BOVAIRD DRIVE IMPROVEMENTS
CLASS ENVIRONMENTAL ASSESSMENT
TRAFFIC NOISE ASSESSMENT

Regional Municipality of Peel

Submitted to:

Regional Municipality of Peel
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Project TP109089

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1.0 Introduction

The following traffic noise assessment evaluates the potential for traffic noise impacts related to proposed improvements along Bovaird Drive in Brampton, Ontario. The project area extends from just west of Worthington Avenue to approximately 1.5 km west of Heritage Road (the project limits are defined graphically in Appendix A, Figure 1). The area under consideration would widen Bovaird Drive from two (2) lanes to four (4) west of Heritage Road, and from two (2) or four (4) lanes to six (6) lanes east of Heritage Road. Bovaird Drive is controlled by Regional Municipality of Peel (the Region of Peel, or The Region) and as such this assessment is being completed as part of the Class Environmental Assessment (EA) being prepared by The Region.

The following assessment provides background information about noise, summarizes the applicable noise regulations and traffic assessment guidelines, describes the methods by which this assessment was completed, evaluates the potential for construction noise impacts and concludes on whether traffic noise impacts/mitigation are expected along the project corridor.

2.0 Background Information about Noise

The human ear responds to a very wide range of sound pressures. The decibel (dB) scale used to describe and quantify sound is a logarithmic scale that provides a convenient system for considering the large differences in audible sound pressures. On this scale, a 10-dB increase represents a perceived doubling of loudness to someone with normal hearing. Therefore, a 70 dB sound level will sound twice as loud as a 60 dB sound level.

People generally cannot detect sound level differences (increases or decreases) of 1 dB in a given noise environment. Although differences of 2 or 3 dB can be detected under ideal laboratory conditions, such changes are usually difficult to discern in an active outdoor noise environment. A 5-dB change in a given noise source could be perceived by most people under normal listening conditions.

When addressing the effects of noise on people, it is necessary to consider the "frequency response" of the human ear, or those frequencies that people hear best. For this reason, sound-measuring instruments and computer noise models are often programmed to "weight" sounds based on the way people hear. The frequency-weighting most often used to evaluate

environmental noise is A-weighting, and sound levels using this system are reported in "A-weighted decibels" or dBA. All sound levels discussed in this assessment are reported in A-weighted decibels.

As mentioned above, the decibel scale used to describe noise is logarithmic. On this scale, a doubling of sound-generating activity (i.e., a doubling of the sound energy) causes a 3-dBA increase in average sound produced by that source, not a doubling of the loudness of the sound (which requires a 10-dBA increase). For example, if traffic along a roadway is causing a 60 dBA sound level at some nearby location, a doubling in traffic volumes would cause the sound level at this same location to increase to 63 dBA. Such an increase might not be discernible in a complex acoustical environment.

For a given noise source, a number of factors affect the sound transmission from the source, which in turn affects the potential for noise impacts. Important factors include distance from the source, frequency of the sound, absorbency and roughness of the intervening ground surface, atmospheric conditions, the presence or absence of obstructions and their absorbency or reflectivity, and the duration of the sound. The degree of noise impact on humans also depends on existing sound levels and who is listening.

The Regional Municipality of Peel, the Ontario Ministry of Environment (MOE) and the Ontario Ministry of Transportation (MTO) use the equivalent sound level (L_{eq}) to characterize sound levels and to evaluate noise impacts. The L_{eq} is the level that if held constant over the same period of time would have the same sound energy as the actual, fluctuating sound. As such, the L_{eq} can be considered an energy-average sound level. But this metric should not be confused with an arithmetic average which tends to de-emphasize high and low values because the L_{eq} gives most weight to the highest sound levels because they contain the most sound energy.

For traffic noise assessments, the Region of Peel and the MTO require the evaluation of a daytime (i.e., 16-hour) L_{eq} for regional roads. Traffic noise levels reported in this assessment are therefore reported as a 16-hour daytime L_{eq}, or $L_{eq(16)}$.

3.0 Applicable Noise Guidelines/Assessment Protocol

Projects completed under the Class EA process related to infrastructure (e.g., a major roadway widening of a Regional Road) and governed by the Region of Peel are subject to

local and provincial noise guidelines. Procedures established by the Region are germane to the evaluation of impacts and mitigation related to the Bovaird Drive widening project. MTO criteria provide additional means to assess the potential for noise impacts. In addition, MTO criteria provide a means to identify noise sensitive areas. These criteria, in addition to relevant by-laws established by the City of Brampton, are presented below.

3.1 The Regional Municipality of Peel

The Regional Municipality of Peel has published two (2) guidance documents specifically aimed at shielding noise from traffic sources:

1. General Guidelines for the Preparation of Acoustical Reports in the Region of Peel

2. Noise Attention Barrier Policy (Policy No. W30-04)

General Guidelines for the Preparation of Acoustical Reports in the Region of Peel (the Guide) has been primarily developed as a tool for use by residential and other noise-sensitive land-use developers to assess traffic impacts and potential mitigation. The noise criteria in the Guide provide a means to ensure sound levels at indoor and outdoor use areas of noise-sensitive lands are maintained at acceptable levels. Additionally, the Guide outlines procedures to evaluate noise mitigation options (i.e., noise barriers). To assess traffic noise, the Guide provides default traffic volumes to be used when predicting traffic noise through modelling. The Region's default traffic volumes are assumed worst-case (i.e., highest volume) traffic conditions that can be expected for two (2), four (4), and six (6) lane roadways. The intent is to ensure that noise-sensitive land use development is designed such that future occupants are adequately shielded from a worst-case traffic scenario. These traffic data are also often used to assess worst-case operating scenarios for Regional road projects, thereby providing consistency with land-use development noise assessments. The following are the Region's default traffic volumes:

Table 1. Region of Peel Noise Prediction Default Traffic Volumes

Number of Lanes	AADT	% of Medium Trucks	% of Heavy Trucks
2 lanes	13,500 [1]	Truck percentages are to be determined from actual counts, or obtained from municipal records where available. Where not available, assume 10% of AADT for truck traffic with 55% of total trucks for Medium Trucks and 45 % for Heavy Trucks [2, 3]	
4 lanes	27,000 [1]		
6 lanes	40,000		

[1] These volumes have been estimated for Level of Service 'C'. For collector type roads the Area Municipality should be consulted for appropriate volumes and truck percentages

[2] In general, Regional Arterial Roads have a higher percentage of heavy trucks than Local Arterial Roads (i.e., 45% for medium and 55% for heavy trucks of total trucks)

[3] Note that truck percentage data for Bovaird Drive has been provided by the project's traffic consultant

The Noise Attenuation Barrier Policy (Policy No. W30-04) provides specific criteria used to establish whether a noise barrier may be installed due to expected increases in traffic noise at *existing* properties (i.e., a noise barrier retrofit). These criteria are applicable to Bovaird Drive because existing land uses are expected to be exposed to an increase in traffic noise as the road is widened. In general, a noise barrier is considered when daytime sound levels are expected to be 60 dBA or greater *at properties with reversed frontage* to the subject road. That is, these criteria apply to backyards or side yards that are adjacent to the road being evaluated. Properties that face the subject road (i.e., that are *not* reversed frontage) are typically not included in the noise barrier assessment. It is worth nothing that it is often difficult to provide effective noise shielding at a front yard with a barrier that would be likely interrupted by a driveway (i.e., a barrier would not be effective).

3.2 Ontario Ministry of Transportation

In 2006, the Ontario Ministry of Transportation (MTO), in coordination with the Ontario Ministry of Environment (MOE), published the *Environmental Guide for Noise* (MTO Guide), a guideline that established procedures for the evaluation of the potential for noise impacts related to roadway construction and operation. This document also establishes when mitigation measures are warranted and how these measures are to be evaluated. The MTO Guide has been prepared to address a wide range of transportation-related project types,

including those completed under the Environmental Assessment (EA) process. The MTO Guide updates and supersedes previous MTO/MOE guidance documents that address assessment of traffic noise related to new and expanded highway projects.

The MTO Guide has established a protocol by which the significance of a potential noise impact can be determined, and thus concludes on the justification for noise mitigation. The determination of potential impacts is based on:

- comparing future *with-project* levels to *future ambient* (i.e., without project) levels, and
- overall sound levels with the proposed undertaking

Table 2 outlines the MTO Guide criteria used to define a traffic noise impact, and thus warrant an evaluation of traffic noise mitigation. These criteria are not specifically applicable to this project, however, because the Region has established local criteria that are specifically applicable to Regional road projects. However, the MTO criteria have been included in this report for completeness and as a tool for selecting noise sensitive areas and evaluating the potential for noise impacts due to sound levels increases over future ambient conditions.

Table 2. MTO Traffic Noise Impact and Mitigation Criteria

Change in Noise Level Above Ambient/Projected Noise Levels with Proposed Improvements	Mitigation Effort Required
< 5 dBA change & < 65 dBA	• None
≥ 5 dBA change OR ≥ 65 dBA	• Investigate noise control measures on right-of-way • Introduced noise control measures within right-of-way and mitigate to ambient if technically, economically and administratively feasible • Noise control measures, where introduced, should achieve a minimum of 5 dBA attenuation, over first row receivers

From MTO Guide (2006), Table 2.1, Page 9

3.2.1 City of Brampton

The entire project corridor is located within the City of Brampton, and as such noise generated by construction activity is subject to City of Brampton by-laws. Currently, the City of Brampton exempts noise from construction activities related to road improvements specifically undertaken by the Region of Peel [City of Brampton Noise By-Law 95-84 4(10)].

3.3 Assessment Protocol

To be consistent with The Region's policy and guidance, this noise assessment has been completed per elements of two Region of Peel noise publications (see Section 3.1). Some elements of the MTO noise criteria have also been considered for reference. The following outlines the approach for this study:

1. Assessment of future traffic noise levels with and without the project. Future ambient traffic volumes are based on The Region's default worst-case traffic volumes; future with-project scenarios are based on data from the project's traffic consultant. In addition, comparison of future ambient to future with-project sound levels to evaluate against MTO criteria.

2. Applicability of noise mitigation based on Region of Peel Policy W30-04 limit of 60 dBA or higher at existing reversed frontage properties.

3. Assessment of expected construction noise levels.

4.0 Noise Sensitive Areas (NSAs)

Sound level receptor locations used in the noise model were selected based on Noise Sensitive Areas (NSAs) located throughout the project corridor. Per MTO/MOE definition, NSAs may include residences (i.e., houses, town homes and apartments), hospitals, or nursing homes. For the purposes of this assessment, NSAs are located in the most exposed side of the dwelling. Therefore, some NSA are representative of properties with frontage to project roadways (and thus would not be subject to the noise barrier retrofit policy, should impacts be identified).

Appendix A, Figure 2 illustrates the location of the NSAs identified along the Bovaird Drive project corridor. Appendix B, Table B1 provides a tabular summary of the NSAs including a description of the NSA, the approximate number of residential receptors represented by each, and information regarding NSA orientation relative to the roadway.

5.0 Noise Impact Assessment

5.1 Traffic Data

As indicated, this assessment was completed using Region of Peel default worst-case traffic volumes for 2- and 4-lane roads and also using traffic data provided by the project's traffic consultant, GENIVAR, Inc. (GENIVAR).

The Region of Peel default worst-case traffic volumes include total Average Annual Daily Traffic (AADT) volumes for both directions of travel for various numbers of travel lanes (see Table 1, page 6). These volumes represent the absolute worst-case conditions when Bovaird Drive would be operating at maximum capacity and were used to assess the potential for noise impacts under 2031 ambient conditions.

Traffic volumes provided by the traffic consultant were used for Bovaird Drive and intersecting roadways (specifically Mississauga Road) for 2031 with-project conditions. In addition, existing hourly traffic count data at several intersections were used to calculate truck percentages. Truck percentages are expected to remain fairly constant through the year 2031.

Future with-project scenarios include traffic volumes with and without influence of a proposed North-South Transportation Corridor (NSTC). The NSTC is proposed to address projected increases in traffic volumes related to growth in Halton Region and the Region of Peel. The NSTC is expected to increase forecasted volumes along Bovaird Drive (and slightly decrease volumes on Mississauga Road). Therefore, this noise assessment has included the evaluation of traffic noise with and without the NSTC (as two future build scenarios).

Details of the traffic data provided by the traffic consultant for future with-project scenarios are found in Appendix C. Appendix C, Table C1 provides a summary of traffic volumes used in the noise impact assessment.

5.2 Noise Calculation Tool

The assessment of noise levels and the determination of the potential for noise impacts was completed following the MOE ORNAMENT noise procedure, using the MOE STAMSON noise model. STAMSON accounts for various traffic types and speeds, source-receiver distances, changes in elevation, the presence of building "rows", and accounts for the effectiveness of noise barriers. STAMSON also allows for consideration of multiple roadways simultaneously.

5.3 Modelling Details

As indicated, forecasted traffic data are provided as 24-hour AADT volumes. These volumes were input to the STAMSON model which calculated 16-hour daytime sound levels ($L_{eq(16)}$).

In addition to traffic volumes, truck percentages, details regarding receptor distances to the eastbound and westbound lanes of Bovaird Drive, and the changes in elevation between each source and receiver were input to the model. The existing traffic speed of 70 km/h was applied to future ambient and future with-project noise modelling scenarios. A summary of model input parameters for each receptor are found in Appendix C, Table C2.

Seventeen (17) of the nineteen (19) NSAs considered in this assessment are along or near Bovaird Drive. Two (2) NSAs represent homes along Mississauga Road, just north of Bovaird Drive.

As per MTO guidance, sound levels were assessed at the most exposed outdoor area of each NSA. The suitability for noise mitigation (i.e., noise walls) was assessed per Region of Peel noise barrier retrofit policy.

6.0 Results

6.1 Preferred Alternative

Appendix B, Table B2 summarizes the results of the noise modelling assessment, under both future ambient and future with-project scenarios.

Sound levels were predicted to remain below the Region's 60 dBA noise barrier retrofit criteria at all five (5) of the nineteen (19) NSAs that represent properties with reversed frontage to Bovaird Drive.

Sound levels were predicted to exceed the Region's 60 dBA noise barrier retrofit criteria at (11) of nineteen (19) NSAs, each representing properties that are *not* reversed frontage (i.e., they face toward the road). For reference, MTO methodology was applied as a means to determine sound levels at the Outdoor Living Areas (OLAs) of NSAs that face the subject roads. Sound levels were calculated at the OLAs with consideration of intervening building row densities and increased distance from the road. This assessment was completed for the future scenario with influence of the NSTC, which represents worst-case future with-project conditions at most NSAs. At two (2) NSAs (R16 and R19), sound levels at the backyard OLA would continue to exceed 60 dBA by less than 1.5 dBA. However, to reiterate Regional policy, the Region does not evaluate mitigation at properties that are not reversed frontage.

In addition, assessment results indicate that the proposed roadway improvements would result in an increase in sound levels of up to 4 dBA over future ambient conditions. This increase is below the MTO's 5-dBA impact criteria due to increases in projected sound levels. The Region of Peel does have noise impact or mitigation criteria that assess increases in noise over a future do-nothing scenario.

The proposed NSTC is expected to result in traffic noise levels that are less than 1 dBA above a no-NSTC scenario. Along Mississauga Road, sound levels would be less than 2 dBA lower with the NSTC due to traffic diverted away from Mississauga Road.

To summarize, noise barrier mitigation is not warranted at any of the existing or known future NSAs along Bovaird Drive or Mississauga Road. This is because either 1) predicted levels are below the Region's noise barrier retrofit policy, or 2) projected impacts are at properties that are not reversed frontage, and therefore do not meet noise barrier retrofit requirements.

Detailed noise modelling results are found in Appendix B, Table B2. Results include future ambient and future with and without NSTC scenarios. Where sound levels were projected to exceed 60 dBA, a conclusion of feasibility is presented, based on whether the corresponding OLA faces the road (i.e., reversed frontage or not).

6.2 Future Development

R14 is representative of a future residential development, the exact details of which were not known at the time of this assessment. Therefore, it was not clear what distance Bovaird Drive would be from this future NSA. Assumptions were therefore made regarding the NSA distance from Bovaird Drive and building row densities providing shielding to backyards.

Regardless of the conclusions of this assessment, developers will be required to follow the Regions' General Guidelines for the Preparation of Acoustical Reports in the Region of Peel to evaluate exterior and interior sound levels at these future properties.

6.3 Alternative Alignments

Proposed alternatives to the preferred alignment included minor changes to intersection configurations (i.e., slightly widened turn lane radii) and extended turning lanes. The alternative configurations are not expected to result in sound levels that are significantly different than are predicted for the future preferred alternative.

7.0 Construction Noise

During construction there would be temporary increases in sound levels at locations near active construction areas and along routes to these areas. The sound level increases would be due to construction activities involving heavy equipment and the hauling of construction materials. The increase in noise levels would depend on the type(s) of equipment being used and the amount of time it is in use. Excavation, grading and paving would generate sounds likely audible on surrounding properties. Appendix B, Table B3 shows the typical range of noise levels for construction equipment that could be used during the construction along Bovaird Drive. Sounds from construction equipment and activities (usually point sources) decrease about 6 dBA for each doubling in distance from the source. Based on these levels, it is likely that NSAs located near the construction areas would be temporarily impacted by construction noise.

7.1 Construction Noise Levels and Mitigation

The City of Brampton has not specifically identified noise from construction activity in its noise by-law. Therefore, there are no regulatory requirements that restrict construction activity or timing. However noise from construction activities related to the proposed project could nonetheless disturb nearby residences. The potential for such disturbance could be reduced with the practical and inexpensive techniques described below. The following construction noise mitigation techniques are suggestions for times when construction activities occur close to existing residences or other sensitive lane uses.

1) Limit noisy construction activity to daytime hours to minimize the potential for noise impacts during typical hours of rest of sleep.

2) Construction noise could be minimized with properly sized and maintained mufflers, engine intake silencers, engine enclosures, and turning off equipment when not in use. Stationary construction equipment should be located away from sensitive receiving properties where possible.

3) Where stationary equipment is located near NSAs and the above noise-reducing measures are not feasible, portable noise barriers could be placed around the equipment with the opening directed away from the sensitive receiving property. These measures are especially effective for engines used in pumps, compressors, welding machines, etc., that operate continuously and contribute to high, steady background noise levels. In addition to providing about a 10-dBA reduction in equivalent sound levels, the portable barriers demonstrate to the public the contractor's commitment to minimizing noise impacts during construction.

4) Back-up alarms used as safety warning devices often emit some of the most annoying sounds from a construction site. One effective technique for reducing backup alarm noise would be to employ ambient-sensing alarms that test the noise environment and broadcast a sound loud enough to be heard instead of using a pre-set (usually maximum) sound level. Alternatively, the use of broadband backup alarms instead of the typically employed pure tone alarms have been found to be very effective in reducing off-site annoyance due to these required warning devices.

5) Noise from material handling can be minimized by requiring operators to lift rather than drag materials wherever feasible.

6) Substituting hydraulic or electric models for impact tools such as jack hammers, rock drills and pavement breakers would also reduce construction noise. Electric pumps could be specified if pumps are required to remove water.

7) The most important element in reducing construction noise impacts would be to restrict noisy work to daytime hours when people nearby are not trying to relax or sleep. Such a restriction is desirable because background noise would be more likely to mask construction noise during the day, and because most people are more sensitive to noises when they expect quiet and when they are trying to sleep.

8.0 Conclusions

The proposed improvements to Bovaird Drive, between just west of Worthington Avenue and approximately 1.5 km west of Heritage Road, will not result in traffic noise levels that exceed the Region's 60 dBA noise barrier retrofit policy at reversed-frontage properties. Noise modelling was completed using an MTO-approved computer noise model and a combination of traffic data from the project's traffic consultant and The Region's default traffic volumes.

Overall sound levels at seventeen (17) of the nineteen (19) NSA outdoor living areas, regardless of orientation (i.e., reverved frontage or not) are expected to remain below the Region's noise barrier retrofit policy criteria of 60 dBA (daytime L_{eq}).

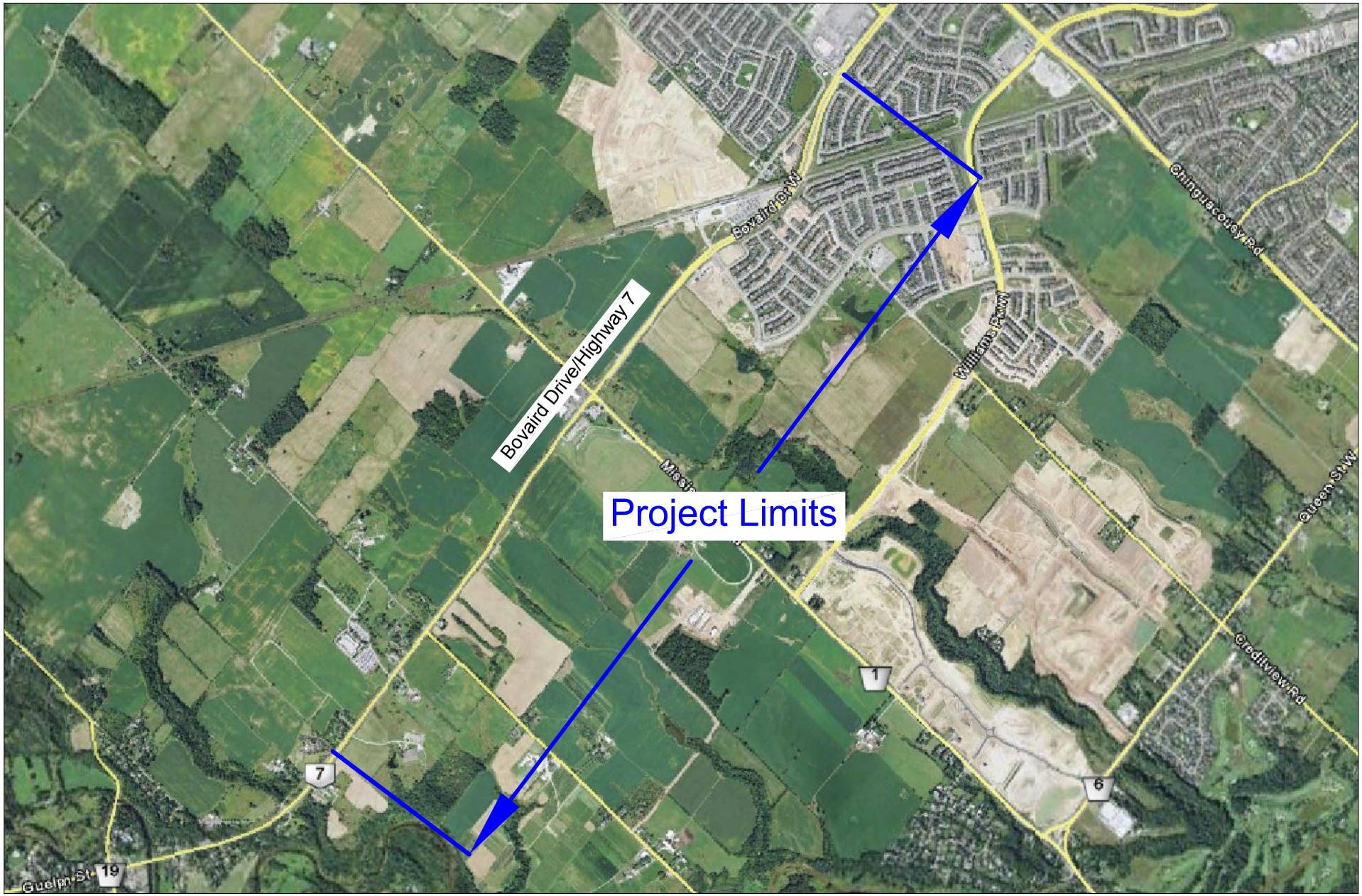
Sound levels are predicted to exceed 60 dBA at two (2) NSAs, the OLAs for both of which are located in back yards that do *not* face Bovaird Drive. These properties therefore do *not* meet the Region's policy criteria for mitigation.

Alternatives to the preferred project alignment include minor alternative configurations of some proposed intersections. The alternative configurations are not expected to result in sound levels that would be significantly different from the preferred project alternative.

Noise related to construction activity is exempt from the City of Brampton Noise By-Laws, however common sense construction techniques can aid to minimize the potential for construction noise impacts.

APPENDIX A

FIGURES



Map Source: Google Earth, 2011.

N

Approximate Scale in Metres

0 500 1,000

amec

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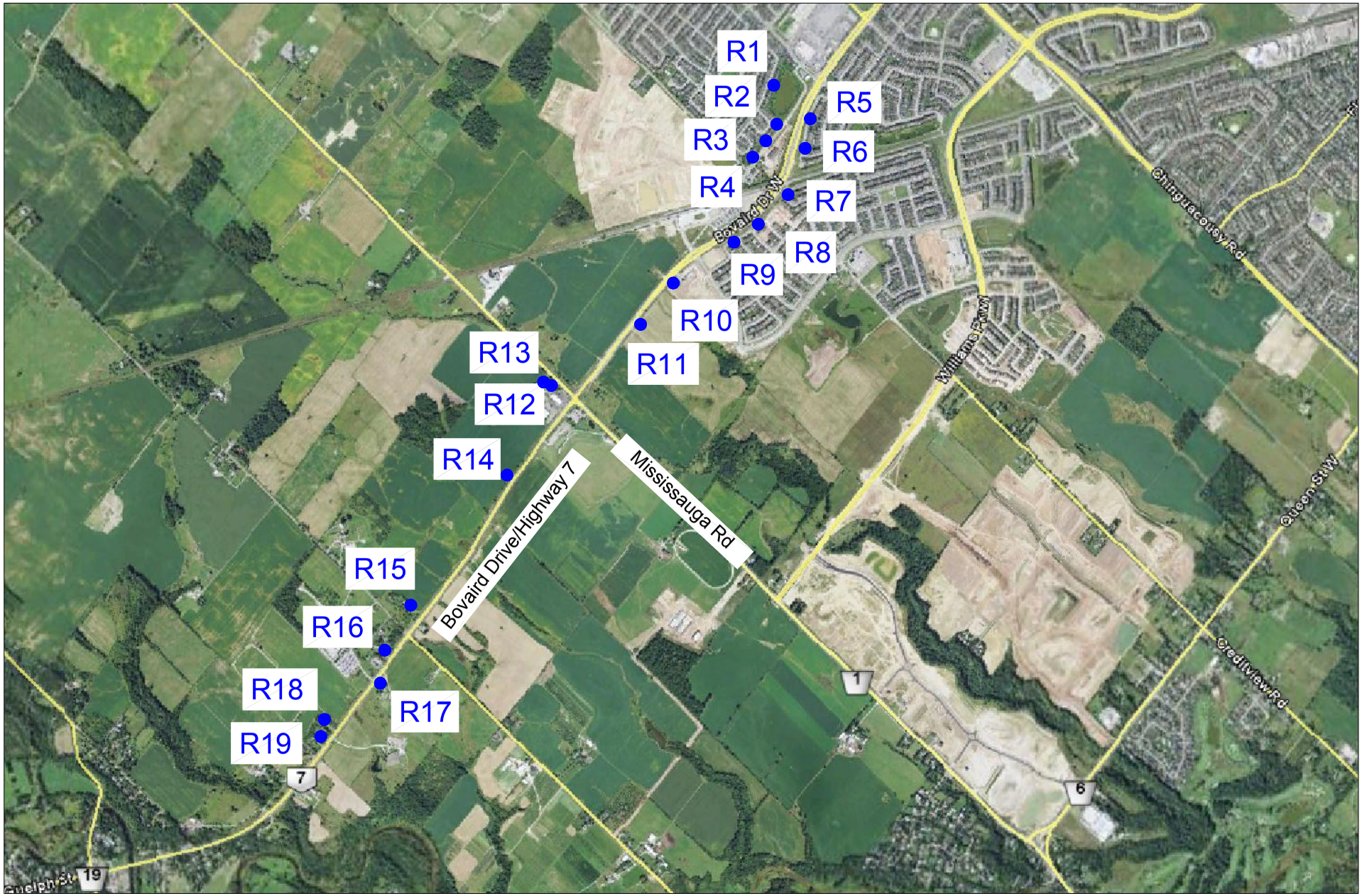
Project Study Area
Traffic Noise Assessment
Bovaird Drive Class EA
Region of Peel, ON

DATE	PROJ. NO.
April 30, 2011	TP109089
DRAWN BY:	DWG. NO.
KMW	Figure 1



Map Source: Google Earth, 2011.

N

Approximate Scale in Metres

0 500 1,000

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Noise Sensitive Areas (NSA)
Traffic Noise Assessment
Bovaird Drive Class EA
Region of Peel, ON

DATE	PROJ. NO.
April 30, 2011	TP109089
DRAWN BY:	DWG. NO.
KMW	Figure 2

APPENDIX B

TABLES

Table B1. Noise Sensitive Areas (NSAs)

Rec #	Description	Number of Sensitive Land Uses	Revsersed Frontage NSA?	Approximte % Shielding to Backyard OLA Provided by Residential Building(s)
1	Residential Properties on Unsworth Street, backyards facing Bovaird	15	Yes	n/a
2	Residential Properties on Sherbo Crescent , backyards facing Bovaird	5	Yes	n/a
3	Residential Properties on Sherbo Crescent , backyards facing Bovaird	5	Yes	n/a
4	Residential Properties on Rowland Street, backyards facing Bovaird	5	Yes	n/a
5	Residential Properties on Ozner Court, front yards facing Bovaird	25	No	95%
6	Residential Properties on Ozner Court, front yards facing Bovaird	19	No	95%
7	Residential Properties on Decker Hallow Circle, front yards and backyards facing Bovaird	8	No	95%
8	Residential Properties on Evanwood Crescent, front yards and backyards facing Bovaird	9	Yes	n/a
9	Residential Properties on Kilrea Way, front yards and back yards facing Bovaird	17	No	95%
10	Residential Properties on Kilrea Way, front yards facing Bovaird	13	No	90%
11	Residential Properties on Unidentifed Street, west of James Porter Drive, frontyards facing Bovaird	11	No	90%
12	Residential Property on Mississuage Rd, front yard facing Mississauga Rd	1	No	0%
13	Residential Property on Mississuage Rd, front yard facing Mississauga Rd	1	No	0%
14	Future Residential Development on Bovaird Drive, facing Mississauga Rd	Unknown (future)	No	50%
15	Residential Property on Bovaird Drive, front yard facing Mississauga Rd	1	No	0%
16	Residential Properties on Bovaird Drive, front yard facing Mississauga Rd	4	No	0%
17	Residential Property on Bovaird Drive, front yard facing Mississauga Rd	1	No	0%
18	Residential Property on Bovaird Drive, front yard facing Mississauga Rd	1	No	0%
19	Residential Property on Bovaird Drive, front yard facing Mississauga Rd	1	No	0%

Table B2. Future (2031) Noise Levels With and Without Undertaking (with and without North-South Corridor)

Rec #	Number of Sensitive Land Uses	2031 Ambient dBA, $L_{eq(16)}$	With Project *Without* NSTC		With Project *With* NSTC [1]				
			2031 With Project At Most Exposed Side of NSAs dBA, $L_{eq(16)}$	Change Due to Undertaking dBA	2031 With Project At Most Exposed Side of NSAs dBA, $L_{eq(16)}$	Change Due to Undertaking at Most Exposed Side of NSA dBA	2031 With Project At Outdoor Use Area dBA, $L_{eq(16)}$ [2]	> 60 dBA?	Mitigation Feasible? (i.e., Reversed Frontage Property?)
1	15	53	54	0.7	54	0.8	same (54)	no	-
2	5	57	58	0.8	58	0.8	same (58)	no	-
3	5	56	57	0.8	57	0.8	same (57)	no	-
4	5	55	56	0.8	56	0.8	same (56)	no	-
5	25	63	63	0.7	63	0.9	50.7	no	-
6	19	56	58	1.5	58	1.7	50.3	no	-
7	8	53	54	0.7	54	0.9	50.1	no	-
8 [3]	9	58	58	0.5	59	0.8	same (59)	no	-
9	17	62	62	0.6	62	0.8	50.3	no	-
10	13	63	64	1.3	65	1.6	53.3	no	-
11	11	63	65	1.5	65	1.8	53.5	no	-
12	1	61	63	2.4	62	0.8	57.6	no	-
13	1	58	61	2.6	59	0.9	55.8	no	-
14	Unknown (future)	65	67	2.3	68	2.7	59.2	no	-
15	1	59	61	1.8	61	2.3	59.1	no	-
16	4	61	65	4.2	66	4.7	61.4	YES	No
17	1	59	63	3.6	64	4.3	59.6	no	-
18	1	59	60	1.5	61	2.0	58.2	no	-
19	1	64	66	2.0	66	2.0	61.3	YES	No

[1] Detailed assessment provided for With Project "With NSTC" because overall sound levels are generally higher (i.e., worst-case) than "Without NSTC" at most NSAs.

[2] Outdoor Living Areas (OLAs) are assumed to be located in the backyard of the corresponding NSA. Sound levels are relfective of shielding provided by internvening NSA buildings (see Table 1 for approximate % of shielding provided)

[3] That that backyards of some NSAs represented by Rec 8 are adjacent to Bovaird Drive and considered reversed frontage, others are not. As a conservative measure, all were assumed reversed frontage.

Table B3. Typical Noise Levels from Construction Activities Equipment (dBA)

Activity	Range of Hourly Leqs		
	At 15 m	At 30 m	At 90 m
Clearing	83	77	67
Grading	75-88	69-82	59-72
Paving	71-88	66-82	56-72
Types of Equipment	**Range of Noise Levels**		
	At 15 m	**At 30 m**	**At 90 m**
Bulldozer	77-96	71-90	61-80
Dump Truck	82-94	76-88	66-78
Scraper	80-93	74-87	64-77
Paver	86-88	80-82	70-72
Generators	71-82	65-76	55-66
Compressors	74-81	68-75	58-65

From US EPA, 1971, modified for this report

APPENDIX C

TRAFFIC DATA

Table C1. Traffic Data

Road	Road Segement	Noise Model Receptors Within Each Segment	2031 AADT Without Undertaking (with or without NSTC) [1]		2031 AADT Traffic Volumes With Undertaking [2]			
					2031 Without NSTC		2031 With NSTC	
			WB/SB	EB/NB	WB/SB	EB/NB	WB/SB	EB/NB
Bovaird Drive	Worthington Ave - Ashby Field Rd	1 - 9	13500	13500	16502	15420	15332	17180
	Ashby Field Rd - Mississauga Rd	10 - 11	13500	13500	16759	22250	15464	25580
	Mississauga Rd - Heritage Rd	14 - 15	13500	13500	20945	17960	21271	23220
	Heritage Rd - Caseley St	16 - 19	6750	6750	16802	19970	8145	11010
Mississauga Rd	North of Bovaird Drive	12 - 13	6750	6750	16260	10805	9340	8754

[1] AADT volumes for 2031 baseline conditions based on maximum traffic for 2- and 4-lane roadways, per Region of Peel "General Guidelines for the Preparation of Acoustical Reports in the Region of Peel"

[2] Traffic data provided by GENIVAR, Inc.

Table C2. Noise Model Input Details

Rec #	Distance from NSA to Existing Centerline (m) [1]		Distance from NSA to Future Centerline (m) [1]		Distance from OLA to Future Centerline (m) [2]		Elevations (m)			2031 Ambient Traffic Data [3, 5]						2031 With Project Traffic Data - No North-South Corridor AADT [4, 5]						2031 With Project Traffic Data - WITH North-South Corridor AADT [4, 5]				
										WB/SB			EB/NB			WB/SB			EB/NB			WB/SB			EB/NB	
	WB/SB	EB/NB	WB/SB	EB/NB	WB/SB	EB/NB	Rec	Road	Elev Change	AADT	Med	Hvy	AADT	Med	Hvy	AADT	Med	Hvy	AADT	Med	Hvy	AADT	Med	Hvy	AADT	Med
1	170	187	171	187	171	187	244	241	3	**13500**	6.8%	3.4%	**13500**	5.9%	3.0%	**16502**	6.8%	3.4%	**15420**	5.9%	3.0%	**15332**	6.8%	3.4%	**17180**	5.9%
2	92	108	92	108	92	108	244	246	2	**13500**	6.8%	3.4%	**13500**	5.9%	3.0%	**16502**	6.8%	3.4%	**15420**	5.9%	3.0%	**15332**	6.8%	3.4%	**17180**	5.9%
3	121	139	119	139	119	139	246	250	4	**13500**	6.8%	3.4%	**13500**	5.9%	3.0%	**16502**	6.8%	3.4%	**15420**	5.9%	3.0%	**15332**	6.8%	3.4%	**17180**	5.9%
4	159	176	158	176	158	176	247	253	6	**13500**	6.8%	3.4%	**13500**	5.9%	3.0%	**16502**	6.8%	3.4%	**15420**	5.9%	3.0%	**15332**	6.8%	3.4%	**17180**	5.9%
5	53	36	53	36	79	62	242	243	1	**13500**	6.8%	3.4%	**13500**	5.9%	3.0%	**16502**	6.8%	3.4%	**15420**	5.9%	3.0%	**15332**	6.8%	3.4%	**17180**	5.9%
6	70	53	72	53	98	79	242	250	8	**13500**	6.8%	3.4%	**13500**	5.9%	3.0%	**16502**	6.8%	3.4%	**15420**	5.9%	3.0%	**15332**	6.8%	3.4%	**17180**	5.9%
7	75	55	75	55	96	76	242	254	12	**13500**	6.8%	3.4%	**13500**	5.9%	3.0%	**16502**	6.8%	3.4%	**15420**	5.9%	3.0%	**15332**	6.8%	3.4%	**17180**	5.9%
8	55	38	57	38	57	38	242	250	8	**13500**	6.8%	3.4%	**13500**	5.9%	3.0%	**16502**	6.8%	3.4%	**15420**	5.9%	3.0%	**15332**	6.8%	3.4%	**17180**	5.9%
9	60	44	62	44	88	70	243	245	2	**13500**	6.8%	3.4%	**13500**	5.9%	3.0%	**16502**	6.8%	3.4%	**15420**	5.9%	3.0%	**15332**	6.8%	3.4%	**17180**	5.9%
10	48	34	52	36	78	62	244	245	1	**13500**	6.8%	3.4%	**13500**	5.9%	3.0%	**16759**	6.8%	3.4%	**22250**	5.9%	3.0%	**15464**	6.8%	3.4%	**25580**	5.9%
11	43	35	50	34	76	60	242	243	1	**13500**	6.8%	3.4%	**13500**	5.9%	3.0%	**16759**	6.8%	3.4%	**22250**	5.9%	3.0%	**15464**	6.8%	3.4%	**25580**	5.9%
12	40	36	43	31	71	59	238	236	2	**6750**	5.5%	2.7%	**6750**	4.9%	2.4%	**16260**	5.5%	2.7%	**10805**	4.9%	2.4%	**9340**	5.5%	2.7%	**8754**	4.9%
13	54	50	58	46	86	74	237	236	1	**6750**	5.5%	2.7%	**6750**	4.9%	2.4%	**16260**	5.5%	2.7%	**10805**	4.9%	2.4%	**9340**	5.5%	2.7%	**8754**	4.9%
14	26	35	22	38	48	64	243	241	2	**13500**	5.8%	2.9%	**13500**	5.3%	2.6%	**20945**	5.8%	2.9%	**17960**	5.3%	2.6%	**21271**	5.8%	2.9%	**23220**	5.3%
15	67	72	62	75	88	101	238	236	2	**13500**	5.8%	2.9%	**13500**	5.3%	2.6%	**20945**	5.8%	2.9%	**17960**	5.3%	2.6%	**21271**	5.8%	2.9%	**23220**	5.3%
16	32	38	29	39	55	65	238	238	0	**6750**	4.7%	2.3%	**6750**	4.6%	2.3%	**16802**	4.7%	2.3%	**19970**	4.6%	2.3%	**8145**	4.7%	2.3%	**11010**	4.6%
17	46	39	48	39	81	72	239	239	0	**6750**	4.7%	2.3%	**6750**	4.6%	2.3%	**16802**	4.7%	2.3%	**19970**	4.6%	2.3%	**8145**	4.7%	2.3%	**11010**	4.6%
18	65	72	62	71	88	97	239	239	0	**6750**	4.7%	2.3%	**6750**	4.6%	2.3%	**16802**	4.7%	2.3%	**19970**	4.6%	2.3%	**8145**	4.7%	2.3%	**11010**	4.6%
19	29	36	27	36	53	62	239	238	1	**6750**	4.7%	2.3%	**6750**	4.6%	2.3%	**16802**	4.7%	2.3%	**19970**	4.6%	2.3%	**8145**	4.7%	2.3%	**11010**	4.6%

[1] Based on distance to most exposed side of representative dwelling, approximately 3m from dwelling building.

[2] Based on distance to Outdoor Living Area (OLA), which is approximately 3m from the dwelling building in the backyard of the respresentative NSA.

[3] AADT volumes for 2031 Ambient conditions based on maximum traffic for 2- and 4-lane roadways, per Region of Peel "General Guidelines for the Preparation of Acoustical Reports in the Region of Peel"

[4] AADT volumes for 2031 With Project conditions based on traffic data provided by GENIVAR, Inc.

[5] Truck percentages based on data provided by GENIVAR, Inc. and on assumption that 2/3 of truck traffic will be medium-duty trucks, the remainder heavy-duty trucks.

Bovaird Drive EA Study

Projected 2021 and 2031 AADT Volumes for Bovaird Drive

2021 AADT Volumes, Without North-South Transporation Corridor

Location	AADT Volumes
Bovaird Drive, west of Worthington Ave.	
Westbound Volumes	14939
Eastbound Volumes	13960
Total Volumes	28899
Bovaird Drive, west of Ashby Field Road	
Westbound Volumes	15172
Eastbound Volumes	20143
Total Volumes	35315
Bovaird Drive, west of Mississauga Road	
Westbound Volumes	17182
Eastbound Volumes	14733
Total Volumes	31915
Bovaird Drive, west of Heritage Road	
Westbound Volumes	13784
Eastbound Volumes	16382
Total Volumes	30166
Bovaird Drive, west of Caseley Street	
Westbound Volumes	3058
Eastbound Volumes	3938
Total Volumes	6996

2031 AADT Volumes, Without North-South Transporation Corridor

Location	AADT Volumes
Bovaird Drive, west of Worthington Ave.	
Westbound Volumes	16502
Eastbound Volumes	15420
Total Volumes	31922
Bovaird Drive, west of Ashby Field Road	
Westbound Volumes	16759
Eastbound Volumes	22250
Total Volumes	39009
Bovaird Drive, west of Mississauga Road	
Westbound Volumes	20945
Eastbound Volumes	17960
Total Volumes	38905
Bovaird Drive, west of Heritage Road	
Westbound Volumes	16802
Eastbound Volumes	19970
Total Volumes	36772
Bovaird Drive, west of Caseley Street	
Westbound Volumes	3741
Eastbound Volumes	4820
Total Volumes	8561

2031 AADT Volumes, With North-South Transporation Corridor

Location	AADT Volumes
Bovaird Drive, west of Worthington Ave.	
Westbound Volumes	15332
Eastbound Volumes	17180
Total Volumes	32512
Bovaird Drive, west of Ashby Field Road	
Westbound Volumes	15464
Eastbound Volumes	25580
Total Volumes	41044
Bovaird Drive, west of Mississauga Road	
Westbound Volumes	21271
Eastbound Volumes	23220
Total Volumes	44491
Bovaird Drive, west of Heritage Road	
Westbound Volumes	8145
Eastbound Volumes	11010
Total Volumes	19155
Bovaird Drive, west of Caseley Street	
Westbound Volumes	2159
Eastbound Volumes	310
Total Volumes	2469

Bovaird Drive EA Study

Projected AADT Volumes for Intersecting Streets with Bovaird Drive

2021 AADT Volumes, Without North-South Transporation Corridor

Location	AADT Volumes
Worthington Avenue, North of Bovaird Drive	
Northbound Volumes	6932
Southbound Volumes	3933
Total Volumes	10865
Worthington Avenue, South of Bovaird Drive	
Northbound Volumes	518
Southbound Volumes	1650
Total Volumes	2168
Ashby Field Road, North of Bovaird Drive	
Northbound Volumes	906
Southbound Volumes	3155
Total Volumes	4061
Ashby Field Road, South of Bovaird Drive	
Northbound Volumes	1499
Southbound Volumes	3760
Total Volumes	5259
Mississauga Road, North of Bovaird Drive	
Northbound Volumes	8864
Southbound Volumes	13339
Total Volumes	22203
Mississauga Road, South of Bovaird Drive	
Northbound Volumes	16760
Southbound Volumes	17375
Total Volumes	34135
Heritage Road, North of Bovaird Drive	
Northbound Volumes	2546
Southbound Volumes	3298
Total Volumes	5844
Heritage Road, South of Bovaird Drive	
Northbound Volumes	3265
Southbound Volumes	2002
Total Volumes	5267
Caseley Street, North of Bovaird Drive	
Northbound Volumes	0
Southbound Volumes	0
Total Volumes	0
Caseley Street, South of Bovaird Drive	
Northbound Volumes	10
Southbound Volumes	59
Total Volumes	69

Bovaird Drive EA Study

Projected AADT Volumes for Intersecting Streets with Bovaird Drive

2031 AADT Volumes, Without North-South Transporation Corridor

Location	AADT Volumes
Worthington Avenue, North of Bovaird Drive	
Northbound Volumes	7657
Southbound Volumes	4344
Total Volumes	12002
Worthington Avenue, South of Bovaird Drive	
Northbound Volumes	573
Southbound Volumes	1822
Total Volumes	2395
Ashby Field Road, North of Bovaird Drive	
Northbound Volumes	1001
Southbound Volumes	3485
Total Volumes	4486
Ashby Field Road, South of Bovaird Drive	
Northbound Volumes	1655
Southbound Volumes	4153
Total Volumes	5809
Mississauga Road, North of Bovaird Drive	
Northbound Volumes	10805
Southbound Volumes	16260
Total Volumes	27065
Mississauga Road, South of Bovaird Drive	
Northbound Volumes	20430
Southbound Volumes	21180
Total Volumes	41610
Heritage Road, North of Bovaird Drive	
Northbound Volumes	3104
Southbound Volumes	4020
Total Volumes	7124
Heritage Road, South of Bovaird Drive	
Northbound Volumes	3980
Southbound Volumes	2441
Total Volumes	6421
Caseley Street, North of Bovaird Drive	
Northbound Volumes	0
Southbound Volumes	0
Total Volumes	0
Caseley Street, South of Bovaird Drive	
Northbound Volumes	10
Southbound Volumes	72
Total Volumes	82

Bovaird Drive EA Study

Projected AADT Volumes for Intersecting Streets with Bovaird Drive

2031 AADT Volumes, With North-South Transporation Corridor

Location	AADT Volumes
Worthington Avenue, North of Bovaird Drive	
Northbound Volumes	7960
Southbound Volumes	4344
Total Volumes	12304
Worthington Avenue, South of Bovaird Drive	
Northbound Volumes	573
Southbound Volumes	1828
Total Volumes	2400
Ashby Field Road, North of Bovaird Drive	
Northbound Volumes	969
Southbound Volumes	3485
Total Volumes	4454
Ashby Field Road, South of Bovaird Drive	
Northbound Volumes	1655
Southbound Volumes	4277
Total Volumes	5932
Mississauga Road, North of Bovaird Drive	
Northbound Volumes	8754
Southbound Volumes	9340
Total Volumes	18094
Mississauga Road, South of Bovaird Drive	
Northbound Volumes	15140
Southbound Volumes	14393
Total Volumes	29533
Heritage Road, North of Bovaird Drive	
Northbound Volumes	1815
Southbound Volumes	940
Total Volumes	2755
Heritage Road, South of Bovaird Drive	
Northbound Volumes	2420
Southbound Volumes	755
Total Volumes	3175
Caseley Street, North of Bovaird Drive	
Northbound Volumes	0
Southbound Volumes	0
Total Volumes	0
Caseley Street, South of Bovaird Drive	
Northbound Volumes	10
Southbound Volumes	14
Total Volumes	24

MG8 ENG

Total Count Diagram

Municipality: Region of Peel
Site #: 10716989
Intersection: Bovaird Drive & Worthington Avenu
TFR File #: 1
Count date: 29-Sep-2009

Weather conditions: Sunny
Person(s) who counted: ZORAN

**** Signalized Intersection ****

Major Road: Bovaird Drive runs W/E

North Leg Total:	4816
North Entering:	2985
North Peds:	27
Peds Cross:	⋈

Cyclists	14	0	0	14
Trucks	225	17	51	293
Cars	823	391	1464	2678
Totals	1062	408	1515	

Cyclists	0
Trucks	116
Cars	1715
Totals	1831

East Leg Total:	13179
East Entering:	6652
East Peds:	179
Peds Cross:	⧖

Worthington Ave

Cyclists	Trucks	Cars	Totals
66	710	6244	7020

Cars	Trucks	Cyclists	Totals
522	67	0	589
5262	484	52	5798
262	3	0	265
6046	554	52	

Bovaird Dr

N
W E
S

Cyclists	Trucks	Cars	Totals
0	39	926	965
54	477	4265	4796
0	5	174	179
54	521	5365	

Bovaird Dr

Cars	Trucks	Cyclists	Totals
5940	533	54	6527

Lake Louise Dr

Peds Cross:	⧖
West Peds:	86
West Entering:	5940
West Leg Total:	12960

Cars	827
Trucks	25
Cyclists	0
Totals	852

Cars	159	267	211	637
Trucks	1	10	5	16
Cyclists	0	0	0	0
Totals	160	277	216	

Peds Cross:	⋈
South Peds:	10
South Entering:	653
South Leg Total:	1505

Comments

MG8 ENG

Total Count Diagram

Municipality: Region of Peel
Site #: na
Intersection: Bovaird Drive & Mississauga Road
TFR File #: 1
Count date: 1-Dec-2009

Weather conditions:
Clear weather, light snow in the morning

Person(s) who counted:
MOMO
MIROSLAV

**** Signalized Intersection ****

Major Road: Bovaird Drive runs W/E

North Leg Total:	3675
North Entering:	1858
North Peds:	2
Peds Cross:	⋈

Cyclists	0	0	0	0
Trucks	36	102	14	152
Cars	93	1467	146	1706
Totals	129	1569	160	

Cyclists	0
Trucks	133
Cars	1684
Totals	1817

East Leg Total:	11083
East Entering:	5575
East Peds:	2
Peds Cross:	⧖

Mississauga Rd

Cyclists	Trucks	Cars	Totals
1	416	4341	4758

Cars	Trucks	Cyclists	Totals
180	15	0	195
3414	268	1	3683
1561	136	0	1697
5155	419	1	

Bovaird Dr

N
W E
S

Cyclists	Trucks	Cars	Totals
0	34	127	161
3	244	3310	3557
1	91	867	959
4	369	4304	

Bovaird Dr

Cars	Trucks	Cyclists	Totals
5144	360	4	5508

Mississauga Rd

Peds Cross:	⧖
West Peds:	0
West Entering:	4677
West Leg Total:	9435

Cars	3895
Trucks	329
Cyclists	1
Totals	4225

Cars	834	1377	1688	3899
Trucks	112	84	102	298
Cyclists	0	0	1	1
Totals	946	1461	1791	

Peds Cross:	⋈
South Peds:	2
South Entering:	4198
South Leg Total:	8423

Comments

MG8 ENG

Total Count Diagram

Municipality: Region of Peel
Site #: 10720341
Intersection: Bovaird Drive & Heritage Rd
TFR File #: 2
Count date: 1-Dec-2009

Weather conditions:
Clear and cold, light snow

Person(s) who counted:
VELE

**** Signalized Intersection ****

Major Road: Bovaird Drive runs W/E

North Leg Total:	784
North Entering:	380
North Peds:	1
Peds Cross:	⋈

Cyclists	0	0	0	0
Trucks	0	3	2	5
Cars	90	227	58	375
Totals	90	230	60	

Cyclists	0
Trucks	5
Cars	399
Totals	404

East Leg Total:	9445
East Entering:	4729
East Peds:	0
Peds Cross:	⧖

Heritage Rd

Cyclists	Trucks	Cars	Totals
1	326	4336	4663

Cars	Trucks	Cyclists	Totals
55	3	0	58
4129	326	1	4456
212	3	0	215
4396	332	1	

Bovaird Dr

N
W E
S

Cyclists	Trucks	Cars	Totals
0	1	124	125
0	323	4148	4471
1	3	124	128
1	327	4396	

Bovaird Dr

Cars	Trucks	Cyclists	Totals
4384	331	1	4716

Heritage Rd

Peds Cross:	⧖
West Peds:	0
West Entering:	4724
West Leg Total:	9387

Cars	563			
Trucks	9			
Cyclists	1			
Totals	573			

Cars	117	220	178	515
Trucks	0	1	6	7
Cyclists	0	0	1	1
Totals	117	221	185	

Peds Cross:	⋈
South Peds:	2
South Entering:	523
South Leg Total:	1096

Comments