

Royal Ridge Subdivision
Trim Road
Noise Control Study

Prepared By:

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January 5, 2011

City of Ottawa
Planning and Infrastructure Approvals Branch
Infrastructure Approvals Division
110 Laurier Street West, 4th Floor
Ottawa, ON
K1P 1J1

Attention: Benoit Leroux

**Reference: Royal Ridge Subdivision
Noise Control Study
Our File No.: 104094**

Enclosed for your record are two (2) copies of the approved Noise Control Study for the Royal Ridge Subdivision. The noise study has been revised to reflect your comments of December 23, 2010 (copy attached in Appendix F).

The study evaluates the impact of noise and outlines noise attenuation measures to mitigate the impacts.

Please contact the undersigned should you have any questions or comments pertaining to the enclosed report.

Yours truly,

NOVATECH ENGINEERING CONSULTANTS LTD.



Greg MacDonald, P.Eng.
Senior Project Manager

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1.0 INTRODUCTION

This Noise Control Study was prepared in fulfillment of Draft Plan Condition # 85 n Approval for the Claridge Homes Subdivision known as Royal Ridge.

Condition # 85 reads:

Have a noise study prepared and certified by a Professional Engineer (expertise in the subject of acoustics related to land use planning). The study shall be to the satisfaction of the City and shall comply with MOEE LU-131, Noise Assessment Criteria in Land Use Planning, the City's Standards for Noise Barriers and Noise Control Guidelines, and be in accordance with the current version of the APEO Guidelines for Professional Engineers providing Acoustical Engineering Services in Land Use Planning

The attached Noise Control Study was prepared as part of the detailed engineering submission to assess the impact of noise and to outline noise attenuation requirements to mitigate the impacts on the proposed residential development.

2.0 BACKGROUND

2.1 Project Description

The Royal Ridge Subdivision is located south of Old Montreal Road, bound by Trim Road to the west and Gerald Street to the east and is shown in **Figure 1 - Key Plan**. The proposed development will provide approximately 104 units consisting of 31 single family dwellings, 83 condominium units and 4 stacked town home dwellings as shown in **Figure 2 – Plan of Subdivision**.

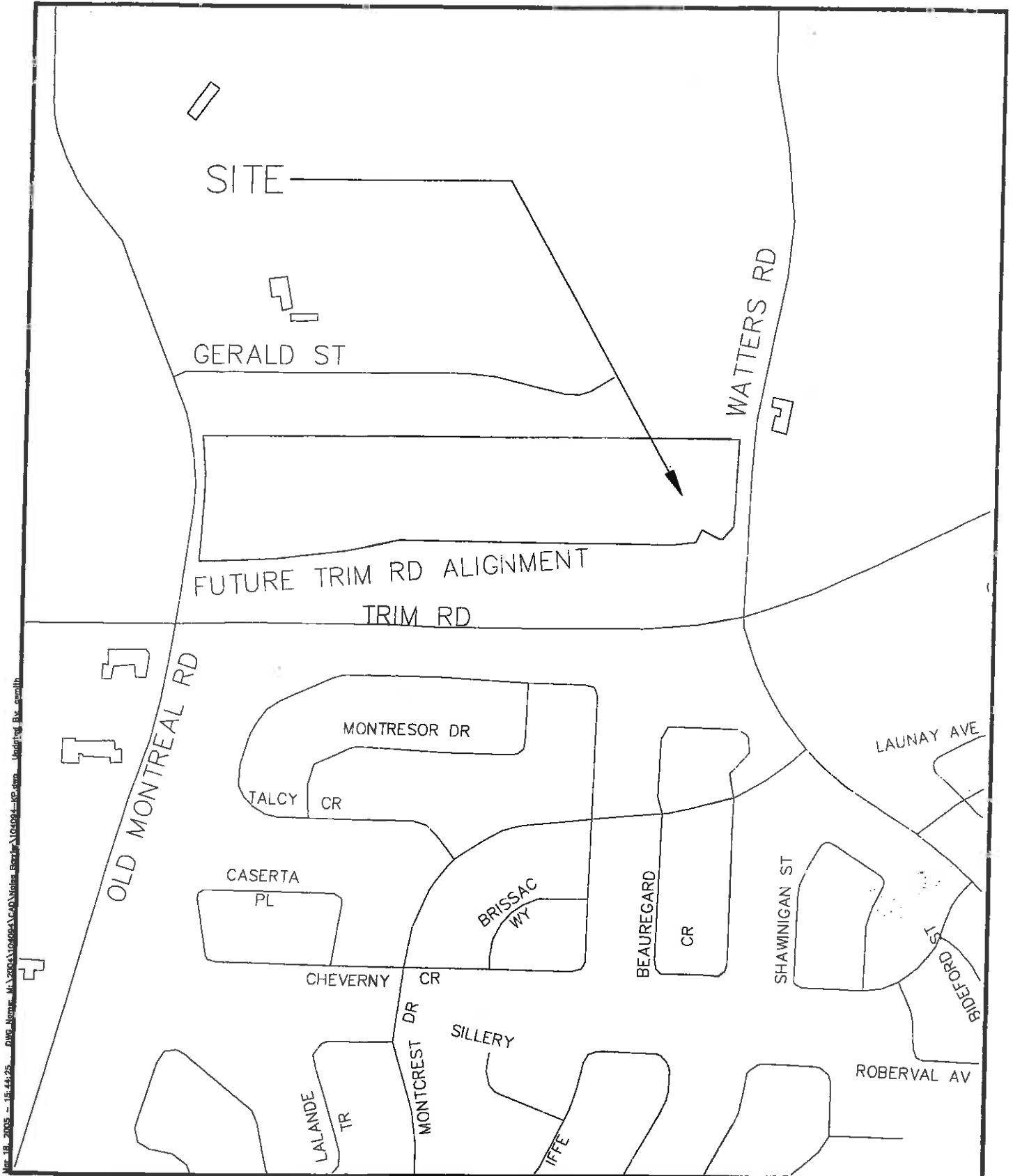
2.2 Noise Sources

The City of Ottawa Official Plan stipulates that a noise study shall be prepared when a new development is proposed within 100 metres of an arterial or major collector roadway, or a rapid-transit corridor.

Future Trim Road will be considered the primary noise source for the subdivision. Map 6 of the City of Ottawa Transportation Master Plan Listed as "Urban Road Network" shows Trim Road as an *Urban Arterial Road*. Schedule 'E' of The City of Ottawa Official Plan (Jan/07) entitled "*Urban Road Network*" displays Trim Road as a proposed Urban Arterial Road. From Annex 1 of the Official Plan – Road Classifications and Right of Ways (ROW), Table **one** lists an expansion for the ROW of Trim Road from Old Montreal Road to Watters Road. Therefore a ROW Width of 46.0m will be applied with a posted speed of 60km/h. Noise will also be assessed for existing Trim Road to determine if attenuation is required in the interim, until future Trim Road is constructed by the City.

No rail or airport noise affects this site.

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ROYAL RIDGE SUBDIVISION
KEY PLAN
 104094 OCT, 2010 FIGURE 1

3.0 CITY OF OTTAWA NOISE CONTROL GUIDELINES

3.1 Sound Level Criteria

The City of Ottawa is concerned with noise from aircraft, roads, transitways and railways as expressed in the City of Ottawa Official Plan (May 2003) since it can affect the quality of life of residents. To protect residents from unacceptable levels of noise, the City of Ottawa has specific environmental noise control guidelines, which are based on the technical guidelines and recommendations prepared by the Ontario Ministry of Environment. The City of Ottawa's *Environmental Noise Control Guidelines (ENCG)*, Final Draft - May 10, 2006 has been used for the purpose of this report.

The quantitative sound level criteria, which requires that specific outdoor and indoor living areas of residential developments meet certain energy equivalent sound levels (Leq), are summarized in Table 1 and Table 2, respectively. Compliance with the outdoor sound level criteria will generally ensure compliance with the indoor sound level criteria when normal construction materials are utilized.

Table 1: City of Ottawa Outdoor Noise Level Criteria

| Time Period | Receiver Location | Noise Level Criteria (Leq) |
|---------------------------|--|----------------------------|
| Daytime (07:00 – 23:00) | Outdoor Living Area (OLA) | 55 dBA |
| Daytime (07:00 – 23:00) | Plane of Window (POW) at Living/Dining Rooms | 55 dBA |
| Nighttime (23:00 – 07:00) | Plane of Window (POW) at Bedrooms/Sleeping Quarter | 50 dBA |

The outdoor living area is defined as that part of an outdoor amenity area, which is provided for the quiet enjoyment of the outdoor environment during the daytime period. These amenity areas are typically backyards, gardens, terraces and patios.

Table 2: City of Ottawa Indoor Noise Level Criteria

| Time Period | Receiver Location | Noise Level Criteria (Leq) |
|---------------------------|--|----------------------------|
| Daytime (07:00 – 23:00) | Living/Dining Rooms of residential dwelling units, theatres, places of worship, school, individual or semi-private offices, conference rooms, reading rooms, classrooms, etc | 45 dBA |
| Nighttime (23:00 – 07:00) | Sleeping quarters of residential units, hospitals, nursing homes, senior citizen homes, etc | 40 dBA |

3.2 Noise Attenuation Requirements

When sound levels are predicted to be less than the specified criteria for the daytime and nighttime conditions, no attenuation measures are required by the proponent. As the noise criteria is exceeded, a combination of attenuation measures are recommended by the City of Ottawa to modify the development environment. These attenuation measures may include:

- Construction of a noise barrier wall and/or berm;
- Installation of a forced air ventilation system with provision for central air conditioning;
- Installation of central air conditioning;
- Custom building design, construction and/or acoustic insulation.

If noise levels are expected to exceed the applicable sound level criteria, the City of Ottawa recommends a warning clause be registered on title. This warning clause serves to alert potential buyers and/or renters of the possible noise condition and of any limitations that may exist on his/her property rights. The warning clause shall be registered on title and incorporated in the Subdivision Agreement and in the Agreement of Purchase and Sale.

Noise attenuation requirements at the Outdoor Living Areas (OLA) and Plane of Window (POW) are outlined in Table 3.

Table 3: City of Ottawa Noise Attenuation Requirements

| Noise Level (dBA) | | | | Noise Attenuation Requirements |
|----------------------------------|------------|-------------------------|------------|---|
| Daytime (07:00-23:00) | | Nighttime (23:00-07:00) | | |
| Unattenuated | Attenuated | Unattenuated | Attenuated | |
| OUTDOOR LIVING AREA (OLA) | | | | |
| OLA < 55 | | | | None |
| 55 < OLA < 60 | | | | Noise Clause Type A |
| OLA > 60 | OLA < 55 | | | Noise Barrier |
| OLA > 60 | OLA > 55 | | | Noise Barrier Noise Clause Type B |
| PLANE OF WINDOW (POW) | | | | |
| POW < 55 | | POW < 50 | | None |
| 55 < POW < 65 | | 50 < POW < 60 | | Forced Air Ventilation Noise Clause Type C |
| POW > 65 | | POW > 60 | | Central Air Conditioning Noise Clause Type D Building Façade Analysis |

The wording of the warning clauses to be placed on title and included in the Subdivision Agreement and the Offer of Purchase and Sale are as follows:

Type A

"Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of Environment's noise criteria."

Type B

"Purchasers/tenants are advised that despite the inclusion of noise control features in this development and within the building units, sound levels due to increasing road traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of the Environment's noise criteria."

Type C

"This dwelling unit is fitted with a forced air heating system and the ducting, etc was sized to accommodate a central air conditioning system. Installation of central air conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of Environment's noise criteria. (Note: The location and installation of the outdoor air conditioning device should be done so as to comply with noise criteria of MOE Publication NPC-216, Residential Air Conditioning Devices and thus minimize the noise impacts both on and in the immediate vicinity of the subject property.")

Type D

"This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of Environment's noise criteria."

4.0 PREDICTION OF OUTDOOR NOISE LEVELS

4.1 Roadway Traffic

Future Trim Road will have a right of way width of 46m consisting of bicycle lanes, pedestrian facilities, and a typical urban arterial 4 lane (two way) divided road

Noise levels for both existing Trim Road and Future Trim Road were assessed using the ultimate road and traffic data from Table 1.7 of the City of Ottawa's Environmental Noise Control Guidelines. The traffic and roadway parameters used for sound level predictions are shown in Table 4.

Table 4: Traffic and Roadway Parameters

| | Existing Trim Road | New Trim Road |
|-------------------------------------|-----------------------------------|-------------------------------|
| Roadway Classification | 2-Lane Urban Arterial - Undivided | 4-Lane Urban Arterial-Divided |
| Annual Average Daily Traffic (AADT) | 15,000 veh/day | 35,000 veh/day |
| Day/Night Split (%) | 92/8 | 92/8 |
| Medium Trucks (%) | 7 | 7 |
| Heavy Trucks (%) | 5 | 5 |
| Posted Speed | 60Km/hr | 60km/hr |

4.2 Noise Level Analysis

The noise level was analysed using version 5.03 of the STAMSON computer program issued by the MOE. Proposed grades were required for the STAMSON software and were attained from the Grading Plan, included in Appendix A. Noise levels were generated for a number of receiver locations as shown on the Receiver Locations Plan (**Figure 3**) for both existing Trim Road and new Trim Road.

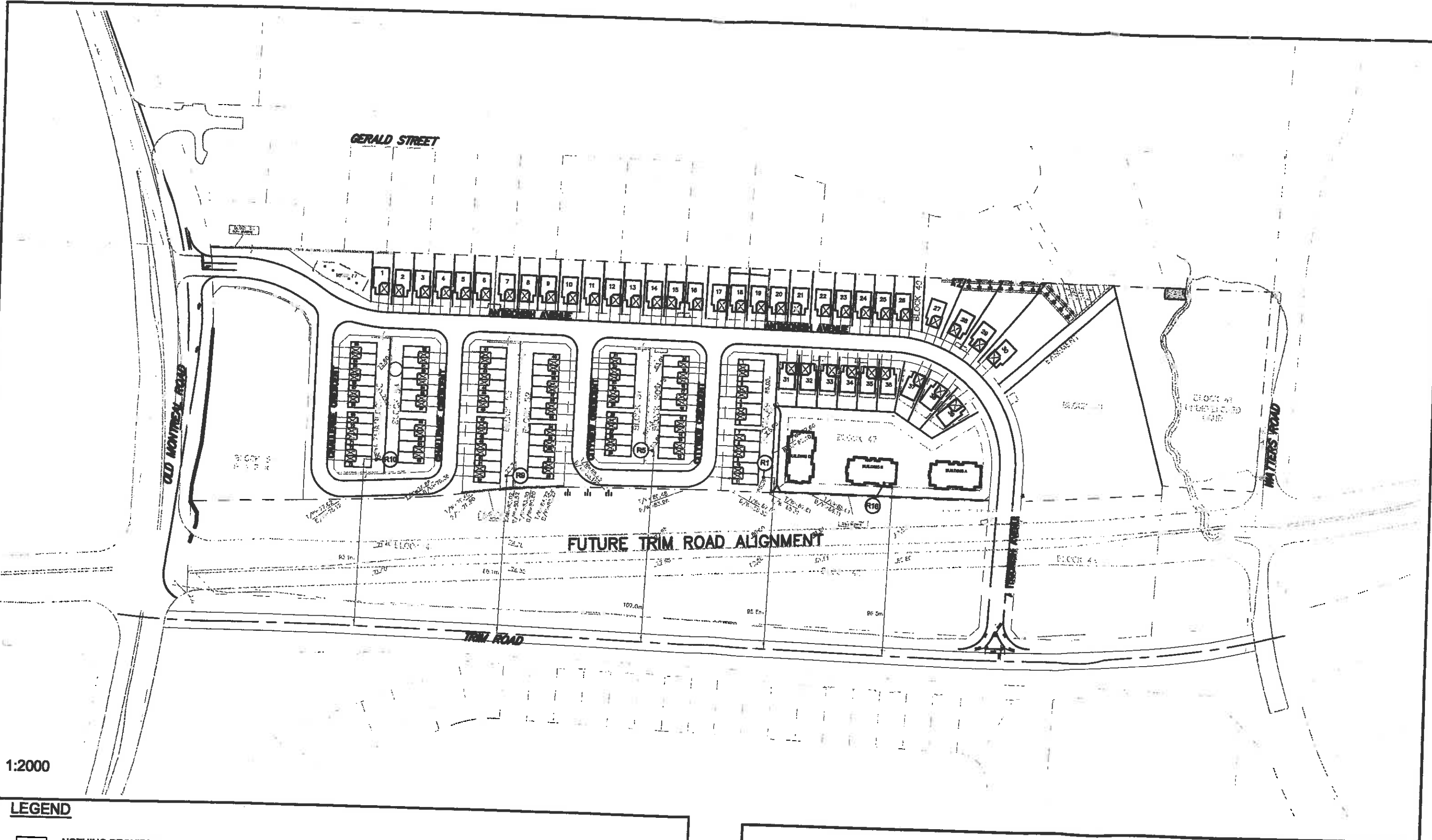
Under existing conditions, noise levels for existing Trim Road are within allowable noise levels set forth by the City of Ottawa ENCG guidelines. As such, no attenuation measures are required as displayed in **Figure 4 – Existing Conditions**. However, once New Trim Road is constructed by City forces in 2012, noise levels will increase due to a closer proximity to the subdivision.

4.3 Noise Level Results

As expected, predicted noise levels for units and condominiums adjacent to New Trim Road exceed the allowable noise level criteria, resulting in the requirement for attenuation measures (noise wall) and a building façade analysis for Buildings A-C. The predicted noise levels at the selected receiver locations within the subdivision are illustrated in Table 5. A summary of mitigation measures is provided in Table 6.

Daytime noise levels are shown for the Outdoor Living Area (OLA) while nighttime noise levels are shown for the Plane of Window (POW). The stacked town homes do not have a designated OLA as the balconies do not meet the City of Ottawa OLA criteria (OLA needs to be a minimum of 4.0m deep, Appendix B5-B6 City of Ottawa Environmental Noise Control Guidelines).

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LEGEND
[Empty box] NOTHING REQUIRED.

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**ROYAL RIDGE SUBDIVISION
EXISTING CONDITIONS**
104094 OCT, 2010 FIGURE 4

Table 5: Mitigation Results

| Location (TH=Town Home) | File Name (R=Receiver) (EC=Existing Condition) | Noise Levels Leq (dBA) | | |
|-------------------------------|---|---------------------------------|--|------------------------|
| | | Daytime Unmitigated (OLA) | Daytime 2.5m Barrier Parallel to Trim (OLA) | Nighttime (POW) |
| TH_11 | R1 | 62.31 | 56.52 | 54.55.27 |
| TH_7 | R2 | 60.19 | 53.08 | 48.98 |
| TH_6 | R3 | 55.12 | 51.48 | 47.04 |
| TH_2 | R4 | 54.82 | 50.08 | 44.71 |
| TH_12 | R5 | 63.59 | 56.51 | 53.92 |
| TH_15 | R6 | 60.17 | 50.93 | 46.95 |
| TH_17 | R7 | 56.74 | 49.12 | 44.44 |
| TH_19 | R8 | 52.12 | 48.21 | 43.24 |
| TH_52 | R9 | 62.47 | 54.27 | 53.87 |
| TH_73 | R10 | 62.23 | 52.55 | 52.42 |
| TH_70 | R11 | 59.92 | 56.11 | 51.36 |
| TH_67 | R12 | 56.28 | 51.45 | 47.24 |
| TH_65 | R13 | 53.50 | 50.56 | 44.89 |
| Lot_32 | R14 | 59.51 | *53.01 | *48.91 |
| Lot_33 | R15 | 59.51 | ----- | 52.79 |
| Building_B | R16Condo | 70.45 | No Barrier | 60.01 (Unmitigated) |
| Building_B | R17Condo | 69.17 | No Barrier | 61.58 (Unmitigated) |
| TH_11 | EC_R1 | 55.77 | ----- | 49.05 |
| TH_12 | EC_R5 | 54.96 | ----- | 48.28 |
| TH_52 | EC_R9 | 56.36 | ----- | 49.60 |
| TH_73 | EC_R10 | 55.96 | ----- | 49.23 |
| Building_B | EC_R16 | 55.70 | ----- | 48.98 |

* REPRESENTS CONDOMINIUM BUILDING ACTING AS 6.0M HIGH NOISE BARRIER.

4.4 Implementation

Noise clauses that need to be included on title and in the Agreement of Purchase and Sale for the various dwelling units for future Trim Road are summarized in Table 6 and illustrated in *Figure 5*. A larger scale plan is provided in Appendix C.

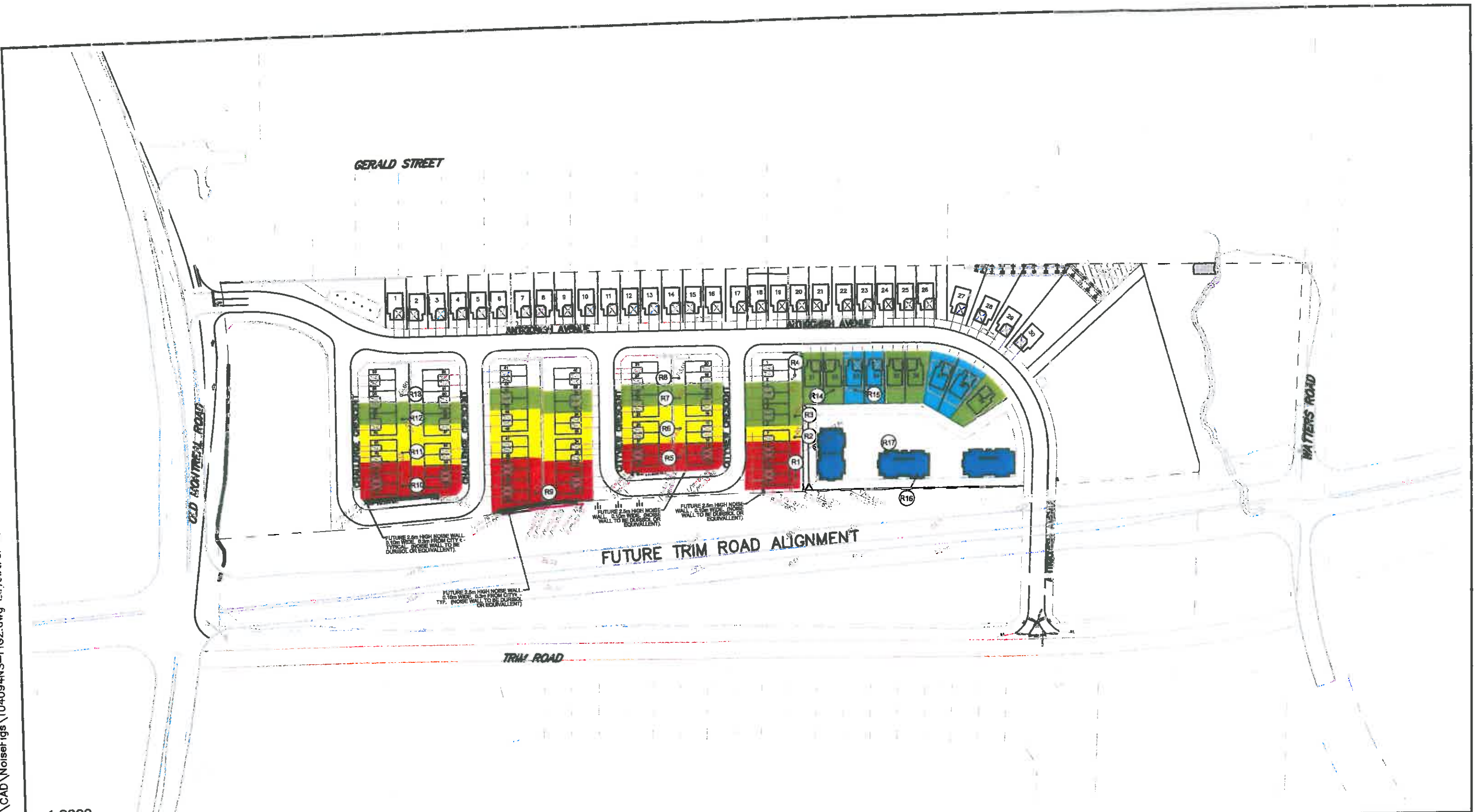
Table 6: Required Noise Attenuation Measures

| Dwelling | Attenuation Measure | Notice on Title |
|--|---|-----------------|
| Buildings A, B and C (Block 47, Town Homes) | <ul style="list-style-type: none"> • Central Air Conditioning • Building Façade Analysis | D |
| Town Homes: 8-13, 28-32, 49-54 and 71-73 | <ul style="list-style-type: none"> • 2.5m Noise Barrier to be constructed 300 mm within private property line, as displayed on the Noise Control Plan (Appendix C). • Forced Air Heating. | B & C |
| Town Homes: 7, 14-16, 25-27, 33-36, 45-48, 55-57 and 68-70 | <ul style="list-style-type: none"> • 2.5m Noise Barrier to be constructed 300 mm within private property line, as displayed on the Noise Control Plan (Appendix C). | B |
| Town Homes: 3-6, 17-18, 23-24, 37-38, 43-44, 58-59 and 66-67 | <ul style="list-style-type: none"> • None | A |
| Lots: 31-32 and 35-36 and 39 | <ul style="list-style-type: none"> • 6.0m High Stacked Town Buildings A-C acting as Noise Barrier. As displayed on the Noise Control Plan (Appendix C). | A |
| Lots: 33-34 and 37-38 | <ul style="list-style-type: none"> • None | A & C |
| Town Homes: 1-2, 19-22, 39-42 and 60-65 | <ul style="list-style-type: none"> • None | None |

For Future Trim Road, The City of Ottawa Environmental Noise Control Guidelines state that the maximum allowable noise barrier wall height is 2.5m. The Noise Control Plan (Appendix C) illustrates the locations and elevations of the proposed noise barrier walls.

As shown in Table 6, the façade of buildings A - C (Block 47) must be examined to determine what sound transmission class (STC) is required in order to mitigate noise levels from roadway traffic and to meet City of Ottawa ENCG guidelines.

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| LEGEND | |
|--|--|
| | NOISE BARRIER, FORCED AIR HEATING AND NOISE CLAUSE 'B' AND 'C' REQUIRED. |
| | NOISE BARRIER AND NOISE CLAUSE 'B' REQUIRED. |
| | FORCED AIR HEATING AND NOISE CLAUSE 'A' AND 'C' REQUIRED. |
| | NOTHING REQUIRED. |
| | BUILDING FACADE ANALYSIS AND NOISE CLAUSE 'D' REQUIRED. |
| | NOISE BARRIER. |
| | T/W=TOP OF WALL B/W=BOTTOM OF WALL |
| R1 | RECEIVER LOCATION. |

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ROYAL RIDGE SUBDIVISION NOISE BARRIER PLAN

104094 JAN, 2011 FIGURE 5

The analysis measures the Acoustic Insulation Factor (AIF), which is a measure of the reduction of outdoor noise provided by the elements of the outer surface of a building. The required AIF is established from *Table 11.2 – AIF required for Road Traffic Noise* (contained in Appendix D) and is based on the noise level at building wall (dBA), number of components forming the room envelope and which part of the dwelling is being examined. For this case, the family room and nook (breakfast area) on the main level and the bedroom on the second level of the home were used to find the AIF requirement. The number of components forming the room envelope is two; exterior wall and window. The AIF requirement must be met for both the window and the walls. Tables from the document entitled *Acoustic Insulation Factor: A Rating for the Insulation of Buildings Against Outdoor Noise*, National Research Council, June 1980 by J.D. Quirt were used to determine the AIF for windows, the window structure (glass thickness, air space, glass thickness) and the wall structure.

To determine a sound transmission class for windows a percentage of window area to floor area is required. The percentage is calculated based on the typical architectural floor plan, found in Appendix E. The percentage calculated is listed in Table 7.

Table 7: Percentage of Window Area to Floor Area

| Typical Unit | Room | Floor Area | Window Area | Percentage (%) |
|-----------------------|-------------|-----------------------------|-----------------------------------|----------------|
| <u>Claridge Homes</u> | Family Room | 4.1x4.0 (16m ²) | 2.2mx2.0m (4.4m ²) | 30 |

To determine a sound transmission class for walls a percentage of wall area to floor area is required. The percentage is calculated based on the typical architectural floor plan, found in Appendix E. The percentage calculated is listed in Table 8.

Table 8: Percentage of Wall Area to Floor Area

| Typical Unit | Room | Floor Area | Wall Area | Percentage (%) |
|----------------|-----------------|----------------------------------|--------------------------|----------------|
| Claridge Homes | Typical Bedroom | 4.10Mx3.5m (14.4m ²) | 3.5x2 (7m ²) | 50 |

Results of this analysis have been converted into a sound transmission class which indicate the building construction material requirements for both windows and walls as listed in **Table nine**.

Table 9: Sound Transmission Class For Building Materials

| Material | Sound Transmission Class (STC) |
|-----------------|---------------------------------------|
| Exterior Walls | 54 |
| Windows | 33 |

5.0 CONCLUSIONS

An analysis of the roadway traffic along existing Trim Road indicates no attenuation measures are necessary. However, the analysis for future Trim road shows that the City of Ottawa's criteria for residential noise will be exceeded, primarily for the units in close proximity to future Trim Road.

The following is a summary of the attenuation measures and notice requirements to be placed on title for each block in accordance with the City of Ottawa Noise Control Guidelines. Refer to the Noise Attenuation Requirements Plan (Figure 4) for an illustration of the affected units.

Buildings A – C (Block 47)

- Central Air Conditioning;
- Exterior Walls with Minimum STC of 34;
- Window Structures with Minimum STC of 33;
- Notice on title: *"This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of Environment's noise criteria."*

Town Homes 8-13, 28-32, 49-54, 71-73

- 2.5m high noise barrier (Durisol or equivalent) to be constructed 300 mm within private property line, detailed on Figure 5 and Appendix C;
- Forced Air Heating;
- Notice on title: *"Purchasers/tenants are advised that despite the inclusion of noise control features in this development and within the building units, sound levels due to increasing road traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of the Environment's noise criteria."*

"This dwelling unit is fitted with a forced air heating system and the ducting, etc was sized to accommodate a central air conditioning system. Installation of central air conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of Environment's noise criteria. (Note: The location and installation of the outdoor air conditioning device should be done so as to comply with noise criteria of MOE Publication NPC-216, Residential Air Conditioning Devices and thus minimize the noise impacts both on and in the immediate vicinity of the subject property.)"

Town Homes 7, 14-16, 25-27, 33-36, 45-48, 55-57, 63-70

- 2.5m high noise barrier (Durisol or equivalent) to be constructed 300 mm within private property line, as detailed on Figure 5 and Appendix C;
- Notice on title: *"Purchasers/tenants are advised that despite the inclusion of noise control features in this development and within the building units, sound levels due to increasing road traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of the Environment's noise criteria."*

Town Homes 3-6, 17-18, 23-24, 37-38, 43-44, 58-59, 66-67

- Notice on title: *"Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of Environment's noise criteria."*

Lots 31-32, 35-36 and 39

- 6.0m high stacked town home buildings acting as noise Barrier.
- Notice on title: *"Purchasers/tenants are advised that despite the inclusion of noise control features in this development and within the building units, sound levels due to increasing road traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of the Environment's noise criteria."*

Lots 33-34 and 37-38

- Forced Air Heating
- Notice on title: *"Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of Environment's noise criteria."*

"This dwelling unit is fitted with a forced air heating system and the ducting, etc was sized to accommodate a central air conditioning system. Installation of central air

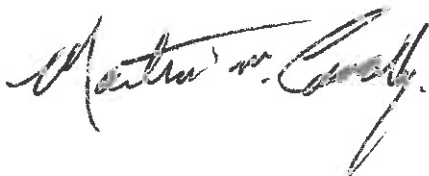
conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of Environment's noise criteria. (Note: The location and installation of the outdoor air conditioning device should be done so as to comply with noise criteria of MOE Publication NPC-216, Residential Air Conditioning Devices and thus minimize the noise impacts both on and in the immediate vicinity of the subject property.")

Town Homes 1-2, 19-22, 39-42, 60-65

No attenuation measures are required for the remainder of the dwelling units as they have daytime and nighttime noise levels below 55 dBA and 50 dBA, respectively.

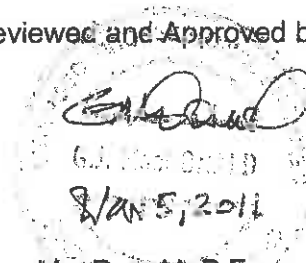
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Prepared by:



Martin W. Connolly
Engineering Technician

Reviewed and Approved by:



Greg MacDonald, P.Eng.
Senior Project Manager

APPENDIX A
GRADING PLAN

APPENDIX B

SOUND LEVEL CALCULATIONS

Filename: r1.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 50 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 38.00 / 38.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.50 m
Barrier receiver distance : 8.00 / 8.00 m
Source elevation : 80.50 m
Receiver elevation : 85.39 m
Barrier elevation : 85.31 m
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Result summary (night)

| | source height (m) | Road Leq (dBA) | Total Leq (dBA) |
|----------|-------------------------|----------------------|-----------------------|
| 1.Trim N | 1.50 | 53.23 | 53.23 * |
| 2.Trim S | 1.50 | 51.02 | 51.02 * |
| Total | | | 55.27 dBA |

* Bright Zone !

Barrier table for segment # 1: Trim N (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 89.31 | 50.23 | 50.23 |
| 4.50 | 89.81 | 48.87 | 48.87 |
| 5.00 | 90.31 | 47.63 | 47.63 |
| 5.50 | 90.81 | 46.57 | 46.57 |
| 6.00 | 91.31 | 45.66 | 45.66 |
| 6.50 | 91.81 | 44.87 | 44.87 |
| 7.00 | 92.31 | 44.19 | 44.19 |
| 7.50 | 92.81 | 43.58 | 43.58 |
| 8.00 | 93.31 | 43.24 | 43.24 |
| 8.50 | 93.81 | 42.95 | 42.95 |

Barrier table for segment # 2: Trim S (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 89.31 | 49.71 | 49.71 |
| 4.50 | 89.81 | 48.53 | 48.53 |
| 5.00 | 90.31 | 47.25 | 47.25 |
| 5.50 | 90.81 | 46.09 | 46.09 |
| 6.00 | 91.31 | 45.10 | 45.10 |
| 6.50 | 91.81 | 44.27 | 44.27 |
| 7.00 | 92.31 | 43.55 | 43.55 |
| 7.50 | 92.81 | 42.93 | 42.93 |
| 8.00 | 93.31 | 42.39 | 42.39 |
| 8.50 | 93.81 | 42.07 | 42.07 |

TOTAL Leq FROM ALL SOURCES (DAY): 56.52
(NIGHT): 55.27

Filename: r2.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 50 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 53.00 / 53.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.50 m
Barrier receiver distance : 30.00 / 30.00 m
Source elevation : 80.50 m
Receiver elevation : 85.05 m
Barrier elevation : 85.31 m
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

STAMSON 5.0 SUMMARY REPORT Date: 18-11-2009 08:50:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r2_u.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 50 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 53.00 / 53.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim S (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 50 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 68.00 / 68.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Result summary (night)

| | source height (m) | Road Leg (dBA) | Total Leq (dBA) |
|----------|-------------------------|----------------------|-----------------------|
| 1.Trim N | 1.50 | 45.52 | 45.52 |
| 2.Trim S | 1.50 | 46.37 | 46.37 |
| Total | | | 48.98 dBA |

Barrier table for segment # 1: Trim N (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 89.31 | 43.58 | 43.58 |
| 4.50 | 89.81 | 43.08 | 43.08 |
| 5.00 | 90.31 | 42.64 | 42.64 |
| 5.50 | 90.81 | 42.24 | 42.24 |
| 6.00 | 91.31 | 41.89 | 41.89 |
| 6.50 | 91.81 | 41.57 | 41.57 |
| 7.00 | 92.31 | 41.42 | 41.42 |
| 7.50 | 92.81 | 41.27 | 41.27 |
| 8.00 | 93.31 | 41.18 | 41.18 |
| 8.50 | 93.81 | 41.13 | 41.13 |

Barrier table for segment # 2: Trim S (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 89.31 | 44.34 | 44.34 |
| 4.50 | 89.81 | 43.78 | 43.78 |
| 5.00 | 90.31 | 43.28 | 43.28 |
| 5.50 | 90.81 | 42.85 | 42.85 |
| 6.00 | 91.31 | 42.46 | 42.46 |
| 6.50 | 91.81 | 42.13 | 42.13 |
| 7.00 | 92.31 | 41.83 | 41.83 |
| 7.50 | 92.81 | 41.56 | 41.56 |
| 8.00 | 93.31 | 41.33 | 41.33 |
| 8.50 | 93.81 | 41.12 | 41.12 |

TOTAL Leq FROM ALL SOURCES (DAY): 53.08
(NIGHT): 48.98

Filename: r3.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 2 / 2
House density : 65 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 75.00 / 75.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.50 m
Barrier receiver distance : 43.00 / 43.00 m
Source elevation : 80.50 m
Receiver elevation : 84.67 m
Barrier elevation : 85.31 m
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Result summary (night)

| | source height (m) | Road Leq (dBA) | Total Leq (dBA) |
|----------|-------------------------|----------------------|-----------------------|
| 1.Trim N | 1.50 | 43.78 | 43.78 |
| 2.Trim S | 1.50 | 44.26 | 44.26 |
| Total | | | 47.04 dBA |

Barrier table for segment # 1: Trim N (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 89.31 | 42.24 | 42.24 |
| 4.50 | 89.81 | 41.84 | 41.84 |
| 5.00 | 90.31 | 41.49 | 41.49 |
| 5.50 | 90.81 | 41.18 | 41.18 |
| 6.00 | 91.31 | 40.91 | 40.91 |
| 6.50 | 91.81 | 40.68 | 40.68 |
| 7.00 | 92.31 | 40.47 | 40.47 |
| 7.50 | 92.81 | 40.29 | 40.29 |
| 8.00 | 93.31 | 40.27 | 40.27 |
| 8.50 | 93.81 | 40.22 | 40.22 |

Barrier table for segment # 2: Trim S (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 89.31 | 42.72 | 42.72 |
| 4.50 | 89.81 | 42.30 | 42.30 |
| 5.00 | 90.31 | 41.93 | 41.93 |
| 5.50 | 90.81 | 41.61 | 41.61 |
| 6.00 | 91.31 | 41.33 | 41.33 |
| 6.50 | 91.81 | 41.09 | 41.09 |
| 7.00 | 92.31 | 40.88 | 40.88 |
| 7.50 | 92.81 | 40.70 | 40.70 |
| 8.00 | 93.31 | 40.54 | 40.54 |
| 8.50 | 93.81 | 40.41 | 40.41 |

TOTAL Leq FROM ALL SOURCES (DAY): 51.48
(NIGHT): 47.04

STAMSON 5.0 SUMMARY REPORT Date: 06-11-2009 09:18:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r4_u.le Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (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 : 3 %
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 : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 2 / 2
House density : 80 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 95.00 / 95.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Trim S (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 : 3 %
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 : 0.00
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: Trim S (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 2 / 2
House density : 80 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 110.00 / 108.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Filename: r4.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 2 / 2
House density : 80 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 95.00 / 95.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.50 m
Barrier receiver distance : 64.00 / 64.00 m
Source elevation : 80.50 m
Receiver elevation : 85.05 m
Barrier elevation : 85.31 m
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Result summary (night)

| | source height (m) | Road Leq (dBA) | Total Leq (dBA) |
|----------|-------------------------|----------------------|-----------------------|
| 1.Trim N | 1.50 | 41.66 | 41.66 |
| 2.Trim S | 1.50 | 41.73 | 41.73 |
| Total | | | 44.71 dBA |

Barrier table for segment # 1: Trim N (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 89.31 | 40.47 | 40.47 |
| 4.50 | 89.81 | 40.17 | 40.17 |
| 5.00 | 90.31 | 39.91 | 39.91 |
| 5.50 | 90.81 | 39.69 | 39.69 |
| 6.00 | 91.31 | 39.50 | 39.50 |
| 6.50 | 91.81 | 39.33 | 39.33 |
| 7.00 | 92.31 | 39.19 | 39.19 |
| 7.50 | 92.81 | 39.08 | 39.08 |
| 8.00 | 93.31 | 39.12 | 39.12 |
| 8.50 | 93.81 | 39.13 | 39.13 |

Barrier table for segment # 2: Trim S (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 89.31 | 41.36 | 41.36 |
| 4.50 | 89.81 | 41.04 | 41.04 |
| 5.00 | 90.31 | 40.76 | 40.76 |
| 5.50 | 90.81 | 40.52 | 40.52 |
| 6.00 | 91.31 | 40.31 | 40.31 |
| 6.50 | 91.81 | 40.14 | 40.14 |
| 7.00 | 92.31 | 39.99 | 39.99 |
| 7.50 | 92.81 | 39.88 | 39.88 |
| 8.00 | 93.31 | 39.78 | 39.78 |
| 8.50 | 93.81 | 39.70 | 39.70 |

TOTAL Leq FROM ALL SOURCES (DAY): 50.08
(NIGHT): 44.71

Filename: r5_u.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (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 : 48.00 / 48.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim S (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 : 62.00 / 53.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Filename: r5.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 50 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 48.00 / 48.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.50 m
Barrier receiver distance : 7.00 / 7.00 m
Source elevation : 77.65 m
Receiver elevation : 83.60 m
Barrier elevation : 83.15 m
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Result summary (night)

| | source height (m) | Road Leq (dBA) | Total Leq (dBA) |
|----------|-------------------------|----------------------|-----------------------|
| 1.Trim N | 1.50 | 51.68 | 51.68 * |
| 2.Trim S | 1.50 | 49.97 | 49.97 * |
| Total | | | 53.92 dBA |

* Bright Zone !

Barrier table for segment # 1: Trim N (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 87.15 | 50.77 | 50.77 |
| 4.50 | 87.65 | 49.70 | 49.70 |
| 5.00 | 88.15 | 48.31 | 48.31 |
| 5.50 | 88.65 | 47.01 | 47.01 |
| 6.00 | 89.15 | 45.88 | 45.88 |
| 6.50 | 89.65 | 44.93 | 44.93 |
| 7.00 | 90.15 | 44.13 | 44.13 |
| 7.50 | 90.65 | 43.43 | 43.43 |
| 8.00 | 91.15 | 42.83 | 42.83 |
| 8.50 | 91.65 | 42.47 | 42.47 |

Barrier table for segment # 2: Trim S (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 87.15 | 49.61 | 49.61 |
| 4.50 | 87.65 | 49.11 | 49.11 |
| 5.00 | 88.15 | 47.89 | 47.89 |
| 5.50 | 88.65 | 46.57 | 46.57 |
| 6.00 | 89.15 | 45.38 | 45.38 |
| 6.50 | 89.65 | 44.38 | 44.38 |
| 7.00 | 90.15 | 43.54 | 43.54 |
| 7.50 | 90.65 | 42.83 | 42.83 |
| 8.00 | 91.15 | 42.22 | 42.22 |
| 8.50 | 91.65 | 41.70 | 41.70 |

TOTAL Leq FROM ALL SOURCES (DAY): 56.51
(NIGHT): 53.92

STAMSON 5.0 SUMMARY REPORT Date: 22-09-2010 13:10:30
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r6_u.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (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 : 55.00 / 55.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim S (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 : 65.00 / 65.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Filename: r6.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 50 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 55.00 / 55.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.50 m
Barrier receiver distance : 23.00 / 23.00 m
Source elevation : 77.65 m
Receiver elevation : 83.43 m
Barrier elevation : 85.13 m
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Result summary (night)

| | ! source ! | Road ! | Total ! |
|----------|------------|---------|-----------|
| | ! height ! | Leq ! | Leq ! |
| | ! (m) ! | (dBA) ! | (dBA) ! |
| 1.Trim N | ! 1.50 ! | 43.81 ! | 43.81 ! |
| 2.Trim S | ! 1.50 ! | 44.06 ! | 44.06 ! |
| Total | | | 46.95 dBA |

Barrier table for segment # 1: Trim N (night)

| Barrier ! | Elev of ! | Road ! | Tot Leq ! |
|-----------|-------------|---------|-----------|
| Height ! | Barr Top! ! | dBA ! | dBA ! |
| 4.00 ! | 89.13 ! | 42.24 ! | 42.24 ! |
| 4.50 ! | 89.63 ! | 41.83 ! | 41.83 ! |
| 5.00 ! | 90.13 ! | 41.46 ! | 41.46 ! |
| 5.50 ! | 90.63 ! | 41.13 ! | 41.13 ! |
| 6.00 ! | 91.13 ! | 40.83 ! | 40.83 ! |
| 6.50 ! | 91.63 ! | 40.75 ! | 40.75 ! |
| 7.00 ! | 92.13 ! | 40.64 ! | 40.64 ! |
| 7.50 ! | 92.63 ! | 40.57 ! | 40.57 ! |
| 8.00 ! | 93.13 ! | 40.54 ! | 40.54 ! |
| 8.50 ! | 93.63 ! | 40.54 ! | 40.54 ! |

Barrier table for segment # 2: Trim S (night)

| Barrier ! | Elev of ! | Road ! | Tot Leq ! |
|-----------|-------------|---------|-----------|
| Height ! | Barr Top! ! | dBA ! | dBA ! |
| 4.00 ! | 89.13 ! | 42.35 ! | 42.35 ! |
| 4.50 ! | 89.63 ! | 41.91 ! | 41.91 ! |
| 5.00 ! | 90.13 ! | 41.52 ! | 41.52 ! |
| 5.50 ! | 90.63 ! | 41.18 ! | 41.18 ! |
| 6.00 ! | 91.13 ! | 40.87 ! | 40.87 ! |
| 6.50 ! | 91.63 ! | 40.60 ! | 40.60 ! |
| 7.00 ! | 92.13 ! | 40.36 ! | 40.36 ! |
| 7.50 ! | 92.63 ! | 40.34 ! | 40.34 ! |
| 8.00 ! | 93.13 ! | 40.27 ! | 40.27 ! |
| 8.50 ! | 93.63 ! | 40.25 ! | 40.25 ! |

TOTAL Leq FROM ALL SOURCES (DAY): 50.93
(NIGHT): 46.95

STAMSON 5.0 SUMMARY REPORT Date: 22-09-2010 13:21:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r7_u.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (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 : 80.00 / 80.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim S (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 : 92.00 / 92.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Filename: r7.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 60 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 80.00 / 80.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.50 m
Barrier receiver distance : 40.00 / 40.00 m
Source elevation : 77.65 m
Receiver elevation : 83.15 m
Barrier elevation : 85.13 m
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Result summary (night)

| | source height (m) | Road Leq (dBA) | Total Leq (dBA) |
|----------|-------------------------|----------------------|-----------------------|
| 1.Trim N | 1.50 | 41.30 | 41.30 |
| 2.Trim S | 1.50 | 41.56 | 41.56 |
| Total | | | 44.44 dBA |

Barrier table for segment # 1: Trim N (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 89.13 | 40.28 | 40.28 |
| 4.50 | 89.63 | 40.01 | 40.01 |
| 5.00 | 90.13 | 39.78 | 39.78 |
| 5.50 | 90.63 | 39.58 | 39.58 |
| 6.00 | 91.13 | 39.40 | 39.40 |
| 6.50 | 91.63 | 39.25 | 39.25 |
| 7.00 | 92.13 | 39.27 | 39.27 |
| 7.50 | 92.63 | 39.25 | 39.25 |
| 8.00 | 93.13 | 39.27 | 39.27 |
| 8.50 | 93.63 | 39.31 | 39.31 |

Barrier table for segment # 2: Trim S (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 89.13 | 40.47 | 40.47 |
| 4.50 | 89.63 | 40.20 | 40.20 |
| 5.00 | 90.13 | 39.96 | 39.96 |
| 5.50 | 90.63 | 39.76 | 39.76 |
| 6.00 | 91.13 | 39.58 | 39.58 |
| 6.50 | 91.63 | 39.42 | 39.42 |
| 7.00 | 92.13 | 39.30 | 39.30 |
| 7.50 | 92.63 | 39.19 | 39.19 |
| 8.00 | 93.13 | 39.25 | 39.25 |
| 8.50 | 93.63 | 39.26 | 39.26 |

TOTAL Leq FROM ALL SOURCES (DAY): 49.12
(NIGHT): 44.44

STAMSON 5.0 SUMMARY REPORT Date: 22-09-2010 13:34:06
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r8_u.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (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 : 92.00 / 103.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim S (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 : 103.00 / 103.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Filename: r8.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 2 / 2
House density : 80 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 95.00 / 95.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.50 m
Barrier receiver distance : 52.00 / 52.00 m
Source elevation : 77.65 m
Receiver elevation : 83.01 m
Barrier elevation : 85.13 m
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Result summary (night)

| | source height (m) | Road Leq (dBA) | Total Leq (dBA) |
|----------|-------------------------|----------------------|-----------------------|
| 1.Trim N | 1.50 | 40.10 | 40.10 |
| 2.Trim S | 1.50 | 40.36 | 40.36 |
| Total | | | 43.24 dBA |

Barrier table for segment # 1: Trim N (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 89.13 | 39.29 | 39.29 |
| 4.50 | 89.63 | 39.09 | 39.09 |
| 5.00 | 90.13 | 38.92 | 38.92 |
| 5.50 | 90.63 | 38.77 | 38.77 |
| 6.00 | 91.13 | 38.65 | 38.65 |
| 6.50 | 91.63 | 38.54 | 38.54 |
| 7.00 | 92.13 | 38.58 | 38.58 |
| 7.50 | 92.63 | 38.59 | 38.59 |
| 8.00 | 93.13 | 38.63 | 38.63 |
| 8.50 | 93.63 | 38.70 | 38.70 |

Barrier table for segment # 2: Trim S (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 89.13 | 39.52 | 39.52 |
| 4.50 | 89.63 | 39.32 | 39.32 |
| 5.00 | 90.13 | 39.14 | 39.14 |
| 5.50 | 90.63 | 38.99 | 38.99 |
| 6.00 | 91.13 | 38.87 | 38.87 |
| 6.50 | 91.63 | 38.77 | 38.77 |
| 7.00 | 92.13 | 38.69 | 38.69 |
| 7.50 | 92.63 | 38.62 | 38.62 |
| 8.00 | 93.13 | 38.70 | 38.70 |
| 8.50 | 93.63 | 38.74 | 38.74 |

TOTAL Leq FROM ALL SOURCES (DAY): 48.21
(NIGHT): 43.24

STAMSON 5.0 SUMMARY REPORT Date: 19-11-2009 10:08:28
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r9_u.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 50 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 39.00 / 39.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim S (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 50 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 48.00 / 48.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Filename: r9.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 50 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 31.00 / 31.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.50 m
Barrier receiver distance : 7.00 / 7.00 m
Source elevation : 77.65 m
Receiver elevation : 77.74 m
Barrier elevation : 79.85 m
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Result summary (night)

| | source height (m) | Road Leq (dBA) | Total Leq (dBA) |
|----------|-------------------------|----------------------|-----------------------|
| 1.Trim N | 1.50 | 51.53 | 51.53 |
| 2.Trim S | 1.50 | 50.07 | 50.07 |
| Total | | | 53.87 dBA |

Barrier table for segment # 1: Trim N (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 83.85 | 47.33 | 47.33 |
| 4.50 | 84.35 | 46.29 | 46.29 |
| 5.00 | 84.85 | 45.40 | 45.40 |
| 5.50 | 85.35 | 44.63 | 44.63 |
| 6.00 | 85.85 | 43.96 | 43.96 |
| 6.50 | 86.35 | 43.59 | 43.59 |
| 7.00 | 86.85 | 43.26 | 43.26 |
| 7.50 | 87.35 | 43.02 | 43.02 |
| 8.00 | 87.85 | 42.86 | 42.86 |
| 8.50 | 88.35 | 42.75 | 42.75 |

Barrier table for segment # 2: Trim S (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 83.85 | 46.08 | 46.08 |
| 4.50 | 84.35 | 45.04 | 45.04 |
| 5.00 | 84.85 | 44.16 | 44.16 |
| 5.50 | 85.35 | 43.41 | 43.41 |
| 6.00 | 85.85 | 42.76 | 42.76 |
| 6.50 | 86.35 | 42.20 | 42.20 |
| 7.00 | 86.85 | 41.95 | 41.95 |
| 7.50 | 87.35 | 41.70 | 41.70 |
| 8.00 | 87.85 | 41.54 | 41.54 |
| 8.50 | 88.35 | 41.44 | 41.44 |

TOTAL Leq FROM ALL SOURCES (DAY): 54.27
(NIGHT): 53.87

Filename: r10.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 50 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 50.10 / 50.10 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.50 m
Barrier receiver distance : 8.00 / 8.00 m
Source elevation : 71.40 m
Receiver elevation : 74.30 m
Barrier elevation : 75.24 m
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Result summary (night)

| | source height (m) | Road Leq (dBA) | Total Leq (dBA) |
|----------|-------------------------|----------------------|-----------------------|
| 1.Trim N | 1.50 | 51.39 | 51.39 * |
| 2.Trim S | 1.50 | 45.67 | 45.67 |
| Total | | | 52.42 dBA |

Barrier table for segment # 1: Trim N (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 79.24 | 47.76 | 47.76 |
| 4.50 | 79.74 | 46.52 | 46.52 |
| 5.00 | 80.24 | 45.44 | 45.44 |
| 5.50 | 80.74 | 44.53 | 44.53 |
| 6.00 | 81.24 | 43.75 | 43.75 |
| 6.50 | 81.74 | 43.08 | 43.08 |
| 7.00 | 82.24 | 42.50 | 42.50 |
| 7.50 | 82.74 | 41.99 | 41.99 |
| 8.00 | 83.24 | 41.78 | 41.78 |
| 8.50 | 83.74 | 41.58 | 41.58 |

Barrier table for segment # 2: Trim S (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 79.12 | 42.62 | 42.62 |
| 4.50 | 79.62 | 41.89 | 41.89 |
| 5.00 | 80.12 | 41.28 | 41.28 |
| 5.50 | 80.62 | 40.75 | 40.75 |
| 6.00 | 81.12 | 40.30 | 40.30 |
| 6.50 | 81.62 | 40.04 | 40.04 |
| 7.00 | 82.12 | 39.84 | 39.84 |
| 7.50 | 82.62 | 39.71 | 39.71 |
| 8.00 | 83.12 | 39.65 | 39.65 |
| 8.50 | 83.62 | 39.64 | 39.64 |

TOTAL Leq FROM ALL SOURCES (DAY): 52.55
(NIGHT): 52.42

STAMSON 5.0 SUMMARY REPORT Date: 19-11-2009 19:44:54
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r11_u.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 50 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 57.00 / 57.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim S (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 50 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 67.30 / 67.30 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Filename: r11.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 50 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 57.00 / 57.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.50 m
Barrier receiver distance : 26.00 / 26.00 m
Source elevation : 71.40 m
Receiver elevation : 74.15 m
Barrier elevation : 75.24 m
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Result summary (night)

| | source height (m) | Road Leq (dBA) | Total Leq (dBA) |
|----------|-------------------------|----------------------|-----------------------|
| 1.Trim N | 1.50 | 46.93 | 46.93 |
| 2.Trim S | 1.50 | 49.42 | 49.42 * |
| Total | | | 51.36 dBA |

* Bright Zone

Barrier table for segment # 1: Trim N (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 79.24 | 44.68 | 44.68 |
| 4.50 | 79.74 | 44.08 | 44.08 |
| 5.00 | 80.24 | 43.56 | 43.56 |
| 5.50 | 80.74 | 43.09 | 43.09 |
| 6.00 | 81.24 | 42.68 | 42.68 |
| 6.50 | 81.74 | 42.32 | 42.32 |
| 7.00 | 82.24 | 41.99 | 41.99 |
| 7.50 | 82.74 | 41.70 | 41.70 |
| 8.00 | 83.24 | 41.57 | 41.57 |
| 8.50 | 83.74 | 41.44 | 41.44 |

Barrier table for segment # 2: Trim S (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 79.24 | 48.98 | 48.98 |
| 4.50 | 79.74 | 48.63 | 48.63 |
| 5.00 | 80.24 | 48.01 | 48.01 |
| 5.50 | 80.74 | 47.28 | 47.28 |
| 6.00 | 81.24 | 46.56 | 46.56 |
| 6.50 | 81.74 | 45.90 | 45.90 |
| 7.00 | 82.24 | 45.31 | 45.31 |
| 7.50 | 82.74 | 44.79 | 44.79 |
| 8.00 | 83.24 | 44.33 | 44.33 |
| 8.50 | 83.74 | 43.93 | 43.93 |

TOTAL Leq FROM ALL SOURCES (DAY): 56.11
(NIGHT): 51.36

STAMSON 5.0 SUMMARY REPORT Date: 19-11-2009 14:09:35
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r12_u.ta Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3%
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 60 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 84.50 / 84.50 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope: no barrier)
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3%
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim S (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 60 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 99.80 / 99.80 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope: no barrier)
Reference angle : 0.00

Filename: r12.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 60 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 84.50 / 84.50 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.50 m
Barrier receiver distance : 44.00 / 44.00 m
Source elevation : 71.40 m
Receiver elevation : 73.85 m
Barrier elevation : 75.24 m
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Result summary (night)

| | source height (m) | Road Leq (dBA) | Total Leq (dBA) |
|----------|-------------------------|----------------------|-----------------------|
| 1.Trim N | 1.50 | 44.25 | 44.25 |
| 2.Trim S | 1.50 | 44.20 | 44.20 |
| Total | | | 47.24 dBA |

Barrier table for segment # 1: Trim N (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 79.24 | 42.67 | 42.67 |
| 4.50 | 79.74 | 42.25 | 42.25 |
| 5.00 | 80.24 | 41.88 | 41.88 |
| 5.50 | 80.74 | 41.56 | 41.56 |
| 6.00 | 81.24 | 41.27 | 41.27 |
| 6.50 | 81.74 | 41.03 | 41.03 |
| 7.00 | 82.24 | 40.82 | 40.82 |
| 7.50 | 82.74 | 40.63 | 40.63 |
| 8.00 | 83.24 | 40.47 | 40.47 |
| 8.50 | 83.74 | 40.34 | 40.34 |

Barrier table for segment # 2: Trim S (night)

| Barrier Height | Elev of Barr Top | Road dBA | Tot Leq dBA |
|-------------------|---------------------|-------------|----------------|
| 4.00 | 79.24 | 42.75 | 42.75 |
| 4.50 | 79.74 | 42.34 | 42.34 |
| 5.00 | 80.24 | 41.97 | 41.97 |
| 5.50 | 80.74 | 41.64 | 41.64 |
| 6.00 | 81.24 | 41.36 | 41.36 |
| 6.50 | 81.74 | 41.12 | 41.12 |
| 7.00 | 82.24 | 40.92 | 40.92 |
| 7.50 | 82.74 | 40.74 | 40.74 |
| 8.00 | 83.24 | 40.60 | 40.60 |
| 8.50 | 83.74 | 40.47 | 40.47 |

TOTAL Leq FROM ALL SOURCES (DAY): 51.45
(NIGHT): 47.24

Filename: r13.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Trim N (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
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: Trim N (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 2 / 2
House density : 80 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 98.30 / 98.30 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.50 m
Barrier receiver distance : 58.00 / 58.00 m
Source elevation : 71.40 m
Receiver elevation : 73.60 m
Barrier elevation : 75.24 m
Reference angle : 0.00

Road data, segment # 2: Trim S (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Result summary (night)

| | ! source ! | Road ! | Total ! |
|----------|------------|---------|-----------|
| | ! height ! | Leq ! | Leq ! |
| | ! (m) ! | (dBA) ! | (dBA) ! |
| 1.Trim N | ! 1.50 ! | 42.32 ! | 42.32 ! |
| 2.Trim S | ! 1.50 ! | 41.40 ! | 41.40 ! |
| Total | | | 44.89 dBA |

Barrier table for segment # 1: Trim N (night)

| Barrier ! | Elev of ! | Road ! | Tot Leq ! |
|-----------|------------|---------|-----------|
| Height ! | Barr Top ! | dBA ! | dBA ! |
| 4.00 ! | 79.24 ! | 41.45 ! | 41.45 ! |
| 4.50 ! | 79.74 ! | 41.11 ! | 41.11 ! |
| 5.00 ! | 80.24 ! | 40.82 ! | 40.82 ! |
| 5.50 ! | 80.74 ! | 40.56 ! | 40.56 ! |
| 6.00 ! | 81.24 ! | 40.35 ! | 40.35 ! |
| 6.50 ! | 81.74 ! | 40.16 ! | 40.16 ! |
| 7.00 ! | 82.24 ! | 40.00 ! | 40.00 ! |
| 7.50 ! | 82.74 ! | 39.87 ! | 39.87 ! |
| 8.00 ! | 83.24 ! | 39.76 ! | 39.76 ! |
| 8.50 ! | 83.74 ! | 39.67 ! | 39.67 ! |

Barrier table for segment # 2: Trim S (night)

| Barrier ! | Elev of ! | Road ! | Tot Leq ! |
|-----------|------------|---------|-----------|
| Height ! | Barr Top ! | dBA ! | dBA ! |
| 4.00 ! | 79.24 ! | 41.40 ! | 41.40 ! |
| 4.50 ! | 79.74 ! | 41.40 ! | 41.40 ! |
| 5.00 ! | 80.24 ! | 41.18 ! | 41.18 ! |
| 5.50 ! | 80.74 ! | 40.92 ! | 40.92 ! |
| 6.00 ! | 81.24 ! | 40.70 ! | 40.70 ! |
| 6.50 ! | 81.74 ! | 40.51 ! | 40.51 ! |
| 7.00 ! | 82.24 ! | 40.36 ! | 40.36 ! |
| 7.50 ! | 82.74 ! | 40.23 ! | 40.23 ! |
| 8.00 ! | 83.24 ! | 40.12 ! | 40.12 ! |
| 8.50 ! | 83.74 ! | 40.04 ! | 40.04 ! |

TOTAL Leq FROM ALL SOURCES (DAY): 50.56
(NIGHT): 44.89

STAMSON 5.0 SUMMARY REPORT Date: 21-10-2010 09:58:05
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: EC_R10.te Time Period: Day/Night 16/8 hours
 Description:

Road data, segment # 1: EX Trim Rd (day/night)

Car traffic volume : 12144/1056 veh/TimePeriod *
 Medium truck volume : 966/84 veh/TimePeriod *
 Heavy truck volume : 690/60 veh/TimePeriod *
 Posted speed limit : 60 km/h
 Road gradient : 3 %
 Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 15000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 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: EX Trim Rd (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 : 93.10 / 93.10 m
 Receiver height : 1.50 / 4.50 m
 Topography : 1 (Flat/gentle slope; no barrier)
 Reference angle : 0.00

Result summary (day)

| | source | Road | Total |
|--------------|--------|-----------|-------|
| | height | Leq | Leq |
| | (m) | (dBA) | (dBA) |
| 1.EX Trim Rd | 1.50 | 55.96 | 55.96 |
| Total | | 55.96 dBA | |

Result summary (night)

| | source | Road | Total |
|--------------|--------|-----------|-------|
| | height | Leq | Leq |
| | (m) | (dBA) | (dBA) |
| 1.EX Trim Rd | 1.50 | 49.23 | 49.23 |
| Total | | 49.23 dBA | |

TOTAL Leq FROM ALL SOURCES (DAY): 55.96
 (NIGHT): 49.23

STAMSON 5.0 SUMMARY REPORT Date: 21-10-2010 09:47:35
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: EC_R1.te Time Period: Day/Night 16/8 hours
 Description:

Road data, segment # 1: EX Trim Rd (day/night)

Car traffic volume : 12144/1056 veh/TimePeriod *
 Medium truck volume : 966/84 veh/TimePeriod *
 Heavy truck volume : 690/60 veh/TimePeriod *
 Posted speed limit : 60 km/h
 Road gradient : 3 %
 Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 15000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 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: EX Trim Rd (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 : 95.60 / 95.60 m
 Receiver height : 1.50 / 4.50 m
 Topography : 1 (Flat/gentle slope; no barrier)
 Reference angle : 0.00

Result summary (day)

| source | Road | Total |
|--------------|-------|-----------|
| height | Leq | Leq |
| (m) | (dBA) | (dBA) |
| 1.EX Trim Rd | 1.50 | 55.77 |
| Total | | 55.77 dBA |

Result summary (night)

| source | Road | Total |
|--------------|-------|-----------|
| height | Leq | Leq |
| (m) | (dBA) | (dBA) |
| 1.EX Trim Rd | 1.50 | 49.05 |
| Total | | 49.05 dBA |

TOTAL Leq FROM ALL SOURCES (DAY): 55.77
 (NIGHT): 49.05

STAMSON 5.0 SUMMARY REPORT Date: 21-10-2010 09:55:31
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: EC_R5.te Time Period: Day/Night 16/8 hours
 Description:

Road data, segment # 1: EX Trim Rd (day/night)

Car traffic volume : 12144/1056 veh/TimePeriod *
 Medium truck volume : 866/84 veh/TimePeriod *
 Heavy truck volume : 690/60 veh/TimePeriod *
 Posted speed limit : 60 km/h
 Road gradient : 3 %
 Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 15000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 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: EX Trim Rd (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 : 107.00 / 107.00 m
 Receiver height : 1.50 / 4.50 m
 Topography : 1 (Flat/gentle slope; no barrier)
 Reference angle : 0.00

Result summary (day)

| | ! source ! | Road ! | Total |
|--------------|------------|-----------|-----------|
| | ! height ! | Leq ! | Leq |
| | ! (m) ! | ! (dBA) ! | ! (dBA) |
| 1.EX Trim Rd | ! 1.50 ! | ! 54.96 ! | ! 54.96 |
| Total | | | 54.96 dBA |

Result summary (night)

| | ! source ! | Road ! | Total |
|------------|------------|-----------|-----------|
| | ! height ! | Leq ! | Leq |
| | ! (m) ! | ! (dBA) ! | ! (dBA) |
| EX Trim Rd | ! 1.50 ! | ! 48.28 ! | ! 48.28 |
| Total | | | 48.28 dBA |

TOTAL Leq FROM ALL SOURCES (DAY): 54.96
 (NIGHT): 48.28

STAMSON 5.0 SUMMARY REPORT Date: 21-10-2010 09:57:05
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: EC_R9.te Time Period: Day/Night 16/8 hours
 Description:

Road data, segment # 1: EX Trim Rd (day/night)

Car traffic volume : 12144/1056 veh/TimePeriod *
 Medium truck volume : 966/84 veh/TimePeriod *
 Heavy truck volume : 690/60 veh/TimePeriod *
 Posted speed limit : 60 km/h
 Road gradient : 3 %
 Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 15000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 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: EX Trim Rd (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 : 88.10 / 88.10 m
 Receiver height : 1.50 / 4.50 m
 Topography : 1 (Flat/gentle slope; no barrier)
 Reference angle : 0.00

Result summary (day)

| | ! source ! | Road ! | Total |
|--------------|------------|-----------|-----------|
| | ! height ! | Leq ! | Leq |
| | ! (m) ! | ! (dBA) ! | ! (dBA) ! |
| 1.EX Trim Rd | 1.50 | 56.36 | 56.36 |
| Total | | 56.36 dBA | |

Result summary (night)

| | ! source ! | Road ! | Total |
|--------------|------------|-----------|-----------|
| | ! height ! | Leq ! | Leq |
| | ! (m) ! | ! (dBA) ! | ! (dBA) ! |
| 1.EX Trim Rd | 1.50 | 49.60 | 49.60 |
| Total | | 49.60 dBA | |

TOTAL Leq FROM ALL SOURCES (DAY): 56.36
 (NIGHT): 49.60

STAMSON 5.0 SUMMARY REPORT Date: 21-10-2010 14:08:51
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: EC_R16.te Time Period: Day/Night 16/8 hours
 Description:

Road data, segment # 1: EX Trim Rd (day/night)

Car traffic volume : 12144/1056 veh/TimePeriod *
 Medium truck volume : 966/84 veh/TimePeriod *
 Heavy truck volume : 690/60 veh/TimePeriod *
 Posted speed limit : 60 km/h
 Road gradient : 3 %
 Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 15000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 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: EX Trim Rd (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 : 96.50 / 96.50 m
 Receiver height : 1.50 / 4.50 m
 Topography : 1 (Flat/gentle slope; no barrier)
 Reference angle : 0.00

Result summary (day)

| | source | Road | Total |
|--------------|--------|-----------|-------|
| | height | Leq | Leq |
| | (m) | (dBA) | (dBA) |
| 1.EX Trim Rd | 1.50 | 55.70 | 55.70 |
| Total | | 55.70 dBA | |

Result summary (night)

| | source | Road | Total |
|--------------|--------|-----------|-------|
| | height | Leq | Leq |
| | (m) | (dBA) | (dBA) |
| 1.EX Trim Rd | 1.50 | 48.98 | 48.98 |
| Total | | 48.98 dBA | |

TOTAL Leq FROM ALL SOURCES (DAY): 55.70
 (NIGHT): 48.98

APPENDIX C

NOISE CONTROL PLAN

APPENDIX D

ACCOUSTIC INSULATION FACTOR TABLES

| Noise level at building wall (dBA) | Bedrooms | | | | | Living, dining, recreation | | | | | Kitchen, bathrooms | | | | |
|------------------------------------|--|----|----|----|----|----------------------------|----|----|----|----|--------------------|----|----|----|----|
| | Number of components forming the room envelope | | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| 50 | 22 | 25 | 27 | 28 | 29 | 17 | 20 | 22 | 23 | 24 | 12 | 15 | 17 | 18 | 19 |
| 51 | 23 | 26 | 28 | 29 | 30 | 18 | 21 | 23 | 24 | 25 | 13 | 16 | 18 | 19 | 20 |
| 52 | 24 | 27 | 29 | 30 | 31 | 19 | 22 | 24 | 25 | 26 | 14 | 17 | 19 | 20 | 21 |
| 53 | 25 | 28 | 30 | 31 | 32 | 20 | 23 | 25 | 26 | 27 | 15 | 18 | 20 | 21 | 22 |
| 54 | 26 | 29 | 31 | 32 | 33 | 21 | 24 | 26 | 27 | 28 | 16 | 19 | 21 | 22 | 23 |
| 55 | 27 | 30 | 32 | 33 | 34 | 22 | 25 | 27 | 29 | 29 | 17 | 20 | 22 | 23 | 24 |
| 56 | 28 | 31 | 33 | 34 | 35 | 23 | 26 | 28 | 29 | 30 | 18 | 21 | 23 | 24 | 25 |
| 57 | 29 | 32 | 34 | 35 | 36 | 24 | 27 | 29 | 30 | 31 | 19 | 22 | 24 | 25 | 26 |
| 58 | 30 | 33 | 35 | 36 | 37 | 25 | 28 | 30 | 31 | 32 | 20 | 23 | 25 | 26 | 27 |
| 59 | 31 | 34 | 36 | 37 | 38 | 26 | 29 | 31 | 32 | 33 | 21 | 24 | 26 | 27 | 28 |
| 70 | 32 | 35 | 37 | 38 | 39 | 27 | 30 | 32 | 32 | 34 | 22 | 25 | 27 | 28 | 29 |
| 71 | 33 | 36 | 38 | 39 | 40 | 28 | 31 | 33 | 34 | 35 | 23 | 26 | 28 | 29 | 30 |
| 72 | 34 | 37 | 39 | 40 | 41 | 29 | 32 | 34 | 35 | 36 | 24 | 27 | 29 | 30 | 31 |
| 73 | 35 | 38 | 40 | 41 | 42 | 30 | 33 | 35 | 36 | 37 | 25 | 28 | 30 | 31 | 32 |
| 74 | 36 | 39 | 41 | 42 | 43 | 31 | 34 | 36 | 37 | 38 | 26 | 29 | 31 | 32 | 33 |
| 75 | 37 | 40 | 42 | 43 | 44 | 32 | 35 | 37 | 38 | 39 | 27 | 30 | 32 | 33 | 34 |
| 76 | 38 | 41 | 43 | 44 | 45 | 33 | 36 | 38 | 39 | 40 | 28 | 31 | 33 | 34 | 35 |

2000 L (night)

2000 L (DAY)

Table 11.2. AIF required for Road Traffic Noise.

TABLE 5: Acoustic Insulation Factor for Various Types of Windows

| Window area as a percentage of total floor area of room <small>(1)</small> <i>DAY TIME (10-16)</i> | Acoustic Insulation Factor (AIF) (2) | | | | | | | | | | Single glazing | Double glazing of indicated glass thickness | | | | Triple glazing 3mm, 3mm and 3mm glass 3mm, 3mm and 6mm glass Interpane spacings in mm (5) | | |
|--|--------------------------------------|----|----|----|----|----|----|----|----|----|----------------|---|----|-----------|-----|--|-------------------|-------------------|
| | 4 | 5 | 6 | 8 | 10 | 13 | 15 | 20 | 25 | 32 | | 40 | 50 | 63 | 80 | | 2mm and 2mm glass | 3mm and 3mm glass |
| 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 2mm | 3mm | 4mm | 6mm | 6 |
| 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 3mm | 4mm | 6mm | 6mm | 6 |
| 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 4mm - 5mm | 5 | 6 | 6 | 6 |
| 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 5mm | 6 | 6 | 6 | 6 |
| 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 6mm | 6 | 6 | 6 | 6 |
| 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 6mm | 6 | 6 | 6 | 6 |
| 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 6mm | 6 | 6 | 6 | 6 |
| 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 6mm | 6 | 6 | 6 | 6 |
| 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 6mm | 6 | 6 | 6 | 6 |
| 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 6mm | 6 | 6 | 6 | 6 |
| 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 6mm | 6 | 6 | 6 | 6 |
| 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 6mm | 6 | 6 | 6 | 6 |
| 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 6mm | 6 | 6 | 6 | 6 |
| 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 6mm | 6 | 6 | 6 | 6 |
| 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 6mm | 6 | 6 | 6 | 6 |
| 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 6mm | 6 | 6 | 6 | 6 |

Source: National Research Council, Division of Building Research, June 1960.

Explanatory Notes:

- 1) Where the calculated percentage window area is not presented as a column heading, the nearest percentage column in the table values should be used.
- 2) AIF data listed in the table are for well-fitted weatherstripped units that can be opened. The AIF values apply only when the windows are closed. For windows fixed and sealed to the frame, add three (3) to the AIF given in the table.
- 3) If the interpane spacing or glass thickness for a specific double glazed window is not listed in the table, the nearest listed values should be used.
- 4) The AIF ratings for 3mm and 12mm glass are for laminated glass only; for solid glass subtract two (2) from the AIF values listed in the table.
- 5) If the interpane spacings for a specific triple-glazed window are not listed in the table, use the listed case whose combined spacings are nearest the actual combined spacing.
- 6) The AIF data listed in the table are for typical windows, but details of glass mounting, window seals, etc. may result in slightly different performance for some manufacturers' products. If laboratory sound transmission loss data (conforming to ASTM test method E-90) are available, these should be used to calculate the AIF.

TABLE 6: ACOUSTIC INSULATION FACTOR FOR VARIOUS TYPES OF EXTERIOR WALL

| | Percentage of exterior wall area to total floor area of room | | | | | | | | | | Type of Exterior Wall | |
|----------------------------------|--|----|----|----|----|----|----|----|-----|-----|-----------------------|--------------|
| | 15 | 20 | 25 | 32 | 40 | 50 | 63 | 80 | 100 | 125 | | 160 |
| Acoustic Insulation Factor | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | EW1 |
| | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | EW2 |
| | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | EW3 |
| | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | EW4 |
| | 55 | 54 | 53 | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | EW5 or EW1R |
| | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | 48 | 47 | 46 | EW2R or EW3R |
| | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | 48 | 47 | EW4R |
| | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | 48 | EW6 |
| | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | EW7 |
| | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | EW5R |
| | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | EW8 or EW6R |
| | 64 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | EW7R |

Note: Where the calculated percentage wall area is not presented as a column heading, the nearest percentage column in the table should be used.

Source: National Research Council, Ottawa, November 1975

Explanatory Notes.

- 1) EW1 denotes exterior wall as in Note 2), plus sheathing, plus wood siding or metal siding and fibre backer board.
 EW2 denotes exterior wall as in Note 2), plus rigid insulation (25-50 mm), and wood siding or metal siding and fibre backer board.
 EW3 denotes simulated mansard with structure as in Note 2), plus sheathing, 38 x 89 mm framing, sheathing, and asphalt roofing material.
 EW4 denotes exterior wall as in Note 2), plus sheathing and 20 mm stucco.
 EW5 denotes exterior wall as in Note 2), plus sheathing, 25 mm air space, 100 mm brick veneer.
 EW6 denotes exterior wall composed of 12.7 mm gypsum board, rigid insulation (25-50 mm), 100 mm back-up block, 100 mm face brick.
 EW7 denotes exterior wall composed of 12.7 mm gypsum board, rigid insulation (25-50 mm), 140 mm back-up block, 100 mm face brick.
 EW8 denotes exterior wall composed of 12.7 mm gypsum board, rigid insulation (25-50 mm), 200 mm concrete.
- 2) The common structure of walls EW1 to EW5 is composed of 12.7 mm gypsum board, vapour barrier, 38 x 89 mm studs, and 50 mm (or thicker) mineral wool or glass fibre batts.
- 3) R signifies the mounting of the interior gypsum board on resilient clips.
- 4) An exterior wall conforming to rainscreen design principles and composed of 12.7 mm gypsum board, 100 mm concrete block, rigid insulation (25-50 mm), 25 mm air space, and 100 mm brick veneer has the same AIF as EW5.
- 5) An exterior wall described in EW1 with the addition of rigid insulation (25-50 mm) between the sheathing and the external finish has the same AIF as EW3.

Table D2 : Approximate conversion from STC to AIF for windows and doors

| Window (or door) area expressed as percentage of room floor area | Acoustic Insulation Factor (AIF) |
|--|----------------------------------|
| 80 | STC-5 |
| 63 | STC-4 |
| 50 | STC-3 |
| 40 | STC-2 |
| <u>32</u> | STC-1 |
| 25 | STC |
| 20 | STC+1 |
| 16 | STC+2 |
| 12.5 | STC+3 |
| 10 | STC+4 |
| 8 | STC+5 |
| 6.3 | STC+6 |
| 5 | STC+7 |
| 4 | STC+8 |

Note: For area percentages not listed in the table, use the nearest listed value.

Examples: For a window whose area = 20% of the room floor area and STC = 32, the AIF is $32 + 1 = 33$.

For a window whose area = 60% of the room floor area and STC = 29, the AIF is $29 - 4 = 25$.

$$32 + 1 = \underline{33 \text{ STC}}$$

Table 10 : Approximate conversion from STC to AIF for exterior walls

| Exterior wall area expressed as percentage of room floor area | Acoustic Insulation Factor (AIF) |
|---|----------------------------------|
| 200 | STC-10 |
| 160 | STC-9 |
| 125 | STC-8 |
| 100 | STC-7 |
| 80 | STC-6 |
| 63 | STC-5 |
| <u>50</u> | STC-4 |
| 40 | STC-3 |
| 32 | STC-2 |
| 25 | STC-1 |
| 20 | STC |
| 16 | STC+1 |
| 12.5 | STC+2 |
| 10 | STC+3 |
| 8 | |

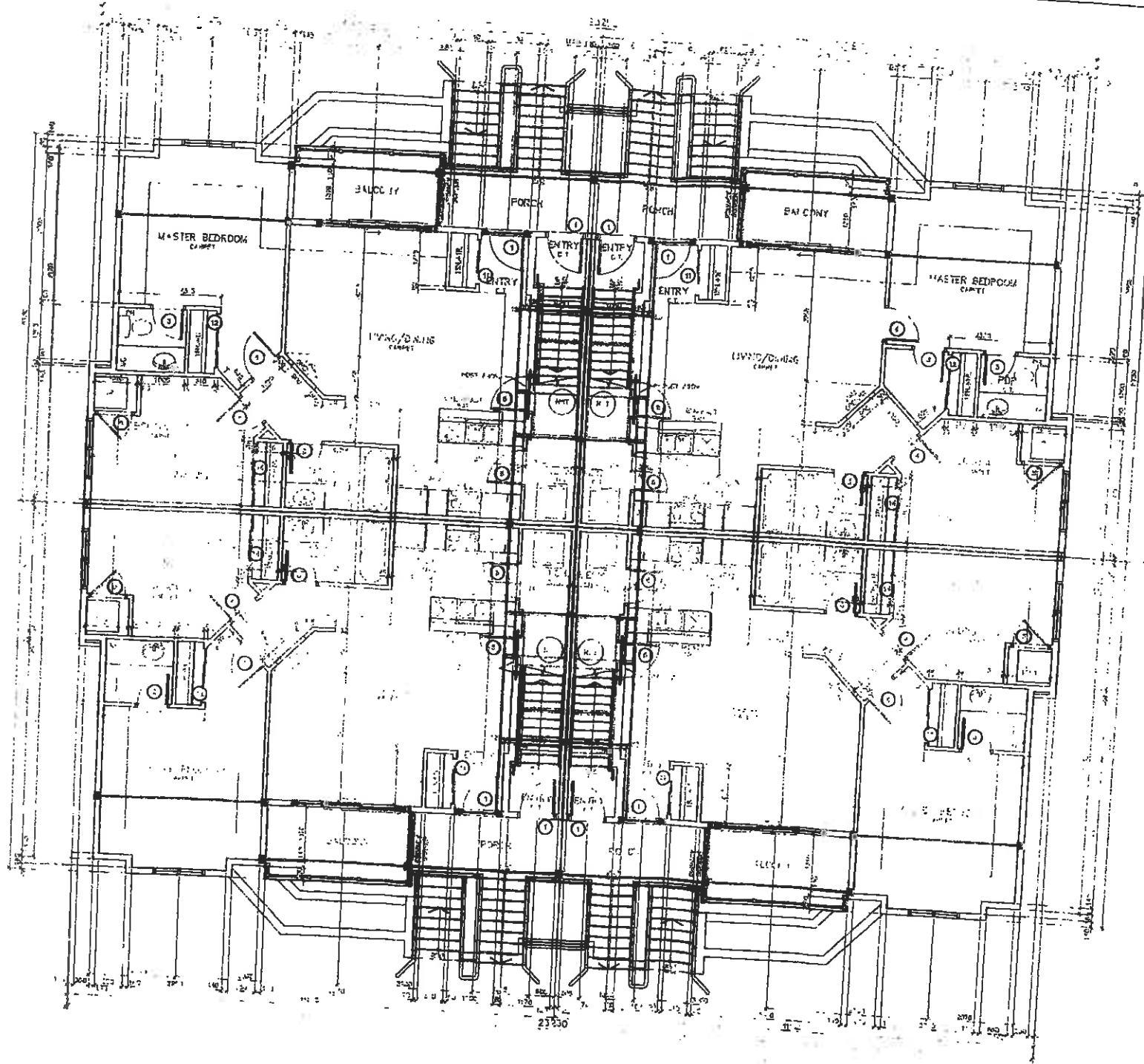
Note: For area percentages not listed in the table, use the nearest listed value.

Examples: For a wall whose area = 120% of the room floor area and STC = 48, the AIF is $48 - 8 = 40$.

$$38 - 4 = 34 \text{ STC}$$

APPENDIX E

ARCHITECTURAL TYPICAL SINGLE CONDO DWELLING



NTS

NOVATECH
 ENGINEERING
 CONSULTANTS LTD.
 ENGINEERS & PLANNERS
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RUSSELL FINDLAY LANDS
ARCHITECTURAL FLOOR
PLAN
 104094 DEC, 2009 APPEND 'E'

APPENDIX F

CITY CORESPONDANCE DEC 21, 2011



File Number: D07-16-05-0010

December 23, 2010

Mr. Greg MacDonald, P.Eng.
Mr. Martin .W. Connolly
Novatech Engineering Consultants Ltd.
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, K2M 1P6

Dear Mr. MacDonald, Mr. Connolly

Re: Noise Control Study
Royal Ridge Subdivision Trim Road

This Department has completed its review of the revised noise study, prepared by Novatech Engineering Consultants Ltd. dated October 29, 2010, Your File No. 104094. The City concurs with the noise levels in so far as they pertain to the proposed residential development. *The City thereby approves in pending the noise study as listed below subject to the resubmission after having made the corrections, as identified below, and to certain notices on title and the following conditions: (The final approval letter will be forwarded upon the receipt of two revised copies of noise study.*

Corrections to be made on Noise Study:

Pages 9 & 10: 5.0 Conclusion: The wording needs to be changed as – The noise barrier will be constructed along the property lines and NOT along future Trim Road right of way.

Should changes occur to the layout of the subdivision, types of dwelling units, grading and drainage, etc., the noise levels must be reviewed by the noise consultant and revised to reflect the change(s). This Department will then circulate the noise study for review and approval. Please send a copy of the approved grading and drainage plan showing the exact location of the noise barrier together with the elevations at the top of the barrier as soon as possible.

Please ensure this department is given the name of the manufacturer and supplier of the noise barrier as well as the contractor who will be installing the noise barrier. Also required is a set of detailed drawings and manufactures specifications of the noise barriers for our review. This information will become part of our files for future projects utilizing the same barrier.

Connecting People, Creating a Great City

Rapprocher les gens, créer une ville remarquable

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NOTICES ON TITLE

Outdoor Noise Control Features

In order to protect the outdoor living areas of Town Homes 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 25, 26, 27, 28, 29, 30, 32, 33, 34, 35, 36, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 68, 69, 70, 71, 72 & 73, Noise Barriers are to be constructed as follows:

- A 2.50 meter high noise barrier (Durisol or equivalent) shall be constructed along the property lines as shown on the Noise Control Plan (Drawing No. 104094-NCP).

The noise attenuation barriers shall be constructed of solid material (no gaps) with a minimum surface density of 20 kg/square meter.

Indoor Noise Control Features

In order to protect the indoor living areas of Buildings A – C (Block 47), Town Homes 8-13, 28-32, 49-54, 71-73, Lots 33-34, 37-38, building components must be designed/included as follows:

- Forced air heating systems shall be installed in Town homes 8-13, 28-32, 49-54, 71-73, Lots 33-34 & 37-38, such that the system is sized to accommodate the future installation of central air conditioning by the occupant, if desired.
- Buildings A – C (Block 47) directly adjacent to Future Trim Road, the noise levels at the building face exceed 65 dBA daytime and/or 60 dBA nighttime requiring mandatory central air conditioning, a review of the building components, and a type "D" warning clause. Building components are to be reviewed to determine the sound insulation requirements using the Acoustic Insulation Factor (AIF) method. The AIF method is detailed in the Central Mortgage and Housing Corporation (CMHC) manual "Road and Rail Effects on Housing."

Warning Clauses

The following Notices on Title (Warning Clauses) shall be included in the Development Agreement. The Notices on Title shall be included in Agreements of Purchase and Sale in Accordance with the terms specified by the Development Agreement.

Buildings A – C (Block 47)

"This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of the Environment's noise criteria."

"The transferee covenants with the transferor that the above clause, verbatim, shall be included in all subsequent Agreements of Purchase and Sale and Deeds conveying the lands described herein, which covenant shall run with the said lands and is for the benefit of the owner of the adjacent road."

Town Homes 8-13, 28-32, 49-54, 71-73

"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to (road) traffic may on occasion interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of the Environment's noise criteria."

"This dwelling unit has been fitted with a forced air heating system and the ducting, etc. was sized to accommodate central air conditioning. Installation of central air conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of the Environment's noise criteria. (Note: The location and installation of the outdoor air conditioning device should be done so as to comply with noise criteria of MOE Publication NPC-216, Residential Air Conditioning Devices and thus minimize the noise impacts both on and in the immediate vicinity of the subject property.)"

"The transferee covenants with the transferor that the above clause, verbatim, shall be included in all subsequent Agreements of Purchase and Sale and Deeds conveying the lands described herein, which covenant shall run with the said lands and is for the benefit of the owner of the adjacent road."

Town Homes 7, 14-16, 25-27, 33-36, 45-48, 55-57, 68-70

"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to (road) traffic may on occasion interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of the Environment's noise criteria."

"The transferee covenants with the transferor that the above clause, verbatim, shall be included in all subsequent Agreements of Purchase and Sale and Deeds conveying the lands described herein, which covenant shall run with the said lands and is for the benefit of the owner of the adjacent road."

Town Homes , 3-6, 17-18, 23-24, 37-38, 43-44, 58-59, 66-67, Lots 33-34 & 37-38

"Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of Environment's noise criteria."

"The transferee covenants with the transferor that the above clause, verbatim, shall be included in all subsequent Agreements of Purchase and Sale and Deeds conveying the lands described herein, which covenant shall run with the said lands and is for the benefit of the owner of the adjacent road."

Lots 33-34 and Lots 37-38

"This dwelling unit has been fitted with a forced air heating system and the ducting, etc. was sized to accommodate central air conditioning. Installation of central air conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of the Environment's noise criteria. (Note: The location and installation of the outdoor air conditioning device

should be done so as to comply with noise criteria of MOE Publication NPC-216, Residential Air Conditioning Devices and thus minimize the noise impacts both on and in the immediate vicinity of the subject property.)"

"The transferee covenants with the transferor that the above clause, verbatim, shall be included in all subsequent Agreements of Purchase and Sale and Deeds conveying the lands described herein, which covenant shall run with the said lands and is for the benefit of the owner of the adjacent road."

Financial Requirement

Letter of Credit: The owner agrees to secure a letter of credit prior to construction for the cost of the noise barriers and their installation. The total value of the letter of credit shall be determined by the developer's/owner's consultant. "The owner shall provide information to identify the material to be utilized in the noise barrier construction, specification details for installation, barrier cross sections and construction."

Conditions:

- 1. City of Ottawa Standard for Noise Barriers:** The most current version must be complied with.
- 2. Noise Barriers:** Noise attenuation fences are to be constructed 300mm inside the property line on private property to the height identified in the Novatech Engineering Consultants Ltd., and at the locations identified in this letter. Fences shall be solid construction with a minimum density of 20 kg/m² (4 lbs./sq ft)
- 3. Installation of Footings:** The Owner agrees to install noise barrier footings to a minimum depth of 2 meter depending on soil conditions when temperatures are above 5 degrees Celsius and when the frost is NOT in the ground, whenever possible. If the Owner agrees to install the footings in accordance with cold weather concrete provisions as per OPSS 904.07.03.08.
- 4. Surface Drainage:** The Owner agrees to ensure that all surface drainage channels such as grassed swales and ditches shall not cross the proposed noise barrier but shall be self-contained and directed to a municipal drain. This will ensure the mitigation effect of the noise barrier base by eliminating holes and gaps.
- 5. Noise Isolation STC 50:** The Ontario Building Code requires that the surfaces separating adjoining units in a multi-unit building be designed to at least a noise rating of STC 50. (Building inspectors should confirm the noise rating).
- 6. Stepping Up:** If stepping is required, the interval height per panel section will be no greater than 101.6 mm (4 inches).
- 7. Letter of Credit for Interior/Exterior Noise Mitigation Features:** The Owner agrees to provide a letter of credit, upon request, by the City of Ottawa, for the full cost of the required interior/exterior noise mitigation.

8. Sound Emission Standards for Residential Central Air Conditioners and Heat Pumps: Where required to be installed, the final installation shall comply with the Ministry of Environment criteria for the installation of Residential Air Conditioning Devices September 1994 Publication NPC-216.

9. Ownership/Maintenance: Where a noise barrier is installed by the owner as a condition of development approval, the owner agrees to notify the purchaser (via a notice on title), whose lot and/or block is adjacent to the right-of-way of an area municipality, regional road, transitway, and/or railway facility, that the purchaser is responsible to maintain the noise barrier in a good and sound condition including if necessary, the replacement or reconstructing of the barrier.

10. Letters of Certification

a. For the Noise Barrier Design: The Owner agrees that prior to construction of the noise barrier the consultant's engineer must file a letter with the City of Ottawa certifying the acoustical and structural integrity of the design. The design drawings accompanying the letter of certification (are to include the location, grading, barrier details, elevations, lots affected etc.) are to be stamped and signed by a professional engineer.

b. For the As-Built Noise Barrier (with drawings): The Owner agrees to provide a letter of certification via the developer's consultant, after construction, an "as-built" drawing of the barrier confirming the location, elevations, grades and a statement certifying that the structure installed is a noise barrier that will mitigate traffic noise to levels in the approved study.

c. Letter of Certification for the Interior/Exterior Noise Mitigation Features: The Owner agrees that prior to occupancy and/or final building inspection, the Owner's engineering consultant shall inspect the site and certify, upon request, to the City of Ottawa with a letter, that the recommended interior/exterior noise control measures comply with the measures in the approved study.

Any questions please telephone me at telephone number 580-2424, extension 16571.

Yours truly

(signed original copy)

Asad Yousfani, M.Eng.

Project Manager, Infrastructure Approvals-Transportation

Development Review (Suburban Services)

City of Ottawa

Planning and Growth Management Department

Infrastructure Services and Community Sustainability

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Cc: Benoit Leroux

Project Manager, Infrastructure Approvals

City of Ottawa