
ACOUSTICAL IMPACT ASSESSMENT

THE CLUB WILLOWELLS

WILLOWELLS RECREATION CENTER REDEVELOPMENT

Project No.: 2014-0300-14

December 5, 2017

DRAFT

THE CLUB WILLOWELLS

ACOUSTICAL IMPACT ASSESSMENT

Willowells Recreation Center Redevelopment

Table of Contents

	Page
1.0 INTRODUCTION.....	1
2.0 ADDITIONAL BACKGROUND.....	1
3.0 NOISE LEVEL CRITERIA.....	1
3.1 Line Source Criteria.....	1
4.0 SOURCE INFORMATION.....	2
4.1 Line Source Sensitive Receivers.....	3
5.0 NOISE IMPACT ASSESSMENT RESULTS.....	3
5.1 Line Source Results.....	3
5.1.1 Outdoor Living Areas (OLAs).....	4
5.1.2 Plane-of-Window.....	4
6.0 MITIGATION MEASURES.....	5
6.1 Outdoor Living Areas (OLAs).....	5
6.2 Plane-of-Window– Ventilation Requirements.....	5
6.3 Indoor Living Areas – Building Components.....	5
6.4 Noise Warning Clauses.....	5
7.0 SUMMARY OF FINDINGS.....	6

Appendices

Appendix A	Traffic Data
Appendix B	Receiver Locations
Appendix C	Sample STAMSON Output
Appendix D	Modelling Results
Appendix E	Limiting Distances

1.0 INTRODUCTION

WalterFedy was retained by The Club Willowells to conduct an Acoustical Impact Assessment Study for a proposed condominium tower to be located at the site with municipal address of 40 Blue Springs Drive, in the City of Waterloo.

The subject property is bounded by an existing residential condominium building to the north, a restaurant to the west, Blue Springs Drive to the south, and Four Wells Lake to the east. The acoustical assessment is in support of an Official Plan/Zoning Bylaw Amendment. The site, while not severed yet, will be about 1.01 ha (2.5 acres) in area. The site is currently zoned Green (G) and designated as Open Space in the City of Waterloo Official Plan, consisting of a community center, tennis courts, and associated parking. The proposed development is to replace the above developed area with a new residential condominium tower, with ground-level commercial space.

This study will identify the noise impacts at the sensitive receivers and determine the mitigation measures, if required, to be included in the development.

2.0 ADDITIONAL BACKGROUND

A site visit was performed prior to any noise analysis of the development to determine if there are any additional noise sources within the surrounding area requiring acoustical assessment. The primary noise source impacting the site is road traffic on King Street. The site is also approximately 500 m south of the Conestoga Parkway (ON-85). Based on the site visit, it was determined that the existing residential building to the north of the site, and office building close to Conestoga Parkway will provide some acoustical shielding to this development from the highway traffic noises. It was also evident that, while the existing single-storey restaurant to the east may provide acoustical shielding for the ground level outdoor living area from the King Street traffic, upper floor levels will still be exposed.

Traffic data for King Street was obtained from the Regional Municipality of Waterloo ("Region"). Traffic data for Conestoga Parkway was obtained from the Ministry of Transportation (MTO). The data was used to estimate future sound levels (L_{EQ}) at the location of future rear yards and living areas, utilizing a preliminary grading plan prepared by WalterFedy. The estimated noise levels were compared against the guidelines of the Ministry of Environment and Climate Change (MOECC) and the Region.

3.0 NOISE LEVEL CRITERIA

A condition of development from the Region requires that the proposed development be examined at all sensitive receiver locations from the perspective of noise impacts due to the surrounding line sources (King Street and Conestoga Parkway). Sensitive receivers are defined as land uses that may be adversely impacted by noise levels and that must be planned and/or designed using appropriate land use compatibility principles.

The proposed development is located in the urban boundary of the City of Waterloo and assumed to be in a "Class 1 Area" (urban) as defined by the MOECC.

3.1 Line Source Criteria

A "Line Source" is defined as a source of noise that traverses along a line such as a transportation corridor (i.e. roadways and railways). Acoustical impacts from these sources are to be determined at all sensitive receivers within the proposed development and are to be assessed as outlined by the MOECC publication NPC-300 *Environmental Noise Guideline: Stationary and Transportation Sources – Approval and Planning*, dated August 2013. Assuming a Class 1 Area, the MOECC criteria for noise levels resulting from line sources where no attenuation measures are required are as summarized in the following table. The values in Table 1 are energy equivalent (average) sound levels (L_{EQ}) in units of A-weighted decibels (dBA).

Table 1: Line Source Sound Level Criteria - Plane-of-Window

Living Space	Description	Time Period	Leq (dBA)
Outdoor Living Area	Rear yards, common areas, etc.	0700 - 2300	55
Indoor Living Spaces	Living/dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc.	0700 - 2300	45
	Living/dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres)	2300 - 0700	45
	Sleeping quarters	0700 - 2300	45
	Sleeping quarters	2300 - 0700	40

The guidelines in NPC-300 allow the sound levels in an Outdoor Living Area to be exceeded by up to 5 dBA, without mitigation, if warning clauses are placed in the property and tenancy agreements (i.e. any agreement for lease or sale).

In the circumstance where noise levels resulting from line sources exceed the criteria identified in Table 1 by more than 5 dBA, mitigation measures shall be incorporated into the development through the use of acoustical barriers to protect the outdoor living areas and/or improved building components with extra sound insulation properties (i.e. walls, windows, doors, etc.) to protect the indoor living spaces. The physical mitigation is required to reduce the Outdoor Living Area (OLA) sound level to below 60 dBA and as close to 55 dBA as technically, economically, and administratively feasible.

Additionally, alternative forms of ventilation are required where nighttime sound levels outside bedroom windows exceed 50 dBA to ensure bedroom windows can remain closed. Air conditioning is a requirement under MOECC guidelines where nighttime sound levels outside bedroom windows exceed 60 dBA. Table 2 below summarizes the different ventilation and building component requirements under NPC-300.

Table 2: Ventilation and Building Component Requirements

Time Period	Noise Level (dBA)	Ventilation Requirements	Building Component Requirements
Daytime (0700-2300)	< 55	No forced air heating or Air Conditioning required	No additional components required
	55 to 65	Forced air heating is to be provided with provision for installation of Air Conditioning	Normal building component construction
	> 65	Forced air heating and Air Conditioning required	Special building components to be identified
Night Time (2300 - 0700)	<50	No forced air heating or Air Conditioning required	No additional components required
	50 to 60	Forced air heating is to be provided with provision for installation of Air Conditioning	Normal building component construction
	> 60	Forced air heating and Air Conditioning required	Special building components to be identified

4.0 SOURCE INFORMATION

Traffic data for King Street North and Blue Springs Drive was obtained from the Region and traffic data for Conestoga Parkway was obtained from the MTO. A 2% compound-growth factor was applied to the MTO data to forecast future growth, and percentages of medium and heavy trucks were assumed. The data, including future AADT forecasts, is provided in Appendix A and is summarized below.

Table 3: Projected Road Traffic Data

Source	AADT (vpd)	Count Year	Speed Limit	Medium Trucks (%)	Heavy Trucks (%)	Road Grade	Day/Night Split
King Street	33,830	2027	60km/h	1.3%	1.5%	1.8%	90%/10%
Blue Springs Drive	1,800	2027	50km/h	1.4%	1.0%	3.5%	90%/10%
Conestoga Pkwy	64,900*	2027	100km/h	10.0%	15.0%	1.3%	66.6%/33.3%

*As per the Ontario Provincial Highways Traffic Volumes on Demand, dynamic traffic volume for the year 2016 on Highway 85 between University Avenue and King Street is noted to be 52,200. A compounding factor of 2.0% annual increase, for 11 years (count year 2027) was applied to calculate the AADT of 64,900.

4.1 Line Source Sensitive Receivers

The proposed development is to consist of a multi-storey tower with mixed uses at the lower levels. Sensitive receivers have been identified at the OLA for the outdoor amenity areas at the rear of the building. An OLA is defined as noise sensitive land that is intended and designed for the quiet enjoyment of the outdoor environment and is readily accessible from the building.

In the case of this development, the most sensitive receivers were noted to be the open rear yard of the building. Other sensitive receivers are also noted on plane-of-window (POW) levels for the upper level residential units. The receiver locations are shown in Appendix B.

5.0 NOISE IMPACT ASSESSMENT RESULTS

5.1 Line Source Results

The road traffic noise was assessed using the Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT) published by the MOECC using an automated spreadsheet based on the “worksheet method” published in ORNAMENT and a computer program called STAMSON version 5.04. The results of the worksheet method are the same as the results from STAMSON and a sample STAMSON output has been provided in Appendix C to confirm the results.

A “free-field” assessment was conducted to assess the zone of influence from the line sources, which assumes that no noise attenuation barriers are, or will be, present along the development boundary. The theoretical, calculated noise levels and are shown in Table 4. Model outputs are found in Appendix D.

Table 4: Line Source Zone of Influence

Source	Total Noise Impact (dBA)			
	Daytime Criteria	Distance to Source (m)	Nighttime Criteria	Distance to Source (m)
King Street North	55 dBA	96.40	50 dBA	78.02
Blue Springs Dr.	55 dBA	12.38	50 dBA	10.42
Conestoga Parkway	55 dBA	561.47	50 dBA	1119.94

As noted in the table above, any development within 97 m of the centerline of King Street, 13 m of the centerline of Blue Springs Drive, and 1120 m of the centerline of Conestoga Parkway will experience noise levels greater than limits prescribed by MOECC if no mitigation from acoustic sources is provided.

The limiting distances above are plotted on figures in Appendix E. It is noted that the site is not located within the zone of influence from King Street North and will, therefore, experience noise levels lower than prescribed limits from this source. As a result, no further assessment of acoustic levels from traffic on King Street North is included in the analysis presented herein. In addition, the proposed building is sufficiently set back to not within the zone of influence of Blue Springs Drive, and no outdoor amenity areas fronting Blue Springs Drive exist within this 16 m zone. As such, analysis of acoustical impacts from Blue Springs Drive is also excluded.

5.1.1 Outdoor Living Areas (OLAs)

An assessment of acoustic levels at three OLA receiver locations was conducted to assess acoustic levels from traffic on Conestoga Parkway (ON-85). The receiver locations A and B represent ground-level rear yard areas, set 3 m away from the face of the building, whereas receiver location C represents the third-floor rooftop amenity area. Taking into consideration the physical mitigation provided by existing surrounding buildings, the calculated noise levels are shown in Table 5.

Table 5: Calculated Acoustic Levels at OLAs

Receiver	Total Noise Impact (dBA)			
	Calculated (Day)	Criteria	Calculated (Night)	Criteria
A	51.57	55	51.51	50
B	51.31	55	51.25	50
C	52.77	55	52.71	50

5.1.2 Plane-of-Window

In addition to outdoor areas, MOECC and Region standards require the calculation of acoustic levels at the POW to determine sound levels that could be experienced at sensitive indoor locations such as bedrooms or living rooms facing the line sources. Acoustic levels were analyzed at receiver locations D, E, F, and G.

Receiver D represents the POW for bedrooms or living rooms at Levels 1 and 2, corresponding to OLA B. Receivers E and F represent the POW at Levels 3 – 5, and Receiver G represents POW for Levels 6-15. Refer to Appendix B for an illustration of the locations of the sensitive receivers.

The acoustic levels at each of the receiver locations are summarized below.

Table 6: Calculated Acoustic Levels at POWs

Receiver	Floor	Total Noise Impact (dBA)			
		Calculated (Day)	Criteria	Calculated (Night)	Criteria
D	1	51.44	55	51.37	50
D	2	53.21	55	53.15	50
E	3	52.82	55	52.76	50
E	4	54.13	55	54.06	50
E	5	55.43	55	55.37	50
F	3	53.05	55	52.99	50
F	4	53.92	55	53.85	50
F	5	54.87	55	54.80	50
G	6	56.46	55	56.39	50
G	7	56.90	55	56.84	50
G	8	58.67	55	58.60	50
G	9	59.11	55	59.04	50
G	10	59.39	55	59.33	50
G	11	59.69	55	59.63	50
G	12	59.54	55	59.48	50
G	13	59.02	55	58.95	50
G	14	58.56	55	58.50	50

Receiver	Floor	Total Noise Impact (dBA)			
		Calculated (Day)	Criteria	Calculated (Night)	Criteria
G	15	58.31	55	58.25	50

6.0 MITIGATION MEASURES

Based on the modelling presented above, the development is impacted by noise generated from traffic on Conestoga Parkway and, therefore, mitigation measures are required to ensure sensitive areas within the development comply with MOECC standards. The mitigation measures are to reduce daytime noise to below 55 dBA and nighttime noise to below 50 dBA, unless it can be demonstrated that achieving these standards are not feasible for technical, economic, or administrative reasons.

6.1 Outdoor Living Areas (OLAs)

The calculated night-time noise levels at the rear yard amenity areas as well as the third-floor roof top amenity area marginally exceed the 50 dBA limit. MOECC and the Region allow exceedances of up to 5 dBA without requiring any active mitigation measures. As such, it is proposed that mitigation be in the form of standard warning clauses to be included on any lease or sale agreements. Given that these amenity areas are for the use of all occupants of the building, the warning clauses are to appear on sale and lease agreements for all units.

6.2 Plane-of-Window– Ventilation Requirements

The results in Table 6 illustrate that plane-of-window noise levels exceed MOECC prescribed limits at receiver locations representing windows facing Conestoga Parkway for floors level 5 and above during the day time and for all levels during the night time. The allowable limits are presented in Table 2. It is noted that daytime exceedances are less than 5 dBA at all levels, whereas night time exceedances are less than 10 dBA. As such, it is recommended that all units facing Conestoga Parkway be designed at minimum, with forced air heating and the provision for the installation of central air conditioning in the future, at the occupant's discretion.

6.3 Indoor Living Areas – Building Components

The results in Table 6 do not exhibit day time noise levels exceeding 65 dBA or night time noise levels exceeding 60 dBA. As such, it is understood that noise levels are not large enough to warrant further attenuation through specifying minimum standards of building components.

It is understood that construction will comply with standards set out in the Ontario Building Code and all other governing Codes and Standards.

6.4 Noise Warning Clauses

The following clauses are to appear on the title and/or are to be included in any lease or sale agreements for the property and/or individual units:

(Type A)

“Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally 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.”

(Type B)

“Purchasers/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 traffic may on occasions 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.”

The following clause is to appear on the title and/or are to be included in any lease or sale agreements for all units facing Conestoga Parkway:

(Type 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 in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment.”

7.0 SUMMARY OF FINDINGS

Based on the discussion herein, the following summary of recommendations are proposed for the development to provide mitigation to acoustical impacts and ensure that acoustical levels are within the criteria specified by the Region and MOECC.

1. The proposed development is sensitive to traffic noise and acoustic levels from traffic on Conestoga Parkway which exceed MOECC and Region of Waterloo standards. Acoustic levels from traffic on King Street North and Blue Springs Drive do not affect the development.
2. The acoustic levels are such that units facing Conestoga Parkway require specific ventilation requirements. These units are to be designed to include, at minimum, forced air heating and the provision to include central air conditioning in the future, at the occupant’s discretion.
3. Acoustic levels are not large enough to warrant specifying acoustic performance of building components for construction. Standard design and construction practices in compliance with the OBC shall apply.
4. Acoustical impacts are such that acoustical warning clauses, as noted, are required to be placed on title and/or rental agreements for all units within the development. An additional clause is required for units facing Conestoga Parkway.

Therefore, based on the analysis presented in the report and the implementation of the specified mitigation measures, the acoustical impacts to the residential units will conform to the criteria specified by the Region and MOECC.

All of which is respectfully submitted,

WALTERFEDY

Rushin Khakharia, E.I.T.
Civil Engineering

rkhakharia@walterfedy.com
519.576.2150 Ext. 469

Shelley Forwell, P.Eng
Civil Engineering
Business Unit Lead, Senior Associate

sforwell@walterfedy.com
519.576.2150 Ext. 241

DRAFT

APPENDIX A

Traffic Data

DRAFT

APPENDIX B

Receiver Locations

DRAFT

APPENDIX C

Sample STAMSON Output

DRAFT

APPENDIX D

Noise Level Calculations

DRAFT

APPENDIX E

Limiting Distances