shall not create *Noise* to exceed 65 *dba* at any *Point of Reception*.
- (2) An application for exemption from the provisions of the *Noise By-law* for motor racing competitions at temporary venues shall be made in writing to the *Director of Enforcement* at least sixty (60) days prior to the commencement of the temporary motor competition for which the exemption is sought and shall include the application provisions as outlined in Section 20 (2), and may include any other conditions as determined by the *Director of Enforcement*.
- (3) The *Director of Enforcement* may require the *Applicant* to provide documentation confirming that notification of the motor racing competition at a temporary venue has been given to the affected parties including but not limited to community associations, business improvement areas and adjacent residents and businesses.
- (4) Where the *Director of Enforcement* requires monitoring of *Sound* levels resulting from the event or activity, the monitoring shall be conducted at the *Applicant's* expense as outlined in the *City's Fee By-law*.

22. ENFORCEMENT

This By-law shall be enforced by any *Enforcement Officer* or person duly authorized by the *City*.

23. OFFENCE AND PENALTIES

- (1) Every person who contravenes any of the provisions of this By-law is guilty of an offence.

- (2) Every person who is convicted of an offence under this By-law is liable to a fine as provided for in the Provincial Offences Act, R.S.O. 1990, Chap. P.33
- (3) When a person has been convicted of an offence under this by-law,
 - (a) the Ontario Court (Provincial Division) of the *City of Vaughan*, or
 - (b) any court of competent jurisdiction thereafter may, in addition to any other penalty imposed on the person convicted, issue an order prohibiting the continuation or repetition of the offence or the doing of any act or thing by the person convicted directed toward the continuation or repetition of the offence.

24. INTERPRETATION

- (1) It is declared that if any Section, Subsection or part or parts thereof be declared by any Court of Law to be bad, illegal or ultra vires, such Section, Subsection or part or parts shall be deemed to be severable and all parts hereof are declared to be separate and independent and enacted as such.
- (2) In this by-law, a word interpreted in the singular number has a corresponding meaning when used in the plural.

Schedules "1", "2", "3", "4", "5" and any Publications NPC annexed hereto are hereby declared to form part of this By-law.

25. EFFECTIVE DATE

This By-law shall come into effect on the 11th day of April, 2018

Enacted by City of Vaughan Council this 11th day of April, 2018.

Hon. Maurizio Bevilacqua, Mayor

Todd Coles, Deputy City Clerk

Schedule 1

General Prohibitions

1. Racing of any *Motorized Conveyance* other than in a racing event regulated by law.
2. The operation of a *Motor Vehicle* in such a way that the tires squeal.
3. The operation of any combustion engine shall not discharge into the open air, on any *Property* other than a *Highway*, the exhaust of any *Motor Vehicle* except through a proper muffler or legal device which effectively prevents loud or explosive *Noises*.
4. The operation of a *Vehicle* or a *Vehicle* with a trailer resulting in banging, clanking, squealing or other like *Sounds* due to improperly secured load or equipment;
5. The operation of an engine or motor in, or on, any *Motor Vehicle* or item of attached auxiliary equipment for a continuous period exceeding five minutes, while such *Vehicle* is stationary in a *Residential Area* or, unless,
 - (a) The *Vehicle* is in an enclosed structure constructed so as to effectively prevent excessive *Noise* emission; or,
 - (b) The original equipment manufacturer specifically recommends a longer idling period for normal and efficient operation of the *Motor Vehicle* in which case such recommended period shall not be exceeded;
 - (c) Operation of such engine or motor is essential to a basic function of the *Vehicle* or equipment, including but not limited to, operation of ready mixed concrete trucks, lift platforms or refuse compactors and heat exchange systems; or,
 - (d) Weather conditions justify the use of heating or refrigerating systems powered by the motor or engine for the safety and welfare of the operator, passengers or animals, or preservation of perishable cargo; or,
 - (e) Prevailing low temperatures make longer idling periods necessary, immediately after starting the motor or engine; or,
 - (f) The idling is for the purpose of cleaning and flushing the radiator and associated circulation system for seasonal change or antifreeze, cleaning of the fuel system, carburetor or the like, when such work is performed other than for profit.

6. The operation of a *Motor Vehicle* horn or other warning device except where required or authorized by law in accordance with good safety practices.
7. The operation of any item of *Construction Equipment* shall not discharge into the open air, on any *Property* other than a *Highway* the exhaust except through a proper muffler or legal device, which effectively prevents loud or explosive *Noises*.

Schedule 2

Time and Place Prohibited Periods

No.	Activity	When it is prohibited in the <i>Quiet Zone</i>	When it is prohibited in a <i>Residential</i>
1	The operation of any auditory signaling device, including but not limited to the ringing of bells or gongs and the blowing of horns or sirens or whistles, or the production, reproduction or amplification of any similar <i>Sounds</i> by-law; or unless required in accordance with good safety practices.	at any time	19:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. on Sundays)
2	The operation of any electronic device or group of connected electronic devices incorporating one or more loudspeakers or other electro mechanical transducers, and intended for the production, reproduction or amplification of <i>Sound</i> .	at any time	23:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. on Sundays)
3	Loading, unloading, delivering, packing, unpacking, or otherwise handling any containers, produce, materials, or refuse whatsoever, unless necessary for the maintenance of essential services.	19:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. on Sundays)	19:00 hrs. of one day to 07:00 hrs. next day and all day Sundays and Statutory Holidays
4	The operation of any <i>Construction Equipment</i> in connection with <i>Construction</i> .	17:00 hrs. of one day to 07:00 hrs. next day and all day Sundays and Statutory Holidays	19:00 hrs. of one day to 07:00 hrs. next day and all day Sundays and Statutory Holidays
5	The detonation of fireworks or explosive devices	at any time	23:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. on Sundays)
6	The operation of a combustion engine which is, or is used in, or is intended for use in, a toy or a model or replica of a larger device, which model or replica has no function other than amusement and which is not a <i>Conveyance</i> .	at any time	19:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. on Sundays)
7	The operation of any powered rail car including but not limited to refrigeration cars, locomotives or self-propelled passenger cars, while stationary on <i>Property</i> not owned or controlled by a railway governed by The Canada Railway Act.	at any time	23:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. on Sundays)

No.	Activity	When it is prohibited in the <i>Quiet Zone</i>	When it is prohibited in a <i>Residential</i>
8	The operation of any <i>Motorized Conveyance</i> other than on a <i>Highway</i> or other place intended for its operation, in which " <i>Motorized Conveyance</i> " includes, but is not limited to snowmobiles, mopeds, go-carts, track bikes and trail bikes.	at any time	19:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. on Sundays)
9	The venting, release or pressure relief of air, steam or other gaseous material, product or compound from any autoclave, boiler, pressure vessel, pipe, valve, machine, device or system.	at any time	23:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. on Sundays)
10	Persistent barking, calling or whining or other similar persistent <i>Noise</i> making by any domestic pet.	at any time	at any time
11	The operation of any powered or non-powered tool for domestic purposes other than snow removal.	17:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. on Sundays)	21:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. on Sundays)
12	The operation of solid waste bulk lifts or <i>Refuse Compacting Equipment</i> .	17:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. on Sundays)	19:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. on Sundays)
13	The operation of commercial car wash with air-drying equipment.	17:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. on Sundays)	22:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. on Sundays)
14	The operation of a power assisted hang glider or Para foil.	at any time	at any time
15	The operation of any item of snow making equipment.	at any time	at any time
16	The operation of a <i>Sound</i> emitting pest control device.	at any time	at any time
17	The discharge of firearms.	at any time	at any time

Schedule 3

Index of *NPC Publications*

<i>NPC Publication-101</i>	Technical Definitions Publication
<i>NPC Publication-102</i>	Instrumentation
<i>NPC Publication-103</i>	Procedures
<i>NPC Publication-104</i>	Sound Level Adjustments
<i>NPC Publication-115</i>	Construction Equipment
<i>NPC Publication-117</i>	Domestic Outdoor Power Tools
<i>NPC Publication-118</i>	Motorized Conveyances
<i>NPC Publication-119</i>	Blasting
<i>NPC Publication-206</i>	Road Traffic
<i>NPC Publication-300</i>	Stationary and Transportation Sources

Schedule 4

City of Vaughan Class 4 Designated Areas

Tesmar Holdings Inc., part of Lot 15, Concession 4, being Parts 1 to 9 Incl. on Plan 65R32119, City of Vaughan, Regional Municipality of York.

Schedule 5

City of Vaughan Exempted Employment Areas

805062 Ontario Limited, a wholly owned subsidiary of Granite Real Estate Investment Trust and Granite REIT Inc., and its lessee, Magna International Inc., part of Lot 15, Concession 4, being Parts 1, 2, 11, 12, 13, 14, 15, 16 on 65R-34051, City of Vaughan, Regional Municipality of York. Municipally known as 401 Caldari Road, Vaughan, ON L4K 5P1.