

Transportation Noise Impact Study

Villalago Residences

Proposed Residential Townhouse Development

Highway 50 and 5 Sideroad
Town of Caledon

May 27, 2016
Project: 116-0170

Prepared for


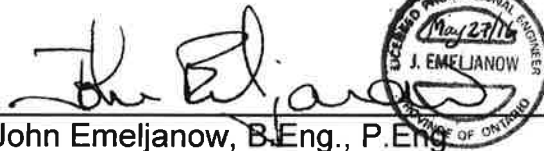
Villalago Residences
% Treasure Hill Homes

Prepared by



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VALCOUSTICS

Canada Ltd.

TABLE OF CONTENTS

1.0	PURPOSE.....	1
2.0	THE SITE AND SURROUNDING AREA.....	1
3.0	NOISE SOURCES.....	2
3.1	TRANSPORTATION NOISE SOURCES.....	2
3.1.1	Road Traffic.....	2
3.1.2	Rail Traffic.....	2
3.2	STATIONARY SOURCES.....	2
4.0	TRANSPORTATION NOISE CRITERIA.....	3
4.1	MOE.....	3
4.1.1	Architectural Elements.....	3
4.1.2	Ventilation.....	3
4.1.3	Outdoors.....	3
4.2	REGION OF PEEL.....	4
4.3	TOWN OF CALEDON.....	4
5.0	ROAD AND RAIL NOISE IMPACT ASSESSMENT.....	4
5.1	PREDICTED SOUND LEVELS.....	4
5.2	NOISE CONTROL MEASURES.....	5
5.2.1	Exterior Wall and Window Construction.....	5
5.2.2	Ventilation Requirements.....	5
5.2.3	Outdoors.....	5
5.2.4	Warning Clauses.....	6
6.0	CONCLUSIONS.....	6
7.0	REFERENCES.....	6

LIST OF TABLES

TABLE 1A	ROAD TRAFFIC DATA.....	7
TABLE 1B	RAIL TRAFFIC DATA – CPR MACTIER SUBDIVISION.....	7
TABLE 2	PREDICTED OUTDOOR SOUND LEVELS – NO MITIGATION.....	8
TABLE 3	MINIMUM NOISE ABATEMENT MEASURES.....	10
	NOTES TO TABLE 3.....	11

/cont'd...

TABLE OF CONTENTS (continued)

LIST OF FIGURES

FIGURE 1 KEY PLAN

FIGURE 2 SITE PLAN

FIGURE 3 TRANSPORTATION NOISE CONTROL REQUIREMENTS

LIST OF APPENDICES

APPENDIX A LAND USE SCHEDULE

APPENDIX B TRAFFIC DATA

APPENDIX C MOE NOISE GUIDELINES

APPENDIX D SAMPLE SOUND EXPOSURE CALCULATION
TRANSPORTATION SOURCE

Transportation Noise Impact Study

Villalago Residences

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Highway 50 and 5 Sideroad
Town of Caledon

1.0 PURPOSE

Valcoustics Canada Ltd. (VCL) has prepared this report in support of the re-zoning application for the proposed residential development located near Highway 50 and 5 Sideroad in the Town of Caledon (Bolton). The purpose is to assess the potential impact of environmental noise on the subject site and to determine the appropriate mitigation measures required to meet the applicable Ministry of the Environment and Climate Change (MOE) noise guideline limits.

This report addresses transportation (road and rail) noise sources only. A separate study assessing the impacts from stationary noise sources will be included as part of a second submission.

2.0 THE SITE AND SURROUNDING AREA

The site is located near Highway 50 and 5 Sideroad in the Town of Caledon.

The site is bounded by:

- Existing commercial uses to the north. Note that 5 Sideroad, along the northern portion of the site, will be closed as part of this development and will be part of the development site.
- Existing residential uses to the east.
- The Canadian Pacific Railway (CPR) MacTier Subdivision, with existing industrial uses beyond, to the south.
- Highway 50/Queen Street South to the west, with existing industrial uses beyond, to the west.

A Key Plan is included as Figure 1. The study is based on the Site Plan prepared by One Riser Designs dated April 7, 2016. The Site Plan is included as Figure 2. Appendix A shows the Bolton South Hill Land Use Plan.

The proposed development consists of nineteen three-storey residential townhouse blocks. The townhouse blocks will include outdoor amenity areas (“Outdoor Living Areas” – OLA’s) in the form of covered balconies for Blocks 2 to 13, 18 and 19 and rear yards for Blocks 1 and 14 to 17.

As shown on the Site Plan and Appendix A, 5 Sideroad will be closed as part of the development.

3.0 NOISE SOURCES

3.1 TRANSPORTATION NOISE SOURCES

The transportation noise sources with the potential to impact the site are road traffic on Highway 50 and rail traffic on the CPR MacTier Subdivision. As mentioned above, 5 Sideroad will be closed in the future, and traffic volumes on other surrounding roadways are minor compared to Highway 50 and have therefore not been considered.

Road and rail traffic data correspondence are included as Appendix B.

3.1.1 Road Traffic

Existing (2015) and ultimate road traffic volumes for Highway 50 were obtained from the Region of Peel. The data contained day/night split, truck percentages and posted speed. Note, the data obtained indicates that the posted speed for Highway 50 in the vicinity of the site is 80 kph.

The road traffic data is shown in Table 1A.

3.1.2 Rail Traffic

CPR rail traffic for the MacTier Subdivision applicable to the year 2016 was obtained directly from CPR. The CPR rail traffic data was escalated to the year 2036 design condition (20 year projection as required by the Town of Caledon) at a rate of 2.5% compounded annually. This escalation rate is suggested by the railways when preparing environmental noise studies.

The rail traffic data is summarized in Table 1B.

The CPR MacTier Subdivision is classified as a Principal Main Line. Rail activity includes freight traffic only. Current trackage at this point consists of two mainline tracks. The grade of Highway 50 is elevated relative to the railway line, as there is an underpass for the railway.

3.2 STATIONARY SOURCES

There are a few commercial establishments in the vicinity of the site that are of potential concern:

- Shoppers Drug Mart to the north, located at 1 Queensgate Boulevard;
- Husky Injection Molding Systems Ltd. to the west, located at 500 Queen Street South; and
- Monterra Lumber Mills Ltd. to the south, located at 12833 Highway 50.

Figure 1 also shows the locations of the neighbouring stationary sources.

The noise impact from the above stationary sources will be addressed as part of the second submission for the site.

4.0 TRANSPORTATION NOISE CRITERIA

4.1 MOE

The applicable noise guidelines for new residential development are those in MOE Publication NPC-300, “Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning”.

The environmental noise guidelines of the MOE, as provided in Publication NPC-300, are discussed briefly below and summarized in Appendix C.

4.1.1 Architectural Elements

In the daytime, the indoor criterion for road noise is $L_{eq\ Day}^{(1)}$ of 45 dBA for sensitive spaces such as living/dining rooms, dens and bedrooms. At night, the indoor criterion for road noise is $L_{eq\ Night}^{(2)}$ of 45 dBA for sensitive spaces such as living/dining rooms and dens and 40 dBA for bedrooms.

The architectural design of the building envelope (walls, windows, etc.) must provide adequate sound isolation to achieve these indoor sound exposure limits, based on the applicable outdoor sound exposure on the facades.

4.1.2 Ventilation

In accordance with the MOE noise guideline for road traffic sources, if the daytime sound level ($L_{eq\ Day}$), at the exterior face of a noise sensitive window is greater than 65 dBA, means must be provided so that windows can be kept closed for noise control purposes and central air conditioning is required. For daytime sound levels between 56 dBA and 65 dBA inclusive, there need only be the provision for adding air conditioning at a later date. A warning clause advising the occupant of the potential interference with some activities is also required. At nighttime, air conditioning would be required when the sound level exceeds 60 dBA ($L_{eq\ Night}$) at a noise sensitive window (provision for adding air conditioning is required when greater than 50 dBA).

4.1.3 Outdoors

For OLA's, the guideline is 55 dBA $L_{eq\ Day}$, with an excess not exceeding 5 dBA considered acceptable if it is technically not practicable to achieve the 55 dBA objective, providing warning clauses are registered on title. Note that for road traffic sources, a balcony is not considered an OLA, unless it is the only OLA for the occupant and it is:

- at least 4 m in depth;
- outside the building facade; and
- unenclosed.

(1) $L_{eq\ Day}$ - 16-hour energy-equivalent continuous sound level (0700-2300 hours).

(2) $L_{eq\ Night}$ - 8-hour energy-equivalent continuous sound level (2300-0700 hours).

4.2 REGION OF PEEL

The Region of Peel guidelines are essentially the same as the MOE guidelines except that the nighttime level for triggering the air conditioning requirement is one dBA more stringent (i.e., lower) than the levels specified by the MOE – i.e., mandatory air conditioning for nighttime sound exposures of 60 dBA or greater, and the provision for adding air conditioning for levels between 51 to 59 dBA inclusive.

A maximum desirable sound barrier height of 4 m (relative to roadway centreline) is indicated with a maximum acoustic fence component height of 2.4 m, although a height of no more than 2.0 m is preferred.

4.3 TOWN OF CALEDON

The Town of Caledon's policy is:

- not to accept the 5 dBA excess above the 55 dBA objective in OLA's;
- that traffic noise predictions are to be based on the ultimate or future projections (20 year future design condition) of traffic volumes; and
- road traffic noise predictions should use a traffic speed which is 10 kph over the posted speed.

The Town of Caledon Development Standards, Policies and Guidelines, Section 3.18.5 permits a maximum sound barrier wall height of 2.4 m.

5.0 ROAD AND RAIL NOISE IMPACT ASSESSMENT

5.1 PREDICTED SOUND LEVELS

Using the traffic data in Tables 1A and 1B, the sound energy exposures, in terms of $L_{eq\ Day}$ and $L_{eq\ Night}$, were determined using STAMSON V5.04 – ORNAMENT, the computerized road traffic noise prediction model of the MOE.

The daytime and nighttime sound levels were calculated at the top storeys for each dwelling representing the third-storey windows at a height of 7.5 m above grade. At the rear yard OLA's for Blocks 1 and 14 to 17, the receptor height used was 1.5 m above grade.

In accordance with MOE guidelines, since the uncovered balconies proposed for Blocks 2 to 13, 18 and 19 are less than 4 m in depth, they are not considered to be OLA's.

Table 2 shows the predicted sound levels due to transportation noise sources. A sample calculation is included as Appendix C.

The highest plane-of-window sound levels of 70 dBA daytime and 70 dBA nighttime are predicted to occur at the western face of Block 4.

The highest sound level of 67 dBA during the daytime at an outdoor point of reception is predicted to occur at the rear yard of the western-most unit of Block 1. At the rear yards of Blocks 14 to 17, the highest predicted sound level is 50 dBA.

5.2 NOISE CONTROL MEASURES

The noise control measures for transportation noise sources can generally be classified into two categories which are inter-related, but which can be treated separately for the most part:

- (a) Architectural elements to achieve acceptable indoor noise guidelines;
- (b) Design features to protect the OLA's.

Figure 3, Table 3 and the notes to Table 3 summarize the transportation noise abatement recommendations.

5.2.1 Exterior Wall and Window Construction

The required Sound Transmission Class (STC) ratings for the exterior facades were calculated assuming windows have a surface area equalling 30% of the associated room floor area, and exterior walls were assumed to have a surface area equal to 80% of the associated room floor area. These assumptions are based on typical unit designs provided by the client.

The exterior wall and window requirements are based on assumptions and should be checked once detailed floor plan and elevation drawings are available for the dwellings.

Based on these assumptions, the blocks closest to the railway line require brick veneer (or STC 54 equivalent) exterior wall construction and windows of up to STC 38 rating.

5.2.2 Ventilation Requirements

Blocks 1 to 9, 12, 15, 18 and 19 require central air conditioning.

Blocks 10, 11, 13, 14, 16 and 17 require the provision to allow the future installation of air conditioning by the occupant. For low-density developments, this normally takes the form of a ducted ventilation system suitably sized to accommodate the addition of central air conditioning.

5.2.3 Outdoors

Since the predicted sound levels at the rear yards of Blocks 14 to 17 are less than 55 dBA, sound barriers are not required.

At the rear yards of Block 1, a sound barrier is required. The sound barrier can be built along the edge of the property, where a safety berm or crash wall will be required due to the proximity to the railway line. To meet the 55 dBA requirement, the full height of the combined safety and sound barrier would need to have a minimum height of 10 m above grade. A 5 m high safety and sound barrier reduces the sound level to 60 dBA at the rear yards. The safety berm needs to be a minimum of 2.5 m in height. The sound barrier can be constructed atop the safety berm.

Sound barriers must be of solid construction with no holes, gaps or cracks and must have a minimum face density of 20 kg/m². Sound barriers can be constructed of wood, masonry, plastics, composite materials, earthen berms or a combination of these materials.

Alternatively, the site may be redesigned such that the rear yards of Block 1 face away from Highway 5 and railway line, or the rear yards may be eliminated by designing the units to be the same as Blocks 3 and 4; i.e., double-frontage units with no rear OLA's.

Another option would be to construct a local sound barrier to protect the rear yards of Block 1. This local barrier needs to be 5.0 m in height to meet the 55 dBA objective. To meet 60 dBA, the height reduces to 3.0 m.

Even if a sound barrier is not constructed along the rail line, a minimum 2.5 m safety berm or crash wall will still be required.

5.2.4 Warning Clauses

Where the sound exposure guidelines are exceeded, appropriate warning clauses should be registered on title to make future occupants aware of the potential noise situation.

6.0 CONCLUSIONS

With appropriate design of the development, a suitable acoustical environment can be provided and the applicable MOE noise guideline requirements met. Thus, the proposed development is considered feasible with respect to transportation noise, by means of proper design, and will implement the development objectives (outlined in the Official Plan and Zoning By-laws) of the Town of Caledon.

7.0 REFERENCES

1. PC STAMSON 5.04, "Computer Program for Road Traffic Noise Assessment", Ontario Ministry of the Environment.
2. Building Practice Note No. 56: "Controlling Sound Transmission into Buildings", by J. D. Quirt, Division of Building Research, National Council of Canada, September 1985.
3. "Environmental Noise Guideline, Stationary and Transportation Sources - Approval and Planning", Ontario Ministry of the Environment, Publication NPC-300, October 21, 2013

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TABLE 1A
ROAD TRAFFIC DATA

Roadway	AADT ⁽¹⁾	% Trucks		Day/Night Split (%)	Speed Limit (kph) ⁽²⁾
		Medium	Heavy		
Highway 50	32 400	Day: 1.3 Night: 2.2	Day: 1.4 Night: 1.5	72/28	80 (90)

Notes:

- (1) AADT – Annual Average Daily Traffic, applicable to the Ultimate condition. Data obtained from the Region of Peel Transportation System Planning department.
- (2) Speed shown is the posted speed in the area of the road. For future road traffic noise analysis, the speed was increased by 10 km/hr (as shown in parentheses) as per the Town of Caledon policies.

TABLE 1B
RAIL TRAFFIC DATA – CPR MACTIER SUBDIVISION

Period	Train Type	# of Trains ⁽¹⁾	# of Cars per Train	# of Locomotives per Train	Maximum Speed (kph)
Daytime (0700-2300 Hours)	Freight	9 (14.7)	80	2	88
Nighttime (2300-0700 Hours)	Freight	5 (8.2)	80	2	88

Note:

- (1) Data obtained from CP for the year 2016. Values shown in brackets has been extrapolated to the Year 2026 design condition using a 2.5 % growth rate, compounded annually.

TABLE 2
PREDICTED OUTDOOR SOUND LEVELS – NO MITIGATION

Location	Source	Distance (m) ⁽¹⁾	L _{eq} Day (dBA) ⁽²⁾	L _{eq} Night (dBA) ⁽³⁾
Block 3 South Facade	Highway 50	93	61	61
	Canadian Pacific Railway	46	66	67
	TOTAL	–	68	68
Block 2 South Facade	Highway 50	71	62	62
	Canadian Pacific Railway	46	66	67
	TOTAL	–	68	68
Block 1 West Facade	Highway 51	57	64	63
	Canadian Pacific Railway	41	67	67
	TOTAL	–	69	68
Block 1 South Facade	Highway 51	57	62	61
	Canadian Pacific Railway	41	66	66
	TOTAL	–	67	67
Block 4 West Facade	Highway 52	39	67	66
	Canadian Pacific Railway	43	67	68
	TOTAL	–	70	70
Block 4 South Facade	Highway 52	39	64	63
	Canadian Pacific Railway	43	66	66
	TOTAL	–	68	68
Block 5 West Facade	Highway 53	36	67	67
	Canadian Pacific Railway	62	62	63
	TOTAL	–	69	68
Block 6 West Facade (South Unit)	Highway 53	32	68	67
	Canadian Pacific Railway	81	57	57
	TOTAL	–	68	68
Block 6 West Facade (North Unit)	Highway 54	27	69	68
	Canadian Pacific Railway	98	58	58
	TOTAL	–	69	69
Block 6 North Facade	Highway 54	27	66	65
	Canadian Pacific Railway	98	54	55
	TOTAL	–	66	65
Block 12 West Facade	Highway 55	32	68	67
	Canadian Pacific Railway	120	58	59
	TOTAL	–	68	68

.../cont'd

TABLE 2 (continued)

PREDICTED OUTDOOR SOUND LEVELS – NO MITIGATION

Location	Source	Distance (m)⁽¹⁾	L_{eq} Day (dBA)⁽²⁾	L_{eq} Night (dBA)⁽³⁾
Block 7 West Facade	Highway 55	29	67	66
	Canadian Pacific Railway	132	58	59
	TOTAL	–	68	67
Block 8 North Facade	Highway 56	73	63	62
	Canadian Pacific Railway	173	48	49
	TOTAL	–	63	62
Block 9 West Facade	Highway 56	124	61	60
	Canadian Pacific Railway	222	46	46
	TOTAL	–	61	60
Block 19 South Facade	Highway 57	72	58	57
	Canadian Pacific Railway	72	59	59
	TOTAL	–	61	61
Block 18 South Facade	Highway 57	67	60	60
	Canadian Pacific Railway	99	54	55
	TOTAL	–	61	61
Block 16 South Facade	Highway 58	62	61	60
	Canadian Pacific Railway	108	52	53
	TOTAL	–	61	61
Block 15 South Facade	Highway 58	58	57	56
	Canadian Pacific Railway	124	56	56
	TOTAL	–	59	59
Block 17 South Facade	Highway 59	94	52	51
	Canadian Pacific Railway	136	51	52
	TOTAL	–	55	54
Block 14 South Facade	Highway 59	89	56	55
	Canadian Pacific Railway	152	44	44
	TOTAL	–	56	55
Block 11 South Facade	Highway 60	79	56	55
	Canadian Pacific Railway	154	44	44
	TOTAL	–	56	56
Block 10 South Facade	Highway 60	133	50	49
	Canadian Pacific Railway	205	42	42
	TOTAL	–	50	50

.../cont'd

TABLE 2 (continued)

PREDICTED OUTDOOR SOUND LEVELS – NO MITIGATION

Location	Source	Distance (m) ⁽¹⁾	L _{eq} Day (dBA) ⁽²⁾	L _{eq} Night (dBA) ⁽³⁾
Block 13 South Facade	Highway 61	134	49	49
	Canadian Pacific Railway	188	42	42
	TOTAL	–	50	50
Block 1 Rear Yard	Highway 50	60	62	–
	Canadian Pacific Railway	43	66	–
	TOTAL	–	67	–
Block 15 Rear Yard	Highway 50	63	50	–
	Canadian Pacific Railway	119	40	–
	TOTAL	–	50	–

Notes:

- (1) Distance to centreline of roadway. The indicated distances apply to a receptor at the indicated building facade.
- (2) Daytime and nighttime sound exposures taken at a height of 10.5 m, corresponding to a top storey bedroom window. For the OLA, the calculation was done at a height of 1.5 m.
- (3) For the OLA calculation the intervening ground surface was taken to be soft, as a majority of the area is the open space for the Robinson Creek. For all other locations the intervening ground surface was taken to be hard. This was done to be conservative.

TABLE 3

MINIMUM NOISE ABATEMENT MEASURES

Location	Air Conditioning ⁽¹⁾	Exterior Wall ⁽²⁾	Window STC Rating ⁽³⁾	Sound Barrier ⁽⁴⁾	Warning Clauses ⁽⁵⁾
Block 1	Mandatory	Brick Veneer (or STC 54 equivalent)	up to STC 36	Min 5.0 m	A + B + D
Blocks 2 to 9, 12, 15, 16, 18 and 19	Mandatory	Brick Veneer (or STC 54 equivalent)	up to STC 38	none	B + D
Blocks 10, 11, 13, 14 and 17	Provision for Adding	OBC (STC 41)	OBC (STC-26)	none	C + D

For notes to this table, see the following page.

NOTES TO TABLE 3

- (1) Where means must be provided to allow windows to remain closed for road noise control purposes, a commonly used technique is that of air central conditioning.
- (2) STC - Sound Transmission Class Rating (Reference ASTM-E413).

Masonry construction or acoustically equivalent construction to brick veneer meeting minimum STC 54. OBC denotes any construction meeting the minimum non-acoustical requirements of the Ontario Building Code.


The requirements are based on assumed percentages of wall and window area to associated floor area and should be checked once building plans are finalized.
- (3) Upgraded windows have been recommended to provide a suitable indoor acoustical environment.

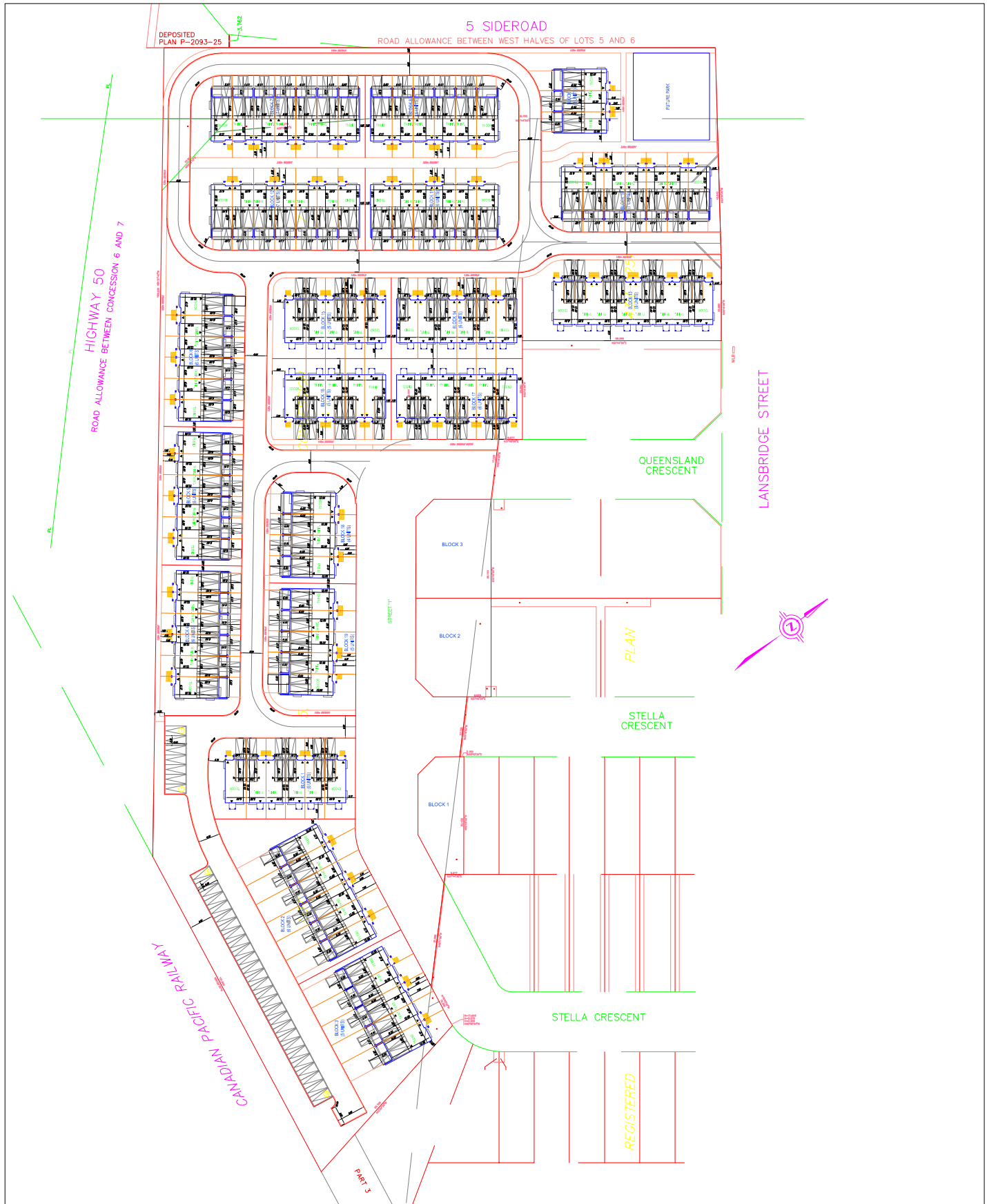
OBC means any construction complying with the minimum non-acoustical requirements of the OBC (typically about STC 25). A sliding glass walkout door should be considered as a window and be included in the percentage of glazing. Window requirements were based on standard assumptions and should be reviewed once building (floor) plans are finalized.

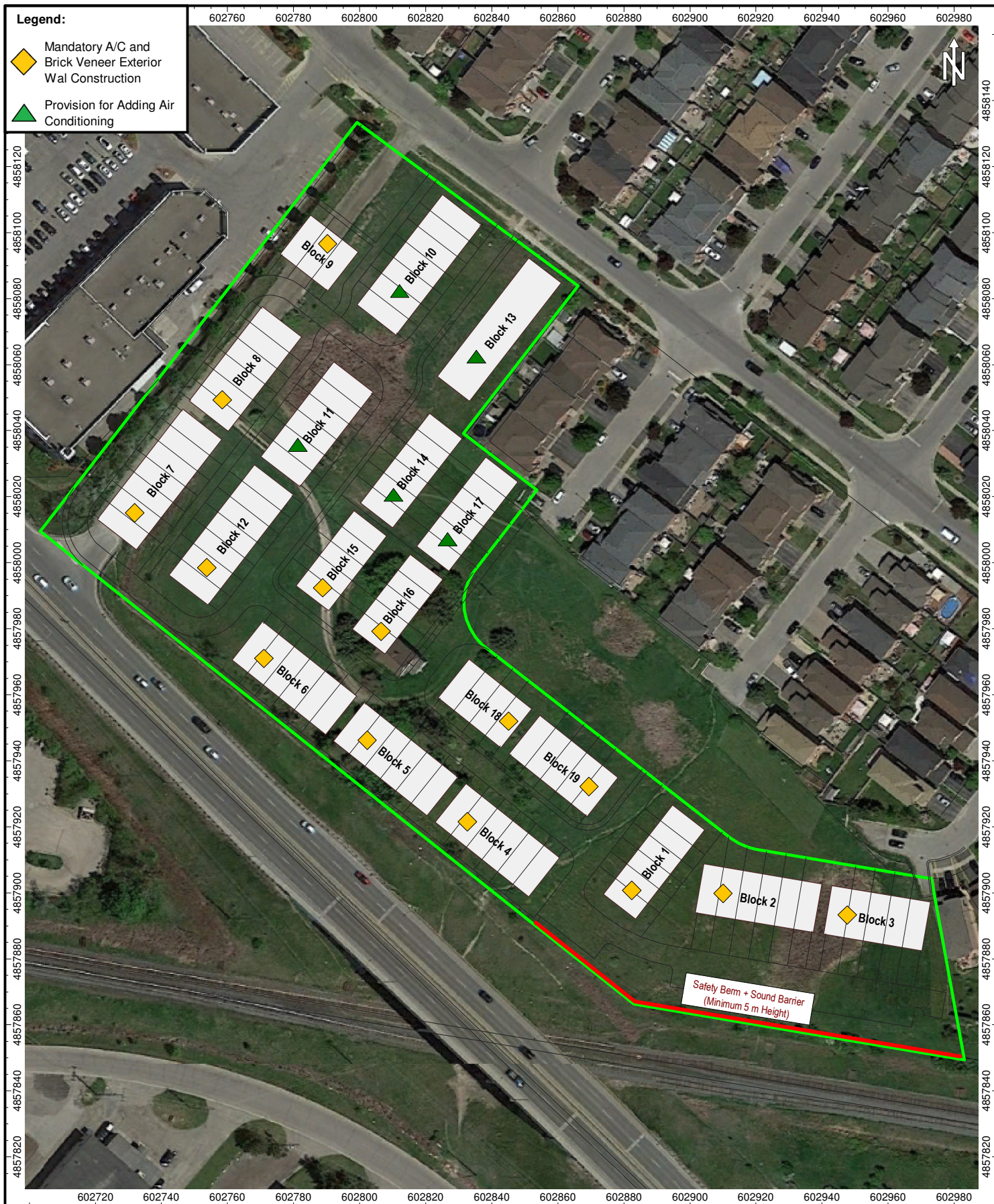
The window STC rating applies to the entire window assembly and not just the glazing. The window supplier should provide acoustical laboratory test data (following a recognized test standard) for the intended windows indicated the STC ratings can be met.


The requirements are based on assumed percentages of wall and window area to associated floor area and should be checked once building plans are finalized.
- (4) Sound barriers must be of solid construction having a minimum face density of 20 kg/m² with no gaps, cracks or holes.
- (5) Warning clauses to be included in Occupancy Agreements:
 - A. "Tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road or rail traffic may on occasion interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."
 - B. "This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."
 - C. "This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."
 - D. "Purchasers/occupants are advised that due to the proximity to the adjacent commercial facility (Shoppers Drug Mart), noise from this facility may at times be audible."
- (6) Conventional ventilated attic roof construction meeting OBC requirements is satisfactory in all cases.
- (7) All exterior doors shall be fully weatherstripped.



	Title	Date	Figure 1
	Key Plan Project Name Villalago Residences/Bolton	2016-05-24 Project No. 116-0170	

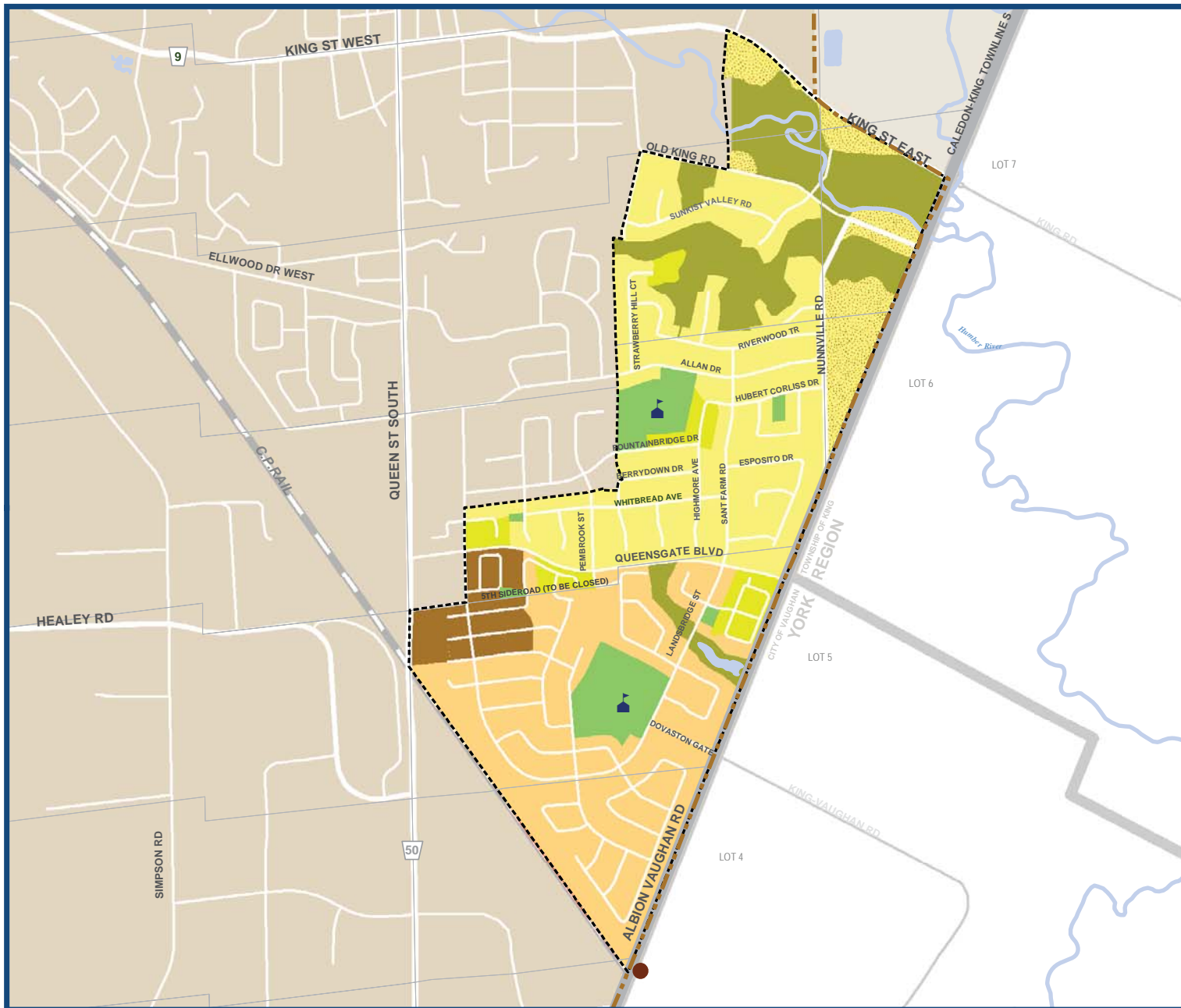





 VALCOUSTICS <i>Canada Ltd.</i> consulting acoustical engineers	Title		Date	Figure
	Transportation Noise Control Requirements		2016-05-24	
	Project Name		Project No.	3
	Villalago Residences/Bolton		116-0170	

APPENDIX A

LAND USE SCHEDULE





Schedule C-2

(A Subschedule to Schedule "C")


BOLTON SOUTH HILL LAND USE PLAN

- High Density Residential
- Medium Density Residential
- Low Density Residential
- Mixed Low/Medium Density Residential
- Special Residential
- Environmental Policy Area
- Open Space Policy Area
- School
- Secondary Plan Area
- Bolton Settlement
- Future Grade Separation
- Collector Road 30m R.O.W.
- Collector Road 26m R.O.W.
- Local Road 22m R.O.W.
- Regional Road
- Local Road
- Railway


Regional Road


Local Road

Railway



Base Data Source: Town of Caledon





APPENDIX B

TRAFFIC DATA

March 13, 2015

Seema Nagaraj
Valcoustics Canada Ltd.
Re: Traffic Data Request – Acoustical Study
Highway 50 1.0 km North of Mayfield Road
Town of Caledon

Seema:

Per your request, we are providing the following traffic data.

	Existing	Planned
24 Hour Traffic Volume	24,226	32,400
# of Lanes	4	4
Day/Night Split	72/28	72/28
Day Trucks (% of Total Volume)	1.3% Medium 1.4% Heavy	1.3% Medium 1.4% Heavy
Night Trucks (% of Total Volume)	2.2% Medium 1.5% Heavy	2.2% Medium 1.5% Heavy
Right-of-Way Width	45 metres	
Posted Speed Limit	80 km/h	

If you require further assistance, please contact me at (905) 791-7800 ext. 4420.

Regards,



Alejandro Cifuentes, MCIP, RPP
Principal Planner | Transportation System Planning
Region of Peel
10 Peel Centre Drive, Suite B - 4th Floor
Brampton ON, L6T 4B9
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alejandro.cifuentes@peelregion.ca

Public Works

10 Peel Centre Dr., Suite B, Brampton, ON L6T 4B9
Tel: 905-791-7800 www.peelregion.ca



April 22, 2016

Via e-mail: Anthony@valcoustics.com

Valcoustics Canada Ltd.
30 Wertheim Court, Unit 25
Richmond Hill, Ontario L4B 1B9

Dear Sir/Madam:

**Re: Rail Traffic Volumes, CP Mileage 20.48, Mactier Subdivision
Highway 50/Queen Street, Town of Caledon (Bolton), ON**

This is in reference to your request for rail traffic data for a noise study in the vicinity of where Highway 50 intersects with the CP Rail corridor, being mile 20.48 of our Mactier Subdivision. The Mactier Subdivision is classified as a Principal Main Line.

The information requested is as follows:

1. Number of freight trains 0700 to 2300: 9
Number of freight trains 2300 to 0700: 5
2. Average number of cars per train freight: 80
Maximum cars per train freight: 188
3. Number of Locomotives per train: 2 (4 max)
4. Maximum permissible speed: 55 mph (88 kph)
5. The whistle signal is not routinely through the study area. Please note that the whistle may be sounded if deemed necessary by the train crew for safety reasons at any location.
6. There is one main line track with welded joints in the vicinity of the study area and one passing track with bolted joints along with an additional siding track north of the study area. Due to the additional tracks, trains will meet numerous times a day at in this area which may cause longer than usual train idling time while awaiting other trains to pass by.

The information provided is based on rail traffic over the past month to date. Variations of the above may exist on a day-to-day basis. Specific measurements may also vary significantly depending on customer needs.

Yours truly,

Josie Tomei
Specialist Real Estate Sales
& Acquisitions – Ontario
905-803-3429. josie_tomei@cpr.ca

APPENDIX C

MOE NOISE GUIDELINES

APPENDIX C

ENVIRONMENTAL NOISE GUIDELINES

MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE (MOE)

Reference: MOE Publication NPC-300, October 2013: “Environmental Noise Guideline, Stationary and Transportation Source – Approval and Planning”.

SPACE	SOURCE	TIME PERIOD	CRITERION
Living/dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc.	Road	07:00 to 23:00	45 dBA
	Rail	07:00 to 23:00	40 dBA
	Aircraft	24-hour period	NEF/NEP 5
Living/dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres)	Road	23:00 to 07:00	45 dBA
	Rail	23:00 to 07:00	40 dBA
	Aircraft	24-hour period	NEF/NEP 5
Sleeping quarters	Road	07:00 to 23:00	45 dBA
	Rail	07:00 to 23:00	40 dBA
	Aircraft	24-hour period	NEF/NEP 0
Sleeping quarters	Road	23:00 to 07:00	40 dBA
	Rail	23:00 to 07:00	35 dBA
	Aircraft	24-hour period	NEF/NEP 0
Outdoor Living Areas	Road and Rail	07:00 to 23:00	55 dBA
Outdoor Point of Reception	Aircraft	24-hour period	NEF/NEP 30 [#]
	Stationary Source Class 1 Area	07:00 to 19:00 ⁽¹⁾	50 ⁺ dBA
		19:00 to 23:00 ⁽¹⁾	50 ⁺ dBA
	Class 2 Area	07:00 to 19:00 ⁽²⁾	50 ⁺ dBA
		19:00 to 23:00 ⁽²⁾	45 ⁺ dBA
	Class 3 Area	07:00 to 19:00 ⁽³⁾	45 ⁺ dBA
		19:00 to 23:00 ⁽³⁾	40 ⁺ dBA
	Class 4 Area	07:00 to 19:00 ⁽⁴⁾	55 ⁺ dBA
		19:00 to 23:00 ⁽⁴⁾	55 ⁺ dBA

..../cont'd

SPACE	SOURCE	TIME PERIOD	CRITERION
Plane of a Window of Noise Sensitive Spaces	Stationary Source Class 1 Area	07:00 to 19:00 ⁽¹⁾	50 ⁺ dBA
		19:00 to 23:00 ⁽¹⁾	50 ⁺ dBA
		23:00 to 07:00 ⁽¹⁾	45 ⁺ dBA
	Class 2 Area	07:00 to 19:00 ⁽²⁾	50 ⁺ dBA
		19:00 to 23:00 ⁽²⁾	50 ⁺ dBA
		23:00 to 07:00 ⁽²⁾	45 ⁺ dBA
	Class 3 Area	07:00 to 19:00 ⁽³⁾	45 ⁺ dBA
		19:00 to 23:00 ⁽³⁾	45 ⁺ dBA
		23:00 to 07:00 ⁽³⁾	40 ⁺ dBA
	Class 4 Area	07:00 to 19:00 ⁽⁴⁾	60 ⁺ dBA
		19:00 to 23:00 ⁽⁴⁾	60 ⁺ dBA
		23:00 to 07:00 ⁽⁴⁾	55 ⁺ dBA

- # may not apply to in-fill or re-development.
 * or the minimum hourly background sound exposure $L_{eq}(1)$, due to road traffic, if higher.
 (1) Class 1 Area : Urban
 (2) Class 2 Area : Urban during day; rural-like evening and night
 (3) Class 3 Area : Rural
 (4) Class 4 Area: Subject to land use planning authority's approval

Reference: MOE Publication ISBN 0-7729-2804-5, 1987: "Environmental Noise Assessment in Land-Use Planning".

EXCESS ABOVE RECOMMENDED SOUND LEVEL LIMITS (dBA)	CHANGE IN SUBJECTIVE LOUDNESS ABOVE	MAGNITUDE OF THE NOISE PROBLEM	NOISE CONTROL MEASURES (OR ACTION TO BE TAKEN)
No excess (<55 dBA)	—	No expected noise problem	None
1 to 5 inclusive (56 to 60 dBA)	Noticeably louder	Slight noise impact	If no physical measures are taken, then prospective purchasers or tenants should be made aware by suitable warning clauses.
6 to 10 inclusive (61 - 65 dBA)	Almost twice as loud	Definite noise impact	Recommended.
11 to 15 inclusive (66 - 70 dBA)	Almost three times as loud	Serious noise impact	Strongly Recommended.
16 and over (>70 dBA)	Almost four times as loud	Very serious noise impact	Strongly Recommended (may be mandatory).

APPENDIX D

SAMPLE SOUND EXPOSURE CALCULATION TRANSPORTATION SOURCE

STAMSON 5.04 NORMAL REPORT Date: 27-05-2016 09:56:06
 MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE / NOISE ASSESSMENT

Filename: b4wf.te Time Period: Day/Night 16/8 hours
 Description:

Rail data, segment # 1: CP (day/night)

Train Type	! Trains	! Speed (km/h)	!# loc /Train	!# Cars /Train	! Eng type	!Cont !weld
1. Freight	14.7/8.2	88.0	2.0	80.0	Diesel	No

Data for Segment # 1: CP (day/night)

Angle1	Angle2	: -90.00 deg	90.00 deg
Wood depth	:	0	(No woods.)
No of house rows	:	0 / 0	
Surface	:	1	(Absorptive ground surface)
Receiver source distance	:	42.60 / 41.30 m	
Receiver height	:	7.50 / 7.50 m	
Topography	:	1	(Flat/gentle slope; no barrier)
No Whistle	:		
Reference angle	:	0.00	

Results segment # 1: CP (day)

LOCOMOTIVE (0.00 + 65.54 + 0.00) = 65.54 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.41	72.89	-6.37	-0.99	0.00	0.00	0.00	65.54

WHEEL (0.00 + 61.16 + 0.00) = 61.16 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.51	69.20	-6.85	-1.19	0.00	0.00	0.00	61.16

Segment Leq : 66.89 dBA

Total Leq All Segments: 66.89 dBA

Results segment # 1: CP (night)

LOCOMOTIVE (0.00 + 66.20 + 0.00) = 66.20 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.41	73.37	-6.18	-0.99	0.00	0.00	0.00	66.20

WHEEL (0.00 + 61.84 + 0.00) = 61.84 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.51	69.68	-6.64	-1.19	0.00	0.00	0.00	61.84

Segment Leq : 67.56 dBA

Total Leq All Segments: 67.56 dBA

Road data, segment # 1: Hwy 50 (day/night)

Car traffic volume : 22698/8736 veh/TimePeriod
Medium truck volume : 303/200 veh/TimePeriod
Heavy truck volume : 327/136 veh/TimePeriod
Posted speed limit : 90 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Hwy 50 (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 39.40 / 39.40 m
Receiver height : 7.50 / 7.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 8.00 m
Reference angle : 0.00

Results segment # 1: Hwy 50 (day)

Source height = 1.09 m

ROAD (0.00 + 66.81 + 0.00) = 66.81 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-90 90 0.25 72.73 0.00 -5.25 -0.66 0.00 0.00 0.00 66.81

Segment Leq : 66.81 dBA

Total Leq All Segments: 66.81 dBA

Results segment # 1: Hwy 50 (night)

Source height = 1.11 m

ROAD (0.00 + 66.06 + 0.00) = 66.06 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-90 90 0.25 71.97 0.00 -5.25 -0.66 0.00 0.00 0.00 66.06

Segment Leq : 66.06 dBA

Total Leq All Segments: 66.06 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.86
(NIGHT): 69.88

STAMSON 5.0 NORMAL REPORT Date: 27-05-2016 10:01:08
 MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE / NOISE ASSESSMENT

Filename: b1_by_b4.te Time Period: Day/Night 16/8 hours
 Description:

Rail data, segment # 1: CP (day/night)

Train Type	! Trains !	! Speed ! (km/h)	! # loc ! /Train	! # Cars ! /Train	! Eng ! type	! Cont ! weld
* 1.	!	14.7/8.2	!	88.0	!	2.0 ! 80.0 ! Diesel! No

* The identified number of trains have been adjusted for future growth using the following parameters:

Train type: No Name	! Unadj. ! Trains	! Annual % ! Increase	! Years of ! Growth
1.	!	9.0/5.0	!
		2.50	!
		20.00	!

Data for Segment # 1: CP (day/night)

Angle1	Angle2	: -90.00 deg	90.00 deg
Wood depth		: 0	(No woods.)
No of house rows		: 0 / 0	
Surface		: 1	(Absorptive ground surface)
Receiver source distance		: 42.50 / 42.50 m	
Receiver height		: 1.50 / 1.50 m	
Topography		: 2	(Flat/gentle slope; with barrier)
No Whistle			
Barrier angle1		: -90.00 deg	Angle2 : 90.00 deg
Barrier height		: 10.00 m	
Barrier receiver distance		: 23.00 / 23.40 m	
Source elevation		: 0.00 m	
Receiver elevation		: 0.00 m	
Barrier elevation		: 0.00 m	
Reference angle		: 0.00	

Results segment # 1: CP (day)

Barrier height for grazing incidence

Source Height (m)	! Receiver ! Height (m)	! Barrier ! Height (m)	! Elevation of ! Barrier Top (m)
4.00	!	1.50	!
0.50	!	1.50	!
		2.85	!
		0.96	!

LOCOMOTIVE (0.00 + 52.11 + 0.00) = 52.11 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	72.89	-4.52	0.00	0.00	0.00	-16.26	52.11

WHEEL (0.00 + 46.71 + 0.00) = 46.71 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.09	69.20	-4.93	-0.26	0.00	0.00	-17.31	46.71

Segment Leq : 53.21 dBA

Total Leq All Segments: 53.21 dBA

Barrier table for segment # 1: CP (day)

Barrier Height	Elev of Barr Top	Loco dBA	Wheel dBA	Whistle left dBA	Whistle right dBA	Tot Leq dBA
11.50	11.50	51.24	46.82	--	--	52.58
12.00	12.00	51.01	46.68	--	--	52.37
12.50	12.50	50.82	46.55	--	--	52.20
13.00	13.00	50.64	46.43	--	--	52.04
13.50	13.50	50.48	46.32	--	--	51.89
14.00	14.00	50.34	46.22	--	--	51.76
14.50	14.50	50.21	46.14	--	--	51.65
15.00	15.00	50.10	46.06	--	--	51.54
15.50	15.50	49.99	45.98	--	--	51.44
16.00	16.00	49.90	45.91	--	--	51.36

Results segment # 1: CP (night)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	2.88	2.88
0.50	1.50	0.95	0.95

LOCOMOTIVE (0.00 + 52.59 + 0.00) = 52.59 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	73.37	-4.52	0.00	0.00	0.00	-16.25	52.59

WHEEL (0.00 + 47.17 + 0.00) = 47.17 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.09	69.68	-4.93	-0.26	0.00	0.00	-17.32	47.17

Segment Leq : 53.69 dBA

Total Leq All Segments: 53.69 dBA

Road data, segment # 1: Hwy 50 (day/night)

Car traffic volume : 22698/8736 veh/TimePeriod
 Medium truck volume : 303/200 veh/TimePeriod
 Heavy truck volume : 327/136 veh/TimePeriod
 Posted speed limit : 90 km/h
 Road gradient : 0 %
 Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Hwy 50 (day/night)

Angle1 Angle2 : -90.00 deg 45.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 60.10 / 60.10 m
 Receiver height : 1.50 / 1.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -90.00 deg Angle2 : 45.00 deg
 Barrier height : 10.00 m
 Barrier receiver distance : 23.00 / 23.00 m
 Source elevation : 7.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Results segment # 1: Hwy 50 (day)

Source height = 1.09 m

Barrier height for grazing incidence

Source	!	Receiver	!	Barrier	!	Elevation of
Height (m)	!	Height (m)	!	Height (m)	!	Barrier Top (m)
1.09	!	1.50	!	4.02	!	4.02

ROAD (0.00 + 49.73 + 0.00) = 49.73 dBA										
Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	45	0.07	72.73	0.00	-6.46	-1.40	0.00	0.00	-15.13	49.73

Segment Leq : 49.73 dBA

Total Leq All Segments: 49.73 dBA

Barrier table for segment # 1: Hwy 50 (day)

Barrier	!	Elev of	!	Road	!	Tot Leq	!
Height	!	Barr Top	!	dBA	!	dBA	!
11.50	!	11.50	!	48.82	!	48.82	!
12.00	!	12.00	!	48.49	!	48.49	!
12.50	!	12.50	!	48.22	!	48.22	!
13.00	!	13.00	!	47.99	!	47.99	!
13.50	!	13.50	!	47.79	!	47.79	!
14.00	!	14.00	!	47.61	!	47.61	!
14.50	!	14.50	!	47.45	!	47.45	!
15.00	!	15.00	!	47.31	!	47.31	!
15.50	!	15.50	!	47.19	!	47.19	!
16.00	!	16.00	!	47.07	!	47.07	!

Results segment # 1: Hwy 50 (night)

Source height = 1.11 m

Barrier height for grazing incidence

Source	!	Receiver	!	Barrier	!	Elevation of
Height (m)	!	Height (m)	!	Height (m)	!	Barrier Top (m)
1.11	!	1.50	!	4.03	!	4.03

ROAD (0.00 + 48.99 + 0.00) = 48.99 dBA										
Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	45	0.07	71.97	0.00	-6.46	-1.40	0.00	0.00	-15.12	48.99

Segment Leq : 48.99 dBA

Total Leq All Segments: 48.99 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 54.82
(NIGHT): 54.96