SS WILSON ASSOCIATES
*Consulting Engineers*

**REPORT NO. WA17-047**
**REVISION 1**

# NOISE CONTROL FEASIBILITY STUDY FOR THE PROPOSED BARRON HEIGHTS RESIDENTIAL SUBDIVISION BARRON ROAD, THOROLD

**SUBMITTED TO:**

**COLA HOLDINGS INC.**
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**CONCORD, ON**
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# NOISE CONTROL FEASIBILITY STUDY-REVISION 1
# FOR THE PROPOSED BARRON HEIGHTS
# RESIDENTIAL SUBDIVISION
# BARRON ROAD
# THOROLD

INDEX PAGE

## 1.0 INTRODUCTION

**1.1** The services of SS Wilson Associates (SSWA) were retained on behalf of Cola Holdings Inc. to prepare a First Revision of a previously completed Noise Control Feasibility Study for the proposed residential development referred to as Barron Heights Residential, located south of Barron Road and Gainer Street, in the City of Thorold.

The objective of this report is to support an application for Draft Plan Approval of the proposed development.

**1.2** The site is bounded by the following land uses:

- to the north by Residential Developments, and furthermore, by Barron Road
- to the south by CN Railway Line
- to the east by Residential Developments
- to the west by CN Railway Line

The key plan and the aerial view of the site is shown in Figures 1 and 2.

**1.3** Major features of the development are defined by the Key Plan drawing received on August 30, 2021. Figure 3 illustrates the general layout of the proposed development.

**1.4** The major surface transportation noise source (current and future) of concern to the development is the CN Railway Line, which is located south of the proposed development.

**1.5** There are no nearby stationary noise sources of concern for the proposed development.

**1.6** The proposed development is located outside the 25 NEF/NEP contour lines prepared by Transport Canada; therefore aircraft noise is not considered a problem.

**1.7** The proposed development was the subject of a Noise Feasibility Study Report prepared earlier by SS Wilson Associates, Report No. WA98-09 dated March 13, 1998.

**1.8** The subject development is also located within the influence zone of ground-borne vibration due to the railway of concern. The potential impact due to ground-borne railway vibration is also addressed in a report under separate cover titled “Railway Vibration Measurements and Assessment, Report No. WA17-047-V, dated September 14, 2017” prepared by SS Wilson Associates.

**1.9** This Revision 1 is based on the updated drawings referenced in Section 1.3 above. It should be noted that no changes were made to the recommendations within the study.

## 2.0 SUMMARY AND RECOMMENDATIONS

### 2.1 SUMMARY

Based on the analysis conducted in this investigation it is concluded that:

1. The unattenuated daytime sound levels in the Outdoor Living Areas (OLAs)[1] of some of the residential dwellings will exceed the recommended objective sound level. For these dwellings, outdoor noise control measures are required along with relevant warning clauses. All other dwellings on the development will have acceptable outdoor sound levels in their OLAs and, therefore, no outdoor noise control measures need be considered.

2. The unattenuated sound levels at the outside walls of some of the dwellings will exceed the recommended objective sound levels. Indoor noise controls are required for these dwellings along with relevant warning clauses. All other dwellings on the development will have acceptable indoor sound levels. Therefore, noise control measures are not required.

3. Although the projected sound levels are predicted to be above the sound level criteria outlined in Section 3, it is feasible to control sound levels within the outdoor and indoor areas of the proposed development to meet the stated criteria.

### 2.2 RECOMMENDATIONS

A summary of the minimum noise attenuation requirements is presented in Table 1. Detailed description is as follows:

1. **Outdoor Noise Control Measures**

   **Blocks: 22 to 32**

   a. Acoustical barriers should be constructed to shield the Outdoor Living Areas with the following details:

      (i) Barriers should be constructed along the alignments shown schematically in Figure 4.

[1] At times, it may also be referred to as Outdoor Amenity Areas. The size of an OLA is subject to municipal standards and other project requirements (except when classified as a balcony along with other applicable MECP rules).

(ii) The required barrier height as shown in Figure 4 could be as high as 5.0 m.

(iii) The barrier may consist of an earth berm, a fence or a combination thereof. The fence component to be constructed of a durable material having approximately 20 kg/$m^2$ (Ξ 4 lb/$ft^2$) of surface area and be in a continuous line without openings or gaps.

(iv) The Builder/Contractor should be required to seek approval, including shop drawing approvals of the detailed construction of the proposed barrier prior to its installation and the approval of the Engineer shall cover: material/wood species, construction details, support details, arrangements of the panels and exact locations on a development plan.

b. Since final grading plans are not available at this stage, the barrier height is based on the assumption that the ground elevations at the road, the base of the barrier and the receiver are all equal. The ground elevations are all assumed to be 0m in this case until such time as the grading plans become available.

Accordingly, a Detailed Noise Control Study should be undertaken prior to final approval of the specified locations requiring a barrier to define specific barrier alignments and heights based on the final grading plans.
It is also the responsibility of the developer/builder responsible for final design and construction of the sound barrier to ensure that the correct barrier elevation details are secured from the Acoustical Engineer prior to planning and construction of the specified barrier.

## 2. Air Conditioning

**Blocks: 22 to 33**

The above noted properties should be equipped with central air conditioning systems with their condensing units to be located in noise insensitive locations. The sound levels of the outdoor condensing units should meet the MECP's the maximum sound level, $L_{AS}$ of 50 dBA[2] at the neighbour's closest point(s) of reception, i.e. at their ground-based outdoor areas as well as the closest window on any floor level as outlined in MECP publication NPC-216 and other levels specified by the municipality. The following warning clause should be registered in all Development Agreement(s) and Offers of Sale and Purchase or Lease of these properties:

"*This dwelling unit has been supplied with a central air conditioning system*

[2] Or the lowest hourly ambient Leq due to road traffic projected at the receptor location(s)

*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 and Climate Change*".

It is also our recommendation that the necessary detailed technical analysis be performed prior to submitting an application for Building Permit to optimize the required air conditioning unit noise rating number/specification in order to meet the Provincial sound level standards at the closest receptors (i.e., a maximum sound level LAS of 50 dBA**3** at the neighbour's closest point(s) of reception within their ground-based outdoor areas as well as at the closest window on any floor level) after taking into consideration the specific property design and proposed A/C unit location. Other A/C noise control measures, where required to meet the sound level criteria at the point(s) of reception, should also be identified and shown on the applicable permit drawings/specifications.

The Analysis Section in this study provides additional important details on the application of air conditioners.

## 3. Provision for Air Conditioning

**Blocks: 1 to 5, 18 to 20, 21**
**Lot: 17**

The above noted properties should be equipped with a ducted forced air heating system: furnace/fan, supply air plenum, and duct work. The components are to be appropriately situated and sized to accommodate future installation of central air conditioning systems. The provision for future air conditioning should also include the installation of the necessary rough-in work such as a floor drain for the condensate, appropriate electrical power supply, thermostat control wiring and a capped sleeve in the exterior wall for future refrigeration tubing in an approved location (Installation cost of the air conditioning system is an option to the developer/builder as they see fit).

If the purchaser/occupant does not take the central air conditioning option, the following clause should be registered in all Development Agreement(s) and Offers of Sale and Purchase or Lease of these properties:

"*This dwelling unit has been fitted with provisions, which include a fan forced heating system, suitably sized ducts, plenum, electrical power wiring, thermostatic control wiring, a nearby floor drain, etc. sized to accommodate the future addition of central air conditioning by the occupant at their expense and 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*

[3] Or the lowest hourly ambient Leq due to road traffic projected at the receptor location(s)

*the Ministry of the Environment and Climate Change. Future installation of the air conditioning system should meet the Ministry of the Environment and Climate Change criteria in Publication NPC-216 (a maximum sound level $L_{AS}$ of 50 dBA at the neighbour's closest point(s) of reception, i.e. at their ground-based outdoor areas as well as at the closest window on any floor level) and other applicable levels specified by the municipality.*"

**4. <u>Warning Clause *4</u>**

**Blocks: 1 to 5, 18 to 20, 21 to 33**
**Lot: 17**

The following warning clause should be registered in all Development Agreement(s) and Offers of Sale and Purchase or Lease of these properties:

"*Purchasers/tenants are advised that despite the inclusion of noise control features within this development area and within the dwellings, sound levels from increasing rail traffic may continue to be of concern, occasionally interfering with some activities of the dwelling occupants as the sound level exceeds the Municipality's and the Ministry of the Environment and Climate Change noise criteria.*"

In addition, the following warning clause should be included in all offers of purchase Agreement(s) of sale and purchase or lease and in the title deed or lease of all dwellings:

"*Warning: CN Rail and its assigns and successors in interest has or have right-of-way within 300 m from the subject land hereof. There may be alterations to or expansions of the rail facilities on such right-of-way in the future, including the possibility that they or any railway company entering into an agreement with this railway company to use the right-of-way or their assigns or successors as aforesaid may expand their operations. The expansion may affect the living environment of the residents in the vicinity notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). CN Rail will not be responsible for any complaints or claims arising from the use of such facilities and/or operations on, over or under the aforesaid right-of-way*."

Due to the proximity of the proposed development to the noted railway tracks, reference should also be made to the previously noted railway vibration study report referred to in Section 1.

The following is a summary of the railway vibration report findings and

*4 Reference should be made to Bulletin No. 91003, Environmental Warnings/Restrictions, Ontario Ministry of Consumer and Commercial Relations.

recommendations forming part of this study's recommendations including the necessary implementation:

Based on the measurements conducted, vibrations due to train pass-bys is not considered of concern, however due to closer distance setback of the facades of some of the dwellings located within 35m along the property line facing the rail line should administer a warning clause to the subdivision agreement.

## 5. Building Acoustic Insulation

**Blocks: 22 to 33**

All exterior building components (walls, windows and doors) should meet the minimum Acoustic Insulation Factors (AIF) shown in Table 3. All windows should be well fitted and weather-stripped.

It is also the responsibility of the developer/builder responsible for final design and construction of the subject dwellings to ensure that the correct windows, walls and doors acoustic specifications are secured from the Acoustical Engineer prior to planning and construction of the noted dwellings.

Typical Acoustic Insulation Factors (AIF) is shown in Table 3. The Detailed Noise Control Study should provide complete and specific tabulations of AIF's for all properties affected.

It is also the responsibility of the developer/builder responsible for final design and construction of the subject dwellings to ensure that the correct windows, walls and doors acoustic specifications are secured from the Acoustical Engineer prior to planning and construction of the noted dwelling(s).

The exterior walls of the following dwelling units should be of the brick veneer type or acoustically equivalent[5] light frame construction from the ground to the underside of the roof rafters:

**Blocks: 3 to 5, 18 to 20, 21 to 33**
**Lot: 17**

## 6. Required Sections and Details

Typical cross sections should be prepared and submitted in due course by the Consulting Engineers responsible for preparation of the site grading and drainage plans based on the final approved elevations. The sections should typically include existing and proposed future building grade elevations, source, receiver and barrier/berm ground elevations, berm slopes, drainage

[5] As certified by an Acoustic Engineer

provisions, etc.

## 7. Implementation Procedures

a) Prior to final approval of this development, a Detailed Noise Control Study, or an upgraded noise study should be required to take into consideration the following:
   - The proposed detailed grading plans
   - Final lot layout, lot/block numbers, etc.
   - Possible proposed building locations
   - The exact distances to all sources of concern
   - Final/approved sound barrier locations as well as barrier height-sound level alternatives
   - Other relevant conditions to noise in the Development Agreement

b) The necessary Development Agreement(s) should include the details of all the necessary noise control measures and procedures as outlined herein this noise study to the satisfaction of all concerned parties.

c) Prior submission of the project plans for Building Permit, the Builder's plans, with respect to the units requiring noise control measures as referred to earlier, should be certified by an Acoustical Engineer as being in conformance with the recommendations of the Detailed Noise Control Study as approved and/or amended by the authorities having jurisdiction.

   The barrier certification should include approval of the sound barrier shop drawings (showing the barrier material/wood species, construction details, support details, arrangements of the panels and exact locations on a development plan, height, and material composition) if applicable.

d) Prior to their final inspection and release for occupancy, these dwellings should be certified by an Acoustical Engineer as being in compliance with the recommendations of the Detailed Noise Control Study.

In view of the fact that municipal implementation procedures of the noise control measures recommended herein may differ, it is the responsibility of the developer/builder responsible for final design and construction of the subject structures/dwellings to ensure that the correct details related to the noise control measures referred in this report, such as sound barriers, building shell component specifications (windows, walls, doors, and others), air conditioning noise control technical requirements, etc. are secured from the Acoustical Engineer prior to planning and construction of the noted buildings.

## 3.0 SOUND LEVEL CRITERIA

### 3.1 SURFACE TRANSPORTATION CRITERIA[6]

The surface transportation noise is based on the objective sound levels recommended by the Ministry of the Environment and Climate Change (Ref: MECP Publication NPC-300 "Environmental Noise Guideline, Noise Assessment Criteria for Stationary Sources and for Land Use Planning, 2013") and applicable Regional/Municipal sound level standards and procedures for different land uses and spaces.

The following is a summary of the applicable sound level criteria for surface transportation sources for the shown time periods (day=d & night=n):

**Sound Level Limits for Outdoor Living Areas (OLAs)**

| AREA & TIME PERIOD | $L_{Aeq(day)}$ ROAD AND RAIL (dBA) |
|---|---|
| Designated (Individual or common) Outdoor Living Areas (16 hr day(d), 07:00 - 23:00) | $L_{Aeq(day)}$ 55 |

**Indoor Sound Level Limits**

| Type of Space | $L_{Aeq}$ (Time Period) (dBA) | |
|---|---|---|
| | Road | Rail |
| Living/dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc. (Time period-day: 16 hr(d), 07:00 - 23:00) | $L_{Aeq(day)}$ 45 | $L_{Aeq(day)}$ 40 |
| Living/dining, den areas of residences, hospitals. nursing homes, etc. (except schools or daycare centres) (Time period-night: 8 hr(n), 23:00 - 07:00) | $L_{Aeq(night)}$ 45 | $L_{Aeq(night)}$ 40 |
| Sleeping quarters (Time period-day: 16 hr, 07:00 - 23:00) | $L_{Aeq(day)}$ 45 | $L_{Aeq(day)}$ 40 |
| Sleeping quarters (Time period-night: 8 hr, 23:00 - 07:00) | $L_{Aeq(night)}$ 40 | $L_{Aeq(night)}$ 35 |

[6] Road, rail and rolling stock traffic.

**Additional Supplementary (Best Management Practices) Sound Level Criteria Recommended for Other Uses**

| Type of Space | $L_{Aeq}$ (Time Period) (dBA) | |
|---|---|---|
| | Road | Rail |
| General offices, reception areas, retail stores, etc.<br>(Time period-day: 16 hr, 07:00 - 23:00) | $L_{Aeq(day)}$ 50 | $L_{Aeq(day)}$ 45 |
| Living/dining areas of residences, hospitals, schools, nursing/retirement homes, daycare centres, theatres, places of worship, libraries, individual or semiprivate offices, conference rooms, reading rooms, etc.<br>(Time period-day: 16 hr, 23:00 - 07:00) | $L_{Aeq(day)}$ 45 | $L_{Aeq(day)}$ 40 |
| Sleeping quarters of hotels/motels<br>(Time period-night: 8 hr, 23:00 - 07:00) | $L_{Aeq(night)}$ 45 | $L_{Aeq(night)}$ 40 |
| Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.<br>(Time period-night: 8 hr, 23:00 - 07:00) | $L_{Aeq(night)}$ 40 | $L_{Aeq(night)}$ 35 |

The criteria for acceptable outdoor and indoor sound levels are based on "free-field" predicted and/or measured sound levels at the applicable receiver locations, thus the effects of sound reflections and reverberant sound fields are not considered.

If the sound level is less than or equal to the sound level criteria, no control measures will be required.

The outdoor sound levels ***may*** exceed the outdoor sound level criterion by up to 5 decibels, provided that it can be demonstrated that it is not technically, economically or administratively feasible to achieve the criterion and that the occupants are informed of a potential disturbance due to the excess noise by means of a warning clause or cautionary note to be registered in all Development Agreement(s) and Offers of Sale and Purchase or Lease.

Central air conditioning is required when the nighttime sound level at the outside wall of the sleeping quarters or bedrooms is equal to or exceeds $L_{Aeq(night)}$ 8hrs 60 dBA or when the daytime sound level at the outside wall of the Living/Dining/ Recreation space is equal to or exceeds $L_{Aeq(day)}$ 16 hrs 65 dBA.

If the nighttime sound level at the outside wall exceeds $L_{Aeq(night)}$ 50dBA but is less than 60dBA, or if the daytime sound level at the outside wall exceeds 55dBA but is less than $L_{Aeq(day)}$ 65dBA, then forced air heating with provision for future

installation of central air conditioning is required.

**Application of Criteria**

The following table summarizes the requirements for noise control measures for the various sound level ranges:

| SOURCE OF NOISE | DAYTIME SOUND LEVEL $L_{Aeq(day)}$ | NIGHTTIME SOUND LEVEL $L_{Aeq(night)}$ | AIR COND. | FORCED AIR VENTILATION WITH PROVISION FOR FUTURE AIR COND. | WARNING CLAUSE | ACOUSTIC INSULATION |
|---|---|---|---|---|---|---|
| ROAD | <=55 | <=50 | - | - | - | - |
| | >55 & <=65 | >50 & <=60 | - | Yes | Yes "Type C" | - |
| | >65 | >60 | Yes | - | Yes "Type D" | Yes |
| RAIL | <=55 | <=50 | - | - | - | - |
| | >55 & <=60 | >50 & <=55 | - | Yes | Yes "Type C" | - |
| | >60 & <=65 | >55 & <=60 | - | Yes | Yes "Type C" | Yes |
| | >65 | >60 | Yes | - | Yes "Type D" | Yes |

## 4.0 ANALYSIS

### 4.1 TRANSPORTATION SOURCES OF NOISE

The relevant rail traffic data was obtained from CN Railway Line and are summarized below:

**RAIL TRAFFIC DATA (CN RAIL LINE KNOWN AS THE "STAMFORD SUBDIVISION")**

DAYTIME (0700-2300)

| TYPE OF TRAIN | MAX. NO. OF TRAINS | MAX. NO. OF CARS | MAX. OPER SPEED (KM/H) | MAX. NO. OF LOCOMOTIVES |
|---|---|---|---|---|
| Freight | 4 | 140 | 15 | 4 |
| Way Freight | 6 | 25 | 15 | 4 |

NIGHTTIME (2300-0700)

| TYPE OF TRAIN | MAX. NO. OF TRAINS | MAX. NO. OF CARS | MAX. OPER SPEED (KM/H) | MAX. NO. OF LOCOMOTIVES |
|---|---|---|---|---|
| Freight | 0 | 140 | 15 | 4 |
| Way Freight | 4 | 25 | 15 | 4 |

ADDITIONAL COMMENTS

1. The above traffic is for present day conditions. To allow for future increases in rail traffic volumes we have increased the above data by 2.5% per year for 10 years.
2. The measures recommended in this report are strictly related to environmental noise due to train pass-bys. Reference to other measures for safety including distance setbacks, berming, and specific warning clauses can be found in the relevant policies published by the railway company.

SOURCE OF INFORMATION:

Appendix A contains the relevant rail traffic data used in this study.

### 4.2 OUTDOOR NOISE ENVIRONMENT

Sound level predictions were carried out based on MECP's STEAM sound level

prediction modeling procedures[7] (STEAM, Sound from Trains Environmental Analysis Method, 1990).

Overall sound levels at the OLAs of the selected representative receptor locations are shown in Table 2. Sample sound level calculations at representative receptor locations are presented in Appendix B.

In consideration of the calculations, it is concluded that for Blocks 22 to 33, the unattenuated daytime sound levels in the designated OLAs will exceed 60 dBA, the maximum criteria levels allowed. Therefore, outdoor noise control measures are required for these properties.

In consideration of the calculations, it is concluded that for Blocks 1 to 5, 18 to 21, and Lot 17, the unattenuated daytime sound levels in the designated OLAs will not exceed the objective level of LAeq 55dBA, therefore outdoor noise control measures are not required for these properties.

The conventional approach by which excess noise in the rear yard OLAs may be mitigated is through construction of acoustical barriers. Barrier height calculations for the receptors of concern are included in Appendix B. Top of barrier elevations and barrier heights for the subject receptor locations are shown in Table 2. The barrier alignment is as shown in Figure 4.

## 4.3 INDOOR NOISE ENVIRONMENT

The criteria for indoor $L_{Aeq}$ sound levels are based on projected $L_{Aeq}$ levels at the outside face of the dwellings with appropriate assumptions for the differences between the outdoor and indoor sound levels. If the outside $L_{Aeq}$ levels do not exceed the recommended objective sound levels, then the indoor $L_{Aeq}$ levels will not be exceeded, assuming standard building construction and operable windows.

Overall daytime sound levels at the building facades are shown in Table 2.

In consideration of the estimated sound levels and by comparison to the acceptable indoor sound level criteria (Section 3) the following is concluded:

- The sound levels at the outside walls of the following receptors (within any habitable room on any floor) is predicted to exceed $L_{Aeq(day)}$ 65 and/or $L_{Aeq(night)}$ 60 dBA respectively:

  **Receptors: Blocks 22 to 33**

[7] The MECP's noise prediction models ORNAMENT and STEAM have a limitation as to the minimum AADT value for 24 hour traffic volume (calculated for the daytime and nighttime hourly volume). When the AADT value is less that 40 vph, there is a neutral mathematical manipulation that can be used as long as the hourly traffic volume is not very low. The manipulation is implemented by multiplying the traffic volume by any reasonable factor (for example a factor of 10) and then by deducting 10 x log "factor" from the results (in this case, 10 x log 10=10).

Therefore, central air conditioning is required.

- The daytime/nighttime noise environment at the outside walls of the following receptors (within any habitable room on any floor) is predicted to be in the range of $L_{Aeq\ day}$ 56-65 dBA and/or $L_{Aeq\ night}$ 51-60 dBA:

  - **Receptors: Blocks 1 to 5 and 18 to 21**
    **Lot 17**

  Forced-air heating system with provision for central air conditioning is therefore required.

- All other receptors will have a sound level equal to or less than $L_{Aeq(day)}$ 55 dBA and/or $L_{Aeq(night)}$ 50 dBA and therefore no noise control measures need be considered.

Typical Acoustic Insulation Factors (A.I.F.) are summarized in Tables 3 and 4.

## 4.4 TYPICAL WINDOW / WALL CONSTRUCTION

As the detailed architectural plans for Building Permit submission are not available at this time, it is not possible to specify the window and wall details to meet the AIF requirements presented in Tables 3 and 4. Further detailed analysis should be undertaken based on the data presented in this Report to take into consideration the final room location, floor area, window type (operable or fixed), window size and orientation, etc. Such analysis is required by the MECP and the municipality prior to submission for building permits as part of their Certification process.

Wall construction using concrete block, brick veneer, precast concrete panels or acoustically equivalent light frame construction will be adequate to meet the indoor sound level criteria.

It must be pointed out that there are several factors affecting the final glass selection including:

1. Size of window.
2. Room dimensions.
3. Floor level and direction room faces.
4. Fixed or operable glass.
5. The number of building components.
6. Type of wall to be used.
7. Projected sound levels outside the window

For the calculation of type of windows required for each dwelling, a detailed

description of each unit is required.

As an example, for a typical unit with daytime outdoor sound level of 60 dBA, the AIF value for the Living Room will be 27 assuming 3 components. If the window to floor ratio is 32%, then the window requirements in terms of glass thickness, mm (air space thickness, mm) glass thickness, mm are any of the following:

**Double Glazed: 3mm (13mm) 3mm; 4mm (6mm) 4mm**

The above window glazing construction is typical examples only. It is recommended that prior to the submission of the building plans for Building Permit that the detailed architectural drawings of the units requiring noise control measures, as referred to earlier, be examined by the Acoustical Engineer in order to advise the design consultant on the ***specific*** building components for noise control to suite the actual window construction details.

## 4.5 BARRIER

Where a sound barrier is required, as specified in this study, we recommend that the contractor submit the Shop Drawings for the barrier to the Acoustical Engineer for approval prior to finalization of the designs. In particular, the following information should be made available for submission purposes:

1. Copy of the most up-to-date grading plan of the specific area on which the sound barrier will be erected.
2. Barrier material details including ***actual*** thickness, wood species, gauge, etc.
3. Barrier heights and extent (specified in linear metres), return sections and barrier flanking ends to be shown on a drawing to a suitable scale.

The project design consultant(s) and/or the barrier supplier/manufacturer responsible for design implementation of the sound barrier should be advised to communicate with the Acoustical Engineer respecting any of the above matters.

## 4.6 CONTROL OF AIR CONDITIONING UNITS NOISE

To control the environmental noise emitted by air conditioning or heat pump units it is essential that the following procedures and specifications be considered to by the parties responsible for the selection, design and installation of the air conditioning systems:

1. Control of air conditioning noise is governed by Provincial and/or municipal standards which specify acceptable sound emission levels for the air conditioning devices and/or acceptable sound levels at the point(s) of reception.

   The Ministry of the Environment and Climate Change criteria for control of air

conditioning noise is outlined in several technical publications including publications NPC-300 and NPC-216 (a maximum sound level of 50 dBA[8] at the neighbour's closest point(s) of reception, i.e. at their outdoor areas as well as at the closest window on any floor level). The applicable sound level criteria for new residential development where air conditioning is a mandatory requirement for noise control inside habitable rooms are: 1) a maximum ARI[*] Sound Rating to suit the site specific installation for the air conditioning device, and 2) hourly $L_{Aeq}$ sound level limits of 50 dBA at the point(s) of reception (or the prevailing hourly $L_{Aeq}$ due to vehicular traffic ambient noise if higher than 50 dBA).

Municipal standards for air conditioning noise may also include specific or maximum Sound Rating numbers (in bels) and/or point-of-reception sound level limits in reference to specific municipal By-Laws and/or standards as applicable.

Therefore, it is essential that the final selection, location, design, and specifications of the air conditioning devices ensure compliance with the applicable sound level criteria prior to making any commitment.

The following are examples of the preferred approach when dealing with the issue of air conditioning noise.

a) If the A/C condensing unit is to be installed in backyards in urban areas, then units having lower bels rating may be required. The use of units with lower sound rating of 6.8bel or lower may give the builder the flexibility of locating the unit as close as 3 metres from the joint property lines without exceeding the MECP 50 dBA standard for houses in urban areas.
b) If the unit is to be located in the front or in the side yard areas (closer to the front and provided that there are no windows to habitable rooms on the side walls), then units having less stringent sound level rating requirements may result in complying with sound criteria.
c) Through the building permit process of the specific properties, additional calculations should be performed to optimize the unit sound ratings depending on the house model and the installation location.

2. The resulting sound levels due to residential air conditioners at the nearest points-of-reception should not exceed the levels in MECP Publication NPC-216 (a maximum sound level of 50 dBA[9] at the neighbour's closest point(s) of reception, i.e. at their outdoor areas as well as at the closest window on any floor level).

3. The siting of the split-system central air conditioning units and other systems

[8] Or the lowest hourly ambient Leq due to road traffic projected at the receptor location(s)
[*] When tested in accordance with ARI Standard 270-84
[9] Or the lowest hourly ambient Leq due to road traffic projected at the receptor location(s)

should follow good planning principles.

4. Should location of the outdoor air conditioner unit be in the back or side yard areas where noise is likely to interfere with the outdoor and indoor activities of any occupant and/or neighbor, then it is necessary to design and install noise control measures. Noise control measures include any or a combination of the following:

   a. Distance setback away from the receptor(s).
   b. Sound barrier wall(s) or ultimately an acoustic enclosure.
   c. Sealing selected windows, i.e. installation of non-operable windows.
   d. Deleting selected windows.

   **It is also our recommendation that the necessary detailed technical analysis be performed prior to submitting an application for Building Permit to optimize the required air conditioning unit Sound Rating number in order to meet the Provincial sound level standards at the closest receptors after taking into consideration the specific property design and proposed A/C unit location. Other A/C noise control measures, where required to meet the sound level criteria at the point(s) of reception, should also be identified and shown on the applicable permit drawings/specifications.**

## 4.7 Important Notes for the Residential Builder Regarding Windows

The results in this report provide information on the calculated Acoustic Insulation Factors (AIF) for windows based on typical assumed window and room dimensions.

To assist the Builder in appreciating the fact of whether the results presented herein require typical commercially available residential type windows, or special type windows, the following table[10] provides reasonably accurate information on whether such window(s) are standard industry window or not:

| **Acoustic Insulation Factor (AIF) in this report** | **35** | **34** | **33** | **32** | **31** | **30** | **29** | **28** | **27** | **26** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Window to room floor area percentage NOT to be exceeded** | **10%** | **13%** | **16%** | **20%** | **25%** | **32%** | **40%** | **50%** | **63%** | **80%** |

If the above ratios are exceeded, several options are available to the builder including one or more of: reducing the size of the window, increasing the inter-pane air spacing, the use of thicker glazing, the use of "laminated" glazing (1 or 2 panes), etc.

**WORKED EXAMPLE 1:**

- AIF shown in this study: 31
- Actual room floor area: 250 sq.ft.
- You selected a window area of: 45 sq.ft
- Your window/floor ratio: (45 divided by 250, then times 100) =18%
- Your result is less than above table value 25%; i.e. standard glazing unit

**WORKED EXAMPLE 2:**

- AIF shown in this study: 34
- Actual room floor area: 200 sq.ft.
- You selected a window area of: 50 sq.ft
- Your window/floor ratio: (50 divided by 200, then times 100) =25%
- Your result is more than above table value 13%; i.e. Non-standard (special) glazing unit

[10] Based on a typical commercially available glazing: 3mm inside pane, 16mm inter-pane air space & 3mm exterior pane.

## 4.8 Abbreviations

| Basic Descriptor | Measurement Weighting | Time Weighting Characteristics<br>**F**(Fast)**. S**(Slow)**. I**(Impulse)**.** |
|---|---|---|
| **$L_p$ Sound pressure level** | A-Weighted sound pressure level | $L_{AF}$, $L_{AS}$, $L_{AI}$ |
| | C-Weighted sound pressure level | $L_{CF}$, $L_{CS}$, $L_{CI}$ |
| | Z-Weighted sound pressure level(Flat) | $L_{ZF}$, $L_{ZS}$, $L_{ZI}$ |
| **$L_{eq}$ Equivalent continuous sound level** | Equivalent continuous A-weighted sound level | $L_{Aeq}$, $L_{AIeq}$ |
| | Equivalent continuous C-weighted sound level | $L_{Ceq}$, $L_{CIeq}$ |
| | Equivalent continuous Z-weighted(Flat) sound level | $L_{Zeq}$, $L_{ZIeq}$ |
| **$L_E$ Sound Exposure Level** | A-Weighted sound exposure Level | $L_{AE}$, $L_{AIE}$ |
| | C-Weighted sound exposure Level | $L_{CE}$, $L_{CIE}$ |
| | Z-Weighted sound exposure Level(Flat) | $L_{ZE}$, $L_{ZIE}$ |
| **$L_{max}$, $L_{min}$** | Maximum A-weighted sound level | $L_{AFmax}$, $L_{ASmax}$, $L_{AImax}$ |
| **Maximum Sound Level** | Maximum C-weighted sound level | $L_{CFmax}$, $L_{CSmax}$, $L_{CImax}$ |
| | Maximum Z- weighted sound level(Flat) | $L_{ZFmax}$, $L_{ZSmax}$, $L_{ZImax}$ |
| **$L_N$ Percentile Sound Level** | Percentile A-weighted sound level | $L_{AFNn}$, $L_{ASN}$, $L_{AIN}$ |
| | Percentile C-weighted sound level | $L_{CFNn}$, $L_{CSN}$, $L_{CIN}$ |
| | Percentile Z-weighted sound level(Flat) | $L_{ZFNn}$, $L_{ZSN}$, $L_{ZIN}$ |
| **$L_{peak}$** | A-Weighted peak sound level | $L_{Apeak}$ |
| **Peak Sound Level** | C-Weighted peak sound level | $L_{Cpeak}$ |
| | Z-Weighted peak sound level(Flat) | $L_{Zpeak}$ |

# TABLES

## TABLE 1

## SUMMARY OF MINIMUM REQUIRED NOISE CONTROL MEASURES

| RECEPTOR | SOUND BARRIER | CENTRAL AIR CONDITIONING | PROVISION FOR CENTRAL AIR CONDITIONING | WARNING CLAUSE | BRICK VENEER or acoustically equivalent (FOR RAILWAY NOISE) |
|---|---|---|---|---|---|
| Blocks 1 and 2 | No | No | No | No | No |
| Blocks 3 to 5 | No | No | Yes | Yes | Yes |
| Blocks 18 to 20 | No | No | Yes | Yes | Yes |
| Block 21 Lot 17 | No | No | Yes | Yes | Yes |
| Blocks 22 to 32 | Yes | Yes | - | Yes | Yes |
| Block 33 | No | Yes | - | Yes | Yes |

N6 Leq-AIF Master-Sept 12, 2017 **SS WILSON ASSOCIATES** Proceed

2021-09-17 12:21 **Leq- AIF CALCULATIONS AND TYPICAL WINDOW GLAZING REQUIREMENTS** (Using NRC/MOE Pocedures

**OUTDOORS**

**Table 2**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| File Number : | WA17-047 | | | | | | | | | | | |
| Project Name : | Barron Heights Res, Thorold | | | | | | | | | | | |
| Description : | Residential Developments | | | | | | | | Any Heavy Rail Line ? | | | Yes |
| Description : | | | | | | | | | Acoustic Insulation Factor to account for their | | | |
| Record Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Consider Record | Y | N | N | N | N | N | N | N | N | N | N | N |
| **BLOCK NO.** | Block 31 | | | | | | | | | | | |
| **FACE/DIRECTION** | South | | | | | | | | | | | |
| | | | | | | | | | | | | |
| **Source 1: .....** | **Rail Traffic** | | OUTDOOR DAYTIME LEVELS | | | OUTDOOR DAYTIME LEVELS | | | OUTDOOR DAYTIME LEVELS | | | |
| **Leq Outdoors** | | | | | | | | | | | | |
| Partial angle of exposure, degrees | 180 | | | | | | | | | | | |
| Partial exposure adjust., dB | | | | | | | | | | | | |
| Additional Adjustment, dB | | | | | | | | | | | | |
| Additional Adjustment, dB | | | | | | | | | | | | |
| **Sub-Total Leq, dBA** | | | | | | | | | | | | |
| **Source 2: CN Railway** | **Rail Traffic** | | OUTDOOR DAYTIME LEVELS | | | OUTDOOR DAYTIME LEVELS | | | OUTDOOR DAYTIME LEVELS | | | |
| **Leq Daytime** | 60.00 | | | | | | | | | | | |
| Partial angle of exposure, degrees | 180 | | | | | | | | | | | |
| Partial exposure adjust., dB | | | | | | | | | | | | |
| Barrier Reduction, dB | -11.00 | | | | | | | | | | | |
| Additional Adjustment, dB | | | | | | | | | | | | |
| **Sub-Total Leq, dBA** | **49.00** | | | | | | | | | | | |
| **Source 3: .....** | **Road Traffic** | | OUTDOOR DAYTIME LEVELS | | | OUTDOOR DAYTIME LEVELS | | | OUTDOOR DAYTIME LEVELS | | | |
| **Leq Daytime** | | | | | | | | | | | | |
| Partial angle of exposure, degrees | 180 | | | | | | | | | | | |
| Partial exposure adjust., dB | | | | | | | | | | | | |
| Additional Adjustment, dB | | | | | | | | | | | | |
| Additional Adjustment, dB | | | | | | | | | | | | |
| **Sub-Total Leq, dBA** | | | | | | | | | | | | |
| **Source 4: .....** | **Road Traffic** | | OUTDOOR DAYTIME LEVELS | | | OUTDOOR DAYTIME LEVELS | | | OUTDOOR DAYTIME LEVELS | | | |
| **Leq Daytime** | | | | | | | | | | | | |
| Partial angle of exposure, degrees | 180 | | | | | | | | | | | |
| Partial exposure adjust., dB | | | | | | | | | | | | |
| Additional Adjustment, dB | | | | | | | | | | | | |
| Additional Adjustment, dB | | | | | | | | | | | | |
| **Sub-Total Leq, dBA** | | | | | | | | | | | | |
| **Sub-Tot. 4 Sources Leq, dBA** | **49.00** | | | | | | | | | | | |
| **Aircraft noise NEF/NEP** | | | | | | | | | | | | |
| Adjust.1 | | | | | | | | | | | | |
| Adjust.2 | | | | | | | | | | | | |
| Adjusted NEF/NEP | | | | | | | | | | | | |
| *Approx. Overall Combined Leq* | *49* | | | | | | | | | | | |
| ***Overall Road and/or Rail and/or Stationary Sources, Leq (dBA)*** | ***49*** | | | | | | | | | | | |
| ***Aircraft Noise Only, NEF*** | | | | | | | | | | | | |
| NOTES | 5m High Sound Barrier and Berm Combination Required | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N6 Leq-AIF Master-Sept 12, 2017 | | **SS WILSON ASSOCIATES** | | | | | | | | | |
| 2021-09-17 12:21 | | Leq- AIF CALCULATIONS AND TYPICAL WINDOW GLAZING REQUIREMENTS | | | | | | | | | | |
| File Number : | WA17-047 | | | DAYTIME | | | | | (Using NRC/MOE Pocedures) | | | |
| Project Name : | Barron Heights Res, Thorold | | | Table 3 | | | | | | | | |
| Description : | Residential Developments | | | | | | | | | | | |
| Description : | | | | | | | | Caution: , the AIF Reported for heavy Rail Noise is the Higher of day and night | | | | |
| Record Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Consider Record | Y | Y | Y | N | N | N | N | N | N | N | N | N |
| **BLOCK NO.** | Block 5 | Block 20 | Block 31 | | | | | | | | | |
| **FACE/DIRECTION** | South | South | South | | | | | | | | | |
| | | | | | | | | | | | | |
| ROOM CLASSIFICATION | Living /Dining | Living /Dining | Living /Dining | | | | | | | | | |
| Manual Adjust. to Criterion, | | | | | | | | | | | | |
| **MOE** Transportation Sources Daytime Leq Indoor Criteria, dBA | 45 | 45 | 45 | | | | | | | | | |
| Aircraft Indoor Criteria, NEF | 5 | 5 | 5 | | | | | | | | | |
| **Source 1: .....** | **Traffic** | | DAYTIME LEVELS | | | DAYTIME LEVELS | | | DAYTIME LEVELS | | | |
| **Leq Daytime** | | | | | | | | | | | | |
| Partial angle of exposure, 1-180° | 180 | 180 | 180 | | | | | | | | | |
| Partial exposure adjust., dB | | | | | | | | | | | | |
| Additional Adjustment, dB | | | | | | | | | | | | |
| **Sub-Total Leq, dBA** | | | | | | | | | | | | |
| Caculated AIF | -33 | -33 | -33 | 34 | 43 | 35 | 43 | -33 | -33 | -33 | -33 | -33 |
| Angular range of incidence Case(0,1,2,3) | | | | | | | | | | | | |
| Adjusted AIF | -28 | -28 | -28 | 34 | 43 | 35 | 43 | -28 | -28 | -28 | -28 | -28 |
| **Source 2: CN Railway** | **Rail Traffic** | | DAYTIME LEVELS | | | DAYTIME LEVELS | | | DAYTIME LEVELS | | | |
| **Leq Daytime** | 52.00 | 51.00 | 60.00 | | | | | | | | | |
| Partial angle of exposure, 1-180° | 180 | 180 | 180 | | | | | | | | | |
| Partial exposure adjust., dB | | | | | | | | | | | | |
| Additional Adjustment, dB | | | | | | | | | | | | |
| **Sub-Total Leq, dBA** | **52.00** | **51.00** | **60.00** | | | | | | | | | |
| Caculated AIF | 19 | 18 | 27 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 |
| Angular range of incidence Case(0,1,2,3) | | | | | | | | | | | | |
| Adjusted AIF | 24 | 23 | 27 | -28 | -28 | -28 | -28 | -28 | -28 | -28 | -28 | -28 |
| **Source 3: .....** | **Traffic** | | DAYTIME LEVELS | | | DAYTIME LEVELS | | | DAYTIME LEVELS | | | |
| **Leq Daytime** | | | | | | | | | | | | |
| Partial angle of exposure, 1-180° | 180 | 180 | 180 | | | | | | | | | |
| Partial exposure adjust., dB | | | | | | | | | | | | |
| Additional Adjustment, dB | | | | | | | | | | | | |
| **Sub-Total Leq, dBA** | | | | | | | | | | | | |
| Caculated AIF | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 |
| Angular range of incidence Case(0,1,2,3) | | | | | | | | | | | | |
| Adjusted AIF | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 |
| **Source 4: .....** | **Road Traffic** | | DAYTIME LEVELS | | | DAYTIME LEVELS | | | DAYTIME LEVELS | | | |
| **Leq Daytime** | | | | | | | | | | | | |
| Partial angle of exposure, 1-180° | 180 | 180 | 180 | | | | | | | | | |
| Partial exposure adjust., dB | | | | | | | | | | | | |
| Additional Adjustment, dB | | | | | | | | | | | | |
| **Sub-Total Leq, dBA** | | | | | | | | | | | | |
| Caculated AIF | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 |
| Angular range of incidence Case(0,1,2,3) | | | | | | | | | | | | |
| Adjusted AIF | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 | -38 |
| **Sub-Tot. 4 Sources Leq, dBA** | **52.00** | **51.00** | **60.00** | | | | | | | | | |
| **Aircraft noise NEF/NEP** | | | | | | | | | | | | |
| Adjust.1 | | | | | | | | | | | | |
| Adjust.2 | | | | | | | | | | | | |
| Adjusted NEF/NEP | | | | | | | | | | | | |
| *Approx. Overall Combined Leq* | *52* | *51* | *60* | | | | | | | | | |
| Assumed Window/Floor Area % | 32.0 | 32.0 | 32.0 | | | | | | | | | |
| Assumed Total # of Components (Road, Rail, and Other Sources) | 3 | 3 | 3 | | | | | | | | | |
| Assumed Total # of Components Aircraft ONLY | 3 | 3 | 3 | | | | | | | | | |
| AIF of 4 Sources | *24* | *23* | *27* | | | | | | | | | |
| Aircraft AIF | | | | | | | | | | | | |
| Combined AIF | 24 | 23 | 27 | | | | | | | | | |
| Openable or Fixed windows ? | Openable | Openable | Openable | | | | | | | | | |
| Regular or Laminated Glass | Regular | Regular | Regular | | | | | | | | | |
| Other Adjustment (dB,AIF), Specify | | | | | | | | | | | | |
| **Final Adjusted AIF** | 24 | 23 | 27 | | | | | | | | | |
| AIF for Line # 1 | 26 | 26 | 26 | | | | | | | | | |
| Line # (Min. set is Line 1) | 1 | 1 | 2 | | | | | | | | | |
| *Minimum STC (Approx)* | *25* | *24* | *28* | | | | | | | | | |
| Typical Minimum Double Glazing Alternatives | 3( 6 )3 | 3( 6 )3 | 3( 6 )3 | | | | | | | | | |
| **NOTES** | Forced Air Required | Forced Air Required | A/C Required | | | | | | | | | |

# SS WILSON ASSOCIATES

**SUMMARY TABLE OF** Leq- AIF CALCULATIONS AND TYPICAL WINDOW GLAZING REQUIREMENTS

WA17-047

Barron Heights Res, Thorold

Residential Developments

**DAYTIME**

**Table 3**

- Windows must be well-fitted weatherstripped units.
- The interpane spacing shown in the tables are the minimum acceptable.
- Larger spacing for a given glazing thickness normally improves the performance.

| BLOCK NO. | FACE/DIRECTION | ROOM CLASSIFICATION | | Openable or Fixed Window | Regular Strength or Laminated Glass | Combined AIF | Approx. Overall Combined Leq | Double Glazing Alternatives , mm | Triple Glazing Alternatives , mm | *Minimum STC (Approx)* |
|---|---|---|---|---|---|---|---|---|---|---|
| Block 5 | South | Living /Dining | | Openable | Regular | 24 | 52 | 3( 6 )3 | | *25* |
| Block 20 | South | Living /Dining | | Openable | Regular | 23 | 51 | 3( 6 )3 | | *24* |
| Block 31 | South | Living /Dining | | Openable | Regular | 27 | 60 | 3( 6 )3 | | *28* |
| | | | | | | | | | | |
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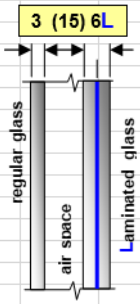
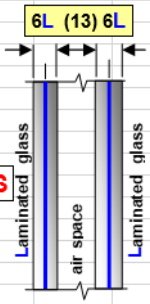
ABBREVIATIONS SPECIFIC TO THIS PROJECT : FF(Front Face), RF(Rear Face), RS(Right Side face), LS(Left Side face)


Double Glazing- regular glass

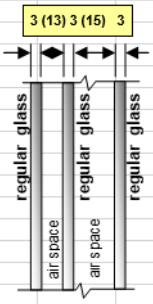



Double Glazing- *single laminated glass*

**EXAMPLES**




Double Glazing- *double laminated glass*




Triple Glazing- regular glass

N6 Leq-AIF Master-Sept 12, 2017 **SS WILSON ASSOCIATES**

2021-09-17 12:21 — **Leq- AIF CALCULATIONS AND TYPICAL WINDOW GLAZING REQUIREMENTS** — (Using NRC/MOE Po

**NIGHT TIME**

**Table 4**

File Number : WA17-047

Project Name : Barron Heights Res, Thorold

Description : Residential Developments

**Caution: , the AIF Reported for heavy Rail Noise is the Higher of day and night**

| Record Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Consider Record | Y | Y | Y | N | N | N | N | N | N | N | N | N |
| **BLOCK NO.** | Block 5 | Block 20 | Block 31 | | | | | | | | | |
| **FACE/DIRECTION** | South | South | South | | | | | | | | | |
| ---------- | | | | | | | | | | | | |
| ROOM CLASSIFICATION | Bedroom | Bedroom | Bedroom | | | | | | | | | |
| Manual Adjust. to Criterion, dBA | | | | | | | | | | | | |
| **MOE** Transportation Sources Night Leq Indoor Criteria, dBA | 40 | 40 | 40 | | | | | | | | | |
| Aircraft Indoor Criteria, NEF | | | | | | | | | | | | |
| **Source 1: .....** | **Traffic** | | **NIGHT TIME LEVELS** | | | NIGHT TIME LEVELS | | | NIGHT TIME LEVELS | | | |
| **Leq Night Time** | | | | | | | | | | | | |
| Partial angle of exposure, degrees | 180 | 180 | 180 | | | | | | | | | |
| Partial exposure adjust., dB | | | | | | | | | | | | |
| Additional Adjustment, dB | | | | | | | | | | | | |
| **Sub-Total Leq, dBA** | | | | | | | | | | | | |
| Angular range of incidence (0,1,2,3) | | | | | | | | | | | | |
| Adjusted AIF | -28 | -28 | -28 | 34 | 43 | 35 | 43 | -28 | -28 | -28 | -28 | -28 |
| **Source 2: CN Railway** | **Rail Traffic** | | **NIGHT TIME LEVELS** | | | NIGHT TIME LEVELS | | | NIGHT TIME LEVELS | | | |
| **Leq Night Time** | 52.00 | 51.00 | 54.00 | | | | | | | | | |
| Partial angle of exposure, degrees | 180 | 180 | 180 | | | | | | | | | |
| Partial exposure adjust., dB | | | | | | | | | | | | |
| Additional Adjustment, dB | | | | | | | | | | | | |
| **Sub-Total Leq, dBA** | **52.00** | **51.00** | **54.00** | | | | | | | | | |
| Angular range of incidence (0,1,2,3) | | | | | | | | | | | | |
| Adjusted AIF | 24 | 23 | 27 | -28 | -28 | -28 | -28 | -28 | -28 | -28 | -28 | -28 |
| **Source 3: .....** | **Traffic** | | **NIGHT TIME LEVELS** | | | NIGHT TIME LEVELS | | | NIGHT TIME LEVELS | | | |
| **Leq Night Time** | | | | | | | | | | | | |
| Partial angle of exposure, degrees | 180 | 180 | 180 | | | | | | | | | |
| Partial exposure adjust., dB | | | | | | | | | | | | |
| Additional Adjustment, dB | | | | | | | | | | | | |
| **Sub-Total Leq, dBA** | | | | | | | | | | | | |
| Angular range of incidence (0,1,2,3) | | | | | | | | | | | | |
| Adjusted AIF | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 |
| **Source 4: .....** | **Road Traffic** | | **NIGHT TIME LEVELS** | | | NIGHT TIME LEVELS | | | NIGHT TIME LEVELS | | | |
| **Leq Night Time** | | | | | | | | | | | | |
| Partial angle of exposure, degrees | 180 | 180 | 180 | | | | | | | | | |
| Partial exposure adjust., dB | | | | | | | | | | | | |
| Additional Adjustment, dB | | | | | | | | | | | | |
| **Sub-Total Leq, dBA** | | | | | | | | | | | | |
| Angular range of incidence (0,1,2,3) | | | | | | | | | | | | |
| Adjusted AIF | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 |
| **dBA** | **52.00** | **51.00** | **54.00** | | | | | | | | | |
| **Aircraft noise NEF/NEP** | | | | | | | | | | | | |
| Adjust.1 | | | | | | | | | | | | |
| Adjust.2 | | | | | | | | | | | | |
| Adjusted NEF/NEP | | | | | | | | | | | | |
| *Approx. Overall Combined Leq* | *52* | *51* | *54* | | | | | | | | | |
| Assumed Window/Floor Area % | 20.0 | 20.0 | 20.0 | | | | | | | | | |
| Assumed Total # of Components (Road, Rail, and Other Sources) | 3 | 3 | 3 | | | | | | | | | |
| Assumed Total # of Components Aircraft ONLY | 3 | 3 | 3 | | | | | | | | | |
| AIF of 4 Sources | *24* | *23* | *27* | | | | | | | | | |
| Aircraft AIF | | | | | | | | | | | | |
| Combined AIF | 24 | 23 | 27 | | | | | | | | | |
| Openable or Fixed windows ? | Openable | Openable | Openable | | | | | | | | | |
| Regular or Laminated Glass | Double Laminate | Regular | Regular | | | | | | | | | |
| Other Adjustment | | | | | | | | | | | | |
| **Final Adjusted AIF** | 21 | 23 | 27 | | | | | | | | | |
| *Minimum STC (Approx)* | *20* | *22* | *26* | | | | | | | | | |
| Typical Minimum Double Glazing Alternatives | 3(6)6 6(6)2 | 3(6)3 | 3(6)3 | | | | | | | | | |
| **NOTES** | Forced Air Required | Forced Air Required | A/C Required | | | | | | | | | |

# SS WILSON ASSOCIATES

*SUMMARY TABLE OF* **Leq- AIF CALCULATIONS AND TYPICAL WINDOW GLAZING REQUIREMENTS**

**WA17-047**

**Barron Heights Res, Thorold**

**Residential Developments**

**NIGHT TIME**

**Table 4**

- Windows must be well-fitted weatherstripped units.
- The interpane spacing shown in the tables are the minimum acceptable.
- Larger spacing for a given glazing thickness normally improves the performance.

| BLOCK NO. | FACE/DIRECTION | ROOM CLASSIFICATION | ..... | Openable or Fixed Window | Regular Strength or Laminated Glass | Combined AIF | Approx. Overall Combined Leq | Double Glazing Alternatives, mm | Triple Glazing Alternatives, mm | *Minimum STC (Approx)* |
|---|---|---|---|---|---|---|---|---|---|---|
| Block 5 | South | Bedroom | | Openable | Double Laminated | 24 | 52 | 3(6)6<br>6(6)2 | | *20* |
| Block 20 | South | Bedroom | | Openable | Regular | 23 | 51 | 3(6)3 | | *22* |
| Block 31 | South | Bedroom | | Openable | Regular | 27 | 54 | 3(6)3 | | *26* |
| | | | | | | | | | | |
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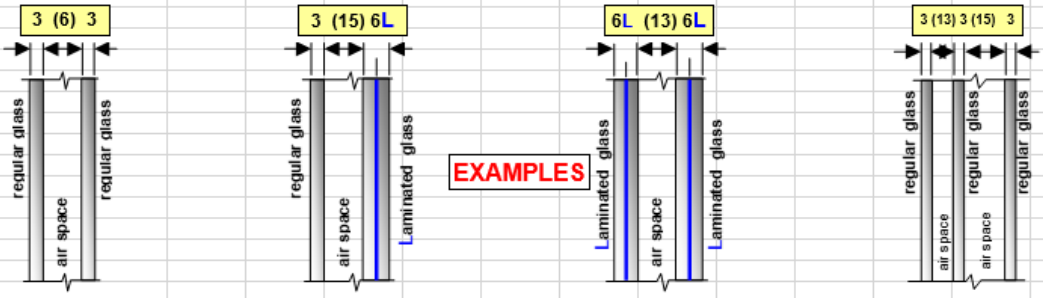
ABBREVIATIONS SPECIFIC TO THIS PROJECT : FF(Front Face), RF(Rear Face), RS(Right Side face), LS(Left Side face)




**Double Glazing- regular glass**

**Double Glazing- *single laminated glass***

**Double Glazing- *double laminated glass***

**Triple Glazing- regular glass**

# FIGURES

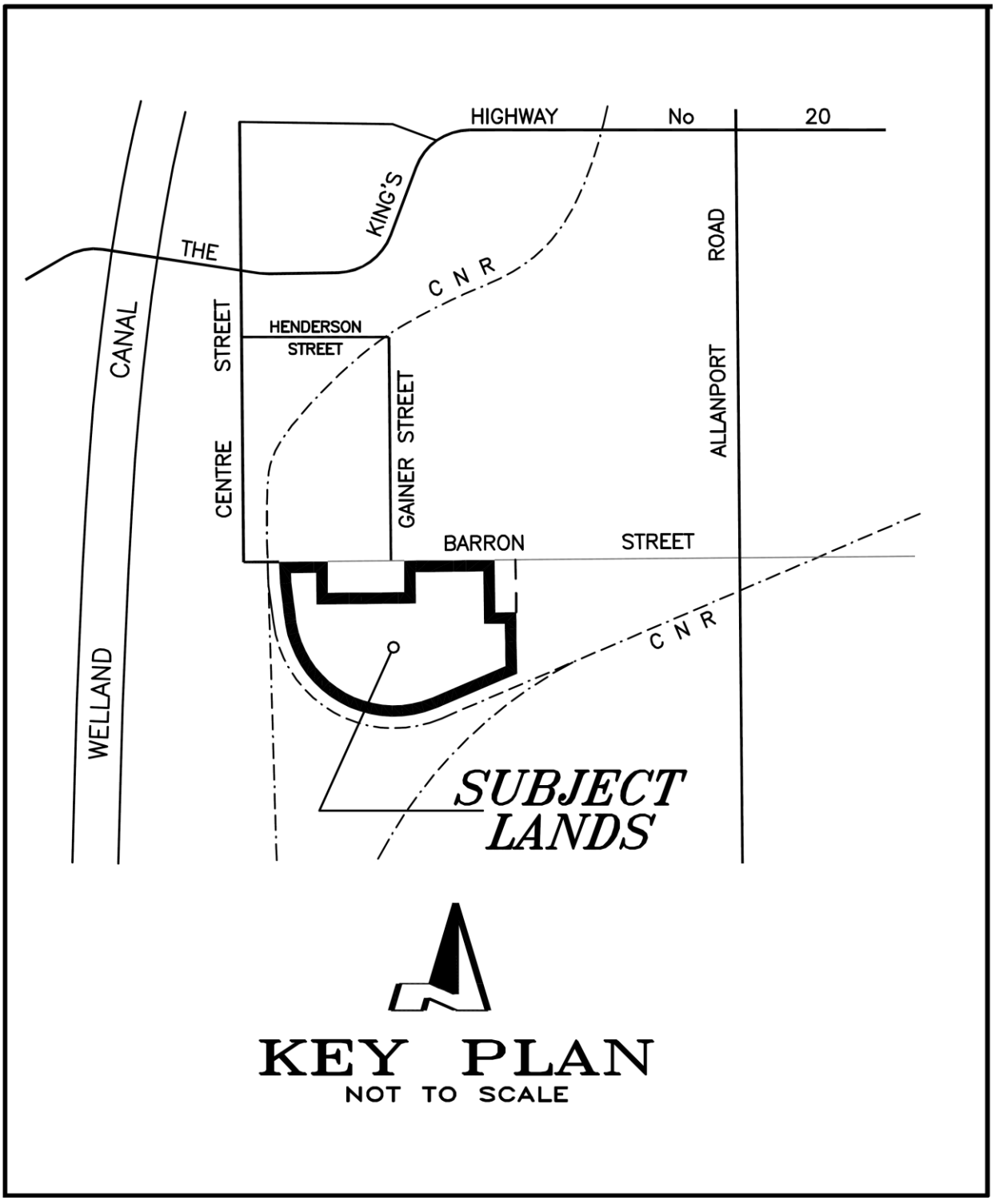



**FIGURE 1**
**KEY PLAN**

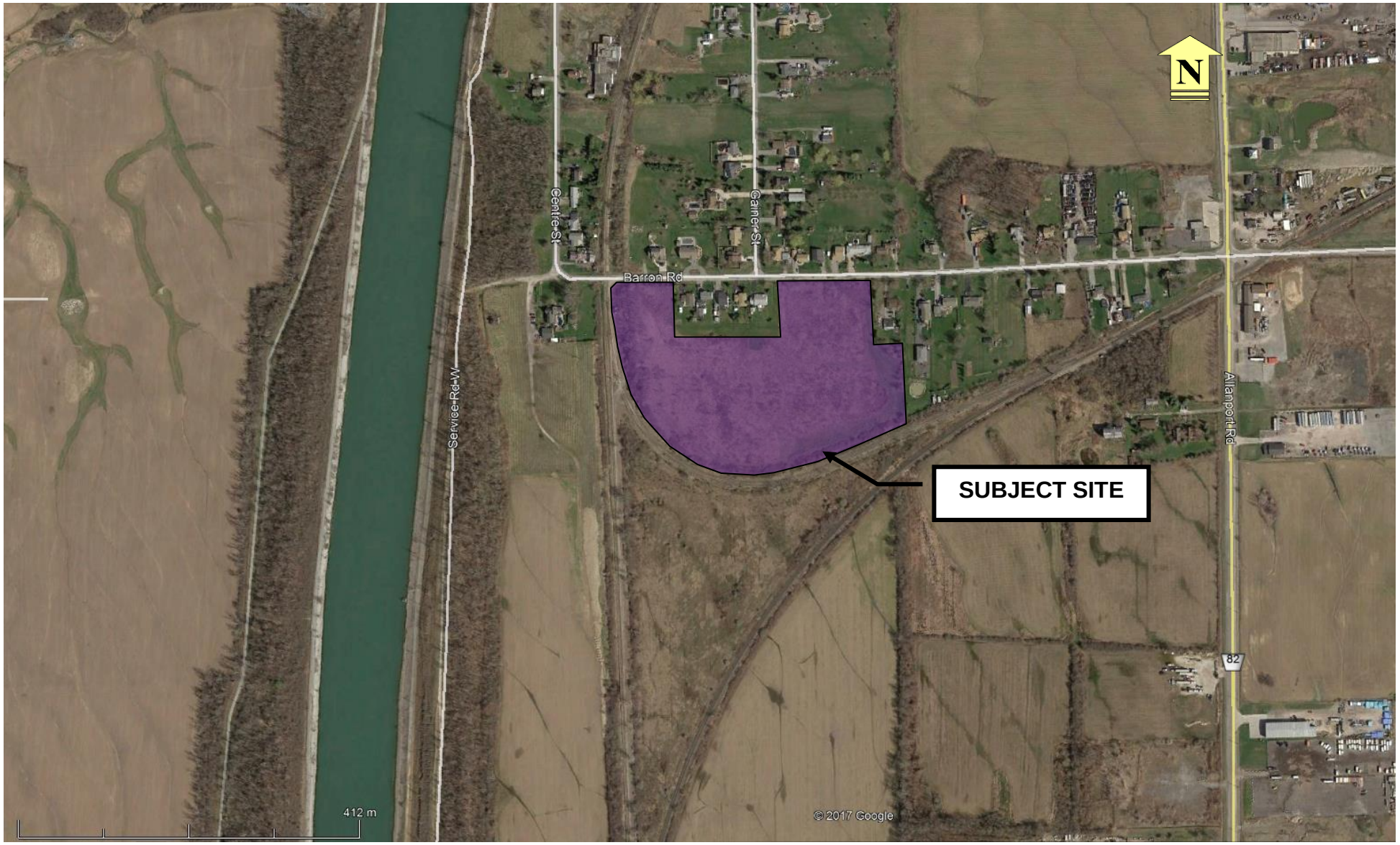



**FIGURE 2**
**AERIAL VIEW OF THE SUBJECT SITE**

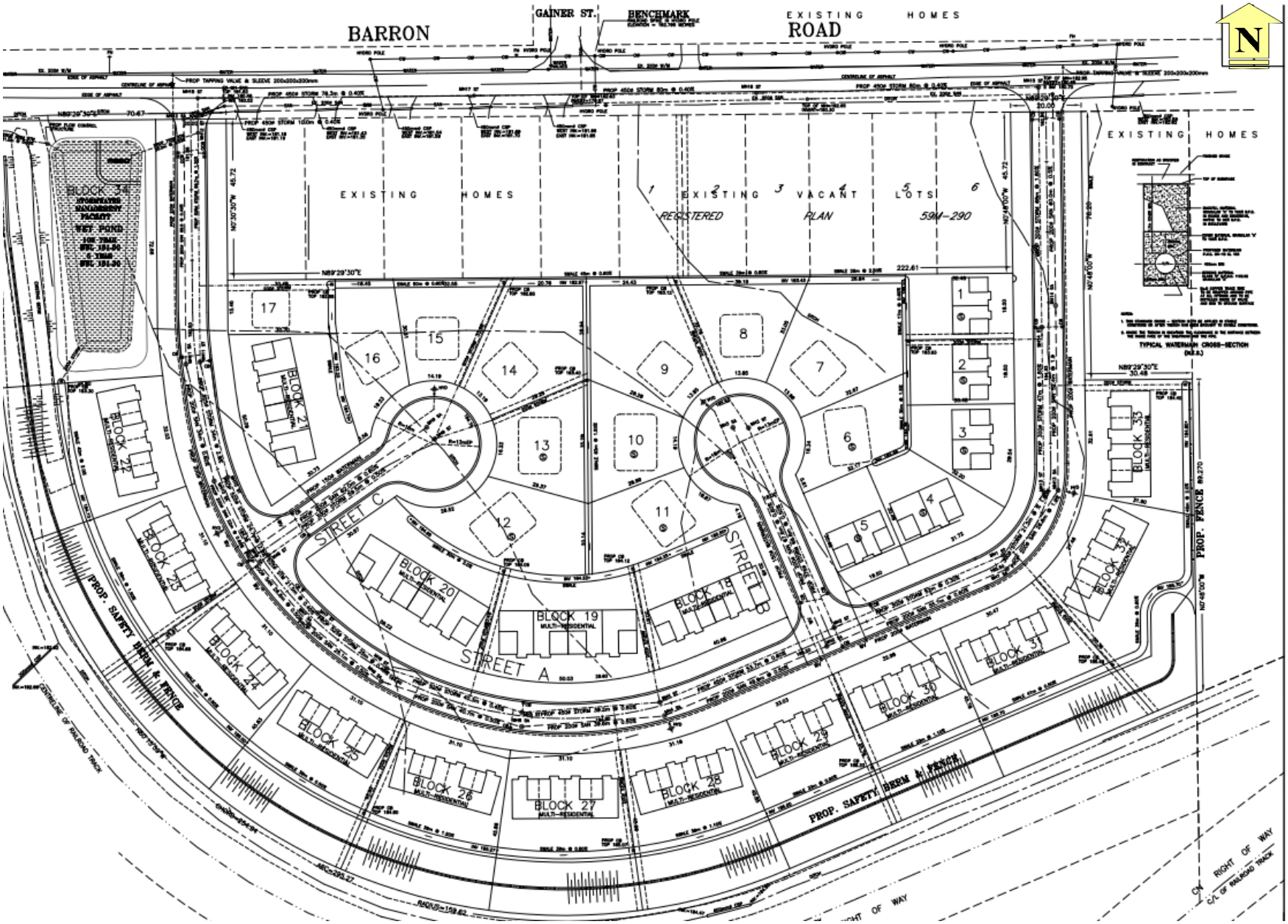
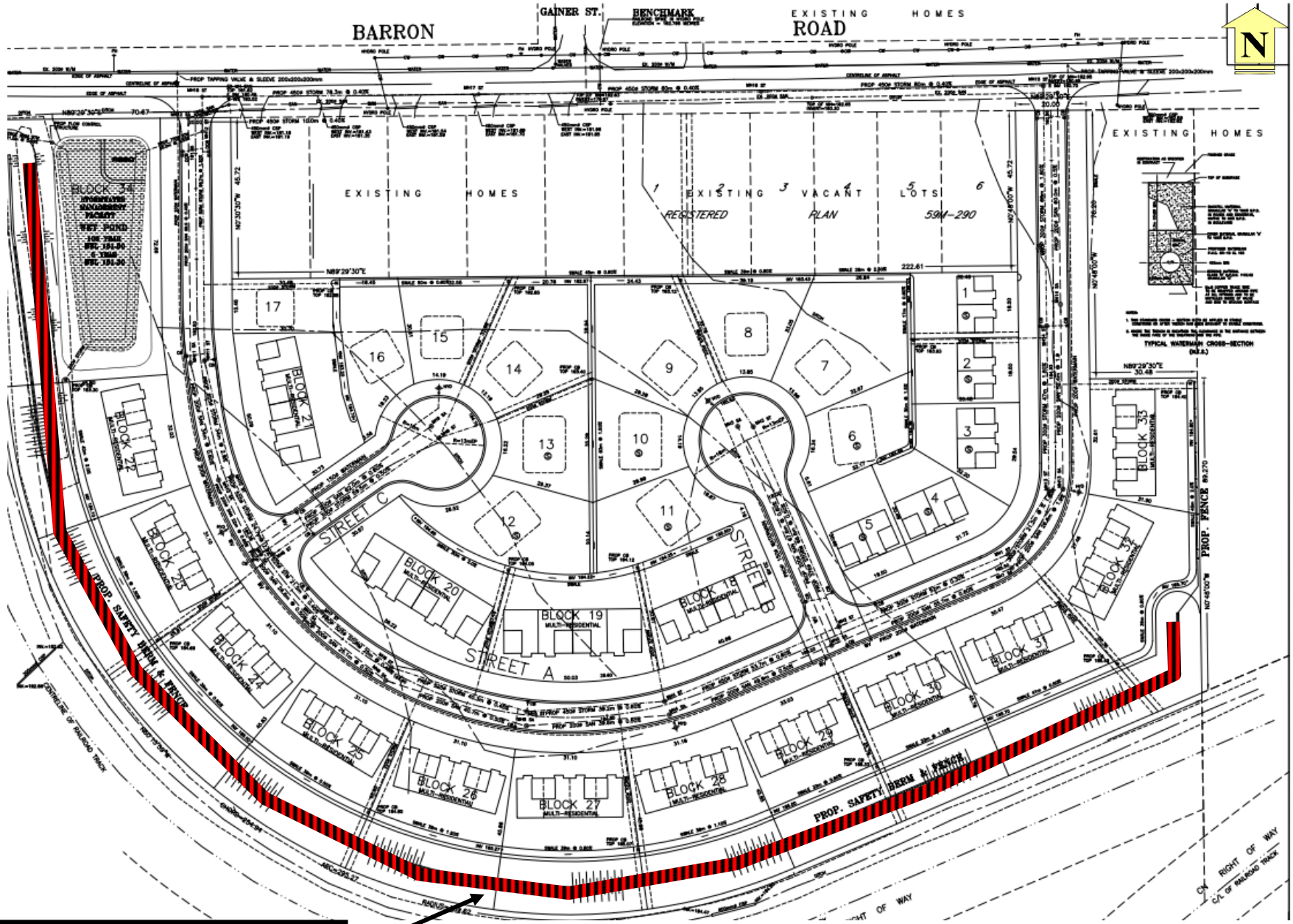



**FIGURE 3**
**SITE PLAN**




**5.0M HIGH SOUND BARRIER + BERM COMBINATION**

**FIGURE 4**
**BARRIER AND BERM ALIGNMENT**

# APPENDIX A

# RAIL TRAFFIC DATA

System Engineering
Engineering Services

1 Administration Road
Concord, ON, L4K 1B9
T: 905.669.3264
F: 905.760.3406

# Train Count Data

## TRANSMITTAL

| | | | |
|---|---|---|---|
| *To:* *Destinataire :* | SS Wilson Associates<br>15 Wertheim Court, Suite 211 Richmond Hill, ON L4B 3H7 | *Project :* | SFD – 23.90 – Thorold Wye, Thorold, ON |
| *Att'n:* | Cheryl McMurter | *Routing:* | engineering@sswilsonassociates.com |
| *From:* *Expéditeur :* | Michael Vallins | *Date:* *date :* | 2021/07/06 |
| *Cc:* | Adjacent Development<br>CN via e-mail | | |

☐ Urgent ☐ For Your Use ☐ For Review ■ For Your Information ☐ Confidential

**Re: Train Traffic Data – CN Stamford Subdivision near Thorold Wye in Thorold, ON**

Please find attached the requested Train Traffic Data; this data does not reflect GO Metrolinx Traffic. The application fee in the amount of **$500.00** +HST will be invoiced.

Should you have any questions, please do not hesitate to contact the undersigned at Permits.gld@cn.ca.

Sincerely,

Michael Vallins P.Eng
Manager of Public Works – Eastern Canada
Permits.gld@cn.ca

**Date:** 2021/07/06 Project Number: SFD – 23.90 – Thorold Wye, Thorold, ON

Dear Cheryl:

**Re: Train Traffic Data – CN Stamford Subdivision near Thorold Wye in Thorold, ON**

The following is provided in response to Cheryl's 2021/06/25 request for information regarding rail traffic in the vicinity of Thorold Wye in Thorold, Ontario at approximately Mile 23.90 on CN's Stamford Subdivision.

Typical daily traffic volumes are recorded below. However, traffic volumes may fluctuate due to overall economic conditions, varying traffic demands, weather conditions, track maintenance programs, statutory holidays and traffic detours that when required may be heavy although temporary. For the purpose of noise and vibration reports, train volumes must be escalated by 2.5% per annum for a 10-year period.

Typical daily traffic volumes at this site location are as follows:

***Maximum train speed is given in Miles per Hour**

| | 0700-2300 | | | |
|---|---|---|---|---|
| Type of Train | Volumes | Max.Consist | Max. Speed | Max. Power |
| Freight | 4 | 140 | 15 | 4 |
| Way Freight | 6 | 25 | 15 | 4 |
| Passenger | 0 | 10 | 15 | 2 |

| | 2300-0700 | | | |
|---|---|---|---|---|
| Type of Train | Volumes | Max.Consist | Max. Speed | Max. Power |
| Freight | 0 | 140 | 15 | 4 |
| Way Freight | 4 | 25 | 15 | 4 |
| Passenger | 0 | 10 | 15 | 2 |

The volumes recorded reflect westbound and eastbound freight and passenger operations on CN's Stamford Subdivision.

Except where anti-whistling bylaws are in effect, engine-warning whistles and bells are normally sounded at all at-grade crossings. There are three at-grade crossing in the immediate vicinity of the study area at Mile 23.38 Private Crossing, Mile 24.05 Allanport Road and Mile 24.10 Barron Road. Anti-whistling bylaws are not in effect at these crossings. Please note that engine warning whistles may be sounded in cases of emergency, as a safety and or warning precaution at station locations and pedestrian crossings and occasionally for operating requirements.

With respect to equipment restrictions, the gross weight of the heaviest permissible car is 286,000 lbs.

The single mainline track is considered continuously welded rail throughout the study area. The presence of one switch located at Mile 23.95 may exacerbate the noise and vibration caused by train movements.

The Canadian National Railway continues to be strongly opposed to locating developments near railway facilities and rights-of-way due to potential safety and environmental conflicts. Development adjacent to the Railway Right-of-Way is not appropriate without sound impact mitigation measures to reduce the incompatibility. For confirmation of the applicable rail noise, vibration and safety standards, Adjacent Development, Canadian National Railway Properties at Proximity@cn.ca should be contacted directly

I trust the above information will satisfy your current request.

Sincerely,

Michael Vallins P.Eng
Manager of Public Works – Eastern Canada
Permits.gld@cn.ca

# APPENDIX B

# SAMPLE SOUND LEVEL CALCULATIONS

**SS WILSON ASSOCIATES -*Consulting Engineers*, Richmond Hill, Ontario** Revised June 8 2015

**RAIL TRAFFIC NOISE PREDICTION MODEL**

**BASED ON MOE STEAM/ORNAMENT**

**Baroron Heights Res**

**Railway Noise**

This area is free to insert any text

| | |
|---|---|
| **Name(s) of Rail Lines:** | CN Rail - Stamford |
| **Receptor Name:** | Block 31 OLA with barrier |
| **SSWA Project Number:** | WA17-047 Comments Text |
| **Purpose of Calculation** | OLA IMPORTANT: TURN WHISTLE OFF |

DO NOT COPY AND PASTE CELLS UNLESS YOU PASTE "VALUES" ONLY

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Include the following Segments ? (No=0 or Yes=1) | 1 | | | 1 | | | 1 | | | 1 | | | | | | | |
| **Rail Name & Direction** | CN Rail | | | CN Rail | | | CN Rail | | | CN Rail | | | | | | | |
| **Rail/Segment Number or Other Data** | Freight | | | Way Freight | | | Freight | | | Way Freight | | | | | | | |
| **Segment Source of Noise** | Locomo | Whistle | Wheels | Locomo | Whistle | Wheels | Locomo | Whistle | Wheels | Locomo | Whistle | Wheels | | | | | |
| IMPORTANT: TURN WHISTLE OFF | Yes | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes | No | Yes | | | | | |
| MOE Topographic Case (1-11)-See Instructions | 1 | | | 1 | | | 1 | | | 1 | | | | | | | |
| | S and R on flat ground | | | S and R on flat ground | | | S and R on flat ground | | | S and R on flat ground | | | | | | | |
| **Traffic Data Calculation Period** *(24Hrs or 16/8 d/n or 1 Hr)* | Day/Night | | | Day/Night | | | Day/Night | | | Day/Night | | | | | | | |
| **Intermediate Surface; Absorptive or Reflective** | Absorptive | | | Absorptive | | | Absorptive | | | Absorptive | | | | | | | |
| **Absorptive Alpha Override; Manual or Auto** | Manual | | | Manual | | | Manual | | | Manual | | | | | | | |
| **Manual Alpha (if Cell is Blank, do not change, otherwise, input your choice for α)** | Input Alpha α from 0.0 to 0.66 0.33 | | | Input Alpha α from 0.0 to 0.66 0.33 | | | Input Alpha α from 0.0 to 0.66 0.33 | | | Input Alpha α from 0.0 to 0.66 0.33 | | | | | | | |
| **Measured Angle Case Number** | 1 | | | 1 | | | 1 | | | 1 | | | | | | | |
| Angle description | -θ1 Left & +θ2 Right | | | -θ1 Left & +θ2 Right | | | -θ1 Left & +θ2 Right | | | -θ1 Left & +θ2 Right | | | | | | | |
| Angle Theta θ1 | -90 | | | -90 | | | -90 | | | -90 | | | | | | | |
| Angle Theta θ2 | 90 | | | 90 | | | 90 | | | 90 | | | | | | | |
| Angle Theta Error Detection Flag | | | | | | | | | | | | | | | | | |
| Subtended Angle (Angle of Exposure), ° | 180 | | | 180 | | | 180 | | | 180 | | | | | | | |
| **Number of Locomotives per train** | 4 | | | 4 | | | 4 | | | 4 | | | | | | | |
| **Number of cars per train** | 140 | | | 25 | | | 140 | | | 25 | | | | | | | |
| **Number of Trains in 24 Hrs.** | | | | | | | | | | | | | | | | | |
| **Hourly Number of Trains in 1 Hour** | | | | | | | | | | | | | | | | | |
| **Number of Daytime Trains 07:00 to 23:00.** | 1 | | | 1 | | | 4 | | | 6 | | | | | | | |
| **Number of Night Trains 23:00 to 07:00** | 0 | | | 0 | | | 0 | | | 8 | | | | | | | |
| **% increase / year** | 2.50% | | | 2.50% | | | 2.50% | | | 2.50% | | | | | | | |
| **Number of years** | 10 | | | 10 | | | 10 | | | 10 | | | | | | | |
| **Future Number of Trains in 24 Hrs.** | | | | | | | | | | | | | | | | | |
| **Future Hourly Number of Trains in 1 Hour** | | | | | | | | | | | | | | | | | |
| **Future Number of Daytime Trains 07:00 to 23:0** | 1 | | | 1 | | | 5 | | | 8 | | | | | | | |
| **Future Number of Nighttime Trains 23:00 to 07** | 0 | | | 0 | | | 0 | | | 10 | | | | | | | |
| **Posted Speed (Km/Hr) [S]** | 25 | | | 25 | | | 25 | | | 25 | | | | | | | |
| **Wood Depth (m)** | 0 | | | 0 | | | 0 | | | 0 | | | | | | | |
| **Day time Receiver Height,m [RH]** (For 24 Hrs. & Hourly also) | 1.5 | | | 1.5 | | | 1.5 | | | 1.5 | | | | | | | |
| **Nighttime Reciever Height (m) [NRH]** | 4.5 | | | 4.5 | | | 4.5 | | | 4.5 | | | | | | | |
| **Source-Receiver Distance [SRD]** | 25 | | | 25 | | | 75 | | | 75 | | | | | | | |
| **Nighttime Source-Receiver Distance [NSRD]** | 25 | | | 25 | | | 75 | | | 75 | | | | | | | |
| **Barrier Height (m) [BH]** | 0 | | | 0 | | | 0 | | | 0 | | | | | | | |
| **Barrier-Receiver Distance (m)** | 10 | | | 10 | | | 10 | | | 10 | | | | | | | |
| **Barrier Receiver Distance Error Flag** | | | | | | | | | | | | | | | | | |
| **Ground Elevation Difference (m) [e]** | 0 | | | 0 | | | 0 | | | 0 | | | | | | | |
| **Source Ground Elevation (m)** | 0 | | | 0 | | | 0 | | | 0 | | | | | | | |
| **Receiver Ground Elevation (m)** | 0 | | | 0 | | | 0 | | | 0 | | | | | | | |
| **Barrier Ground Elevation (m)** | 0 | | | 0 | | | 0 | | | 0 | | | | | | | |
| **Include Effect of Dense Woods?** | No | | | No | | | No | | | No | | | | | | | |
| **Number of Rows of Houses** | 0 | | | 0 | | | 0 | | | 0 | | | | | | | |
| **Nighttime Number of Rows of Houses** | 0 | | | 0 | | | 0 | | | 0 | | | | | | | |
| **Percentage of Row Occupied by Houses (??%)** | 80% | | | 80% | | | 80% | | | 80% | | | | | | | |
| **Height of Row of House [HH]** | 7 | | | 7 | | | 7 | | | 7 | | | | | | | |
| **Do you want to change the model frequency?** | N | | | N | | | N | | | N | | | | | | | |
| **Input your Choice of frequency** | | | | | | | | | | | | | | | | | |
| **Dominant Octave Frequency Band (Hz) [F]** | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | | | | | |

For Wheel noise ONLY: Enter a factor of -5 dB for Continously Welded Rail (CWR) and +5 dB for Trestles as applicable

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Day Time [16 hours] Additional dBA Correction Factor- Specify** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | | | | | |
| **Night Time [8 hours] Additional dBA Correction Factor- Specify** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | | | | | |
| **Switch** | 0 | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 5 | | | | | |
| | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | | | | | |
| **Screech** | 0 | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 5 | | | | | |
| | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | | | | | |

## RESULTS FOR SEGMENTS

| | | | | |
|---|---|---|---|---|
| **Daytime [16 hours] Segment $Leq_{16}$** | 56.1 | 51.4 | 55.8 | 52.9 |
| **Nighttime [8 hours] Segment $Leq_{8}$** | 0.0 | 0.0 | 0.0 | 57.1 |
| **24 Hour Daily Segment $Leq_{24}$** | 59.6 | 54.4 | 63.2 | 58.0 |
| **1 Hour Segment $Leq_{1}$** | 59.6 | 54.4 | 63.2 | 58.0 |

Note: The predicted values may slightly differe than the MOE values

| | |
|---|---|
| **Day Time Leq (16 Hrs.)** | 60 |
| **Night Time Leq (8 Hrs.)** | 57 |
| 24 Hour Daily Leq | |
| 1 Hour Leq | |

**SS WILSON ASSOCIATES -*Consulting Engineers*, Richmond Hill, Ontario** Revised June 8 2015

**RAIL TRAFFIC NOISE PREDICTION MODEL**

**BASED ON MOE STEAM/ORNAMENT**

**Baroron Heights Res**

**Railway Noise**

This area is free to insert any text

**Name(s) of Rail Lines:** CN Rail - Stamford

**Receptor Name:** Block 31 OLA with barrier

**SSWA Project Number:** WA17-047 Comments Text

**Purpose of Calculation** OLA IMPORTANT: TURN WHISTLE OFF

DO NOT COPY AND PASTE CELLS UNLESS YOU PASTE "VALUES" ONLY

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Include the following Segments ? (No=0 or Yes=1) | 1 | | | 1 | | | 1 | | | 1 | | |
| **Rail Name & Direction** | CN Rail | | | CN Rail | | | CN Rail | | | CN Rail | | |
| Rail/Segment Number or Other Data | Freight | | | Way Freight | | | Freight | | | Way Freight | | |
| **Segment Source of Noise** | Locomo | Whistle | Wheels | Locomo | Whistle | Wheels | Locomo | Whistle | Wheels | Locomo | Whistle | Wheels |
| IMPORTANT: TURN WHISTLE OFF | Yes | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes | No | Yes |
| MOE Topographic Case (1-11)-See Instructions | 1 | | | 1 | | | 1 | | | 1 | | |
| | S and R on flat ground | | | S and R on flat ground | | | S and R on flat ground | | | S and R on flat ground | | |
| Traffic Data Calculation Period *(24Hrs or 16/8 d/n or 1 Hr)* | Day/Night | | | Day/Night | | | Day/Night | | | Day/Night | | |
| Intermediate Surface; Absorptive or Reflective | Absorptive | | | Absorptive | | | Absorptive | | | Absorptive | | |
| Absorptive Alpha Override; Manual or Auto | Manual | | | Manual | | | Manual | | | Manual | | |
| Manual Alpha (if Cell is Blank, do not change, otherwise, input your choice for α) | Input Alpha α from 0.0 to 0.66 0.33 | | | Input Alpha α from 0.0 to 0.66 0.33 | | | Input Alpha α from 0.0 to 0.66 0.33 | | | Input Alpha α from 0.0 to 0.66 0.33 | | |
| **Measured Angle Case Number** | 1 | | | 1 | | | 1 | | | 1 | | |
| Angle description | -81 Left & +82 Right | | | -81 Left & +82 Right | | | -81 Left & +82 Right | | | -81 Left & +82 Right | | |
| Angle Theta θ1 | -90 | | | -90 | | | -90 | | | -90 | | |
| Angle Theta θ2 | 90 | | | 90 | | | 90 | | | 90 | | |
| Angle Theta Error Detection Flag | | | | | | | | | | | | |
| Subtended Angle (Angle of Exposure), ° | 180 | | | 180 | | | 180 | | | 180 | | |
| Number of Locomotives per train | 4 | | | 4 | | | 4 | | | 4 | | |
| Number of cars per train | 140 | | | 25 | | | 140 | | | 25 | | |
| Number of Trains in 24 Hrs. | | | | | | | | | | | | |
| Hourly Number of Trains in 1 Hour | | | | | | | | | | | | |
| Number of Daytime Trains 07:00 to 23:00. | 1 | | | 1 | | | 4 | | | 6 | | |
| Number of Night Trains 23:00 to 07:00 | 0 | | | 0 | | | 0 | | | 8 | | |
| % increase / year | 2.50% | | | 2.50% | | | 2.50% | | | 2.50% | | |
| Number of years | 10 | | | 10 | | | 10 | | | 10 | | |
| Future Number of Trains in 24 Hrs. | | | | | | | | | | | | |
| Future Hourly Number of Trains in 1 Hour | | | | | | | | | | | | |
| Future Number of Daytime Trains 07:00 to 23:0 | 1 | | | 1 | | | 5 | | | 8 | | |
| Future Number of Nighttime Trains 23:00 to 07: | 0 | | | 0 | | | 0 | | | 10 | | |
| Posted Speed (Km/Hr) [S] | 25 | | | 25 | | | 25 | | | 25 | | |
| Wood Depth (m) | 0 | | | 0 | | | 0 | | | 0 | | |
| Day time Receiver Height,m [RH] (For 24 Hrs. & Hourly also) | 1.5 | | | 1.5 | | | 1.5 | | | 1.5 | | |
| Nighttime Reciever Height (m) [NRH] | 4.5 | | | 4.5 | | | 4.5 | | | 4.5 | | |
| Source-Receiver Distance [SRD] | 25 | | | 25 | | | 75 | | | 75 | | |
| Nighttime Source-Receiver Distance [NSRD] | 25 | | | 25 | | | 75 | | | 75 | | |
| Barrier Height (m) [BH] | 5 | | | 5 | | | 5 | | | 5 | | |
| Barrier-Receiver Distance (m) | 10 | | | 10 | | | 10 | | | 10 | | |
| Barrier Receiver Distance Error Flag | | | | | | | | | | | | |
| Ground Elevation Difference (m) [e] | 0 | | | 0 | | | 0 | | | 0 | | |
| Source Ground Elevation (m) | 0 | | | 0 | | | 0 | | | 0 | | |
| Receiver Ground Elevation (m) | 0 | | | 0 | | | 0 | | | 0 | | |
| Barrier Ground Elevation (m) | 0 | | | 0 | | | 0 | | | 0 | | |
| Include Effect of Dense Woods? | No | | | No | | | No | | | No | | |
| Number of Rows of Houses | 0 | | | 0 | | | 0 | | | 0 | | |
| Nighttime Number of Rows of Houses | 0 | | | 0 | | | 0 | | | 0 | | |
| Percentage of Row Occupied by Houses (??%) | 80% | | | 80% | | | 80% | | | 80% | | |
| Height of Row of House [HH] | 7 | | | 7 | | | 7 | | | 7 | | |
| Do you want to change the model frequency? | N | | | N | | | N | | | N | | |
| Input your Choice of frequency | | | | | | | | | | | | |
| Dominant Octave Frequency Band (Hz) [F] | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |

For Wheel noise ONLY: Enter a factor of -5 dB for Continously Welded Rail (CWR) and +5 dB for Trestles as applicable

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Day Time [16 hours] Additional dBA Correction Factor- Specify | 0 Text | 0 Text | 0 Text | 0 Text | 0 Text | 0 Text | 0 Text | 0 Text | 0 Text | 0 Text | 0 Text | 0 Text |
| Night Time [8 hours] Additional dBA Correction Factor- Specify | 0 Text | 0 Text | 0 Text | 0 Text | 0 Text | 0 Text | 0 Text | 0 Text | 0 Text | 0 Text | 0 Text | 0 Text |
| Switch | 0 Text | 0 Text | 5 Text | 0 Text | 0 Text | 5 Text | 0 Text | 0 Text | 5 Text | 0 Text | 0 Text | 5 Text |
| Screech | 0 Text | 0 Text | 5 Text | 0 Text | 0 Text | 5 Text | 0 Text | 0 Text | 5 Text | 0 Text | 0 Text | 5 Text |

## RESULTS FOR SEGMENTS

| | | | | |
|---|---|---|---|---|
| Daytime [16 hours] Segment $Leq_{16}$ | 44.3 | 39.8 | 43.9 | 41.0 |
| Nighttime [8 hours] Segment $Leq_{8}$ | 0.0 | 0.0 | 0.0 | 51.4 |
| 24 Hour Daily Segment $Leq_{24}$ | 57.2 | 52.3 | 51.2 | 46.1 |
| 1 Hour Segment $Leq_{1}$ | 57.2 | 52.3 | 51.2 | 46.1 |

Note: The predicted values may slightly differe than the MOE values

| | |
|---|---|
| **Day Time Leq (16 Hrs.)** | **49** |
| **Night Time Leq (8 Hrs.)** | **51** |
| 24 Hour Daily Leq | |
| 1 Hour Leq | |

**SS WILSON ASSOCIATES -*Consulting Engineers*, Richmond Hill, Ontario** Revised June 8 2015

**RAIL TRAFFIC NOISE PREDICTION MODEL**

**BASED ON MOE STEAM/ORNAMENT**

**Baroron Heights Res**

**Railway Noise**

This area is free to insert any text

| | |
|---|---|
| **Name(s) of Rail Lines:** | CN Rail - Stamford |
| **Receptor Name:** | Block 31 Façade |
| **SSWA Project Number:** | WA17-047 |
| **Purpose of Calculation** | OLA |

Comments Text

IMPORTANT: TURN WHISTLE OFF

DO NOT COPY AND PASTE CELLS UNLESS YOU PASTE "VALUES" ONLY

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Include the following Segments ? (No=0 or Yes=1) | 1 | | | 1 | | | 1 | | | 1 | | | | | | | |
| **Rail Name & Direction** | CN Rail | | | CN Rail | | | CN Rail | | | CN Rail | | | | | | | |
| **Rail/Segment Number or Other Data** | Freight | | | Way Freight | | | Freight | | | Way Freight | | | | | | | |
| **Segment Source of Noise** | Locomo | Whistle | Wheels | Locomo | Whistle | Wheels | Locomo | Whistle | Wheels | Locomo | Whistle | Wheels | | | | | |
| IMPORTANT: TURN WHISTLE OFF | Yes | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes | No | Yes | | | | | |
| | 1 | | | 1 | | | 1 | | | 1 | | | | | | | |
| MOE Topographic Case (1-11)-See Instructions | S and R on flat ground | | | S and R on flat ground | | | S and R on flat ground | | | S and R on flat ground | | | | | | | |
| Traffic Data Calculation Period *(24Hrs or 16/8 d/n or 1 Hr)* | Day/Night | | | Day/Night | | | Day/Night | | | Day/Night | | | | | | | |
| Intermediate Surface; Absorptive or Reflective | Absorptive | | | Absorptive | | | Absorptive | | | Absorptive | | | | | | | |
| Absorptive Alpha Override; Manual or Auto | Manual | | | Manual | | | Manual | | | Manual | | | | | | | |
| Manual Alpha (if Cell is Blank, do not change, otherwise, input your choice for α) | Input Alpha α from 0.0 to 0.66 | | | Input Alpha α from 0.0 to 0.66 | | | Input Alpha α from 0.0 to 0.66 | | | Input Alpha α from 0.0 to 0.66 | | | | | | | |
| | 0.33 | | | 0.33 | | | 0.33 | | | 0.33 | | | | | | | |
| **Measured Angle Case Number** | 1 | | | 1 | | | 1 | | | 1 | | | | | | | |
| Angle description | -θ1 Left & +θ2 Right | | | -θ1 Left & +θ2 Right | | | -θ1 Left & +θ2 Right | | | -θ1 Left & +θ2 Right | | | | | | | |
| Angle Theta θ1 | -90 | | | -90 | | | -90 | | | -90 | | | | | | | |
| Angle Theta θ2 | 90 | | | 90 | | | 90 | | | 90 | | | | | | | |
| Angle Theta Error Detection Flag | | | | | | | | | | | | | | | | | |
| Subtended Angle (Angle of Exposure), ° | 180 | | | 180 | | | 180 | | | 180 | | | | | | | |
| Number of Locomotives per train | 4 | | | 4 | | | 4 | | | 4 | | | | | | | |
| Number of cars per train | 140 | | | 25 | | | 140 | | | 25 | | | | | | | |
| Number of Trains in 24 Hrs. | | | | | | | | | | | | | | | | | |
| Hourly Number of Trains in 1 Hour | | | | | | | | | | | | | | | | | |
| Number of Daytime Trains 07:00 to 23:00. | 1 | | | 1 | | | 4 | | | 6 | | | | | | | |
| Number of Night Trains 23:00 to 07:00 | 0 | | | 0 | | | 0 | | | 4 | | | | | | | |
| % increase / year | 2.50% | | | 2.50% | | | 2.50% | | | 2.50% | | | | | | | |
| Number of years | 10 | | | 10 | | | 10 | | | 10 | | | | | | | |
| Future Number of Trains in 24 Hrs. | | | | | | | | | | | | | | | | | |
| Future Hourly Number of Trains in 1 Hour | | | | | | | | | | | | | | | | | |
| Future Number of Daytime Trains 07:00 to 23:0 | 1 | | | 1 | | | 5 | | | 8 | | | | | | | |
| Future Number of Nighttime Trains 23:00 to 07: | 0 | | | 0 | | | 0 | | | 5 | | | | | | | |
| Posted Speed (Km/Hr) [S] | 25 | | | 25 | | | 25 | | | 25 | | | | | | | |
| Wood Depth (m) | 0 | | | 0 | | | 0 | | | 0 | | | | | | | |
| Day time Receiver Height,m [RH] (For 24 Hrs. & Hourly also) | 1.5 | | | 1.5 | | | 1.5 | | | 1.5 | | | | | | | |
| Nighttime Reciever Height (m) [NRH] | 4.5 | | | 4.5 | | | 4.5 | | | 4.5 | | | | | | | |
| Source-Receiver Distance [SRD] | 26 | | | 26 | | | 75 | | | 75 | | | | | | | |
| Nighttime Source-Receiver Distance [NSRD] | 26 | | | 26 | | | 75 | | | 75 | | | | | | | |
| Barrier Height (m) [BH] | 0 | | | 0 | | | 0 | | | 0 | | | | | | | |
| Barrier-Receiver Distance (m) | 10 | | | 10 | | | 10 | | | 10 | | | | | | | |
| Barrier Receiver Distance Error Flag | | | | | | | | | | | | | | | | | |
| Ground Elevation Difference (m) [e] | 0 | | | 0 | | | 0 | | | 0 | | | | | | | |
| Source Ground Elevation (m) | 0 | | | 0 | | | 0 | | | 0 | | | | | | | |
| Receiver Ground Elevation (m) | 0 | | | 0 | | | 0 | | | 0 | | | | | | | |
| Barrier Ground Elevation (m) | 0 | | | 0 | | | 0 | | | 0 | | | | | | | |
| Include Effect of Dense Woods? | No | | | No | | | No | | | No | | | | | | | |
| Number of Rows of Houses | 0 | | | 0 | | | 0 | | | 0 | | | | | | | |
| Nighttime Number of Rows of Houses | 0 | | | 0 | | | 0 | | | 0 | | | | | | | |
| Percentage of Row Occupied by Houses (??%) | 80% | | | 80% | | | 80% | | | 80% | | | | | | | |
| Height of Row of House [HH] | 7 | | | 7 | | | 7 | | | 7 | | | | | | | |
| Do you want to change the model frequency? | N | | | N | | | N | | | N | | | | | | | |
| Input your Choice of frequency | | | | | | | | | | | | | | | | | |
| Dominant Octave Frequency Band (Hz) [F] | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | | | | | |

For Wheel noise ONLY: Enter a factor of -5 dB for Continously Welded Rail (CWR) and +5 dB for Trestles as applicable

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Day Time [16 hours] Additional dBA Correction Factor- Specify** | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 5 | 0 | | | | | |
| | Text | Whistle | Text | Text | Whistle | Text | Text | Whistle | Text | Text | Whistle | Text | | | | | |
| **Night Time [8 hours] Additional dBA Correction Factor- Specify** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | | | | | |
| **Switch** | 0 | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 5 | | | | | |
| | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | | | | | |
| **Screech** | 0 | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 5 | | | | | |
| | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | Text | | | | | |

## RESULTS FOR SEGMENTS

| | | | | |
|---|---|---|---|---|
| Daytime [16 hours] Segment $Leq_{16}$ | 55.9 | 51.2 | 55.8 | 52.9 |
| Nighttime [8 hours] Segment $Leq_{8}$ | 0.0 | 0.0 | 0.0 | 54.1 |
| 24 Hour Daily Segment $Leq_{24}$ | 59.4 | 54.1 | 59.2 | 58.0 |
| 1 Hour Segment $Leq_{1}$ | 59.4 | 54.1 | 59.2 | 58.0 |

Note: The predicted values may slightly differe than the MOE values

| | |
|---|---|
| **Day Time Leq (16 Hrs.)** | **60** |
| **Night Time Leq (8 Hrs.)** | **54** |
| 24 Hour Daily Leq | |
| 1 Hour Leq | |