2019-07-18

**Jerzy Jurewicz**, OAA, ARIDO, AIA
Vice President
Edward J. Cuhaci and Associates Architects Inc.
171 Slater St., Suite 100, Ottawa, Ontario K1P 5H7
jerzyj@cuhaci.com
Telephone: 613-236 7135
Fax 613-236 1944
Cell 613-324 5576

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**Edward J. Cuhaci and Associates Architects Inc. – 700 Cope Drive Stittsville High School Noise Impact Study**

Dear Jerzy,

We are pleased to present the following traffic noise study for the new development of a new high school located at 700 Cope Avenue in Stittsville, Ontario, for which the City of Ottawa has requested a traffic noise study and a stationary noise study to be performed as stated in the pre-consultation meeting notes from February 20, 2019. This noise study is required by the City of Ottawa under the Environmental Noise Control Guidelines 2016 (ENCG), compliant with the Ministry of Environment's NPC-300.

This study considered two different acoustic concerns:

1) Traffic Noise Impact Study – the noise impact from the nearby traffic sources to the new high school
2) Stationary Noise Impact Study – the noise impact this new development will have the surrounding environment

This study analyzes, in part 2.0, the surrounding area using a scaled area plan and determines the noise impact of potential noise generating equipment on the high school property to the surrounding environment, with general recommendations on how to minimize this impact including recommended maximum equipment noise levels and equipment locations. We have also analyzed, in part 3.0, the predicted noise impact from traffic noise sources onto this development and have determined if there is a need for noise analysis and detailed building envelope component review. We have found the traffic noise levels at 4 PORs all to be above 55 dBA and further review of the building envelope is required so that the indoor noise criteria for the City of Ottawa Environmental Noise Control Guidelines is met.

If you have any questions, please do not hesitate to contact me.

Regards,

Jessica Kyoz, P.Eng.
Acoustic Consultant

Rebecca Sondermeyer
Acoustic Consultant

# 1.0 Introduction & Site Description

State of the Art Acoustik Inc. was commissioned by Edward J. Cuhaci and Associates Architects Inc. to complete a Phase 1 feasibility noise study as required by the City of Ottawa for the proposed new high school located at 700 Cope Drive in Stittsville, Ontario. We have followed the 2016 Environmental Noise Control Guidelines, which are complaint with the Ministry of Environment's NPC-300.

The proposed development consists of a 4 storey high school that is approximately 16m tall. It is located in a primarily residential area with existing and future residential planned.

## 1.1 Scaled Area Location Plan

Figure 1.1 and 1.2 below shows the location of the new high school, including the surrounding area and site plan. Adjacent noise sensitive buildings are residential houses or landed planned to be residential homes.


**Figure 1.1 –** Location of new Stittsville High School and surrounding area.

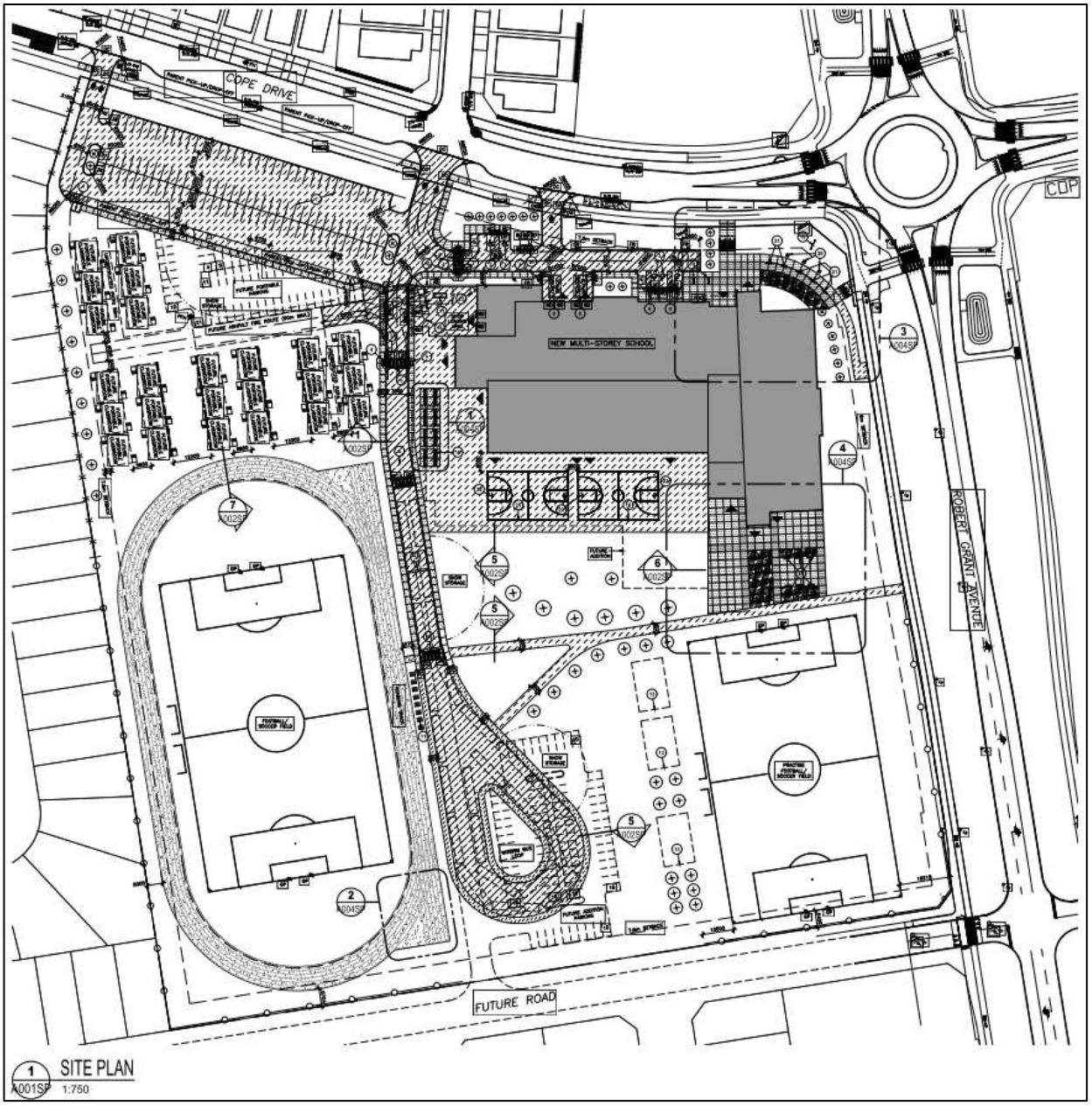



**Figure 1.2** – Site plan of Stittsville High School

# 2.0 Stationary Noise Impact Evaluation

In this section we provide our stationary noise assessment. Since this is a phase 1 feasibility noise study and no mechanical noise data is available, only general recommendations and guidelines will be provided.

## 2.1 City of Ottawa Noise Bylaw & Enviornmental Noise Guidelines for Environmental Noise

The City of Ottawa Noise Bylaw and ENCG have the same limit for daytime permissible Sound Pressure Level (SPL) at a noise sensitive location in a Class 1 area of 50 dBA. The Bylaw is to be used in conjunction with the City of Ottawa Environmental Noise Control Guidelines (ENCG), which are based on the Ministry of Environment NPC-300 Noise Control Guidelines. The City of Ottawa ENCG requires a 45 dBA SPL at night or ambient noise, whichever is higher. Therefore, when analyzing equipment for environmental noise studies, all non-emergency equipment in operation during the day and at night must meet the ENCG limit of 50 dBA during the day and 45 dBA at night.

## 2.2 Significant Noise Sources

No noise sources have been identified yet, but it is anticipated that there will be multiple rooftop units and potentially separate cooling equipment on the school roof, exhaust fans for the cafeteria and kitchen, a generator on grade and a dust collector for the shop area. We have assumed typical noise sources as described in section 2.4.

## 2.3 Points of Reception

As the school is surrounded by residential and future residential zoned land we will provide recommendations to the high school property line at 4.5m, the typical height of a second storey window of a typical residential home.

## 2.4 Calculations and Recommendations

**Recommended Equipment Locations**

Our primary recommendation is to locate noise sources on the south and west sides of the high school building as shown below in Figure 2.1 as there are outdoor facilities including the track and field areas that allow for a greater distance between the noise sources and the noise sensitive residential homes and the school will shield the noise from the equipment to the north and east residential homes. More detail recommendations regarding locations and noise level limits will be giving for specific equipment below relating to Figure 2.1.

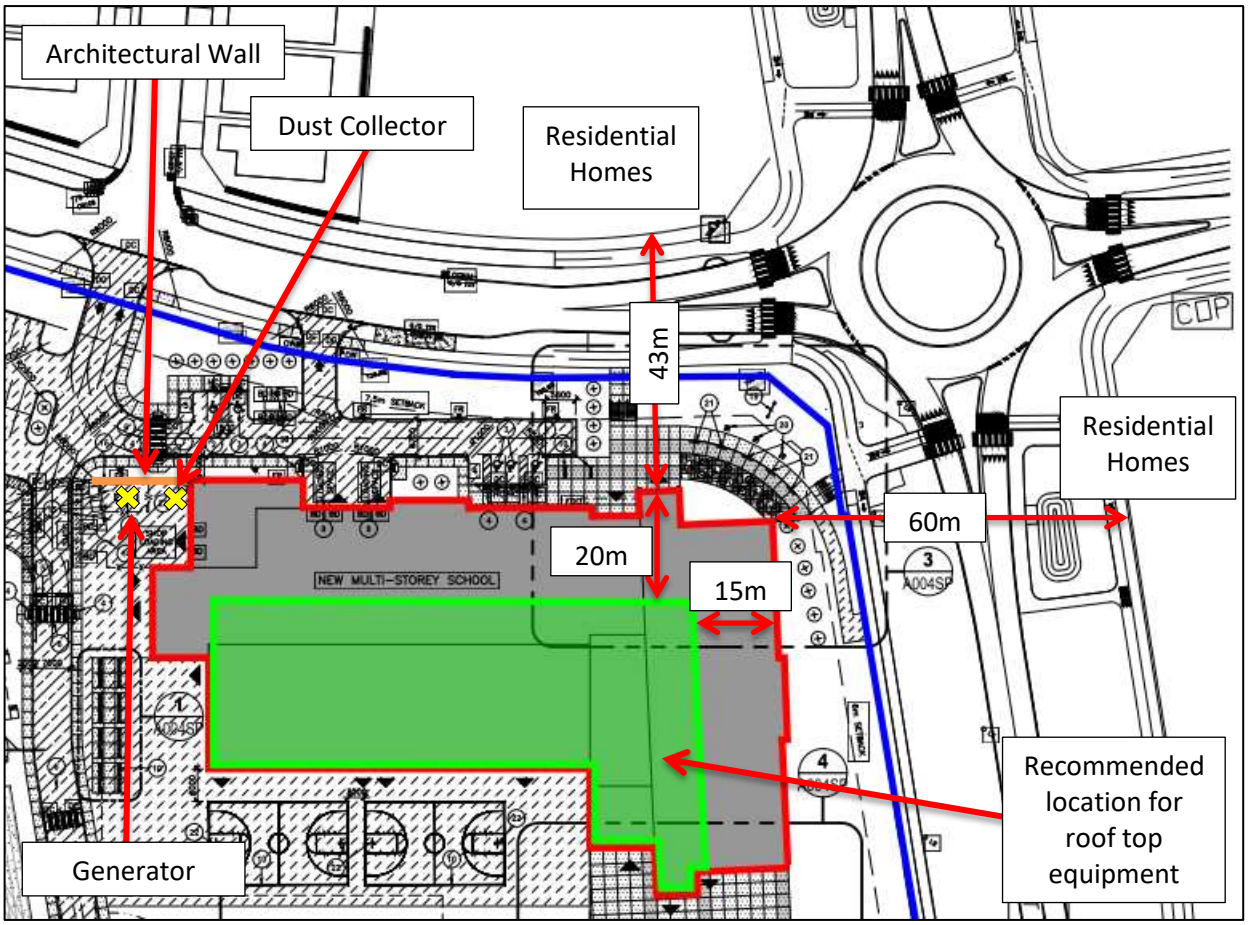



**Figure 2.1** – Recommended locations for noisy equipment

**Generator Recommendations**

The generator is to be located on-grade at the location shown in Figure 2.1 with a yellow X and has an acoustic enclosure with a 72dBA at 7m rating. At the current sound level and location with no barriers, the daytime noise level of 50 dBA at the nearby residential homes to the north will be exceeded. We recommend that the architectural wall(shown in orange on Figure 2.1) to the north of the generator be used as a sound barrier such that it is higher than the generator and built with materials with a density of 20kg/m2. Alternatively, a quieter acoustic enclosure of 68 dBA at 7m can be selected. If the

generator is located closer to residential homes and/or located such that it does not have the architectural wall to use as a barrier, a further improved acoustic enclosure will be needed. We recommend that the generator is tested during the day 7am-7pm before or after school starts.

**Dust Collector Recommendations**

Dust collectors are typically very noisy and not many manufacturers provide sound data. The dust collector selected must be from a manufacturer that can provide viable sound data. Further analysis is required once the dust collector design selection is made. The dust collector location is shown in Figure 2.1 with a yellow X. Since it is typically a tall piece of equipment, it will not be able to use the high school building for shielding. Because of this, we recommend the construction of an enclosure for the dust collector to limit the noise to the nearby residential home. The extent of the enclosure will depend on the sound level of the dust collector from the manufacturer.

**Rooftop Equipment Maximum Sound Power Levels**

This is a preliminary calculation of the total sound power level limit generated by the rooftop equipment, excluding the generator and dust collector, at 700 Cope Drive. This calculation assumes the majority of the noise producing equipment will be located within the area noted in the green area in figure 2.1 and consist of typical rooftop units with a total of 4 units each with a sound power of 89dBA. If equipment is placed elsewhere, the sound power level limit for the equipment will have to be reduced. If a chiller/dry cooler is required, it is recommended that it be located on the gym roof so that the higher roofs to the north and east can provide building shielding.

The green area for recommended locations for equipment as shown in Figure 2.1 was determined using the distances to the nearest residential to the north at 43m and nearest residential to the east at 60m and then set back a sufficient distance that the building edge provides shielding. Equipment on the north should be set back 20m and the equipment on the east should be set back 15m. This is the distance such you should no longer have line of sight of the equipment from the ground level, not including any architectural screen or similar item. If equipment is located outside of the green area, sound level limits will reduce and additional sound barriers may be required.

In order to meet the required 45 dBA at night and 50 dBA during the day, if there are up to 4 rooftop units, each unit should not exceed 89 dBA sound power level. If there are more than 4 units on the roof the sound power limit for each unit must be reduced. These calculations are based on point source sound power level propagation from a hemi-spherical radiation.

Careful consideration when selecting equipment is possible if all our recommendations are followed (and depending on possible dust collector sound levels) to provide a quiet enjoyment of space at the nearby residential areas. A detailed stationary noise study is required once mechanical noise data is available to review and confirm these requirements are met.

# 3.0 Traffic Noise Impact Study

The following section describes our analysis of the road noise impact on the proposed development at 700 Cope Drive.

## 3.1 City of Ottawa Environmental Noise Guidelines for Traffic Noise (Road & Rail)

This assessment uses the City of Ottawa - Environmental Noise Control Guidelines (ENCG), dated January 2016, to assess and mitigate noise from roads, transit ways, railways and aircraft. The maximum road and rail noise levels for indoor and outdoor living areas are taken from Table 2.2a, 2.2b and 2.2c of the ENCG and summarized in Table 3.1 below.

| Item | Type of Space | Time Period | Required Leq (dBA) | |
|---|---|---|---|---|
| | | | Road | Rail |
| Indoor Living Areas | Living/dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc. | 07:00 – 23:00 | 45 | 40 |
| | Living/dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres) | 23:00 – 07:00 | 45 | 40 |
| | Sleeping quarters | 07:00 – 23:00 | 45 | 40 |
| | | 23:00 – 07:00 | 40 | 35 |
| | General offices, reception areas, retail stores, etc. | 16 hours between 07:00 – 23:00 | 50 | 45 |
| | Theatres, places of worship, libraries, individual or semi-private offices, conference rooms, reading rooms, etc. | 16 hours between 07:00 – 23:00 | 45 | 40 |
| | Sleeping quarters of hotels/motels | 8 hours between 23:00 – 07:00 | 45 | 40 |
| | Sleeping quarters of residences, hospitals, nursing/retirement homes, etc. | 8 hours between 23:00 – 07:00 | 40 | 35 |
| Outdoor Living Areas | Backyards (single homes min 56m2, semi-detached min 46m2, row housing min 37m2) , balconies (min 4m depth), and common outdoor living areas for multi-storey apartment buildings or condos. | 16 hour, 07:00 – 23:00 | 55 | |

**Table 3.1 –** Criteria for Indoor Living Areas and Outdoor Living Areas Road and Rail Noise Levels

The ENCG states that noise control studies are to be prepared when the noise sensitive development is within the following setback distances from the road, highway and railway noise sources:

- 100m from an arterial road or a major collector, light rail corridor or bus rapid Transitway
- 250m from an existing or proposed highway
- 300m from a proposed or existing rail corridor or secondary main railway line
- 500m from a 400-series provincial highway or principle main railway line

Based on the requirements, a traffic noise study is required, and the school indoor living areas must meet 45 dBA between 07:00 – 23:00. Section 3.2 will detail the traffic noise sources included in the analysis and Section 3.3 will state the points of reception chosen for the school classroom addition.

No rail or aircraft noise sources are required to be part of the traffic noise study.

### 3.2 Traffic Noise Sources

There are three traffic noise sources within range. These three noise sources are: Cope Drive which is 31 meters away from the school, Robert Grant Avenue and the Transitway, which are both located 38 meters away from the school on the main level and 33 meters away on the second level as shown on Figures 3.1 and 3.2 on the next page. Table 3.2 below summarizes the road parameters which were used in this analysis.

| Road | Road Class | Posted Speed | AADT Vehicles/Day | Day/Night Split (%) | Medium Trucks (%) | Heavy Trucks (%) |
|---|---|---|---|---|---|---|
| Robert Grant Avenue | 4-Lane Urban Arterial-Divided (4-UAD) | 60 km/hr | 8750 per lane | 92/8 | 7 | 5 |
| Cope Drive | 2-Lane Major Collector (2-UCU) | 40 km/hr | 6000 per lane | 92/8 | 7 | 5 |
| Transitway (On Robert Grant Avenue) | 4-Lane Urban Arterial-Divided (4-UAD) | 80 km/hr | 3450 per lane | 92/8 | 100 | 0 |

**Table 3.2 –** Summary of Major Road Noise Source

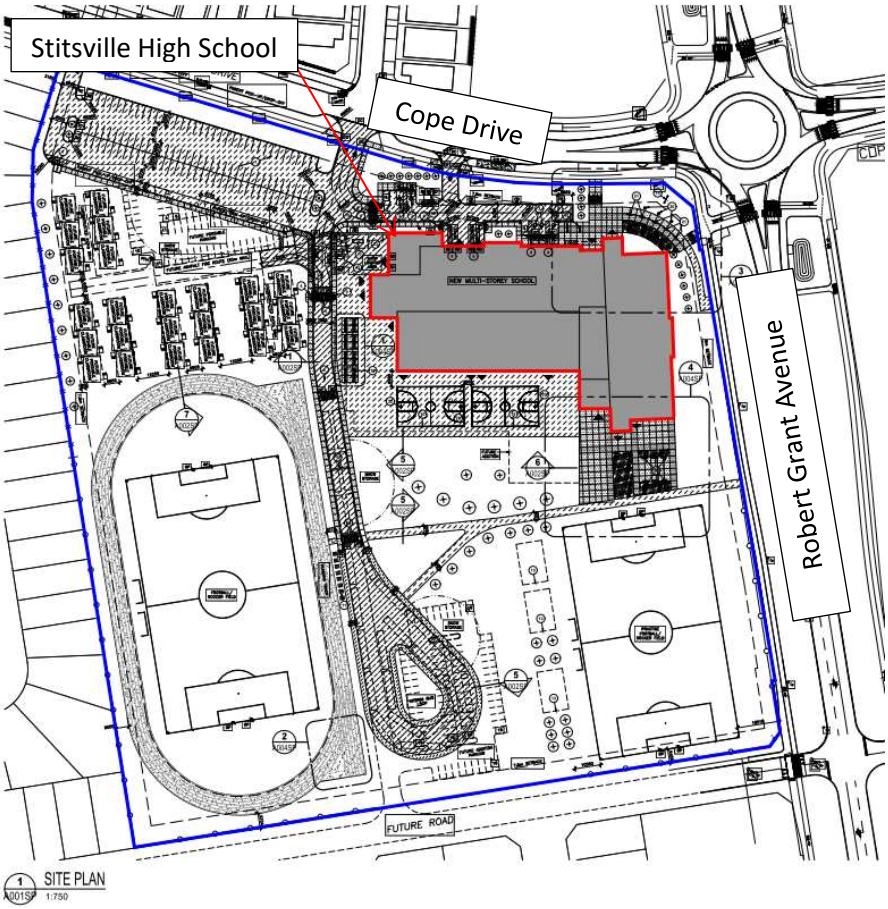



**Figure 3.1 –** Surrounding area of Stittsville High School with site plan.

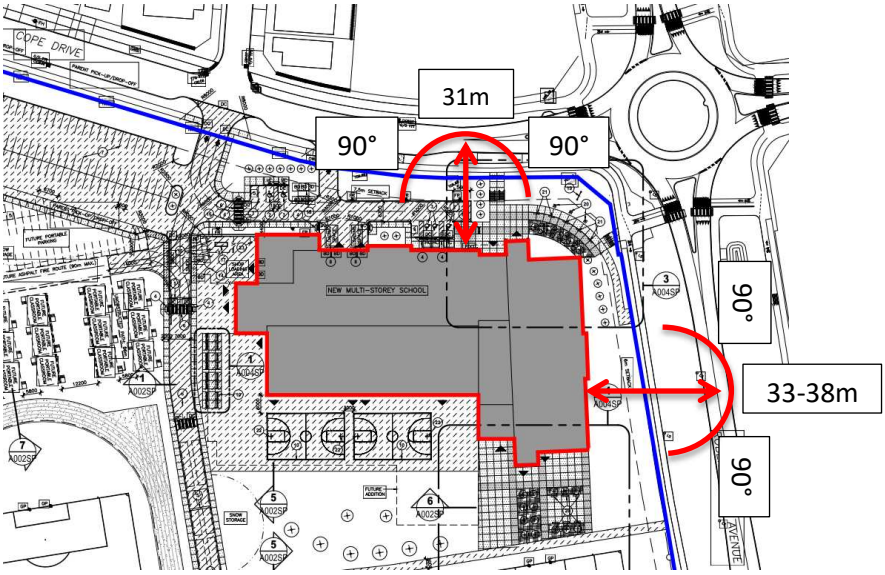



**Figure 3.2 –** Surrounding area of Stittsville High School with locations, distances and angles of relevant noise sources.

### 3.3 Points of Reception

To determine the worst case noise impact on the façade of the building, we have chosen the closest classroom on the first floor facing Cope Drive (POR1) 38 meters away, the closest classroom on the first floor facing Robert Grant Drive (POR2) 31 meters away, the closest classroom facing Cope Drive on the second floor (POR3) 31 meters away and the closest classroom on the second floor facing Robert Grant Drive (POR4) 33 meters away. POR heights are shown in figure 3.3 & 3.4 on a section of the building elevation. Figure 3.5 & 3.6 on the next page show the classroom space for POR1 – POR4. These are the worst case scenario locations for any location within the new high school. Table 3.3 below summarizes receiver heights and distances.

| Receiver | Height (m) | Distance from Source (m) | Angle to source segment from POR (left) | Angle to source segment from POR (right) |
|---|---|---|---|---|
| POR1 | 1.5 | 31 | 90° | 90° |
| POR2 | 1.5 | 38 | 90° | 90° |
| POR3 | 5.5 | 31 | 90° | 90° |
| POR4 | 5.5 | 33 | 90° | 90° |

**Table 3.3 –** Table of receiver height and distance from noise source.

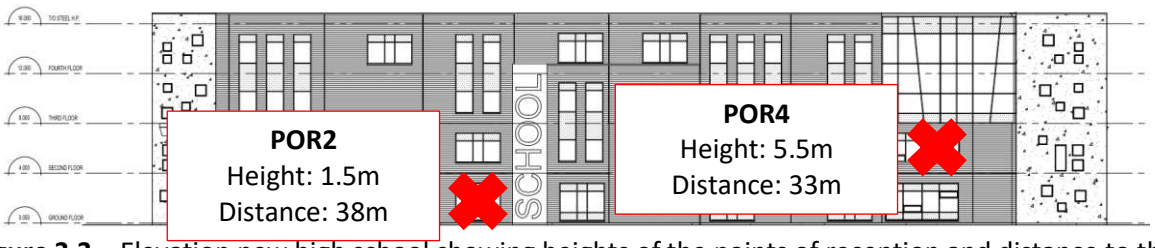



**Figure 3.3 –** Elevation new high school showing heights of the points of reception and distance to the Robert Grant Avenue.


**Figure 3.4 –** Elevation of new high school showing heights of the points of reception and distance to the Cope Drive.

There are no outdoor living areas on the high school; therefore there are no outdoor living area points of reception included in our analysis.

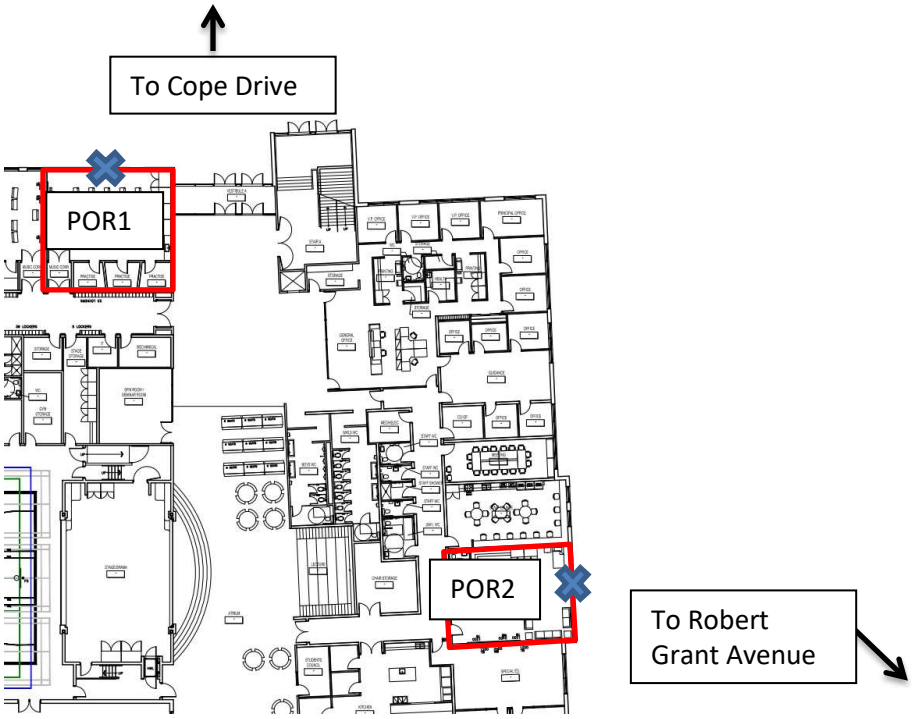



**Figure 3.5 –** Floor Plan of the ground floor showing the Plane of Window Point of Reception POR1 and POR2.

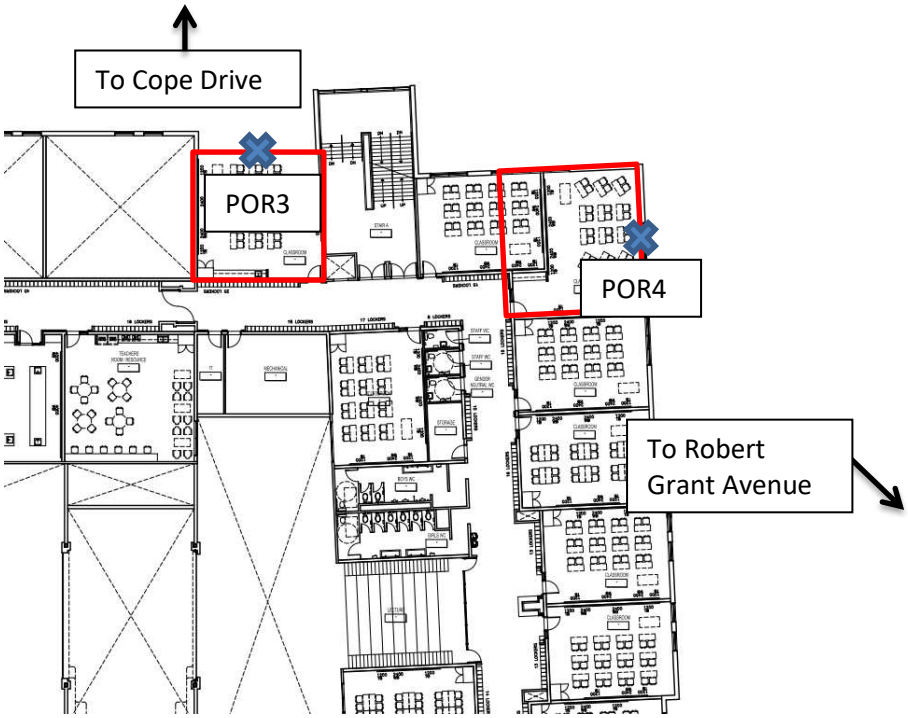



**Figure 3.6 –** Floor Plan of the ground floor showing the Plane of Window Point of Reception POR3 and POR4.

### 3.4 Methodology Used in Traffic Noise Impact Calculation

In order to calculate the road noise impact at the proposed development, we utilized the Ministry of Environment's STAMSON modeling software version 5.04. This program allows us to input variables of a road such as traffic volume, speed, day and night traffic splits and topography to determine the noise impact at a point of reception.

According to the ENCG, when noise levels could exceed 55 dBA at the Plane of Window (POW) of an classroom area (day) the exterior cladding system of the building envelope must be acoustically designed to ensure the indoor noise criteria is achieved. The City of Ottawa recognizes the Acoustic Insulation Factor (AIF[1]) method as an appropriate analysis technique.

(AIF[1]) calculations are not included in this report, as it is a phase 1 feasibility noise study.

#### 3.4.1 STAMSON Analysis Parameters

The parameters used in STAMSON to assess the noise impact at POR5 are indicated in Table 3.4 below. These are used in conjunction with the parameters for road traffic volume given in Table 3.2.

| Parameter | Values Used |
|---|---|
| Roadway | Cope Drive |
| Time Period | 16h |
| Topography | Flat/gentle slope no barrier |
| Rows of Houses | 0 |
| Intermediate Surface | Reflective |
| Receiver Height (m) | POR1: 1.5m; POR3: 5.5m |
| Source Receiver Distance (m) | POR1: 31m; POR3: 31m |

**Table 3.3 –** Parameters used in the STAMSON model

| Parameter | Values Used |
|---|---|
| Roadway | Robert Grant Avenue/ Transitway |
| Time Period | 16h |
| Topography | Flat/gentle slope no barrier |
| Rows of Houses | 0 |
| Intermediate Surface | Reflective |
| Receiver Height (m) | POR2: 1.5m; POR4: 5.5m |
| Source Receiver Distance (m) | POR2: 38m; POR4: 33m |

**Table 3.4 –** Parameters used in the STAMSON model

We have assessed daytime levels only for POR1 – POR4 as this is a high school in which no one is expected to be in overnight.

### 3.5 Surface Transportation Predicted Noise Levels

Table 3.5 shows the predicted sound pressure levels at the points of reception from the results of the STAMSON noise software calculation (Appendix A).

| Noise Source | POR1 (dBA) | POR2 (dBA) | POR3 (dBA) | POR4 (dBA) |
|---|---|---|---|---|
| | Day | Day | Day | Day |
| **Robert Grant Avenue** | N/A | 69.6 | N/A | 70.3 |
| **Transitway** | N/A | 67.9 | N/A | 68.6 |
| **Cope Drive** | 62.6 | N/A | 62.6 | N/A |
| **Sum** | **62.6** | **71.9** | **62.6** | **72.5** |

**Table 3.5 –** Predicted Traffic Noise at the Points of Reception**.**

We have calculated the predicted noise level caused by traffic using STAMSON and have shown that the 16h $L_{eq}$ for all PORs' is above 55dBA, ranging from 63-72dBA. The calculated daytime levels account for a worst case scenario in terms of traffic noise. As the levels during the day are above 55 dBA the following is required:

1) An evaluation of exterior building components using the AIF method is undertaken in Section 8 in order to verify that building components will achieve the required daytime indoor sound level of 45 dBA for classroom-type spaces.
2) Addition of a Warning Clause to the development agreement. The ENGC requires a Warning Clause whenever noise could meet or exceed 55 dBA 16 hour Leq at the Outdoor Living Area or Plane of Window of any living or sleeping area prior to any noise mitigation. General Warning Clause guidelines are provided in Section 3.6.

#### 3.5.1 Building Component Assessment (AIF Analysis)

Not included as this is a Phase 1 Feasibility Noise Study. Based on the predicted noise levels given in section 3.5 a building component assessment is required.

### 3.6 Warning Clauses

Since the predicted noise level from surface transportation exceeds 55 dBA, a generic warning clause must be added to the development agreement.

The City of Ottawa requires a Warning Clause whenever noise could meet or exceed 55 dBA 16 hour Leq at the Outdoor Living Area or Plane of Window of any living or sleeping area prior to any noise mitigation.

Table 3.6 provides the types of warning clauses and example text to be adapted into warning clauses. These warning clauses should be taken as *example only* and are taken from Appendix A of the ENCG which also states:
"*A warning clause is not considered a form of noise mitigation. It is not acceptable therefore to use warning clauses in place of physical noise control measures to identify an excess over the MOE or City noise limits*."

| TYPE | Example Text | Notes |
|---|---|---|
| Generic | Purchasers/tenants are advised that sound levels due to increasing road/rail/Light Rail/transit way traffic may occasionally interfere with some outdoor activities as the sound levels may exceed the sound level limits of the City and the Ministry of the Environment. To help address the need for sound attenuation this development has been designed so as to provide an indoor environment that is within provincial guidelines. Measures for sound attenuation include:<br>• multi-pane glass;<br>• brick veneer;<br>• concrete panels; | The generic warning clause outlines that MOE sound levels may be exceeded but the indoor environment is within guidelines. Mitigation measures are described including urban design features. Mention is also made of landscaping to screen the development visually from the source of noise. |
| Extensive mitigation of indoor and outdoor amenity area | "Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road/rail/Light Rail/transitway traffic may, on occasion, interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the City and the Ministry of the Environment.<br>To help address the need for sound attenuation this development may include:<br>• multi-pane glass;<br>• brick veneer;<br>• construction of a solid fence in backyard area<br>To ensure that provincial sound level limits are not exceeded it is important to maintain these sound attenuation features. This dwelling unit has also been designed with the provision | The warning clause makes reference to MOE sound levels being exceeded from time to time and that there are sound attenuation features and landscaping within the development that should be maintained. |

| | | |
|---|---|---|
| | for adding central air conditioning at the occupant's discretion. Installation of central air conditioning will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the City and the Ministry of the Environment. | |
| No outdoor amenity area | Purchasers/tenants are advised that sound levels due to increasing road/rail/Light Rail/transitway traffic will interfere with outdoor activities as the sound levels exceed the sound level limits of the City and the Ministry of the Environment. To help address the need for sound attenuation this development may includes<br>• multi-pane glass;<br>• brick veneer;<br>• construction of a solid fence in backyard area<br>To ensure that provincial sound level limits are not exceeded it is important to maintain these sound attenuation features. This dwelling unit has been supplied with a central air conditioning system and other measures which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the City and the Ministry of the Environment. | This warning clause notes that only an indoor environment is being provided for. |

**Table 3.6 –** Warning Clause Types and Example Text from the City of Ottawa (from ENCG Table A1)

### 3.7 Roadway Noise Summary

We have calculated the predicted noise level caused by traffic using STAMSON and have shown that the 16h $L_{eq}$ at:

- POR1 the point of reception of the closest classroom to Cope Drive on the first storey of the northern face of the building is 62.6 dBA.
- POR2 the point of reception of the closest classroom to Robert Grant Avenue on the first of the eastern face of the building storey is 71.9 dBA.
- POR3 the point of reception of the closest classroom to Cope Drive on the second storey of the northern face of the building is 62.6 dBA.
- POR4 the point of reception of the closest classroom to Robert Grant Avenue on the second storey of the eastern face of the building is 72.5 dBA.

The surrounding area is future residential development. Robert Grant Drive will be the nearest 4 lane arterial road, this may cause high background sound levels, therefore we recommend taking careful consideration of the envelope elements to insure a proper learning environment for any classrooms and noise sensitive rooms located on the east side of the new high school development.

## 4.0 Conclusion

In Conclusion, our stationary noise source study provides recommended maximum equipment noise levels and recommended equipment locations. A more detailed noise model will be required once all the equipment design selections have been made. Our traffic noise study has determined that the predicted noise level at PORs 1-4 is 63-72 dBA and further building envelope review is required so that the indoor noise limit of 45 dBA from the City of Ottawa Environmental Noise Control Guidelines is met and warning clauses as giving in section 3.6 must be added to the development agreement.

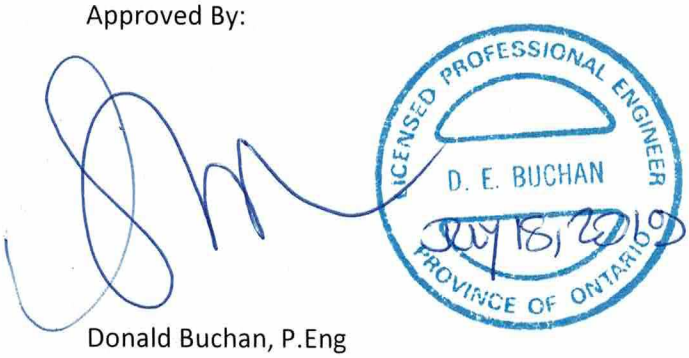
Should you have any comments or questions regarding this report, please do not hesitate to communicate with us.

Sincerely,

Jessica Kyoz, P.Eng.
Acoustic Consultant

Rebecca Sondermeyer
Acoustic Consultant

Approved By:




Donald Buchan, P.Eng
Principal
Buchan Lawton Parent Ltd.

# Appendix A
## Stamson Calculations

STAMSON 5.0 NORMAL REPORT Date: 10-07-2019 19:04:47
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 700cope1.te Time Period: Day/Night 16/8 hours
Description: Cope Drive 1.5m height

Road data, segment # 1: Cope Drive (day/night)
---
Car traffic volume : 9715/845 veh/TimePeriod *
Medium truck volume : 773/67 veh/TimePeriod *
Heavy truck volume : 552/48 veh/TimePeriod *
Posted speed limit : 40 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 12000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 10.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Cope Drive (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 : 31.00 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Cope Drive (day)
---

Source height = 1.50 m

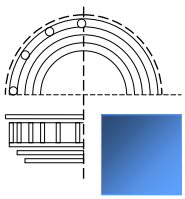
ROAD (0.00 + 62.56 + 0.00) = 62.56 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.00 65.72 0.00 -3.15 0.00 0.00 0.00 0.00 62.56

---

Segment Leq : 62.56 dBA

Total Leq All Segments: 62.56 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.56



STAMSON 5.0 NORMAL REPORT Date: 10-07-2019 19:26:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 700cope2.te Time Period: Day/Night 16/8 hours
Description: Cope Drive 1.5m height

Road data, segment # 1: Transitway (day/night)
---
Car traffic volume : 0/845 veh/TimePeriod
Medium truck volume : 3450/67 veh/TimePeriod
Heavy truck volume : 0/48 veh/TimePeriod
Posted speed limit : 80 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Transitway (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 : 38.00 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Robert Grant (day/night)
---
Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 35000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 10.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Robert Grant (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 : 38.00 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Transitway (day)
---

Source height = 0.50 m

ROAD (0.00 + 67.94 + 0.00) = 67.94 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.00 | 71.98 | 0.00 | -4.04 | 0.00 | 0.00 | 0.00 | 0.00 | 67.94 |

Segment Leq : 67.94 dBA

Results segment # 2: Robert Grant (day)
---

Source height = 1.50 m

ROAD (0.00 + 69.64 + 0.00) = 69.64 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.00 | 73.68 | 0.00 | -4.04 | 0.00 | 0.00 | 0.00 | 0.00 | 69.64 |

Segment Leq : 69.64 dBA

Total Leq All Segments: 71.88 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 71.88

STAMSON 5.0 NORMAL REPORT Date: 10-07-2019 19:31:06
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 700cope3.te Time Period: Day/Night 16/8 hours
Description: Cope Drive 1.5m height

Road data, segment # 1: Cope Drive (day/night)
---
Car traffic volume : 9715/845 veh/TimePeriod *
Medium truck volume : 773/67 veh/TimePeriod *
Heavy truck volume : 552/48 veh/TimePeriod *
Posted speed limit : 40 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 12000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 10.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Cope Drive (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 : 31.00 / 15.00 m
Receiver height : 5.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Cope Drive (day)
---

Source height = 1.50 m

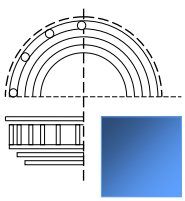
ROAD (0.00 + 62.56 + 0.00) = 62.56 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.00 65.72 0.00 -3.15 0.00 0.00 0.00 0.00 62.56

---

Segment Leq : 62.56 dBA

Total Leq All Segments: 62.56 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.56



STAMSON 5.0 NORMAL REPORT Date: 10-07-2019 19:28:59
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 700cope4.te Time Period: Day/Night 16/8 hours
Description: Cope Drive 1.5m height

Road data, segment # 1: Transitway (day/night)
---
Car traffic volume : 0/845 veh/TimePeriod
Medium truck volume : 3450/67 veh/TimePeriod
Heavy truck volume : 0/48 veh/TimePeriod
Posted speed limit : 80 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Transitway (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 : 33.00 / 15.00 m
Receiver height : 5.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Robert Grant (day/night)
---
Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 35000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 10.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Robert Grant (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 : 33.00 / 15.00 m
Receiver height : 5.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Transitway (day)
---

Source height = 0.50 m

ROAD (0.00 + 68.56 + 0.00) = 68.56 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.00 | 71.98 | 0.00 | -3.42 | 0.00 | 0.00 | 0.00 | 0.00 | 68.56 |

Segment Leq : 68.56 dBA

Results segment # 2: Robert Grant (day)
---

Source height = 1.50 m

ROAD (0.00 + 70.25 + 0.00) = 70.25 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.00 | 73.68 | 0.00 | -3.42 | 0.00 | 0.00 | 0.00 | 0.00 | 70.25 |

Segment Leq : 70.25 dBA

Total Leq All Segments: 72.50 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 72.50