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Consulting Engineers

REPORT NO. WA12-032-B

NOISE CONTROL FEASIBILITY STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
BRONTE GREEN JOINT VENTURE AREA
OAKVILLE, ONTARIO

SUBMITTED TO:

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1.0 INTRODUCTION

1.1 The services of this firm were retained by David Schaeffer Engineering Ltd. on behalf of Bronte Green Corporation to prepare a Noise Control Feasibility Study for the proposed residential development referred to as the Bronte Green Property located in Oakville, Ontario. The subject site is within the planning area known as Merton Tertiary Study Area.

The objective of this report is to support an application for approval of the proposed development.

The site is bounded by the following land uses:

- To the north by Upper Middle Road.
- To the south by the Region of Halton's Head Office Complex as well as by Deerfield Golf Course.
- To the east by the Deerfield Golf Course, Sixteen Mile Creek, and existing residential uses beyond
- To the west by Bronte Road.

The location of the site is shown in Figure 1.

1.2 Major features of the development are defined by the Proposed Draft Plan drawing prepared by Sorensen Gravely Lowes Planning Associates, dated February 14, 2014.

Figures 2.1 and 2.2 illustrate the general layout of the proposed development.

1.3 Major noise sources (current and future) impacting the development include:

- **Transportation Sources of Noise:**
  - Bronte Road
  - Upper Middle Road
  - Queen Elizabeth Way

- **Stationary Sources of Noise:**
  - The Region of Halton's head office complex:
    - Mechanical equipment serving 2 major buildings
    - Public Work Yard operations (sand and gravel, truck storage, etc.)
    - Large parking area

1.4 The scope of this report is to define the minimum noise attenuation requirements for the control of outdoor and indoor environmental sound levels.

1.5 The points of noise assessment/receptors have been designated from R1 to R21

within the proposed development as shown in Figure 2.2.

2.0 SUMMARY AND RECOMMENDATIONS

2.1 SUMMARY

The following is a summary of our findings and recommendations for the subject development area pertaining to environmental noise assessment and noise mitigation:

1. Based on the predictions and analysis of the road transportation noise conducted in this investigation it is concluded that:

   a) The unattenuated daytime sound levels in the Outdoor Living Areas (OLAs) 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.

   b) 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.

   c) 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.

   d) All other dwellings on the development will have acceptable indoor sound levels and, therefore, noise control measures are not required.

2. Preliminary sound level measurements and predictions were also taken in the vicinity of the only stationary sources of noise of concern to this development, which are the Halton Region's headquarters offices and public works yard. The results indicated that the presence of numerous sources of noise have the potential for exceeding the new sound level criteria referenced in NPC-300 for stationary noise in the immediate areas[1] of the proposed development surrounding the sources. Based on the results and the discussion with the Study Team, it is recommended that the Town of Oakville be requested to classify/designate the subject area outlined herein as an MOE **Class 4 Area** for the purposes of stationary noise source analysis and control. The Class 4 Area classification is described in MOE guideline document NPC-300. Details regarding Class 4 and our recommended implementation procedures can be found in Section 4.5 of this report.

[1] Essentially, narrow bands of development lands on the north and east sides of the Halton facilities.

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 – ROAD TRANSPORTATION SOURCES OF NOISE

Minimum noise attenuation requirements are presented in Figures 3.1 and 3.2. Detailed descriptions are as follows:

1. Outdoor Noise Control Measures

Barrier locations as illustrated in Figure 3.1:

Acoustical barriers to be constructed to shield the Outdoor Living Areas (OLAs) with the following details:

(i) Barriers should be constructed along the alignments shown schematically in Figure 3.1.

(ii) The required barrier heights as shown in Figure 3.1 could be as high as 3.5m.

(iii) Barriers may consist of an earth berm, an acoustic fence, or a combination thereof. The fence component should be constructed of a durable material having approximately 20 kilograms per square meter (four pounds per square foot) of surface area and be in a continuous line without openings or gaps.

Accordingly, this Noise Control Feasibility should be updated prior to draft plan approval of these lots requiring a barrier to define specific berm/barrier alignments and heights based on the proposed grading plans and the finalized lot arrangements.

2. Air Conditioning

“Hatched” Areas in Figure 3.2:

Dwellings located within the above-noted areas shall be equipped with central air conditioning systems with their condensing units to be located in noise insensitive locations. The sound levels of the condensing units shall meet the MOE's maximum Sound Rating number as well as the maximum sound level at the point(s) of reception outlined in publication NPC-216 and other levels specified by the municipality. The following warning clause shall be in all Development Agreements and Offers of Sale and Purchase or Lease of these properties:

"In order to achieve a suitable indoor noise environment, windows may have to remain closed; therefore this dwelling unit has been equipped with a central air conditioning system".

3. Provision for Air Conditioning

"Checkered" Areas shown in Figure 3.2:

Dwellings located within the above-noted areas shall be equipped with a ducted forced air heating system consisting of a furnace fan, supply air plenum, and duct work that are appropriately situated and sized to accommodate future installation of central air conditioning systems at the cost and option of the purchaser/occupant. The provisions for future air conditioning shall also include the necessary rough-in work such as a floor drain for the condensate, appropriate wiring for a future heat/cool thermostat and a capped sleeve in the exterior wall for future refrigeration tubing in an approved location.

If the purchaser/occupant does not take the central air conditioning option, the following clause shall be included in all Development Agreements and Offers of Sale and Purchase or Lease of these properties:

"This dwelling is fitted with a forced air heating system and the fan, ducts, etc. are sized to accommodate the installation of a central air conditioning system if it is found necessary by the owner/occupant at any time in the future. If the air conditioning is to be provided at a later date, the outdoor unit shall be located in a noise insensitive location. The final installation shall meet the Ministry of Environment criteria in Publication NPC-216 and other applicable levels specified by the municipality".

4. Air Conditioning

All Apartment Buildings:

Dwelling units within the above noted buildings shall be equipped with central air conditioning. The air conditioning system may be central to the entire building or may be central to each dwelling unit (for example using split-system or packaged incremental units with suitable duct work to all rooms). The Ministry of Environment does not accept window type air conditioning units in lieu of a central system. In all cases, serious attention shall be given by the proponent, the Mechanical Consultant, and the Contractor to the noise potential of the air conditioning system as it may affect the outdoor and indoor receivers within or outside of the proposed development. It is important that the Builder, the Mechanical Consultant, and the Contractor achieve the MOE objectives included in their Publications

NPC-300 and NPC-216.

The following warning clause shall be included in all Development Agreements and Offers of Sale and Purchase or Lease of these properties:

"In order to achieve a suitable indoor noise environment, windows may have to remain closed; therefore this dwelling unit has been equipped with a central air conditioning system".

It is also our recommendation that the necessary detailed technical analysis be performed prior to the certification process for Building Permit to address the specific requirements for the control of the selected air conditioning system to meet the sound level criteria at the point(s) of reception and to include same in the applicable permit drawings/specifications.

5. <u>Warning Clause</u> *2

All Lots requiring Noise Barriers and/or Air Conditioning and/or Provisions for Air Conditioning:

The following warning clause shall be included in all Development Agreements 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 dwelling units, sound levels from increasing road traffic on Bronte Road and/or Upper Middle Road 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 Environment's noise criteria."

The Selected Area Classified as MOE's New Area Classification of Class 4:

A warning clause shall be included in all Development Agreements and Offers of Sale and Purchase or Lease of the properties within close proximity to the Regional property:

"Purchasers/tenants are advised that sound levels due to the adjacent Regional Offices are required to comply with sound level limits that are protective of indoor areas and are based on the assumption that windows and exterior doors are closed. This dwelling unit has been supplied with a ventilation/air conditioning system which will allow windows and exterior doors

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

to remain closed."

6. Building Acoustic Insulation

All Lots requiring Air Conditioning:

Typical Acoustic Insulation Factors (AIF) are shown in Tables 3 and 4. The Detailed Noise Control Study should provide complete and specific tabulations of AIF's for all lots affected.

7. Required Sections and Details

At the request of the Municipality and/or the authority having jurisdiction over the source of noise, typical cross sections be prepared and submitted in due course by the Consulting Engineers responsible for the site grading and drainage plans based on the final elevations. The sections would typically include existing and proposed future grades, source, receiver and barrier/berm ground elevations, berm slopes, sidewalks, boulevards, ditches, etc.

8. Implementation Procedures

- Prior to final approval of this development, a Detailed Noise Control Study shall be required to reflect the proposed lot grading plans and the exact distances to all sources of concern.
- Prior to the issuance of building permits, the Builder's plans with respect to the units requiring noise control measures as referred to earlier shall be certified by an Acoustical Consultant as being in conformance with the recommendations of the Detailed Noise Control Study as approved and/or amended by the authorities having jurisdiction.
- Prior to their final inspection and release for occupancy, these dwellings shall be certified by an Acoustical Consultant as being in compliance with the recommendations of the Detailed Noise Control Study.

2.3 RECOMMENDATIONS – STATIONARY SOURCES OF NOISE AND LAND USE DESIGNATION

The recommendation of this report is to initiate the process of designating the approximate area specified in Figure 3.4 to be the new MOE Class 4 (referred to in NPC-300). The minimum area required to be classified as Class 4 will be the strip of land around the main offices of the Region of Halton's north property lines to contain some form of higher density residential blocks and to cover a depth that is suitable for at least one row of dwellings and a road. The appropriate warning clauses shall be included in the Development Agreements and Offers of Purchase and Sale (detailed in Section 4.5). In addition, it is recommended that a 2.2m barrier (optional) be constructed along the joint property lines for land use

compatibility purposes by providing separation between the two different land uses. Additional recommendations for the housing built form and details will be addressed at the time of submitting the plans for Draft Plan Approval and/or Site Plan Approval of the subject blocks.

3.0 SUMMARY AND RECOMMENDATIONS

3.1 SURFACE TRANSPORTATION CRITERIA

The surface transportation noise is based on the objective sound levels recommended by the Ontario Ministry of Environment (Ref.: Publication NPC-300), the Regional Municipality of Peel and the Town of Oakville for different land uses and spaces.

The following is a summary of the applicable sound level criteria for surface transportation sources:

Outdoor Living Areas (OLA)

Area & Time Period	L_{eq}(16) Road and Rail (dBA)
Individual or Common Outdoor Living Areas (16 hr, 07:00 - 23:00)	55

Indoor Areas

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

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 on title and included 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 Leq_{8hr} of 60 BA or when the daytime sound level at the outside wall of the Living/Dining/ Recreation space is equal to or exceeds Leq_{16hr} of 65dBA.

If the nighttime sound level at the outside wall exceeds Leq_{8hr} of 50 dBA but is less than 60dBA, or if the daytime sound level at the outside wall exceeds 55dBA but is less than Leq_{16hr} of 65dBA, then forced air heating with provision for future installation of central air conditioning is required.

3.2 CRITERIA FOR STATIONARY NOISE SOURCES

The following criteria apply to the impact of Stationary Sources of noise as defined by the MOE to include industrial and commercial facilities. The criteria apply to the impact of Stationary Sources external to the development on the proposed development or to the impact of any proposed Stationary Sources internal to the development on the development itself.

The criteria used in this study are based on the guideline publications prepared by the Ontario Ministry of Environment for planning of noise-sensitive land uses adjacent to sources of noise "Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning NPC-300" dated August 2013 and other relevant publications.

The predicted and/or measured "predictable worst case" 1-hour equivalent sound levels (Leq1hr) of the stationary source(s) are normally compared with the higher of the corresponding Leq_{1hr} of road traffic or the following criteria:

Outdoor Points of Reception

The criteria for outdoor points of reception in any area amenable for use are:

Area	Time Of Day	Sound Level, dBA
Major population centres or urban areas (MOE Class 1 Area)	Daytime and Evening 07:00 - 23:00	Leq1hr 50*
Areas that combine urban and rural environments)	Daytime 07:00 - 19:00	Leq1hr 50*
(MOE Class 2 Area	Evening 19:00 - 23:00	Leq1hr 45*

* or the minimum hourly background (ambient) sound level Leq1 hr, whichever is higher

In the Plane of a Window

The outdoor criteria for the plane of a window during the day and evening time periods are:

Area	Time Of Day	Sound Level, dBA
Major population centres or urban areas (MOE Class 1 Area)	Daytime and Evening 07:00 - 23:00	Leq1hr 50*
Areas that combine urban and rural environments)	Daytime 07:00 - 19:00	Leq1hr 50*
(MOE Class 2 Area	Evening 19:00 - 23:00	Leq1hr 45*

* or the minimum hourly background (ambient) sound level Leq1 hr, whichever is higher

The criteria for bedrooms or sleeping quarters during the nighttime period are:

Area	Time Of Day	Sound Level, dBA
Major population centres or urban areas (MOE Class 1 Area)	Nighttime 23:00 - 07:00	Leq1hr 45*
Areas that combine urban and rural environments (MOE Class 2 Area)	Nighttime 23:00 - 07:00	Leq1hr 45*

* or the minimum hourly background (ambient) sound level Leq1 hr, whichever is higher

Impulse Noise

For impulsive sounds, the MOE recommends with general criteria that the source impulse sound level in dBAi not exceed the ambient Leq due to road traffic or the minimum exclusion limits. The MOE's criteria for specific impulsive sounds that occur on a frequent basis are in the range of 45 to 85 dBAi depending on area class, the number of impulses and the nature of the source.

In general, for land use planning purposes of new noise-sensitive land uses and the approval of new Stationary Sources of noise, the MOE recommends the use of Publication NPC-300.

4.0 ANALYSIS

4.1 TRANSPORTATION SOURCES OF NOISE

The proposed development is located at the South East corner of Bronte Road and Upper Middle Road in the Town of Oakville as shown in Figure 1. The relevant road and traffic data were obtained from Read Voorhees and Associates and the MTO iCorridor website and are summarized below:

- **QEW**

Current No. of Lanes	8
Posted Speed Limit	100km/hr.
Future Posted Speed Limit	100km/hr.
Future AADT (Year 2031)	220,000 vpd
Total Truck Percentage • Medium Truck Split • Heavy Truck Split	8.5% 2.5% 6.0%
Day(16 hrs.)/Night(8 hrs.) Split (assumed)	90%/10%
Directional Traffic Split (assumed)	50%/50%
Road Gradient (assumed)	2%

- **Bronte Road**

Current No. of Lanes	4
Posted Speed Limit	60km/hr.
Future Posted Speed Limit	60km/hr.
Future AADT (Year 2031)	50,000 vpd
Total Truck Percentage • Medium Truck Split • Heavy Truck Split	6.3% 2.5% 3.8%
Day(16 hrs.)/Night(8 hrs.) Split (assumed)	92%/8%
Directional Traffic Split (assumed)	50%/50%
Road Gradient (assumed)	2%

- **Upper Middle Road**

Current No. of Lanes	4
Posted Speed Limit	60 km/hr.
Future Posted Speed Limit	60 km/hr.
Future/Ultimate AADT (Year 2031)	27,850 vpd
Total Truck Percentage (assumed) • Medium Truck Split (assumed) • Heavy Truck Split (assumed)	3.4% 1.7% 1.7%
Day(16 hrs.)/Night(8 hrs.) Split (assumed)	92%/8%
Directional Traffic Split (assumed)	50%/50%
Road Gradient (assumed)	2%
Current R.O.W.	70m

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

Note: Despite availability of traffic data from The Region of Halton, we have used the more conservative traffic data provided to us by Read Voorhees and Associates for this study.

4.2 OUTDOOR NOISE ENVIRONMENT

Noise predictions were carried out using STAMSON Version 5.04 (2000), the computerized version of the MOE noise prediction model, ORNAMENT.

Overall sound levels at the OLAs of the selected representative receptor locations are shown in Table 1.

Sample sound level calculations at representative receptor locations are presented in Appendix B.

In consideration of the calculations, receptor locations which require outdoor noise control measures are illustrated in Figure 3.1.

The conventional approach by which excess noise in the rear yard OLAs may be mitigated is through construction of acoustical barriers. Sound barrier heights required will be up to 4.0m subject to later adjustments with knowledge of the proposed and existing grade elevations.

4.3 INDOOR NOISE ENVIRONMENT

The criteria for indoor L_{eq} sound levels are based on projected L_{eq} 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_{eq} levels do not exceed the recommended objective sound levels, then the indoor L_{eq} 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.

Overall nighttime sound levels at the building facades are shown in Table 3.

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

- The nighttime noise environment at the outside walls of the following lots will equal or exceed 60 dBA:

  All lots within the Hatched area as shown in Figure 3.2

  Central air conditioning is therefore required.

- The daytime/nighttime noise environment at the outside walls of the following lots will be in the range of 55-64 dBA day/51 – 59 dBA night:

  All lots within the Checkered area as shown in Figure 3.2

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

- All other lots/blocks will have a nighttime noise level less than 50 dBA and therefore no noise control measures need be considered.

Typical Acoustic Insulation Factors (A.I.F.) are summarized in Tables 2 and 3.

4.4 TYPICAL WINDOW/WALL CONSTRUCTION

As the detailed architectural plans are not available at this time, it is therefore not possible to specify the window and wall details to meet the AIF requirements presented in Tables 2 and 3. 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 (openable or fixed), window size and orientation, etc. Such analysis is required by the MOE and the municipality prior to submission for building permits as part of their Certification process.

Wall construction using concrete block, or brick veneer, or precast concrete panels 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 openable 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 nighttime outdoor sound level of 65dBA, the AIF value for the bedrooms will be 31 assuming 3 components. If the window to floor ratio is 20%, 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

As an example, for a typical unit with daytime outdoor sound level of 72dBA, the AIF value for the Living Room will be 34 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 (40mm) 3mm; 4mm (32mm) 4mm

As the information above are typical examples only, therefore, prior to submission of the building plans for building permit, we recommend that the detailed architectural drawings of the units requiring noise control measures, as referred to earlier, be examined by the Acoustical Consultant in order to advise the design consultant on the ***specific*** building components for noise control.

Indoor Sound Levels

While the control of the indoor noise created by the air conditioning equipment is not the direct subject of this study, it is important that the selected and designed air conditioning systems achieve indoor sound levels that meet the OBC/ASHRAE criteria and be at least 5 dB lower than the Ministry of Environment's recommended indoor sound level criteria included in Section 3.0 of this study.

4.5 STATIONARY SOURCES OF NOISE

1. Introduction

The south end of the subject development is bordered by the Region of Halton office and facilities. This includes the Region’s main office, Emergency Medical Services (EMS), Public Works Services, and Police Services.

2. Description of the Sources of Stationary Noise

Public Works Facility

The public works facility includes a small holding yard for aggregates, a main building, and a yard to house the various vehicles and equipment in.

The sources of noise emanating from the aggregate yard include the operation and idling of a front-end loader and loading/dump trucks. From our meeting with the Region of Halton staff, the aggregate yard will normally operate from 7:30am to 4:00pm; however emergency work can take place during the off hours.

The main public works building and yard houses the vehicles and equipment used for various public works operations and the sources of noise of concern include the idling and movement of the various vehicles and equipment. In addition, the main building has a repair shop for vehicles with three large overhead doors facing the north that will normally remain open on days with hotter temperatures. The noise emitted from these doors will be assumed to be the idling of large trucks[3]. This part of the public works facility will generally operate only during regular hours of 7:30am to 4:00pm.

EMS Services

The EMS building is a holding facility for the maintenance of EMS vehicles, as well as a storage area during off hours. There is a special exhaust on the roof of this building which turns on when the special exhaust system is coupled with an EMS vehicle and runs for approximately 3 minutes.

In addition, there is an emergency generator within the building that is tested approximately once a month and during off hours.

Police Services

The main sources of noise of concern related to the Police Services building are the more-or-less frequent car door slamming and the idling of its parked police and staff vehicles in the parking lot towards the southeast of the subject development around the clock.

Main Regional Building

There are two sources that are of concern from the Halton Region's main building: a kitchen exhaust fan serving the cafeteria and the cooling tower. The kitchen exhaust operates full tilt during the operating hours of the

[3] Other noise sources including air operated pneumatic tools, hammering, etc. which are all considered as nuisance type sources.

buildings and will be turned off during the off hours.

Figure 4 shows the location of the subject sources of stationary noise.

3. Points of Reception

Four points of reception were selected to represent the worst-case locations where noise will be of a concern due to the operation of the Halton Region facility.

R18, R19, and R20 were chosen to represent the future dwellings that will be subject to the most noise from the aggregate yard and its operations, where R21 represents the dwellings that will be subject to the noise from the rest of the Halton Region facility.

Figure 2 shows the location of the subject receptors.

4. Description of the Sources of Ambient/Background Noise and Operational Data

Ambient noise from Bronte Road and the Highway 403 were not taken into account due to the proximity of the selected receptors from these roads. Therefore, the applicable noise criteria will be the unadjusted MOE criteria mentioned in Section 3.2 of this report.

Figure 1 shows the relative location of the receptors with respect to the sources of ambient noise. Appendix C contains the relevant traffic data of the roads and other sources of noise which establish the ambient noise in the subject area.

5. Measurement Equipment

The attended sound level measurements were performed using the following equipment:

- Rion NA-28, Type 1 Precision Integrating Sound Level Meter and Real Time Frequency Analyzer fitted with 1/1 & 1/3 Octave Bands filters and a 1/2” condenser microphones c/w windscreen.
- Rion Precision Calibrator Model NC-74

The unattended sound level measurements were performed using the following equipment:

- Rion NL-22 Integrating Sound Level Meters fitted with 1/4” piezoelectric microphones and a windscreen. The equipment were contained in weather-protected environmental casings

The sound level measurement procedures were primarily based on the Ministry of Environment procedures in their Publication NPC-103 “Procedures” included in the Model Municipal Noise Control by-Law, the recommendations of the instrument manufactures and the best engineering practices to suit site specific conditions. The sound level meters were checked and calibrated before, during and following completion of the measurement sessions without any appreciable change in the sound levels.

The weather conditions during the measurement sessions were favourable for measurements as the local wind speed did not exceed 30 km/hr and there was no precipitation.

Sound level measurement results can be found in Appendix C.

6. Established Stationary Source Sound Levels

The following are the noise emission levels used for calculation and prediction in the model:

- Front End Loader Idling: 76dBA @ 7.5m
- Front End Loader Moving: 79dBA @ 7.5m
- Large Truck Idling: 72dBA @ 7.5m
- Large Truck Moving: 75dBA @ 15m
- Van/Pickup Truck Idling: 70dBA @ 7.5m
- Van/Pickup Truck Moving: 70dBA @ 7.5m
- Rooftop Units: 58dBA @ 10m
- EMS Exhaust Fan: 62dBA @ 30m
- Kitchen Exhaust Fan: 50dBA @ 95m
- Cooling Tower: 55dBA @ 30m
- Automobile Idling: 57dBA @ 5m

Photographs 1 through 8 show the sources of noise of concern. The sound level measurements can be found in Appendix C.

7. Sound Level Calculations Model

A 3-D computer program for multiple point and line sources and multiple receivers developed by SS Wilson Associates was used to calculate the sound levels. The program takes into account:

- Reference sound levels and reference distances for the equipment working in each area of the subject development, i.e. sound emission levels.
- The Cartesian co-ordinates (x, y & z) of all sources and receivers.
- The number of events or occurrences of the noise in a given time period

and the time period of each event.
- Spherical divergence factor.
- Additional attenuation due to sound barriers; natural or man-made types.
- Additional attenuation due to ground (as modified by sources/receiver elevations, the presence of intervening barriers and the type of ground).
- Atmospheric attenuation due to air molecular absorption.

For the purposes of this study, two sound level adjustments were applied to the measured sound emission levels. In accordance with the MOE procedures, +5 dB tonal adjustments were incorporated into the overall analysis of the Leq.

Other adjustments included acoustical shielding due to the presence of intervening buildings between a specific source and the receptor as well as adjustments due to the directivity of the following source(s):

- 5dB reduction for the noise coming from the overhead doors to R21 and R22 due for edge effect and directionality.

8. Impact Assessment and Findings

Proposed Residential Lots along the North End Of the Public Works Yard

R18, R19, and R20 are locations that represent the proposed dwelling units overlooking the north end of the Public Works Yard (PWY) where mobile equipment and trucks are used to manage aggregate stockpiles and to load and unload aggregates into trucks for use on Public Works projects. The information received from the PWY indicates that while this facility operates primarily during the daytime the fact remains that the Region's work force is on stand-by around the clock in the event that aggregates are needed in connection with night-time and emergency situations.

For the purposes of this assessment, a reasonable number of mobile pieces of equipment was assumed to operate throughout the yard as coded in Figure 5 where the movements of a front-end loader is shown including idling based on the worst-case operational scenario, which is one hour.

The results of the worst-case operational scenario (an MOE requirement) during any hour indicate that the expected Leq at the closest property line of the lots backing onto the yard will be up to Leq 58dBA, which is considered to be a significant increase above the MOE daytime and night-time sound level criteria.

Proposed Residential Lots along the East End of the PWY

R21 is a location that represents the dwelling units overlooking the east end of the Public Works yard where mobile equipment and trucks are used to manage equipment stockpiles and houses other vehicles and equipment for use on Public Works projects (more towards the receptor R20), as well as the car park that services the Halton Police Services. In addition, the receptor will be exposed to the added effect of the Public Works building where other activities take place, as indicated in the yard description. The information received from the PWY indicates that while this facility operates primarily during the daytime, the fact remains that the Region's work force is on stand-by around the clock in the event that aggregates and other services are needed in connection with night time and emergency situations.

For the purposes of this assessment, a reasonable number of mobile pieces of equipment were assumed to operate throughout the yard as coded in Figure 5 where the movements of a front-end loader and utility trucks, including idling of numerous trucks and vans during the morning start up are shown including idling based on the worst-case operational scenario, which is one hour.

The results of the worst-case operational scenario (an MOE requirement) during any hour indicate that the expected Leq at the closest property line of the lots backing onto the yard will be up to Leq 54dBA, which is considered to be a noticeable increase above the MOE daytime and night-time sound level criteria.

Proposed Residential Lots along the South End of the PWY

Receptor R21 also represents the lots facing south and backing directly on a parking lot that is frequently used by the police services of Halton Region where it is used around the clock, as witnessed during our field visits. While parking lot noise is normally exempt for minor commercial applications, the fact that this area is occupied by Halton Police Services' vehicles and staff parking makes it a considerable source of nuisance noise to the future occupants of the dwellings that are located immediately next to this large parking area.

The main sources of noise contributing to the noise level at R21 (in addition to the Public Works building noise) are the rooftop HVAC equipment from Halton Region's main office building, more specifically the kitchen exhaust fan and the cooling tower located in the mechanical room on the top floor.

Long-Term Sound Level Measurements of the Stationary Sources

To gain appreciation of the hourly sound levels emitted by the entire facility around the clock, long-term sound level measurements were taken at several locations around the Halton Region facility to monitor all potential sources of noise, which included to a lesser degree the ambient noise due to traffic on the QEW and Bronte Road.

Appendix C contains the details of the measurements and the results are summarized in the sections to follow.

It is important to note that full reliance was not made on the results of the measurements due to the extraneous sources of noise that was part of the overall ambient in the area that are not associated with the Region of Halton facility. Specifically, there were close-by golfers hitting golf balls with their clubs, which created significant impact noise; the noise due to loud conversation of groups of golfers (as close as 5m to 10m away from the monitors); occasional car movements on the access road within the Halton facility; and perhaps the most serious interference is as a result of the significant noise coming from both Bronte Road and the QEW/403.

The measurement locations are illustrated in Figure 6.

Measurement Location #1: Facing the Public Works Facility

The sound level meter was left in the wooded area between the development lands and the Halton Region's property, which was a low-lying area that was approximately 3m to 4m below the road grade of North Service Road. To improve the accuracy and quality of the measurements, the meter was attached to a tree so that it was above ground level.

Looking at the results of the measurements, it can be concluded that the ambient noise in this area during the daytime is most likely due to traffic and is approximately 55dBA. It was noted from the site visits that there was asphalt work being done in the parking lots of the Halton Region's office, which is reflected in the measurements by the large number of spikes above the ambient. Another explanation of the spikes could include the operation of the Public Works department's vehicles and equipment since it was stated that it is common for the vehicles to idle for a few minutes prior to dispatch.

Measurement Location #2: South Corner Facing the Main Regional Building

The sound level meter was left at an elevated level in the L-shaped corner at the south end of the proposed development, facing the Halton Region offices. The main objective of this measurement was to provide an insight into the overall noise levels coming from the Halton Region main office.

It can be observed from the measurement results that around 5:00am the noise level begins to increase and remains relatively steady throughout the day time. Therefore, it can be concluded (and confirmed with Measurement 1) that the daytime ambient noise in this area is approximately 55dBA. As with Measurement 1 above, the parking lot areas near this measurement location were undergoing construction work, which can be seen in the large spikes in the measurement results.

Measurement Location #3: Southeast Corner Facing the Main Regional Building

The sound level meter was left at an elevated level along the joint property line between the Saw Whet Golf Course and the Region of Halton, facing the main office building.

It can be observed from this meter's measurement results that the ambient noise level in this area is approximately 55dBA. Again, the construction work in the area may be one of the causes for the large spikes during the daytime.

The Region of Halton Standby (Emergency Power Generators Noise Assessment

Operation of the Emergency Power Generators

The staff of the Region of Halton advised us of the presence of three (3) independent emergency power generator stations (gensets) throughout the facility to service 3 separate areas/functions; the main building (2 gensets), the Halton Police Services section (2 gensets) and the Service Yard (1 genset).

Figure 4 illustrates the approximate locations of the three facilities. Photographs 9 through 15 illustrate these generators and their associated equipment.

The staff of the Halton Region further advised that each of the facilities is tested independently starting around 6 am on a scheduled basis with 1 or 2 units running simultaneously for the tests. None of these units is operated for normal day-to-day use and their function is only during power outage situations. The following are the highlights of each group of gensets:

- Halton Maintenance Facility Building:
  - One diesel unit
  - 230kW
  - The engine is located inside on the ground floor with air intake louvers facing east and diesel exhaust stack on the roof

- Photographs 9, 10, and 11 illustrate the system

- Main Halton Region Office Building:
  - Two gas units
  - 1 unit 100kW and 1 unit 250kW
  - Both units are located on the top floor with no roof
  - See photographs 12 and 13

- Main Region Police Services:
  - Two diesel units
  - Both units are located inside the basement floor with three(3) contact points with the outside: Exhaust air stacks, air intake louvers and hot air discharge shaft
  - Photographs 14 and 15 illustrate the system photos from the outside

Applicable Sound Level Criteria

Ontario Regulation 346/12 (Ont. Reg.) mode under the Environmental Protection Act (EPA) published in 2012 governs the operations of the subject units which apply to standby power systems to include one or more generator units with a rated capacity not exceeding 700 KW for each genset.
The applicable sound level criteria and/or provisions for operations of the generator(s) can be found in the text of the Ontario Reg. 346/12. For the purposes of this study only and to provide indication of the degree of acceptance of the present system, the following sound level criterion was used (based on the MOE or 346/12 and the ECA process) for genset testing purposes:

- Criteria 1 (Sound Emission Level):
  - L_p 75 dBA@7m from one genset

- Criteria 2 (Point of Reception Level):
  - L_p 50 dBA

Actual Sound Level Measurements

Arrangements were made with the Region of Halton operational staff to have to generators run for their normal testing purposes of 6 am to 7 am (on bi-weekly or monthly basis) on Friday October 26, 2012 on group at a time. Measurements were taken with the use of a precision sound level analyzer, RION NA-28 calibrated with a Precision Sound Level Calibrator RION NC-74. Each individual genset was operated separately and then each pair was operated simultaneously as commonly done by the Region for the main and the Police Services generators.

The following is a summary of the sound level tests and our extrapolated/interpolated sound levels at the desired locations:

- Main Office Building:
  - Genset 1:
    - Measured L_p @ 25m: 56dBA
    - Extrapolated L_p @ 7.5m: 61dBA
    - Extrapolated L_p @ closest receptor location: 38dBA
  - Genset 2:
    - Measured L_p @ 25m: 57dBA
    - Extrapolated L_p @ 7.5m: 62 dBA
    - Extrapolated L_p @ closest receptor location: 39dBA

- Police Service Building:
  - Genset 1:
    - Measured L_p @ 7.5m: 77dBA
    - Extrapolated L_p @ closest receptor location: 51dBA
  - Genset 2:
    - Measured L_p @ 7.5m: 80dBA
    - Extrapolated L_p @ closest receptor location: 54dBA
  - Measured L_p @ closest receptor location w/ both gensets running: 61dBA

- Halton Public Works Building:
  - Genset:
    - Measured L_p @ 25m: 62dBA
    - Measured L_p @ 7m: 79dBA
    - Extrapolated L_p @ 7.5m: 67dBA
    - Extrapolated L_p @ closest receptor location: 47dBA

Results and Findings

The following is a summary of the results and findings specific to each group of generators:

- Main Office Building:
  - Based on calculations, both generators comply with the MOE sound emission criteria for generators.
  - The measured sound levels at the property line of the nearest receptor exceeds Criteria 2, however it should be noted that the area was dominated by ambient traffic noise (estimated to be at about 55dBA).
  - The extrapolated sound levels to the closest point of reception, R21, are 42dBA with higher contributions due to the traffic ambient.

- Police Services Building:
  - The measured sound levels from both generators do not comply with the MOE sound emission criteria for generators. It is recommended that

- Halton Public Works Building:
  - The predicted sound levels from both generators comply with the MOE sound emission criteria for generators.
  - The measured levels at 7.5m were much higher than the predicted and well above the applicable criteria, but this area's noise environment was dominated by traffic noise; therefore the predictions were taken to be more accurate.

Recommendations Pertaining to the Standby Power Generators

1. The Region of Halton Operations staff should be provided with a copy of this report.

2. The Region of Halton should take a note of the related MOE provisions respecting testing of their standby generators in accordance with Ontario Regulation 346/12 in light of the actual measured sound levels reported herein.

3. Presently, the Region's standby power generators are measured and predicted to have no noise impact on the adjacent or near-by residential receptors. However, our measurements and predictions at the nearest property line of the proposed development indicate the potential for sound levels that are not acceptable. Therefore, further negotiations should take place between the client and the Region of Halton with a view to implementing the necessary noise control measures to reduce the acoustic emission of 2 of the 3 generator sets. The modifications include straight forward noise control measures, including the use of more effective exhaust mufflers, the use of air intake silencers and/or acoustic louvers on the air discharge openings (hot air discharge), and the application of sound absorptive material on air intake openings and wells. The details of such measures can only be established during the Detailed Design stage.

   The overall intent and objective of the necessary generators noise control measures would be to meet the Ontario Regulation 346/12 (Ont. Reg.)

9. Recommendations

With the introduction of the MOE's new NPC-300 document (to supersede the LU-131 and NPC-205 documents), a "relaxation" of the previous criteria in the form of a new area classification, Class 4, was also introduced. For stationary sources of noise, the maximum allowable impact sound level criteria within a

Class 4 Area is 60dBA during the day and 55dBA during the night time, which is a 10dB increase in the criteria compared to a Class 1 Area's sound level limit.

In order for an area to be classified as Class 4, there must have already been and existing stationary source (Halton Region's Main Office, in this case) and the proposed Class 4 area is currently vacant. In addition, the approval of the selected area to be reclassified as Class 4 must come from a formal confirmation by the land use planning authority of the area. This confirmation will be issued under procedures developed by the land use planning authority under the Planning Act.

With the approval for classifying the selected area to be Class 4, prospective purchasers must be informed that the dwelling is located within a Class 4 Area through the appropriate means and informed of the agreements (or lack thereof, in this case) of noise mitigation. In addition, the appropriate warning clause will be required to inform the purchaser that the applicable Class 4 area sound level limits are based on the assumption that windows are closed. With this assumption, air conditioning must be provided and installed for the proposed dwellings as a means to allow the windows to stay closed.

The following lots and blocks (including the adjacent roadways), as per the current iteration of the Draft Plan in Figure 2.1), are recommended to be included within the Class 4 Area:

- Blocks 6 to 10, Block 16, Block 21, and Block 22
- Lot 25, Lot 26, Lot 31, Lot 32, Lot 94 to Lot 99, Lot 233 to Lot 235, 256 to Lot 258, Lot 270 to Lot 272, Lot 287, Lot 288, Lot 290, Lot 392, and Lot 393

Figure 3.4 illustrates the area recommended to be classified as Class 4.

Upon approval and classification of the specified area to be Class 4, noise mitigation to reduce the noise impact due to equipment and activities from Halton Region's head offices and services need not be considered. This is due to the fact that the predicted highest daytime sound level impact is 58dBA at receptor R20, which is below the maximum sound level limit for a Class 4 Area of 60dBA.

Warning clauses shall be included in all Development Agreements and Offers of Sale and Purchase or Lease of the properties within close proximity to the Regional property:

"Purchasers/tenants are advised that sound levels due to the equipment and operations from the adjacent Regional Offices may be audible at times."

"Purchasers/tenants are advised that sound levels due to the adjacent Regional Offices are required to comply with sound level limits that are protective of indoor areas and are based on the assumption that windows and exterior doors are closed. This dwelling unit has been supplied with a ventilation/air conditioning system which will allow windows and exterior doors to remain closed."

As to the implementation procedures, we recommend the following steps:

1. The Town of Oakville is hereby requested to consider classification of a strip of land around the identified stationary noise sources in the subject development area for a total depth to be determined jointly with the Town of Oakville Planning Department and the developer to accommodate at least one row of dwellings and a road allowance, the outline of which are shown conceptually in Figure 3.4.

2. The Town of Oakville in undertaking this task should consult the relevant MOE new Noise Policy NPC-300, as well as the owners of the subject stationary sources (Region of Halton) in regards to this request.

3. To also comply with the MOE procedures, the Town planners are advised to communicate directly with the MOE's district office with a view to classifying any potential stationary sources of noise within the identified areas as being stationary sources so that the MOE can modify the applicable approval criteria for any of such sources that already have for future sources that may demand or necessitate the issuance of future ECAs.

4. It is also important for the Town of Oakville to undertake internal review of the new impending higher sound level criteria in order to maintain consistency with the Provincial criteria notwithstanding the Town's Noise By-Law, which specifies a more conservative sound level criteria at the present time for residential land uses, i.e. the Town of Oakville should consider the use of comparable sound level criteria to NPC-300 when applying their Noise By-law provisions in the subject area.

For land use compatibility, we recommend an optional 2.2m sound barrier to be constructed along the south property lines to provide separation between the proposed residential development and the Region of Halton's offices. The alignment is illustrated in Figure 3.4.

TABLES

N6 Leq-AIF Master-January 2007 Proceed **SS WILSON ASSOCIATES**

13/11/2012 11:14 **Leq- AIF CALCULATIONS AND TYPICAL WINDOW GLAZING REQUIREMENTS** (Using NRC/MOE Pocedures)

File Number :

Project Name :

OUTDOORS
Table 1

Description : WA12-032 Any Heavy Rail Line ? No

Description : BRONTE GREEN, OAKVILLE

Record Number	1	2	3	4	5	6	7	8	9	10	11	12
Consider Record	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
RECEPTOR	R1	R3	R4	R6	R8	R10	R11	R13	R16	R17	R18	R20
FACE/DIRECTION	SOUTH	SOUTH	NORTH	NORTH-EAST	SOUTH	WEST	SOUTH	SOUTH	SOUTH	EAST	SOUTH	WEST
LOCATION	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area	Outdoor Living Area
Source 1: Roads	**Road Traffic**		**OUTDOOR DAYTIME LEVELS**			OUTDOOR DAYTIME LEVELS			OUTDOOR DAYTIME LEVELS			
Leq Outdoors	67.10	56.00	61.20	54.70	61.40	56.00	69.20	68.90	69.20	55.60	68.30	58.00
Partial angle of exposure, degrees	180	180	180	180	180	180	180	180	180	180	180	180
Partial exposure adjust., dB												
Additional Adjustment, dB	-10.80		-6.40		-5.20		-13.20	-12.90	-13.20		-12.30	-6.70
Additional Adjustment, dB												
Sub-Total Leq, dBA	**56.30**	**56.00**	**54.80**	**54.70**	**56.20**	**56.00**	**56.00**	**56.00**	**56.00**	**55.60**	**56.00**	**51.30**
Source 2:	**Road Traffic**		**OUTDOOR DAYTIME LEVELS**			OUTDOOR DAYTIME LEVELS			OUTDOOR DAYTIME LEVELS			
Leq Daytime												
Partial angle of exposure, degrees	180	180	180	180	180	180	180	180	180	180	180	180
Partial exposure adjust., dB												
Additional Adjustment, dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA												
Source 3:	**Road Traffic**		**OUTDOOR DAYTIME LEVELS**			OUTDOOR DAYTIME LEVELS			OUTDOOR DAYTIME LEVELS			
Leq Daytime												
Partial angle of exposure, degrees	180	180	180	180	180	180	180	180	180	180	180	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	180	180	180	180	180	180	180	180	180	180	180
Partial exposure adjust., dB												
Additional Adjustment, dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA												
Sub-Tot. 4 Sources Leq, dBA	**56.30**	**56.00**	**54.80**	**54.70**	**56.20**	**56.00**	**56.00**	**56.00**	**56.00**	**55.60**	**56.00**	**51.30**
Aircraft noise NEF/NEP												
Adjust.1												
Adjust.2												
Adjusted NEF/NEP												
Approx. Overall Combined Leq	***56***	***56***	***55***	***55***	***56***	***56***	***56***	***56***	***56***	***56***	***56***	***51***
Overall Road and/or Rail and/or Stationary Sources, Leq (dBA)	***56***	***56***	***55***	***55***	***56***	***56***	***56***	***56***	***56***	***56***	***56***	***51***
Aircraft Noise Only, NEF												
NOTES	3.4m High Barrier/Berm Combination		2.4m High Barrier/Berm Combination	....	2.4m High Barrier/Berm Combination	....	4.0m High Barrier/Berm Combination	4.0m High Barrier/Berm Combination	4.0m High Barrier/Berm Combination	....	4.0m High Barrier/Berm Combination	2.4m High Barrier/Berm Combination

N6 Leq-AIF Master-January 2007 Proceed **SS WILSON ASSOCIATES**

13/11/2012 11:14 **Leq- AIF CALCULATIONS AND TYPICAL WINDOW GLAZING REQUIREMENTS**

File Number : **DAYTIME** (Using NRC/MOE Pocedures)

Project Name : **Table 2**

Description : WA12-032

Description : BRONTE GREEN, OAKVILLE

Record Number	1	2	3	4	5	6	7	8	9	10	11	12
Consider Record	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N
RECEPTOR	R1	R2	R4	R7	R8	R11	R17					
FACE/DIRECTION	NORTH-WEST	NORTH	NORTH	WEST	WEST	WEST	WEST					
LOCATION	Building Façade	Building Façade	Building Façade	Building Façade	Building Façade	Building Façade	Building Façade					
ROOM CLASSIFICATION	Living /Dining	Living /Dining	Living /Dining	Living /Dining	Living /Dining	Living /Dining	Living /Dining					
Adjustm. to Criterion, dBA												
MOE Transportation Sources Daytime Leq Indoor Criteria, dBA	45	45	45	45	45	45	45	N/A				
Aircraft Indoor Criteria, NEF	5	5	5	5	5	5	5	#N/A				
Source 1: Roads	**Road Traffic**		**DAYTIME LEVELS**			DAYTIME LEVELS			DAYTIME LEVELS			
Leq Daytime	69.80	65.90	61.00	69.70	63.00	72.30	67.70					
Partial angle of exposure, degrees	180	180	180	180	180	180	180		0			
Partial exposure adjust., dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA	**69.80**	**65.90**	**61.00**	**69.70**	**63.00**	**72.30**	**67.70**					
Angular range of incidence (0,1,2,3)												
Adjusted AIF	32	28	23	31	25	34	29	#N/A	#N/A	#N/A	#N/A	#N/A
Source 2:	**Road Traffic**		**DAYTIME LEVELS**			DAYTIME LEVELS			DAYTIME LEVELS			
Leq Daytime												
Partial angle of exposure, degrees	180	180	180	180	180	180	180	18				
Partial exposure adjust., dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA												
Angular range of incidence (0,1,2,3)												
Adjusted AIF	-38	-38	-38	-38	-38	-38	-38	#N/A	#N/A	#N/A	#N/A	#N/A
Source 3:	**Road Traffic**		**DAYTIME LEVELS**			DAYTIME LEVELS			DAYTIME LEVELS			
Leq Daytime												
Partial angle of exposure, degrees	180	180	180	180	180	180	180					
Partial exposure adjust., dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA												
Angular range of incidence (0,1,2,3)												
Adjusted AIF	-38	-38	-38	-38	-38	-38	-38	#N/A	#N/A	#N/A	#N/A	#N/A
Source 4:	**Road Traffic**		**DAYTIME LEVELS**			DAYTIME LEVELS			DAYTIME LEVELS			
Leq Daytime												
Partial angle of exposure, degrees	180	180	180	180	180	180	180					
Partial exposure adjust., dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA												
Angular range of incidence (0,1,2,3)												
Adjusted AIF	-38	-38	-38	-38	-38	-38	-38	#N/A	#N/A	#N/A	#N/A	#N/A
Sub-Tot. 4 Sources Leq, dBA	**69.80**	**65.90**	**61.00**	**69.70**	**63.00**	**72.30**	**67.70**					
Aircraft noise NEF/NEP												
Adjust.1												
Adjust.2												
Adjusted NEF/NEP												
Approx. Overall Combined Leq	***70***	***66***	***61***	***70***	***63***	***72***	***68***					
Assumed Window/Floor Area %	32.0	32.0	32.0	32.0	32.0	32.0	32.0					
Assumed Total # of Components (Road, Rail, and Other Sources)	3	3	3	3	3	3	3					
Assumed Total # of Components Aircraft ONLY	3	3	3	3	3	3	3					
AIF of 4 Sources	*32*	*28*	*23*	*31*	*25*	*34*	*29*					
Aircraft AIF												
Combined AIF	32	28	23	31	25	34	29					
Openable or Fixed windows ?	Openable	Openable	Openable	Openable	Openable	Openable	Openable					
Regular or Laminated Glass	Regular	Regular	Regular	Regular	Regular	Regular	Regular					
Other Adjustment												
Final Adjusted AIF	32	28	23	31	25	34	29					
Minimum STC (Approx)	*33*	*29*	*24*	*33*	*26*	*35*	*31*					
Typical Minimum Double Glazing Alternatives	3(25)3 4(20)4 3(16)6 6(16)6	3(6)3	3(6)3	3(20)3 4(16)4 3(13)6 6(13)6	3(6)3	3(40)3 4(32)4 3(25)6 6(24)6	3(13)3 4(6)4					
NOTES	.....	.....	.....	.....	.....	.....	.....					

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

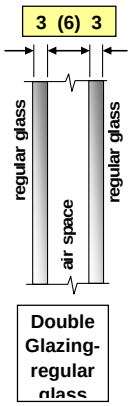
DAYTIME
Table 2

- 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.

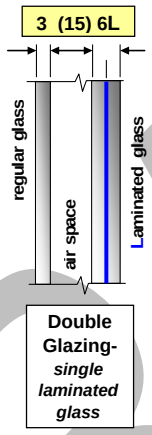
RECEPTOR	FACE/DIRECTION	ROOM CLASSIFICATION	LOCATION	Openable or Fixed Window	Regular Strength or Laminated Glass	Combined AIF	Approx. Overall Combined Leq	Double Glazing Alternatives , mm	Triple Glazing Alternatives , mm	*Minimum STC (Approx)*
R1	NORTH-WEST	Living /Dining	Building Façade	Openable	Regular	32	70	3(25)3 4(20)4 3(16)6 6(16)6		*33*
R2	NORTH	Living /Dining	Building Façade	Openable	Regular	28	66	3(6)3		*29*
R4	NORTH	Living /Dining	Building Façade	Openable	Regular	23	61	3(6)3		*24*
R7	WEST	Living /Dining	Building Façade	Openable	Regular	31	70	3(20)3 4(16)4 3(13)6 6(13)6		*33*
R8	WEST	Living /Dining	Building Façade	Openable	Regular	25	63	3(6)3		*26*
R11	WEST	Living /Dining	Building Façade	Openable	Regular	34	72	3(40)3 4(32)4 3(25)6 6(24)6		*35*
R17	WEST	Living /Dining	Building Façade	Openable	Regular	29	68	3(13)3 4(6)4		*31*

ABBREVIATIONS SPECIFIC TO THIS PROJECT : FF(Front Face), RF(Rear Face), RS(Right Side face), LS(Left Side face)

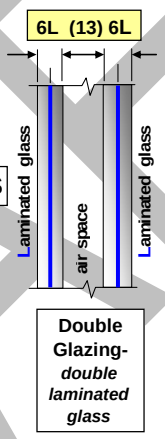
EXAMPLES



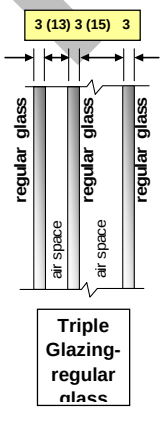
Double Glazing- regular glass



Double Glazing- *single laminated glass*



Double Glazing- *double laminated glass*



Triple Glazing- regular glass

N6 Leq-AIF Master-January 2007 Proceed **SS WILSON ASSOCIATES**

13/11/2012 11:14 **Leq- AIF CALCULATIONS AND TYPICAL WINDOW GLAZING REQUIREMENTS** (Using NRC/MOE Pocedures)

File Number :

Project Name :

NIGHT TIME
Table 3

Description : WA12-032

Description : BRONTE GREEN, OAKVILLE

Record Number	1	2	3	4	5	6	7	8	9	10	11	12
Consider Record	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N
RECEPTOR NO.	R1	R2	R4	R7	R8	R11	R17					
FACE/DIRECTION	NORTH-WEST	NORTH	NORTH	WEST	WEST	WEST	WEST					
LOCATION	Building Façade	Building Façade	Building Façade	Building Façade	Building Façade	Building Façade	Building Façade					
ROOM CLASSIFICATION	Bedroom	Bedroom	Bedroom	Bedroom	Bedroom	Bedroom	Bedroom					
Adjustm. to Criterion, dBA												
MOE Transportation Sources Night Leq Indoor Criteria, dBA	40	40	40	40	40	40	40	N/A				
Aircraft Indoor Criteria, NEF								#N/A	#N/A			
Source 1: Roads	**Road Traffic**		**NIGHT TIME LEVELS**			NIGHT TIME LEVELS			NIGHT TIME LEVELS			
Leq Night Time	62.20	58.40	53.40	62.10	56.10	64.70	60.10					
Partial angle of exposure, degrees	180	180	180	180	180	180	180		0			
Partial exposure adjust., dB												
Additional Adjustment, dB												
Sub-Total Leq, dBA	**62.20**	**58.40**	**53.40**	**62.10**	**56.10**	**64.70**	**60.10**					
Angular range of incidence (0,1,2,3)												
Adjusted AIF	29	25	20	29	23	31	27	#N/A	#N/A	#N/A	#N/A	#N/A
Source 2:	**Road Traffic**		**NIGHT TIME LEVELS**			NIGHT TIME LEVELS			NIGHT TIME LEVELS			
Leq Night Time												
Partial angle of exposure, degrees	180	180	180	180	180	180	180	18				
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	#N/A	#N/A	#N/A	#N/A	#N/A
Source 3:	**Road Traffic**		**NIGHT TIME LEVELS**			NIGHT TIME LEVELS			NIGHT TIME LEVELS			
Leq Night Time												
Partial angle of exposure, degrees	180	180	180	180	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	#N/A	#N/A	#N/A	#N/A	#N/A
Source 4:	**Road Traffic**		**NIGHT TIME LEVELS**			NIGHT TIME LEVELS			NIGHT TIME LEVELS			
Leq Night Time												
Partial angle of exposure, degrees	180	180	180	180	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	#N/A	#N/A	#N/A	#N/A	#N/A
Sub-Tot. 4 Sources Leq, dBA	**62.20**	**58.40**	**53.40**	**62.10**	**56.10**	**64.70**	**60.10**					
Aircraft noise NEF/NEP												
Adjust.1												
Adjust.2												
Adjusted NEF/NEP												
Approx. Overall Combined Leq	***62***	***58***	***53***	***62***	***56***	***65***	***60***					
Assumed Window/Floor Area %	20.0	20.0	20.0	20.0	20.0	20.0	20.0					
Assumed Total # of Components (Road, Rail, and Other Sources)	3	3	3	3	3	3	3					
Assumed Total # of Components Aircraft ONLY	3	3	3	3	3	3	3					
AIF of 4 Sources	*29*	*25*	*20*	*29*	*23*	*31*	*27*					
Aircraft AIF												
Combined AIF	29	25	20	29	23	31	27					
Openable or Fixed windows ?	Openable	Openable	Openable	Openable	Openable	Openable	Openable					
Regular or Laminated Glass	Regular	Regular	Regular	Regular	Regular	Regular	Regular					
Other Adjustment												
Final Adjusted AIF	29	25	20	29	23	31	27					
Minimum STC (Approx)	*28*	*24*	*19*	*28*	*22*	*31*	*26*					
Typical Minimum Double Glazing Alternatives	3(6)3	3(6)3	3(6)3	3(6)3	3(6)3	3(13)3 4(6)4	3(6)3					
NOTES	.....	.....	.....	.....	.....	.....	.....					

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

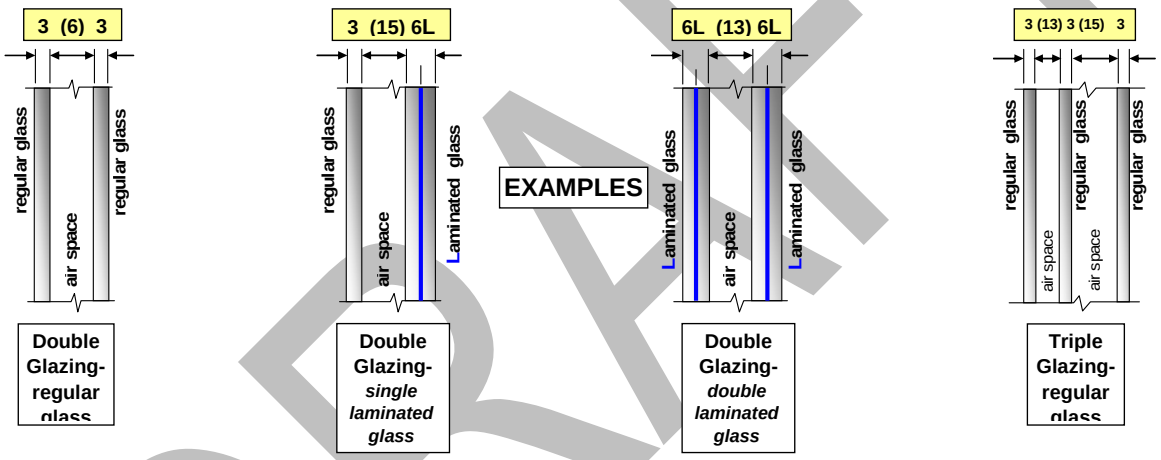
NIGHT TIME

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.

RECEPTOR NO.	FACE/DIRECTION	ROOM CLASSIFICATION	LOCATION	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)*
R1	NORTH-WEST	Bedroom	Building Façade	Openable	Regular	29	62	3(6)3		*28*
R2	NORTH	Bedroom	Building Façade	Openable	Regular	25	58	3(6)3		*24*
R4	NORTH	Bedroom	Building Façade	Openable	Regular	20	53	3(6)3		*19*
R7	WEST	Bedroom	Building Façade	Openable	Regular	29	62	3(6)3		*28*
R8	WEST	Bedroom	Building Façade	Openable	Regular	23	56	3(6)3		*22*
R11	WEST	Bedroom	Building Façade	Openable	Regular	31	65	3(13)3	4(6)4	*31*
R17	WEST	Bedroom	Building Façade	Openable	Regular	27	60	3(6)3		*26*
						#N/A				
						#N/A				

ABBREVIATIONS SPECIFIC TO THIS PROJECT : FF(Front Face), RF(Rear Face), RS(Right Side face), LS(Left Side face)



FIGURES

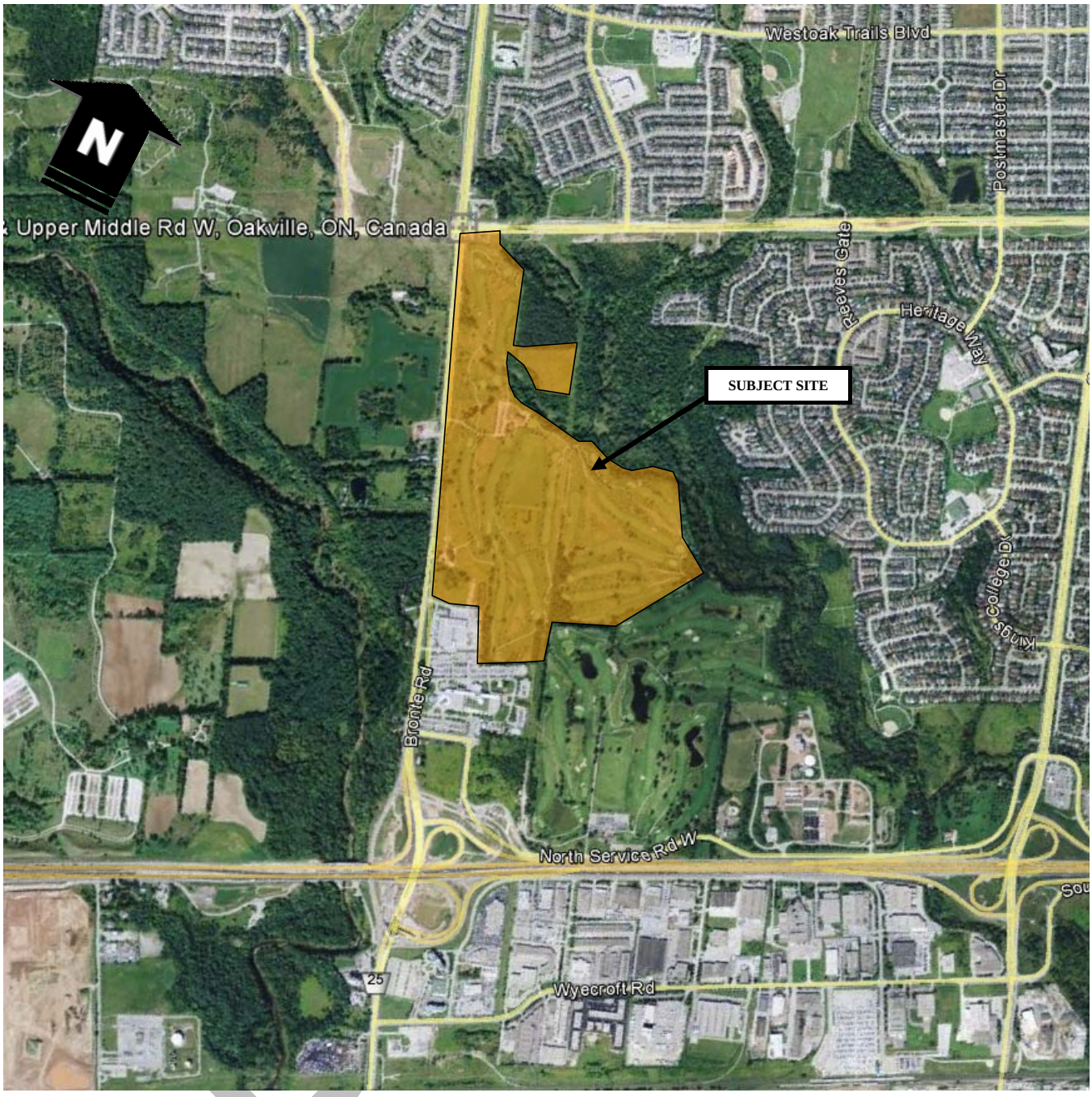


FIGURE 1
KEY PLAN

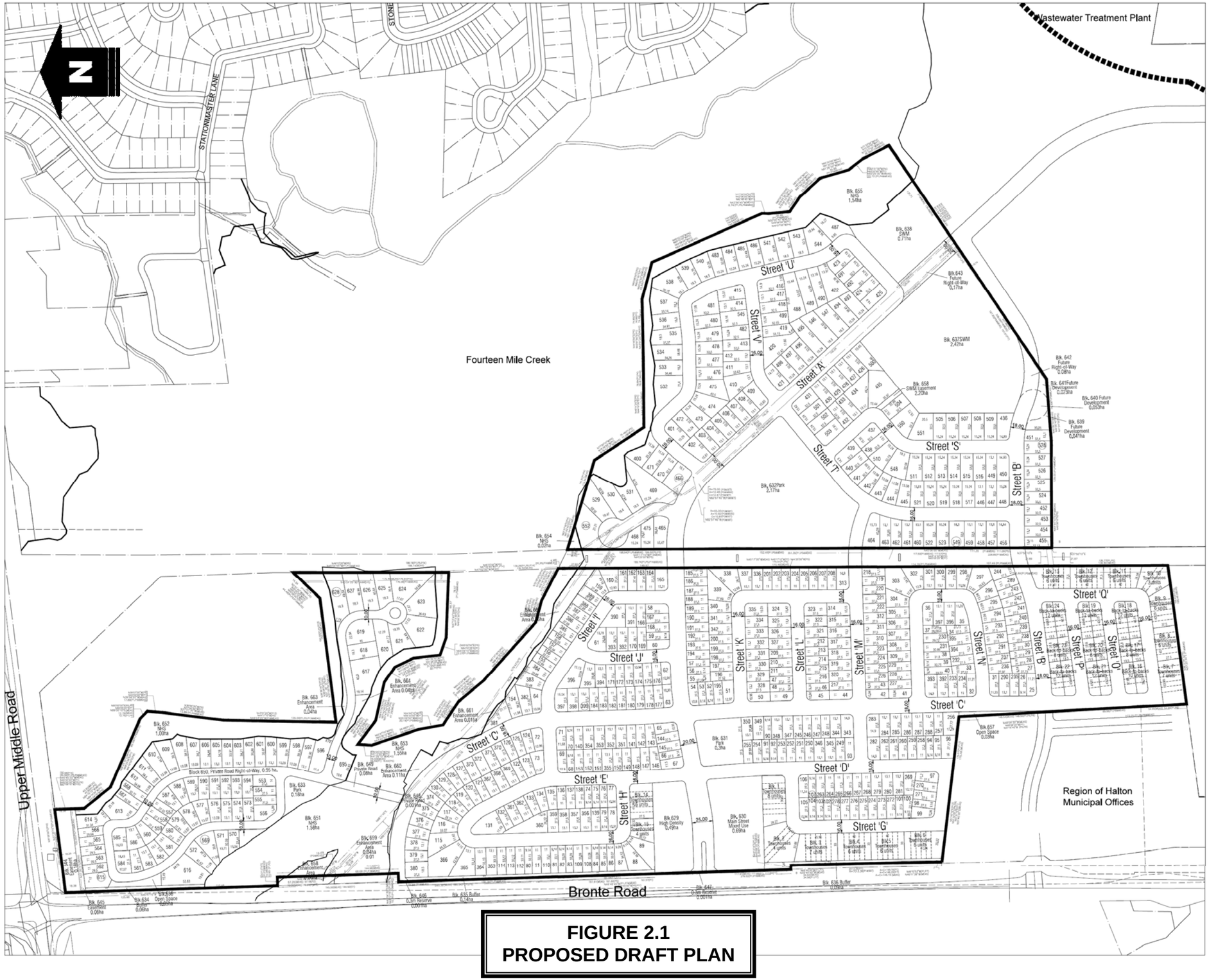


FIGURE 2.1
PROPOSED DRAFT PLAN

FIGURE 2.2
RECEPTOR LOCATIONS

FIGURE 3.1
SCHEMATIC BARRIER ALIGNMENT

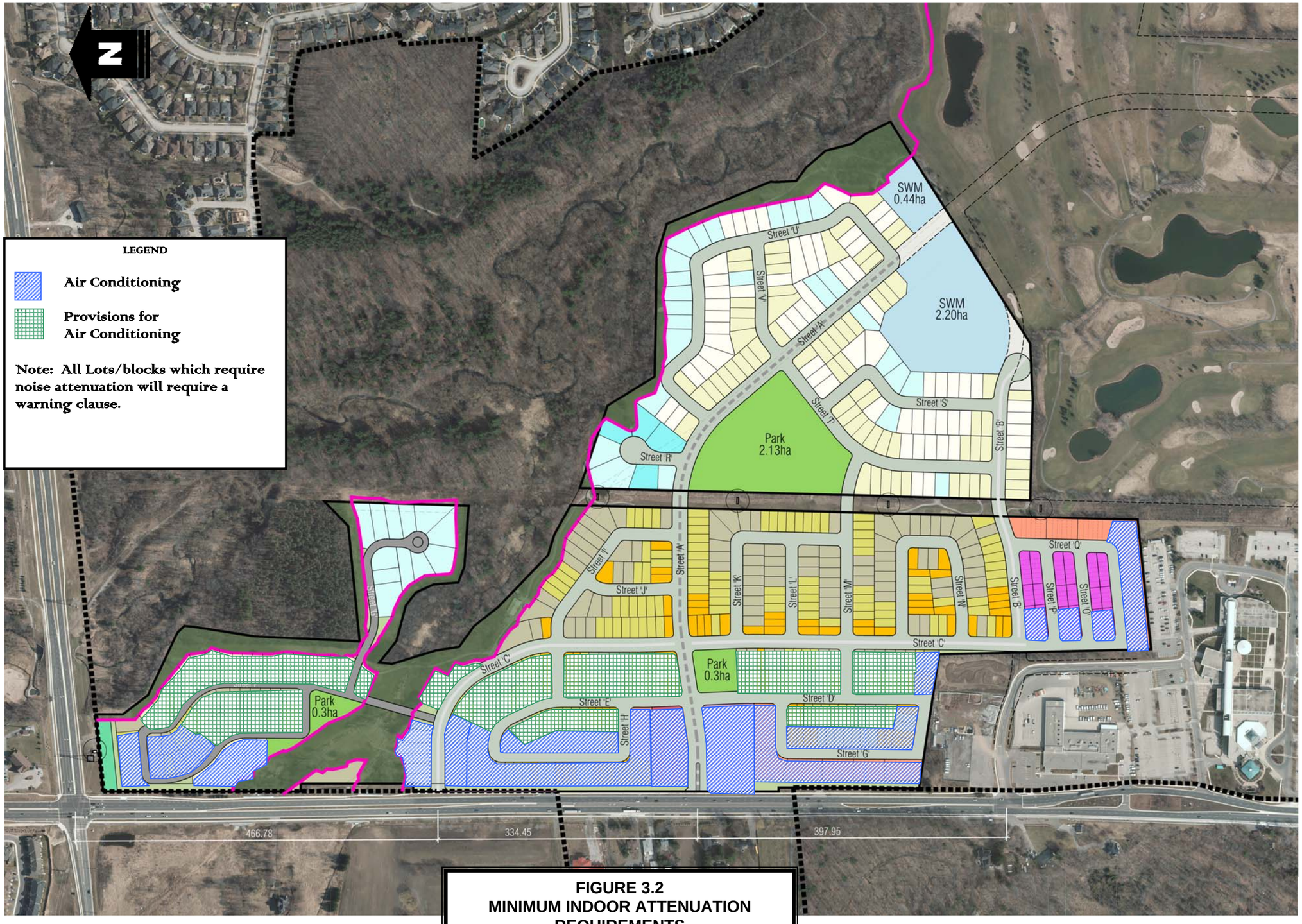


FIGURE 3.2
MINIMUM INDOOR ATTENUATION REQUIREMENTS

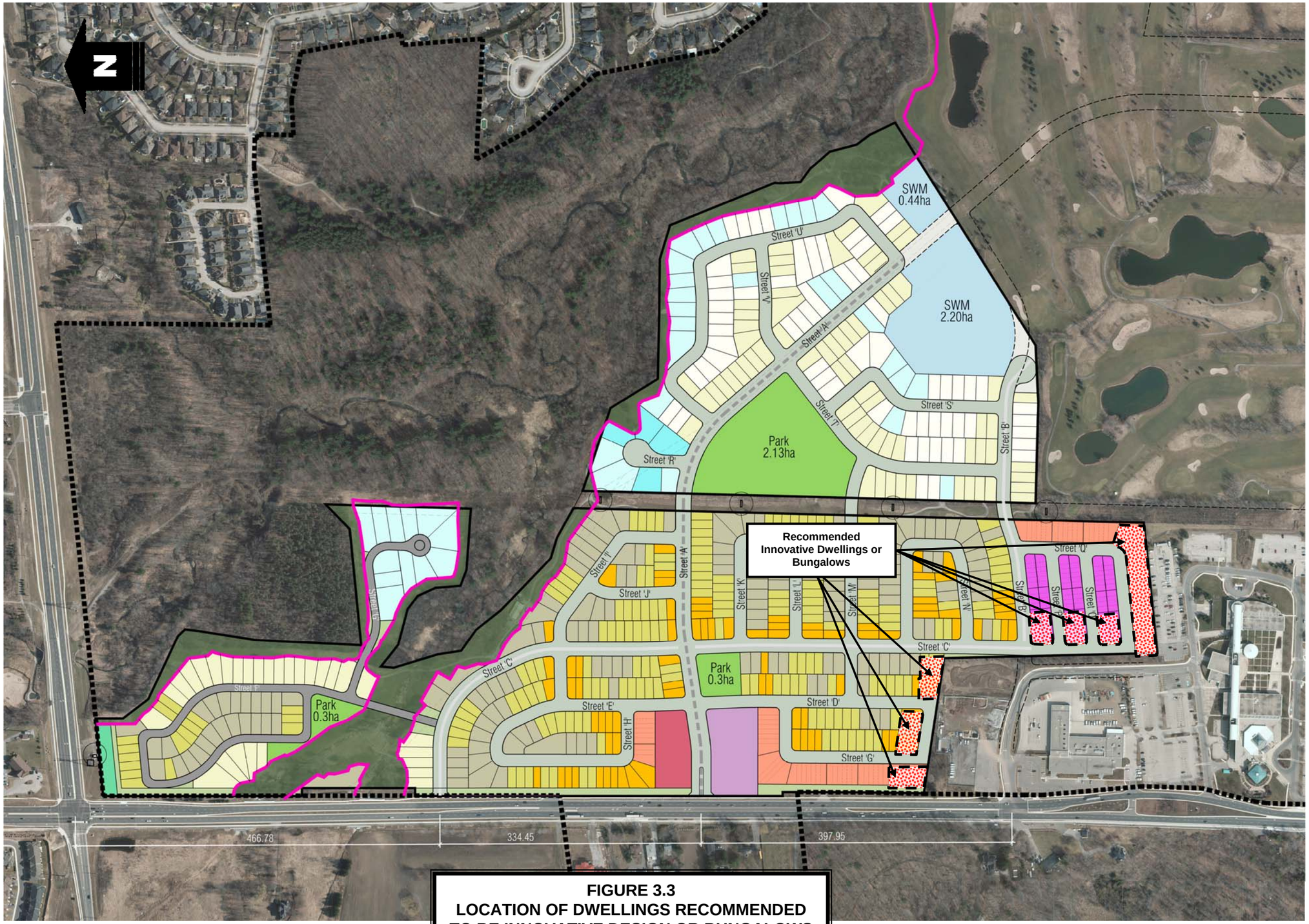


FIGURE 3.3
LOCATION OF DWELLINGS RECOMMENDED TO BE INNOVATIVE DESIGN OR BUNGALOWS

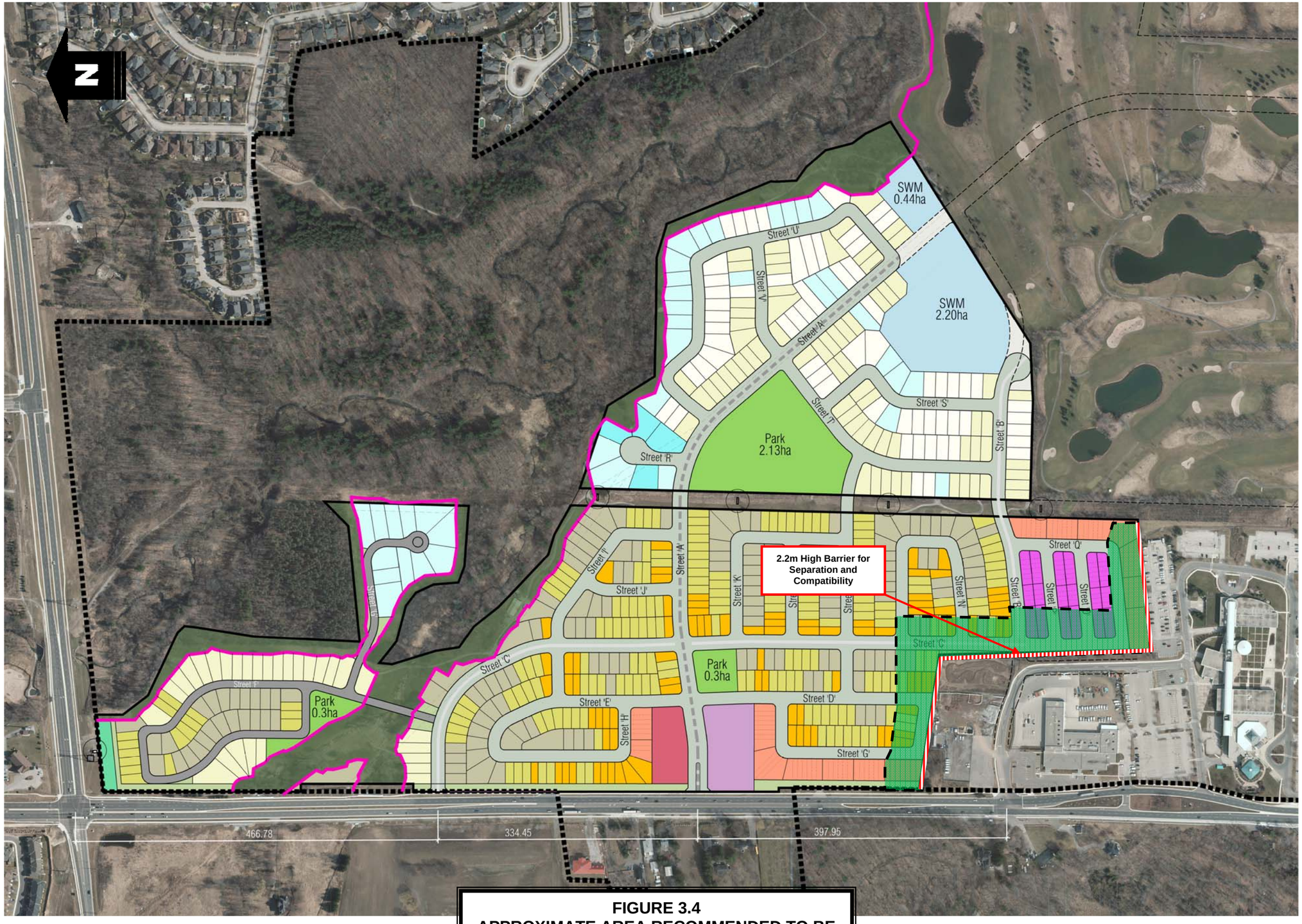


FIGURE 3.4
APPROXIMATE AREA RECOMMENDED TO BE CLASSIFIED AS MOE CLASS 4 AREA

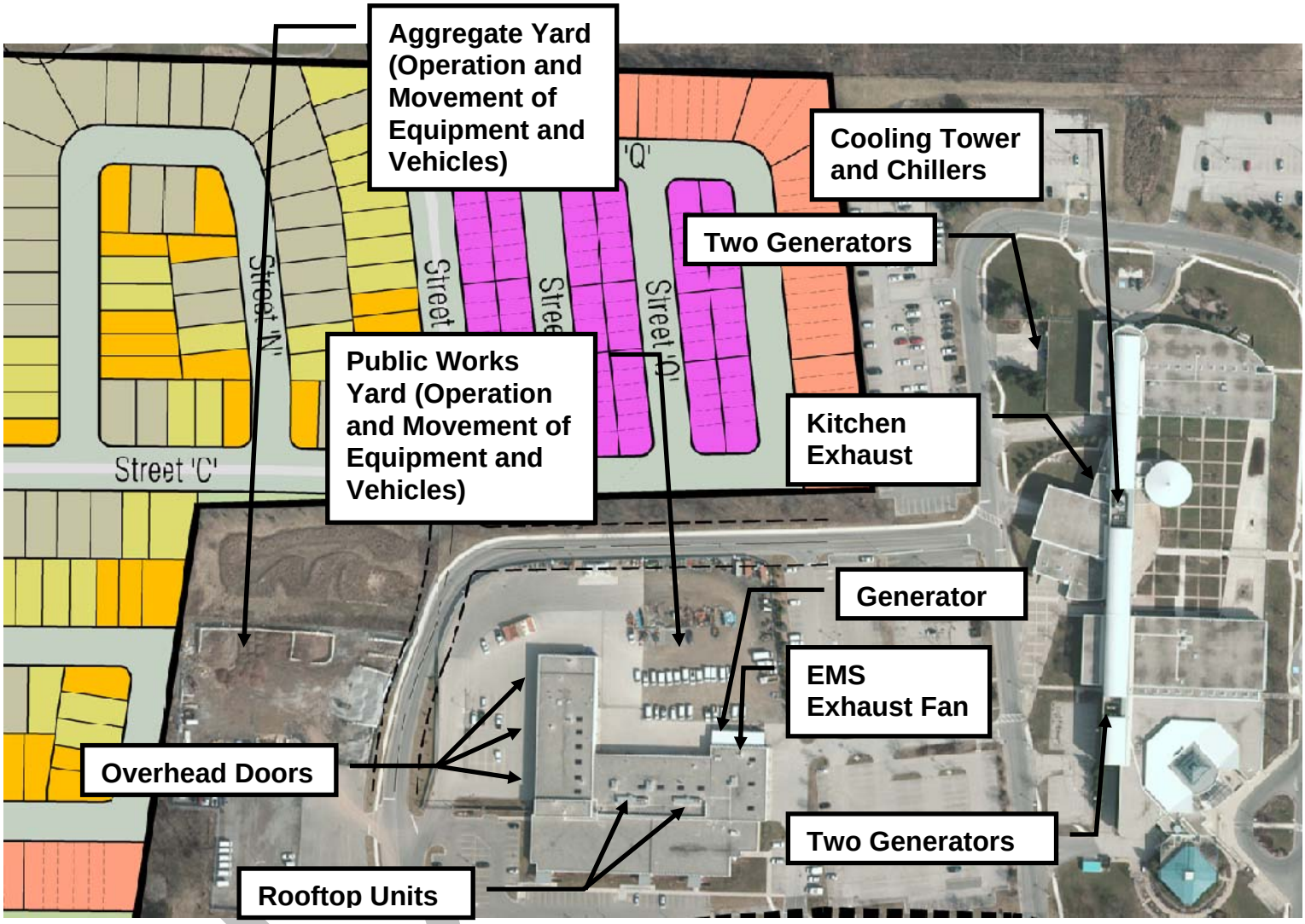


FIGURE 4
SOURCES OF NOISE FROM HALTON HQ

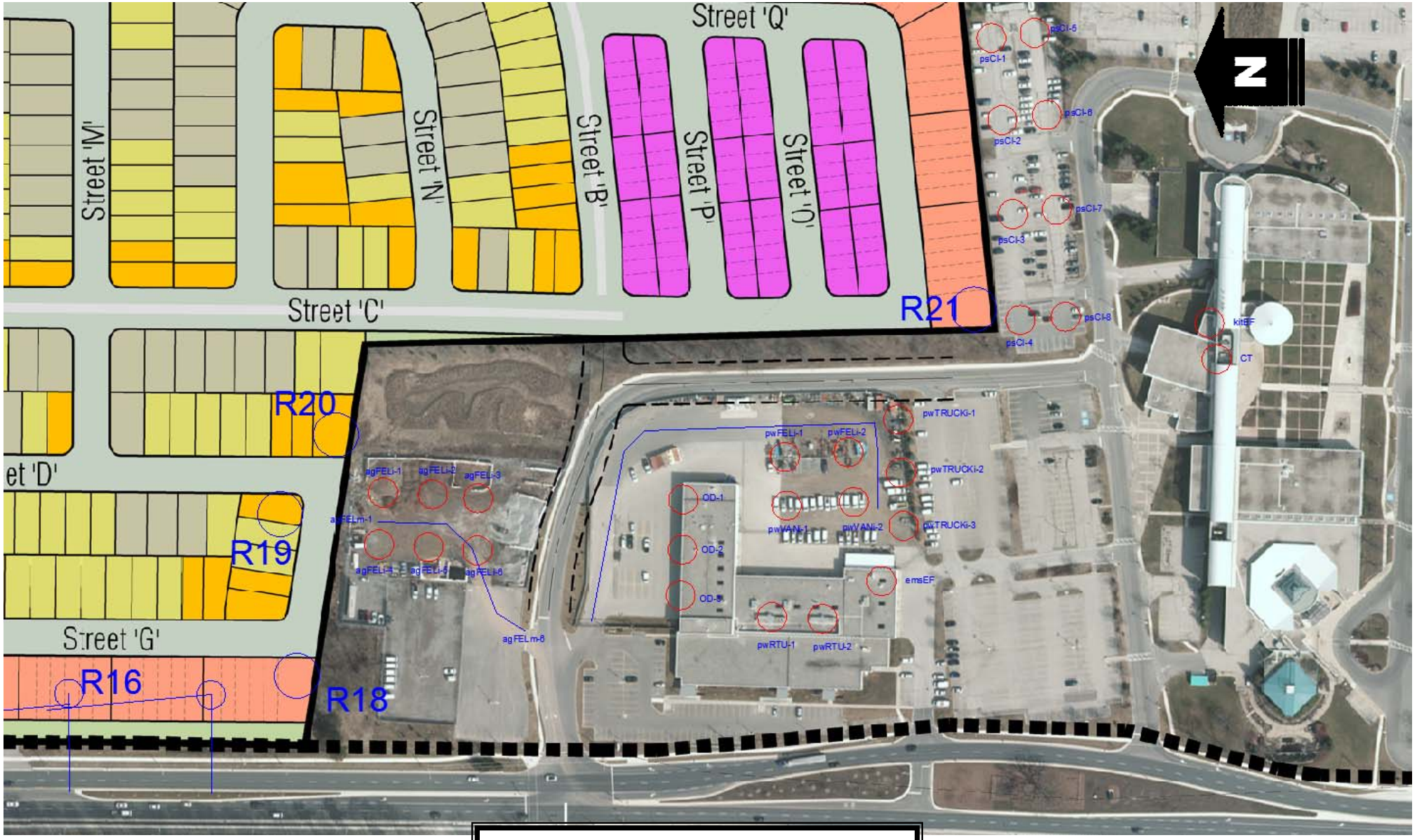


FIGURE 5
SOURCES OF NOISE TAKEN INTO ACCOUNT IN PREDICTIONS

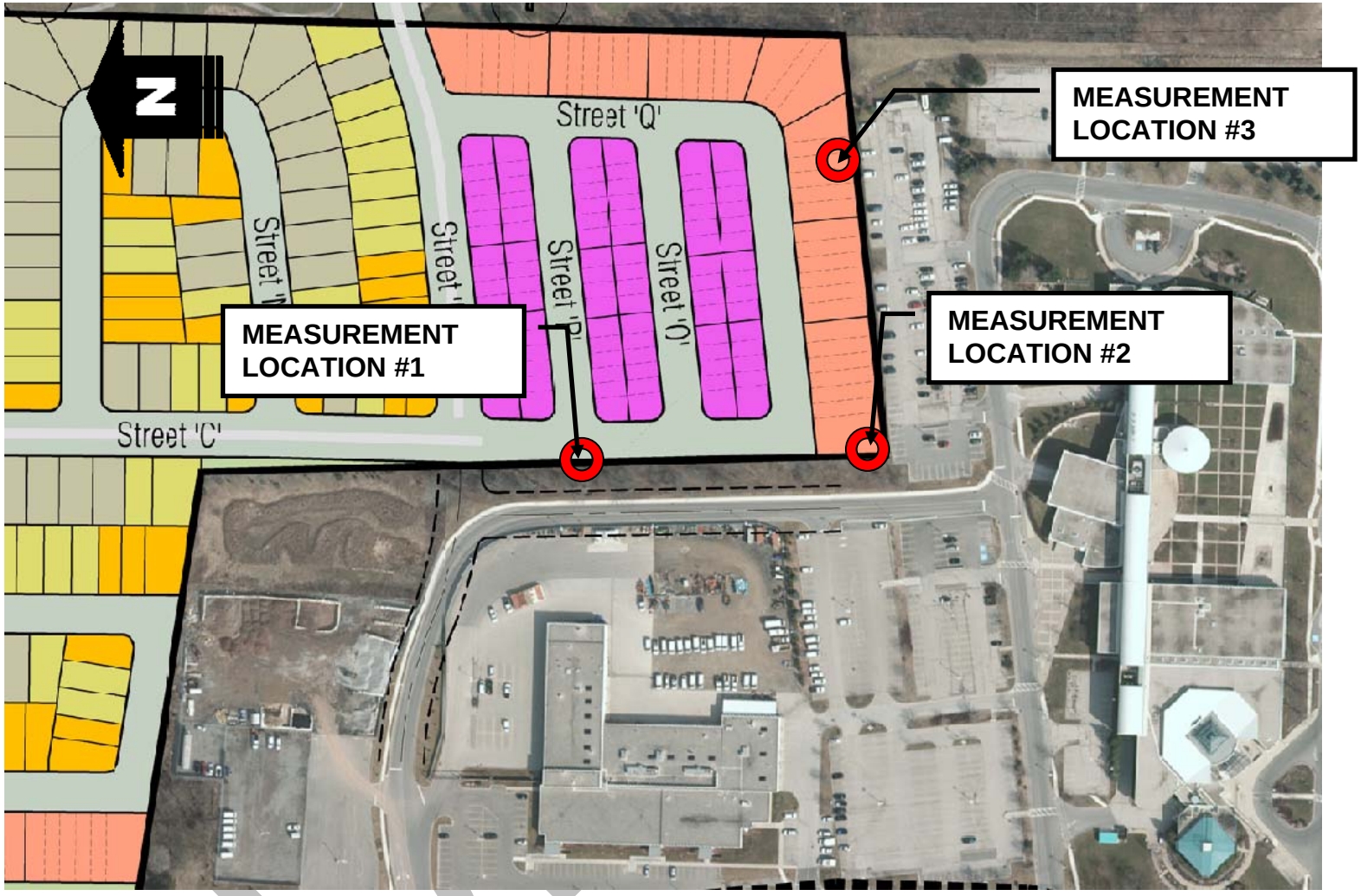


FIGURE 6
LOCATIONS OF LONG TERM MEASUREMENTS

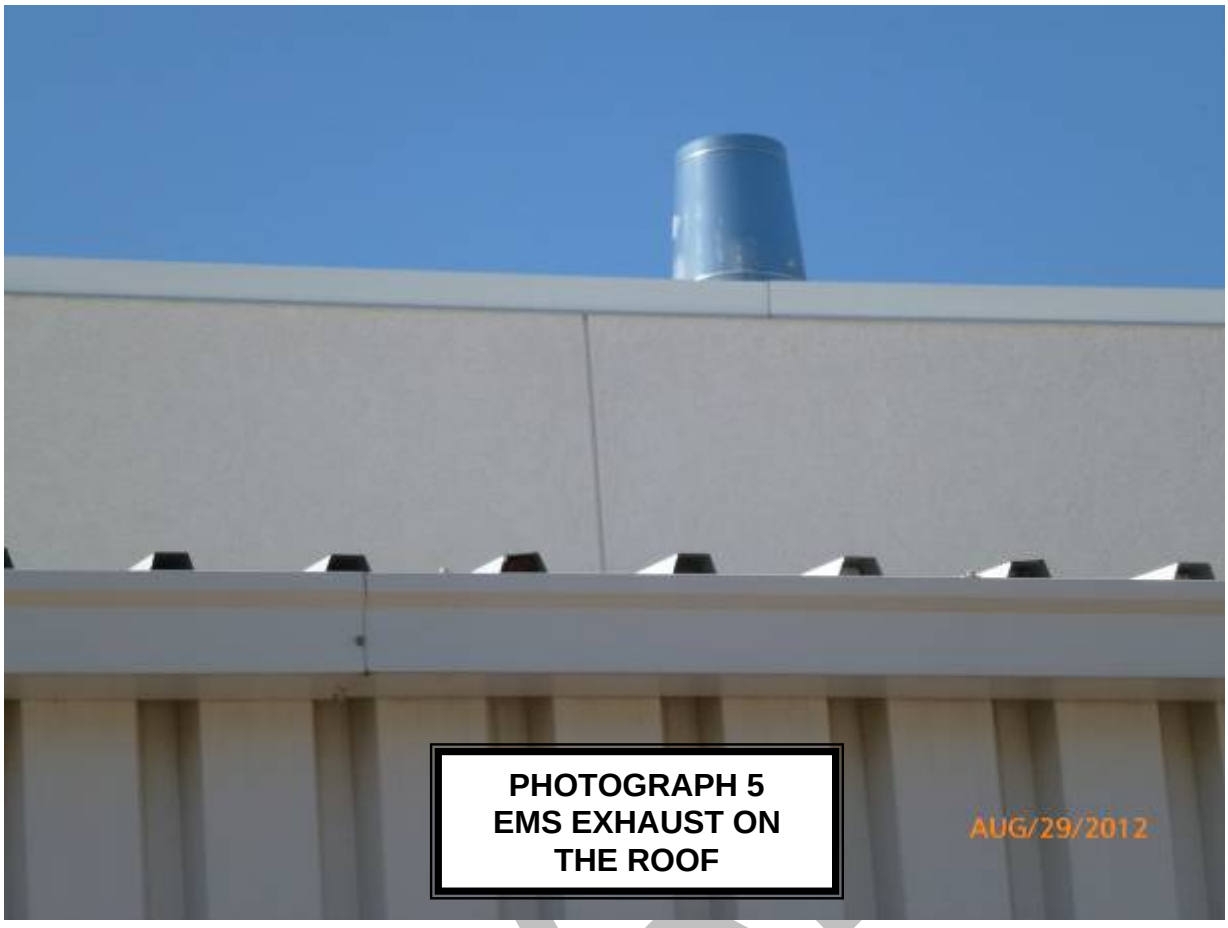
PHOTOGRAPHS

PHOTOGRAPH 1
HALTON REGION
AGGREGATE YARD

PHOTOGRAPH 2
HALTON REGION PUBLIC
WORKS YARD

PHOTOGRAPH 3
HALTON REGION PUBLIC WORKS YARD

PHOTOGRAPH 4
OVERHEAD DOORS TO REPAIR GARAGE

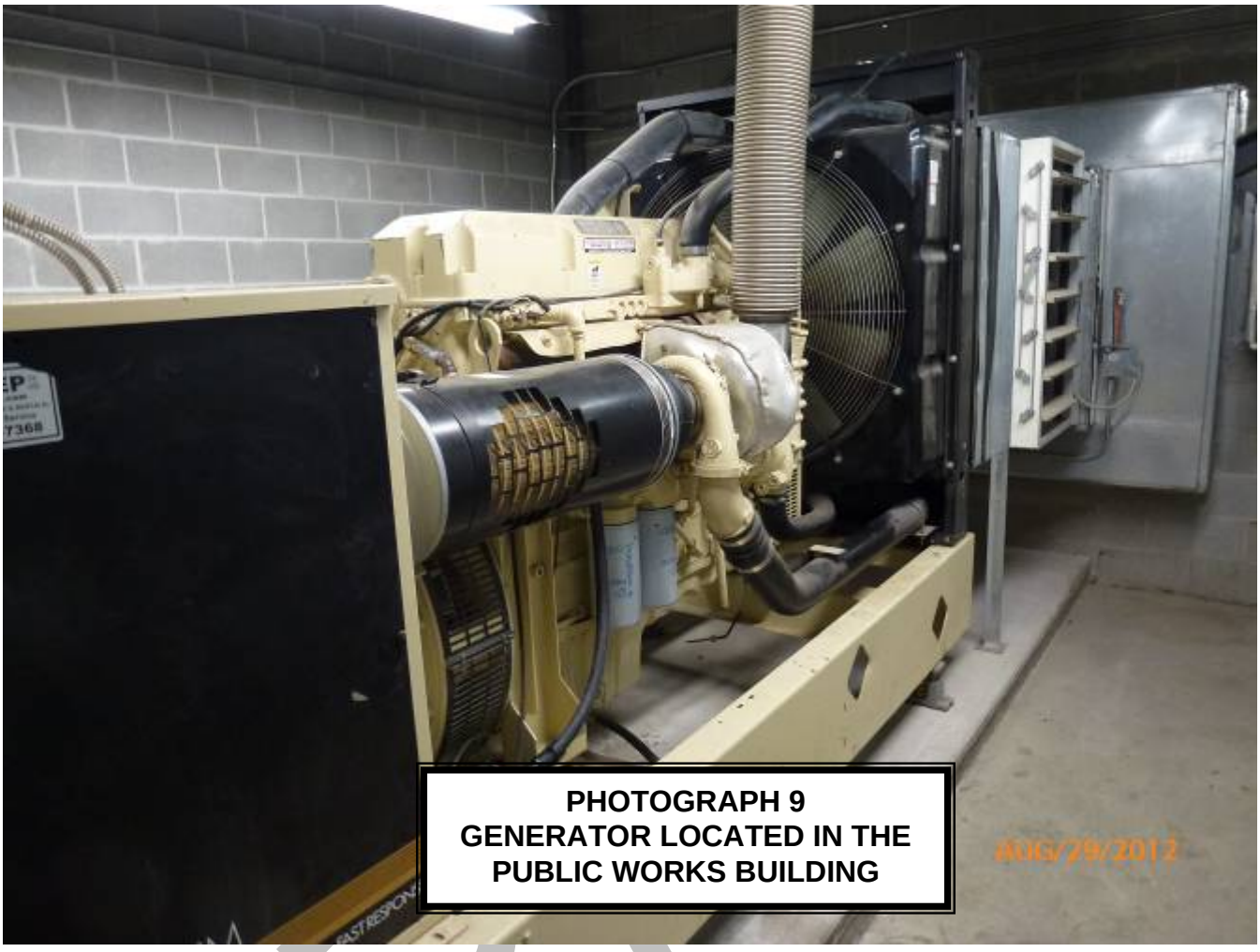


PHOTOGRAPH 5
EMS EXHAUST ON THE ROOF

PHOTOGRAPH 6
COOLING TOWER ON THE MAIN BUILDING

PHOTOGRAPH 7
CONDENSERS IN THE COOLING TOWER MECHANICAL ROOM

PHOTOGRAPH 8
KITCHEN EXHAUST FAN ON THE MAIN BUILDING

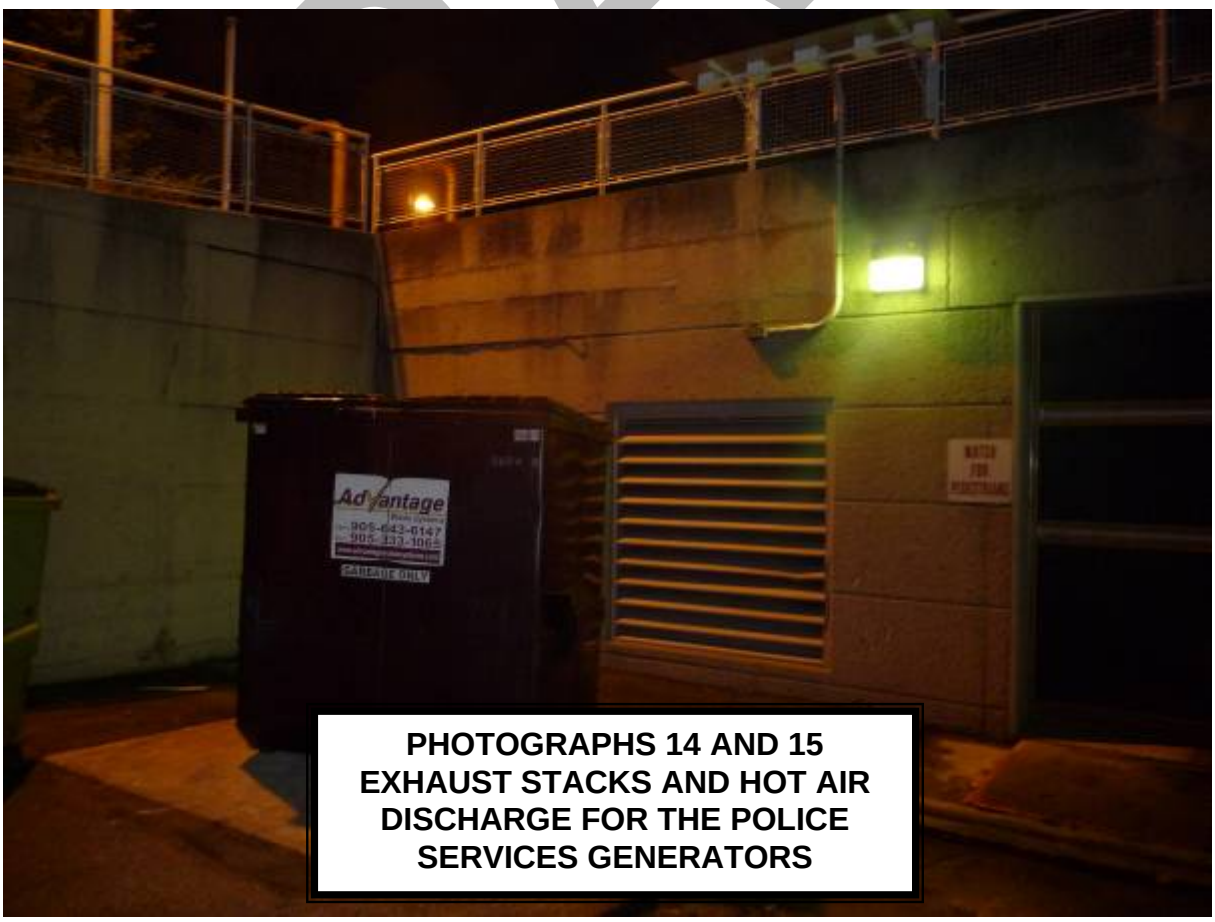


PHOTOGRAPH 9
GENERATOR LOCATED IN THE PUBLIC WORKS BUILDING

PHOTOGRAPHS 10 AND 11
HOT AIR DISCHARGE AND ROOF EXHAUST TO THE PWY GENERATOR


GENERAC
AUG/29/2012


GENERAC
AUG/29/2012



PHOTOGRAPHS 14 AND 15
EXHAUST STACKS AND HOT AIR DISCHARGE FOR THE POLICE SERVICES GENERATORS

APPENDIX A

ROAD TRAFFIC DATA

From: Dan Cherepacha
To: SS Wilson Associates - Info; "Mike Baldesarra"
Subject: Re: Bronte Green - Noise Shopping List
Date: Wednesday, October 31, 2012 12:23:06 PM

Traffic data for Bronte Green.

Existing Bronte Road ROW seems to vary. Regional OP will designate future requirement.

Based on an 8 hour turning movement count, existing AADT is estimated to be 28,500 vpd.

2031 AADT is forecast to be 50,000 vpd.

Existing truck percentages are 2.5% medium trucks and 3.8% heavy trucks. Assume same for 2031.

Current posted speed is 60 km/h, which can be expected to remain in place.

Dan Cherepacha

Read Voorhees and Associates
Phone 416-445-4360 (ext 1)
Fax 416-445-4809

email danc@rva.ca

Traffic data for Upper Middle Road.

Existing Upper Middle Road ROW appears to be 70 metres, but this includes a hydro corridor. Regional OP will designate future requirement, but doubtful if there would be any change on the south side.

Based on the 8 hour turning movement count, existing AADT is estimated to be 10,870 vpd.2031

AADT is forecast to be 27,850 vpd.

Existing truck percentages are 1.7% medium trucks and 1.7% heavy trucks. Assume same for 2031.

Current posted speed is 60 km/h, which can be expected to remain in place.

Dan Cherepacha

Read Voorhees and Associates
Phone 416-445-4360 (ext 1)
Fax 416-445-4809

email danc@rva.ca
----- Original Message -----

Prepared For: Halton Region

Prepared By: *PYRAMID* Traffic Inc.

Site ID: 102501

Location: REG. RD. #25 bw QEW WB & Upper Middle

Interval: 15 min.

Start Date: Thursday Sep 15, 2011

Period Ending	Channel 1 NB	Channel 2 SB	Hourly Summary	Period Ending	Channel 1 NB	Channel 2 SB	Hourly Summary
0:15	32	26		12:15	239	183	1532
0:30	43	20		12:30	242	175	1610
0:45	34	12		12:45	192	163	1581
1:00	16	15	198	13:00	185	198	1577
1:15	16	9	165	13:15	185	182	1522
1:30	18	7	127	13:30	178	187	1470
1:45	15	15	111	13:45	194	174	1483
2:00	12	8	100	14:00	188	184	1472
2:15	16	6	97	14:15	174	200	1479
2:30	11	6	89	14:30	197	195	1506
2:45	21	4	84	14:45	182	191	1511
3:00	8	5	77	15:00	222	225	1586
3:15	16	7	78	15:15	209	211	1632
3:30	11	9	81	15:30	292	210	1742
3:45	6	5	67	15:45	286	212	1867
4:00	9	11	74	16:00	259	222	1901
4:15	5	9	65	16:15	314	270	2065
4:30	11	8	64	16:30	329	356	2248
4:45	8	11	72	16:45	342	428	2520
5:00	16	19	87	17:00	373	441	2853
5:15	22	38	133	17:15	406	341	3016
5:30	37	44	195	17:30	456	312	3099
5:45	43	81	300	17:45	440	338	3107
6:00	54	82	401	18:00	356	316	2965
6:15	56	118	515	18:15	294	272	2784
6:30	81	157	672	18:30	299	228	2543
6:45	94	205	847	18:45	236	214	2215
7:00	119	298	1128	19:00	224	211	1978
7:15	163	209	1326	19:15	178	179	1769
7:30	211	327	1626	19:30	174	158	1574
7:45	214	445	1986	19:45	180	159	1463
8:00	179	411	2159	20:00	172	138	1338
8:15	199	398	2384	20:15	180	129	1290
8:30	175	409	2430	20:30	137	127	1222
8:45	183	390	2344	20:45	141	111	1135
9:00	164	387	2305	21:00	115	81	1021
9:15	140	264	2112	21:15	133	76	921
9:30	162	235	1925	21:30	116	76	849
9:45	156	213	1721	21:45	114	87	798
10:00	118	216	1504	22:00	102	64	768
10:15	119	192	1411	22:15	78	68	705
10:30	150	186	1350	22:30	67	60	640
10:45	156	156	1293	22:45	79	53	571
11:00	136	166	1261	23:00	93	41	539
11:15	150	180	1280	23:15	58	38	489
11:30	178	161	1283	23:30	64	45	471
11:45	176	208	1355	23:45	55	49	443
12:00	210	177	1440	0:00	56	43	408

AM Peak:	2430	PM Peak:	3107	24 HR VOLUME:	29140

Prepared For: Halton Region

Prepared By: *PYRAMID* Traffic Inc.

Site ID: 103812

Location: REG. RD. #38 bw Postmaster Drive and Third Ln

Interval: 15 min.

Start Date: Thursday Oct 20, 2011

Period Ending	Channel 1 EB	Channel 2 WB	Hourly Summary	Period Ending	Channel 1 EB	Channel 2 WB	Hourly Summary
0:15	6	19		12:15	124	111	865
0:30	3	22		12:30	88	108	865
0:45	4	18		12:45	110	102	847
1:00	5	5	82	13:00	82	113	838
1:15	6	8	71	13:15	94	93	790
1:30	2	8	56	13:30	103	100	797
1:45	1	7	42	13:45	94	129	808
2:00	4	3	39	14:00	71	107	791
2:15	4	5	34	14:15	78	106	788
2:30	3	7	34	14:30	112	118	815
2:45	5	2	33	14:45	111	113	816
3:00	5	2	33	15:00	146	153	937
3:15	3	4	31	15:15	103	198	1054
3:30	1	1	23	15:30	95	169	1088
3:45	3	4	23	15:45	104	187	1155
4:00	1	2	19	16:00	107	207	1170
4:15	4	2	18	16:15	109	182	1160
4:30	3	0	19	16:30	131	202	1229
4:45	8	2	22	16:45	131	209	1278
5:00	8	3	30	17:00	141	221	1326
5:15	15	4	43	17:15	148	264	1447
5:30	16	8	64	17:30	151	268	1533
5:45	25	5	84	17:45	116	244	1553
6:00	33	8	114	18:00	154	195	1540
6:15	42	7	144	18:15	158	210	1496
6:30	67	15	202	18:30	137	197	1411
6:45	96	20	288	18:45	106	175	1332
7:00	133	25	405	19:00	118	139	1240
7:15	129	34	519	19:15	101	152	1125
7:30	170	32	639	19:30	105	159	1055
7:45	255	53	831	19:45	86	134	994
8:00	287	100	1060	20:00	81	140	958
8:15	328	157	1382	20:15	61	128	894
8:30	176	128	1484	20:30	76	103	809
8:45	193	95	1464	20:45	59	109	757
9:00	221	99	1397	21:00	55	91	682
9:15	139	92	1143	21:15	58	95	646
9:30	123	67	1029	21:30	60	81	608
9:45	135	89	965	21:45	53	80	573
10:00	129	85	859	22:00	47	57	531
10:15	109	49	786	22:15	45	71	494
10:30	85	75	756	22:30	24	51	428
10:45	85	69	686	22:45	29	57	381
11:00	103	79	654	23:00	32	45	354
11:15	94	96	686	23:15	26	37	301
11:30	104	92	722	23:30	36	37	299
11:45	119	111	798	23:45	17	32	262
12:00	96	108	820	0:00	27	36	248

AM Peak:	1484	PM Peak:	1553	24 HR VOLUME:	16127

APPENDIX B

SAMPLE SOUND LEVEL CALCULATIONS

```
STAMSON 5.0        NORMAL REPORT        Date: 27-01-2014 13:14:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r1ola.te              Time Period: Day/Night 16/8 hours
Description: R1-Sound levels at Outdoor Living Area

Road data, segment # 1: Bronte Road (day/night)
-----------------------------------------------
Car traffic volume  : 43102/3748  veh/TimePeriod  *
Medium truck volume :  1150/100   veh/TimePeriod  *
Heavy truck volume  :  1748/152   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  50000
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :   0.00
    Medium Truck % of Total Volume      :   2.50
    Heavy Truck  % of Total Volume      :   3.80
    Day (16 hrs) % of Total Volume      :  92.00

Data for Segment # 1: Bronte Road (day/night)
---------------------------------------------
Angle1   Angle2           : -80.00 deg   30.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  43.00 / 43.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Bronte Road (day)
----------------------------------

Source height = 1.40 m

ROAD (0.00 + 67.76 + 0.00) = 67.76 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
-
-80     30   0.00  74.48   0.00  -4.57  -2.14   0.00   0.00   0.00  67.76
-------------------------------------------------------------------------
-

Segment Leq : 67.76 dBA

Total Leq All Segments: 67.76 dBA
```

```
Results segment # 1: Bronte Road (night)
----------------------------------------
Source height = 1.40 m

ROAD (0.00 + 60.17 + 0.00) = 60.17 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
-
-80     30   0.00  66.88   0.00  -4.57  -2.14   0.00   0.00   0.00  60.17
-------------------------------------------------------------------------
-

Segment Leq : 60.17 dBA

Total Leq All Segments: 60.17 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.76
                           (NIGHT): 60.17
```

```
STAMSON 5.0        NORMAL REPORT        Date: 27-01-2014 13:16:49
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r1dn.te              Time Period: Day/Night 16/8 hours
Description: R1-Sound Levels at Building Facade

Road data, segment # 1: Bronte Road (day/night)
-----------------------------------------------
Car traffic volume  : 43102/3748  veh/TimePeriod  *
Medium truck volume :  1150/100   veh/TimePeriod  *
Heavy truck volume  :  1748/152   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  50000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   2.50
    Heavy Truck  % of Total Volume     :   3.80
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Bronte Road (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  43.00 / 46.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: Upper Middle (day/night)
------------------------------------------------
Car traffic volume  : 24751/2152  veh/TimePeriod  *
Medium truck volume :   436/38    veh/TimePeriod  *
Heavy truck volume  :   436/38    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     2 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  27850
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   1.70
    Heavy Truck  % of Total Volume     :   1.70
    Day (16 hrs) % of Total Volume     :  92.00



Data for Segment # 2: Upper Middle (day/night)
```

```
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  72.00 / 88.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Bronte Road (day)
-----------------------------------
Source height = 1.40 m

ROAD (0.00 + 69.90 + 0.00) = 69.90 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
-
-90     90   0.00  74.48   0.00  -4.57   0.00   0.00   0.00   0.00  69.90
-------------------------------------------------------------------------
-

Segment Leq : 69.90 dBA

Results segment # 2: Upper Middle (day)
-----------------------------------
Source height = 1.14 m

ROAD (0.00 + 57.11 + 0.00) = 57.11 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
-
-90     90   0.66  69.87   0.00 -11.31  -1.46   0.00   0.00   0.00  57.11
-------------------------------------------------------------------------
-

Segment Leq : 57.11 dBA

Total Leq All Segments: 70.12 dBA

Results segment # 1: Bronte Road (night)
-----------------------------------
Source height = 1.40 m

ROAD (0.00 + 62.01 + 0.00) = 62.01 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
-
-90     90   0.00  66.88   0.00  -4.87   0.00   0.00   0.00   0.00  62.01
-------------------------------------------------------------------------
-

Segment Leq : 62.01 dBA
```

```
Results segment # 2: Upper Middle (night)
-----------------------------------------
Source height = 1.14 m

ROAD (0.00 + 48.81 + 0.00) = 48.81 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
-
-90     90   0.58  62.28   0.00 -12.15  -1.32   0.00   0.00   0.00  48.81
-------------------------------------------------------------------------
-

Segment Leq : 48.81 dBA

Total Leq All Segments: 62.21 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 70.12
                           (NIGHT): 62.21
```

APPENDIX C

SAMPLE MEASUREMENTS

SS WILSON ASSOCIATES
***Consulting Engineers*, Richmond Hill, Ontario**

MEASURED/PREDICTED 1/3 OCTAVE BANDS SOUND LEVELS

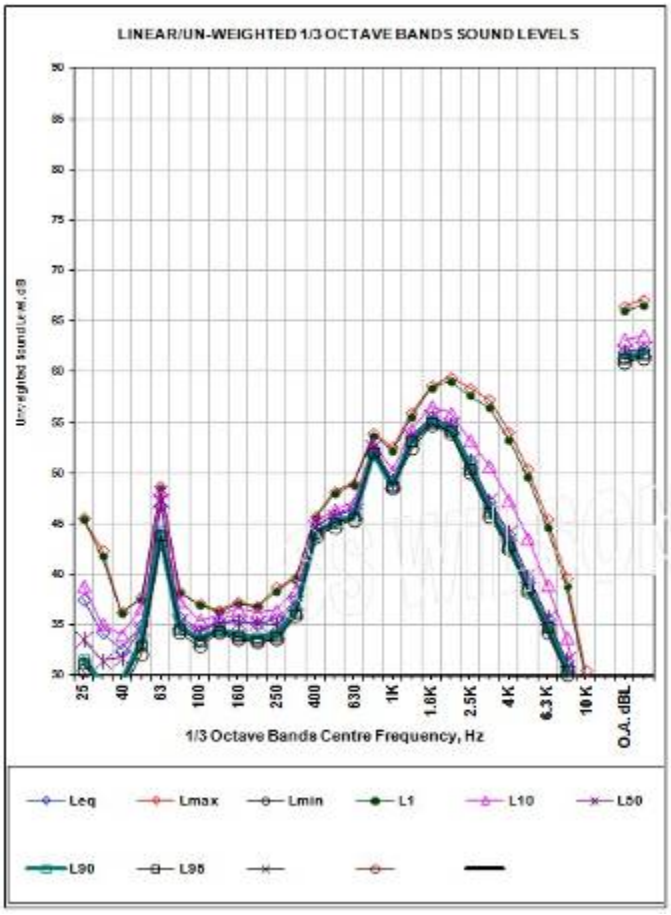
File No. : WA12-032
Project : Saw Whet Lands

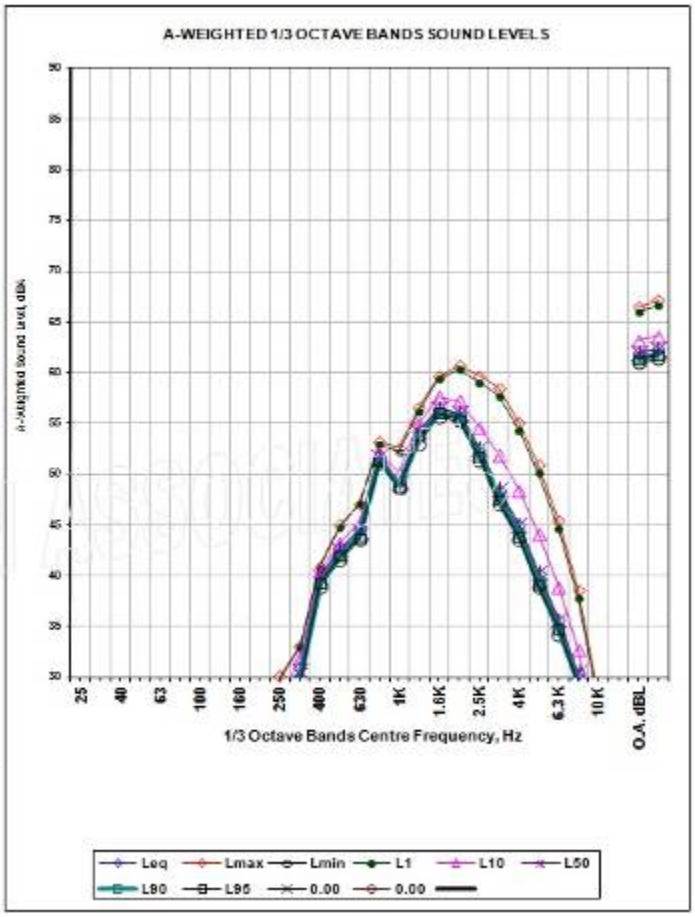
Source Name: EMS Fan

SLM Mem.Code: M-50

Other Data: 30m from exhaust
.....
.....
.....

1/3 OCTAVE BANDS





SS WILSON ASSOCIATES
***Consulting Engineers*, Richmond Hill, Ontario**
MEASURED/PREDICTED 1/3 OCTAVE BANDS SOUND LEVELS

File No. : WA12-032
Project : Saw Whet / Bronte Green Subdivision

Source Name: Penthouse Louver
Source Tag/ID: .....
Source Location: Rooftop, middle of the building (approx.)
Source Type: HVAC
Other Description: .....

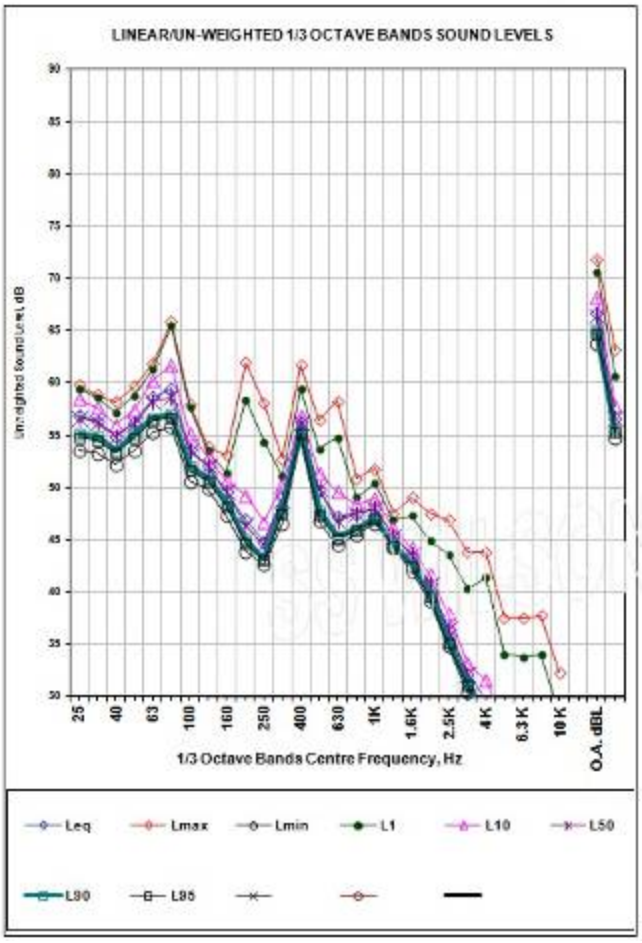
Opening/Duct Size: .....
Opening Direction: .....
Opening/Source Ht.: .....
Above: .....

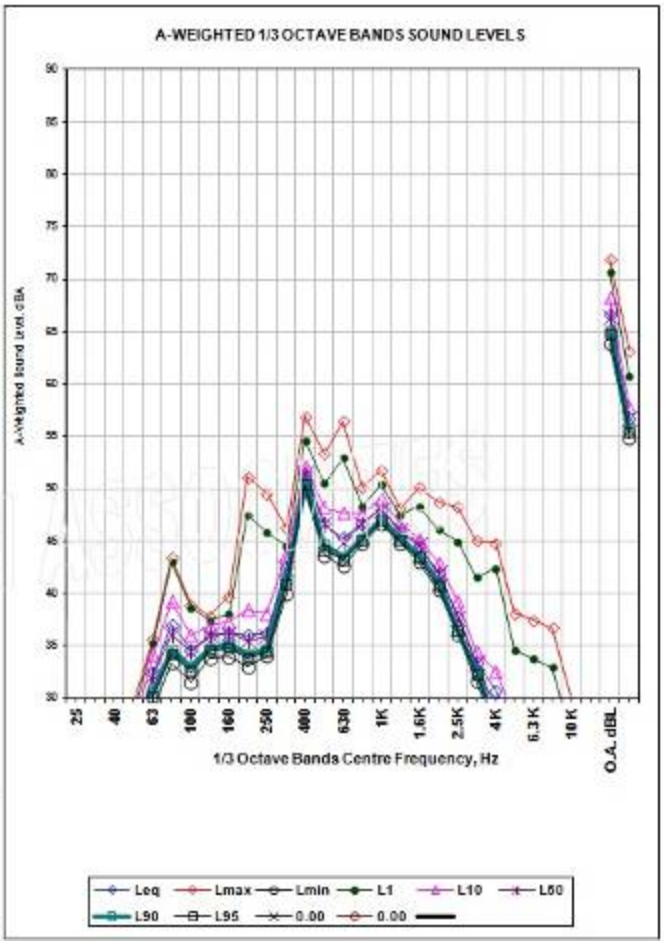
Measurement Date: October 26, 2012 (5:45am!)
SLM Mem.Code: M-01

Tonality,..etc .....
Condition of Source: .....

Other Data: Ambient Present
Use L90
56m, N of middle entrance
.....

1/3 OCTAVE BANDS





SS WILSON ASSOCIATES
***Consulting Engineers*, Richmond Hill, Ontario**

MEASURED/PREDICTED 1/3 OCTAVE BANDS SOUND LEVELS

File No. : WA12-032
Project : Saw Whet / Bronte Green Subdivision

Source Name: Public Works Generator
Source Tag/ID: .....
Source Location: Rooftop, west die of the building
Source Type: HVAC
Other Description: .....

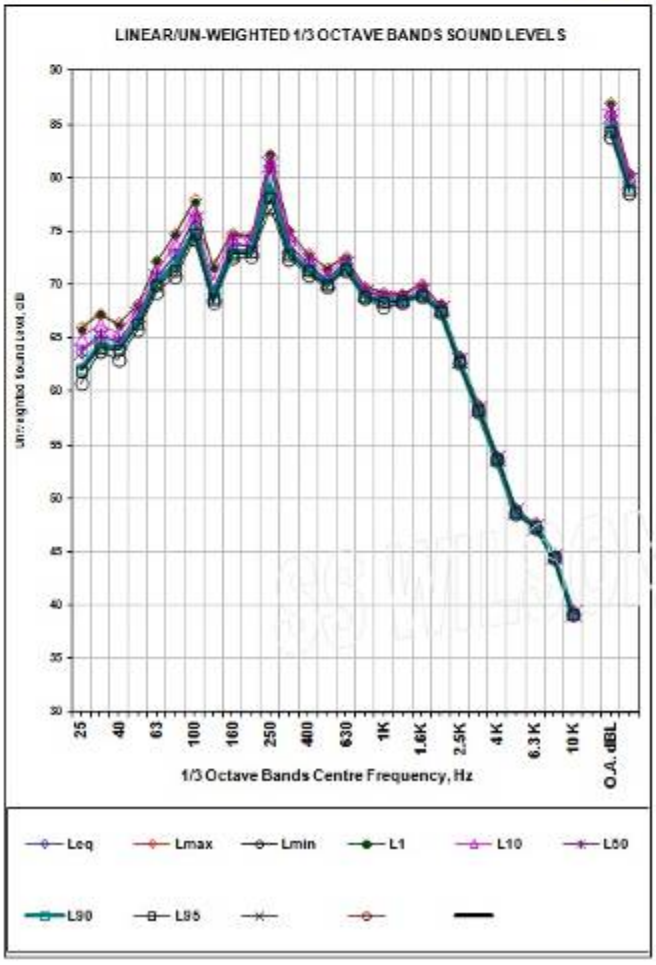
Opening/Duct Size: .....
Opening Direction: .....
Opening/Source Ht.: .....
Above: .....

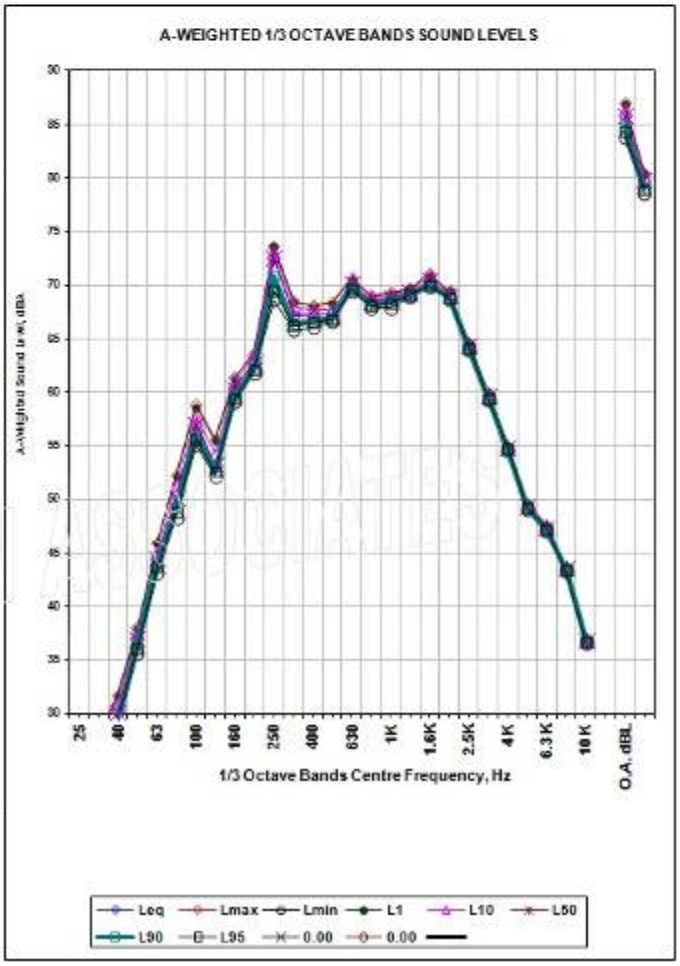
Measurement Date: October 26, 2012 (5:45am!)
SLM Mem.Code: M-06

Tonality,..etc .....
Condition of Source: .....

Other Data: Little Ambient Present
Use L90 or Lmin
7m from Hot Air louver
Some reflections

1/3 OCTAVE BANDS





SS WILSON ASSOCIATES
***Consulting Engineers*, Richmond Hill, Ontario**

MEASURED/PREDICTED 1/3 OCTAVE BANDS SOUND LEVELS

File No. : WA12-032
Project : Saw Whet / Bronte Green Subdivision

Source Name: Rooftop Generator #1
Source Tag/ID: .....
Source Location: Rooftop, west die of the building
Source Type: HVAC
Other Description: .....

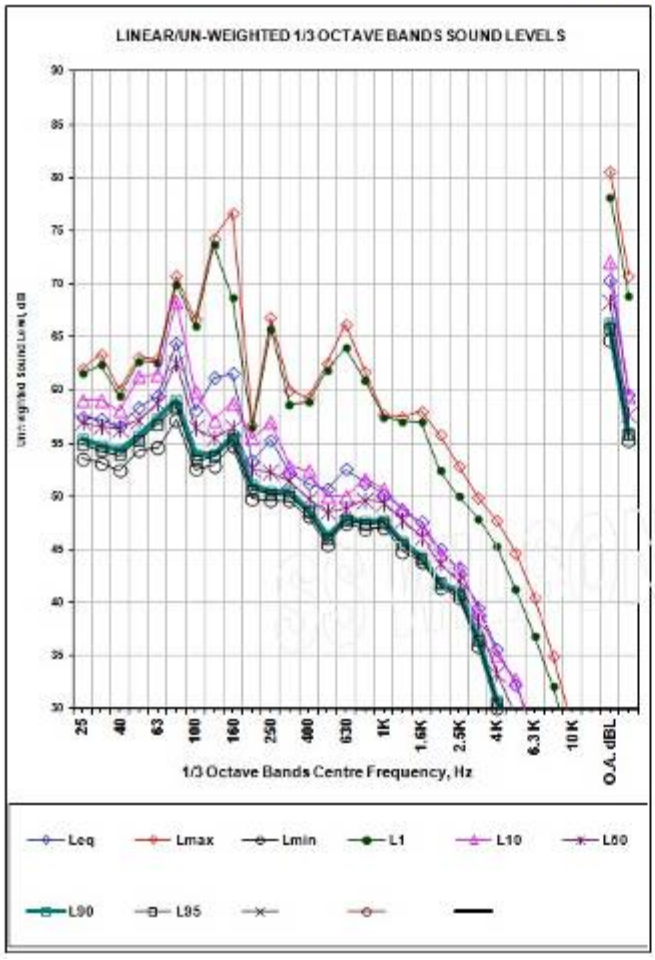
Opening/Duct Size: .....
Opening Direction: .....
Opening/Source Ht.: .....
Above: .....

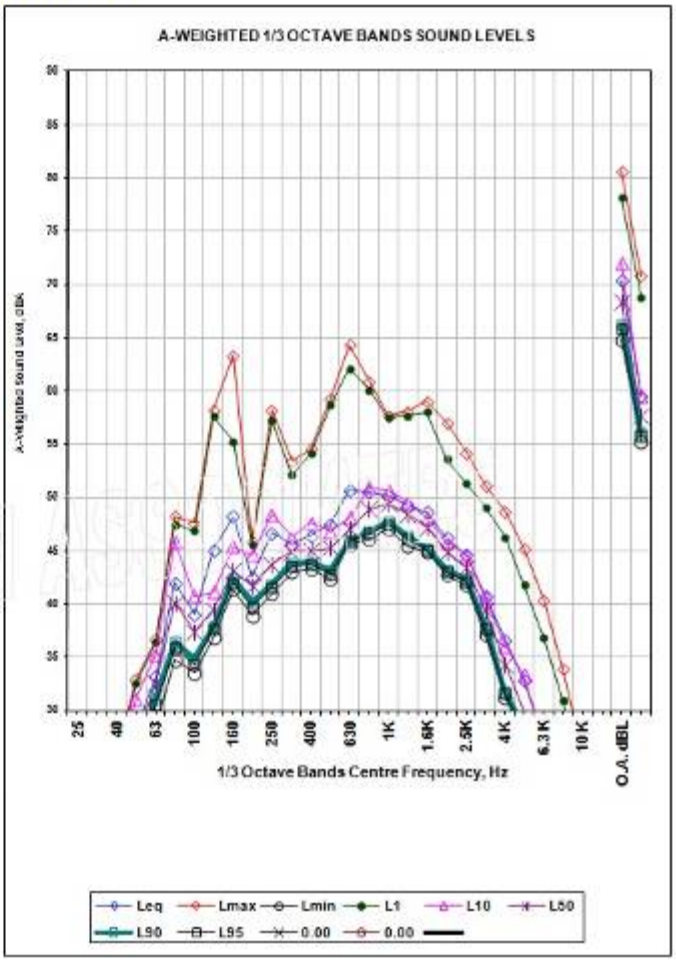
Measurement Date: October 26, 2012 (5:45am!)
SLM Mem.Code: M-03

Tonality,..etc .....
Condition of Source: .....

Other Data: Ambient Present
Use L90 or Lmin
25m from roof opening
.....

1/3 OCTAVE BANDS





SS WILSON ASSOCIATES
***Consulting Engineers*, Richmond Hill, Ontario**

MEASURED/PREDICTED 1/3 OCTAVE BANDS SOUND LEVELS

File No. : WA12-032
Project : Saw Whet / Bronte Green Subdivision

Source Name: Police Generator #1
Source Tag/ID: .....
Source Location: Rooftop, west die of the building
Source Type: HVAC
Other Description: .....

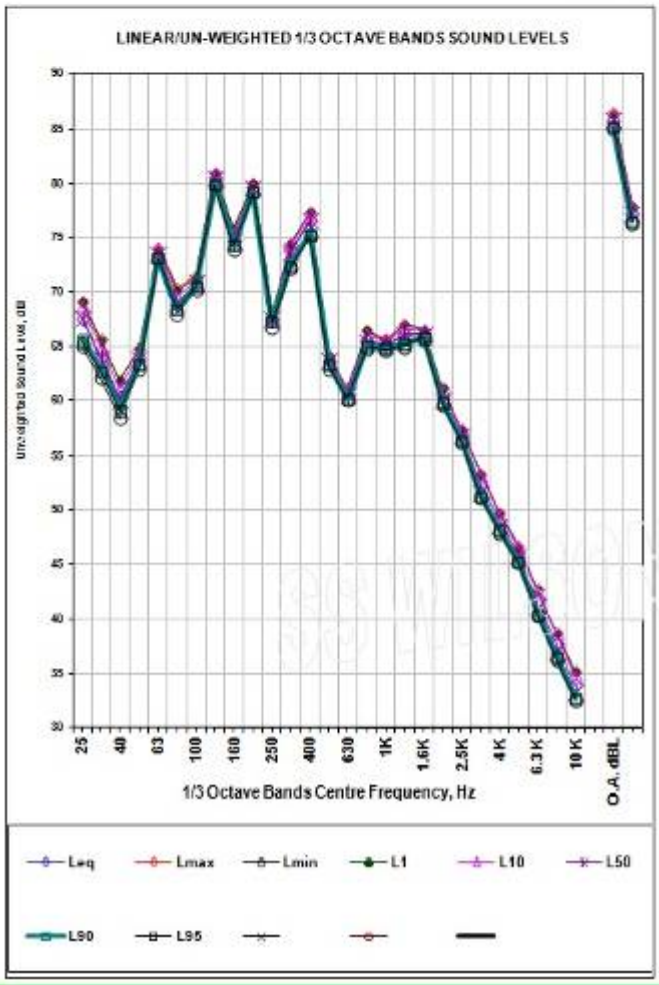
Opening/Duct Size: .....
Opening Direction: .....
Opening/Source Ht.: .....
Above: .....

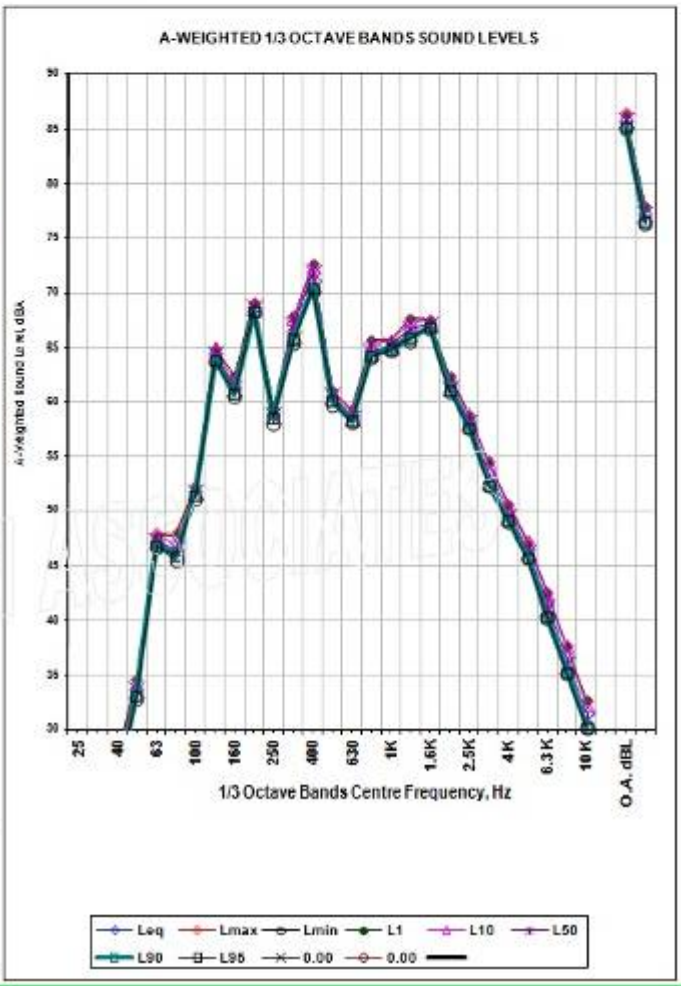
Measurement Date: October 26, 2012 (5:45am!)
SLM Mem.Code: M-08

Tonality,..etc .....
Condition of Source: .....

Other Data: Little Ambient Present
Use L90 or Lmin
7.5m east of Stacks

1/3 OCTAVE BANDS





SS WILSON ASSOCIATES
***Consulting Engineers*, Richmond Hill, Ontario**

MEASURED/PREDICTED 1/3 OCTAVE BANDS SOUND LEVELS

File No. : WA12-032
Project : Saw Whet / Bronte Green Subdivision

Source Name: Police Generator #1 Intake
Source Tag/ID: .....
Source Location: Rooftop, west die of the building
Source Type: HVAC
Other Description: .....

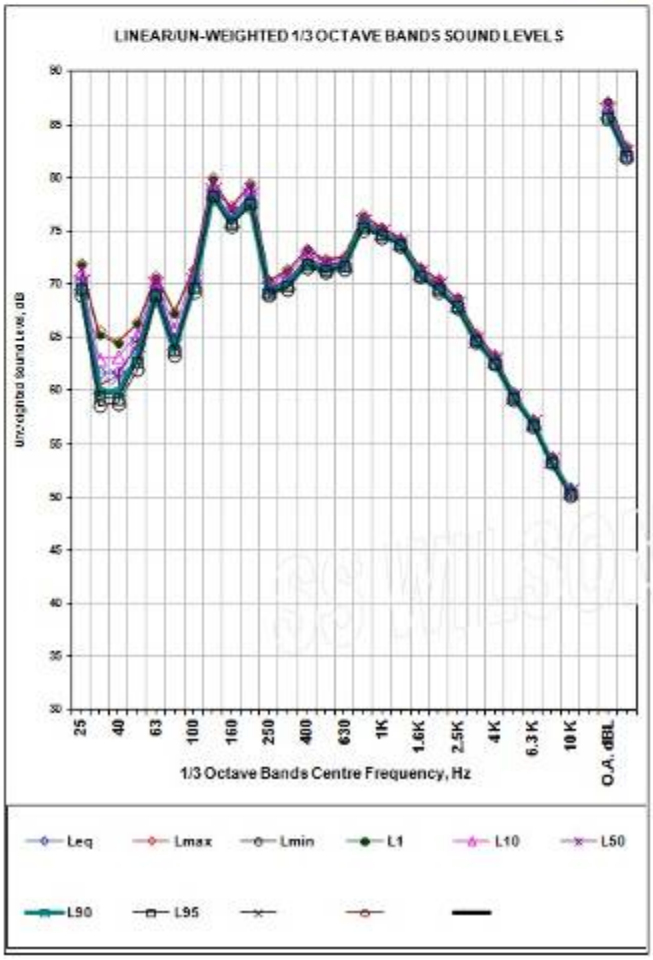
Opening/Duct Size: .....
Opening Direction: .....
Opening/Source Ht.: .....
Above: .....

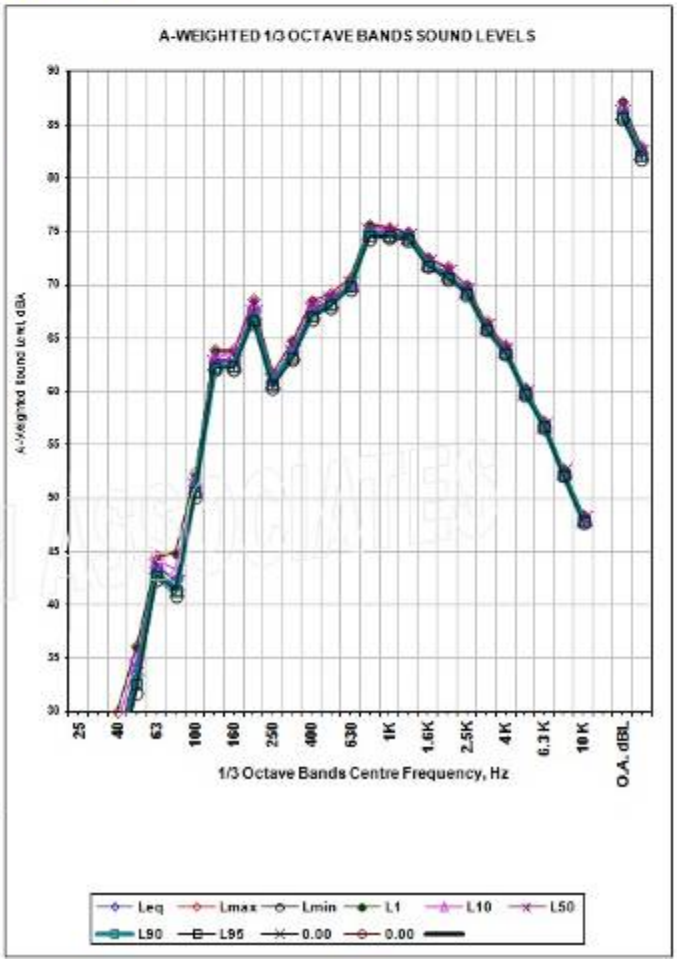
Measurement Date: October 26, 2012 (5:45am!)
SLM Mem.Code: M-09

Tonality,..etc .....
Condition of Source: .....

Other Data: Little Ambient Present
Use L90 or Lmin
7m east from intake
Intake Louver

1/3 OCTAVE BANDS





SS WILSON ASSOCIATES
***Consulting Engineers*, Richmond Hill, Ontario**

MEASURED/PREDICTED 1/3 OCTAVE BANDS SOUND LEVELS

File No. : WA12-032
Project : Saw Whet / Bronte Green Subdivision

Source Name: Police Generator #1 + #2
Source Tag/ID: .....
Source Location: Rooftop, west die of the building
Source Type: HVAC
Other Description: .....

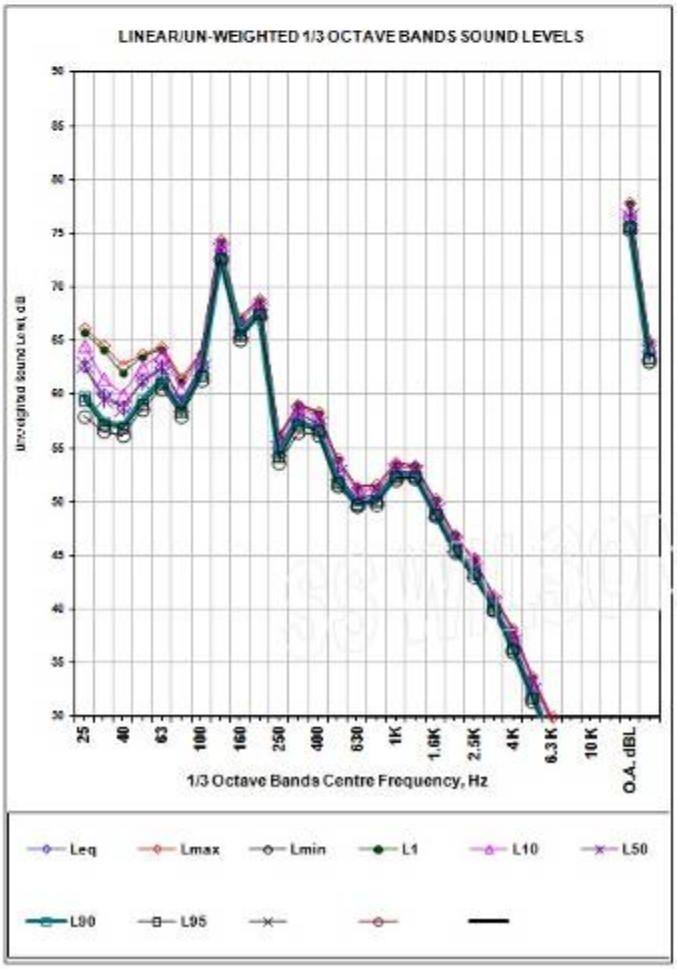
Opening/Duct Size: .....
Opening Direction: .....
Opening/Source Ht.: .....
Above: .....

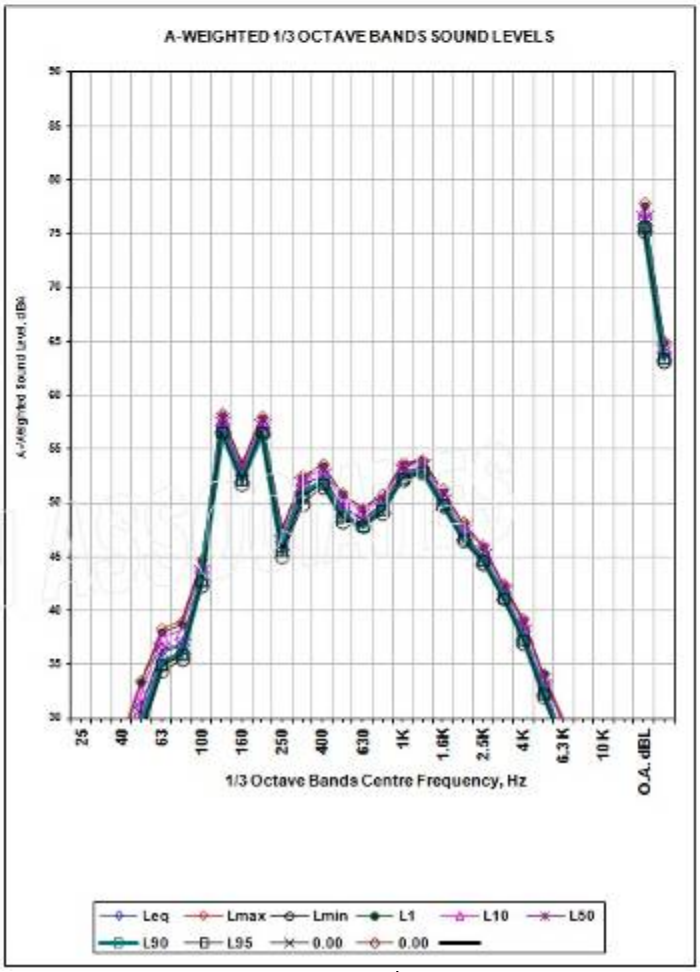
Measurement Date: October 26, 2012 (5:45am!)
SLM Mem.Code: M-12

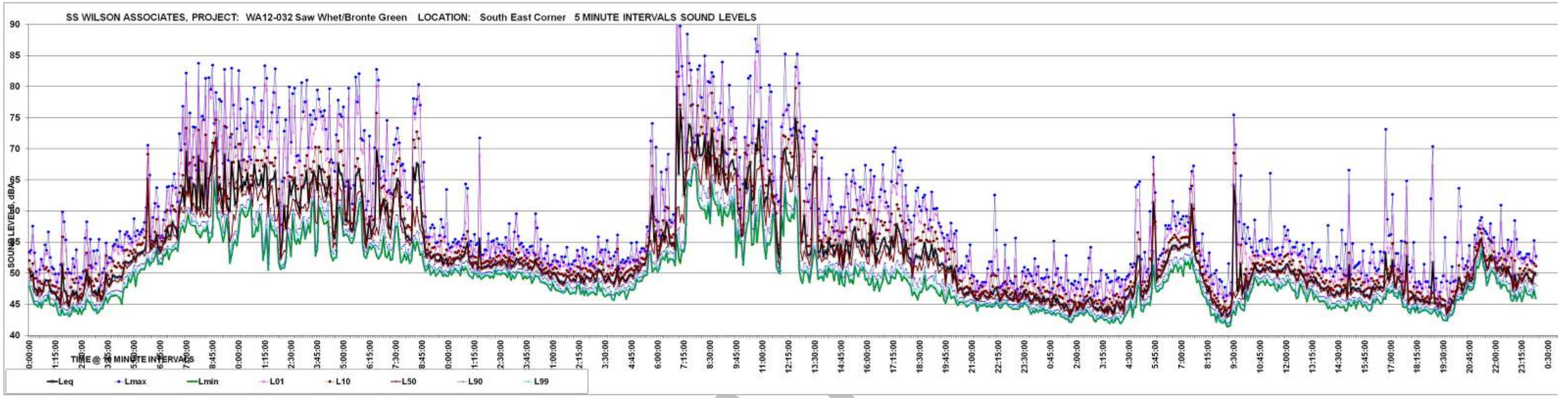
Tonality,..etc .....
Condition of Source: .....

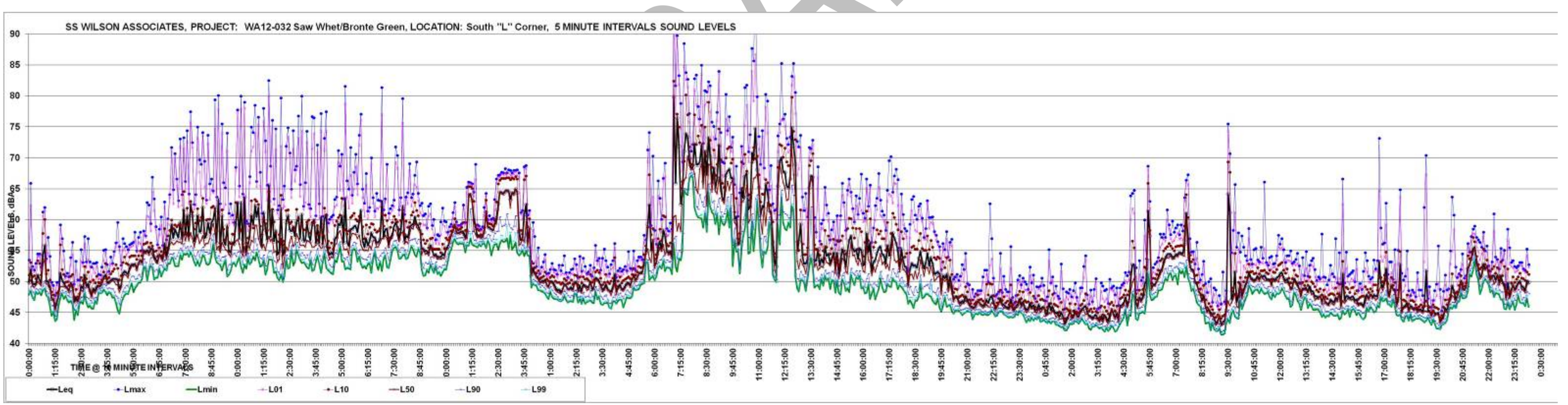
Other Data: Little Ambient Present
Use L90 or Lmin
Near PL directly north of Stacks
.....

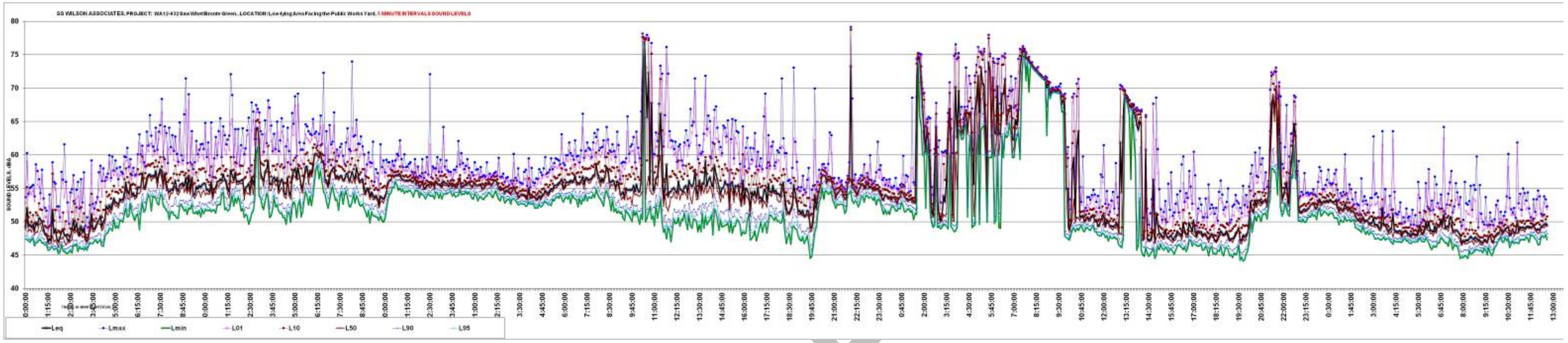
1/3 OCTAVE BANDS






SS WILSON ASSOCIATES, PROJECT: WA12-032 Saw Whet/Bronte Green LOCATION: South East Corner 5 MINUTE INTERVALS SOUND LEVELS
SOUND LEVELS, dBAs
TIME @ 15 MINUTE INTERVALS
Leq
Lmax
Lmin
L01
L10
L50
L90
L99


SS WILSON ASSOCIATES, PROJECT: WA12-032 Saw Whet/Bronte Green, LOCATION: South "L" Corner, 5 MINUTE INTERVALS SOUND LEVELS
SOUND LEVELS, dBAs
TIME @ 15 MINUTE INTERVALS
Leq
Lmax
Lmin
L01
L10
L50
L90
L99


SS WILSON ASSOCIATES, PROJECT: WA12-032 Saw Wheel Bronte Green, LOCATION: Low-lying Area Facing the Public Works Yard, 5 MINUTE INTERVALS SOUND LEVELS
SOUND LEVELS, dBA
80
75
70
65
60
55
50
45
40
Leq
Lmax
Lmin
L01
L10
L50
L90
L95