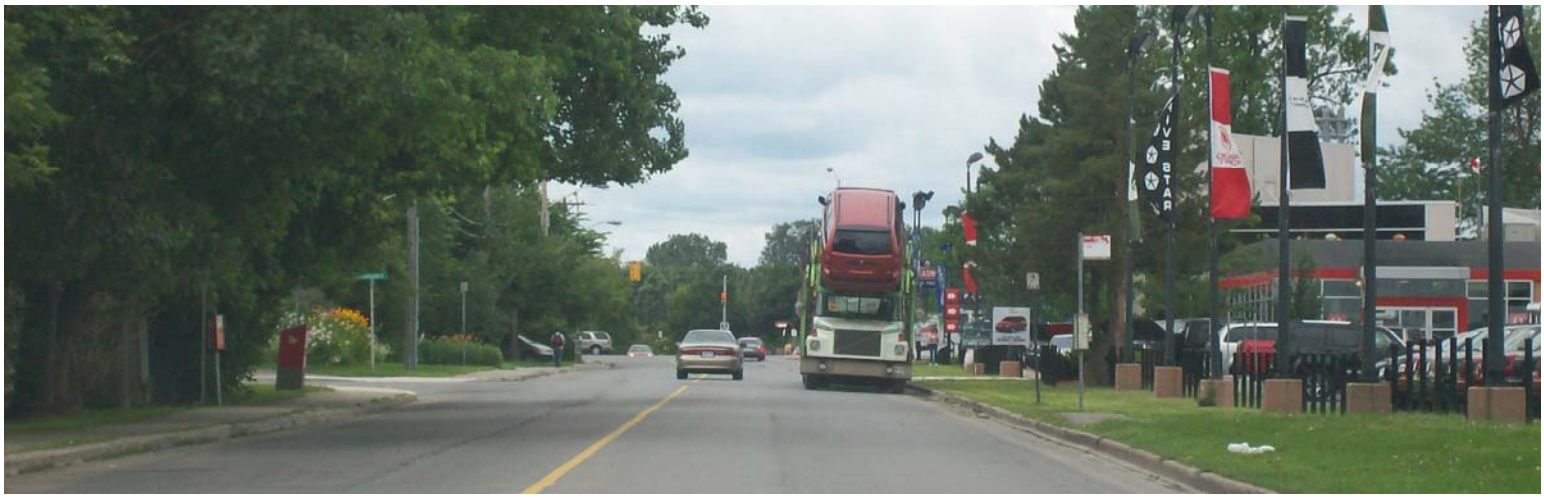
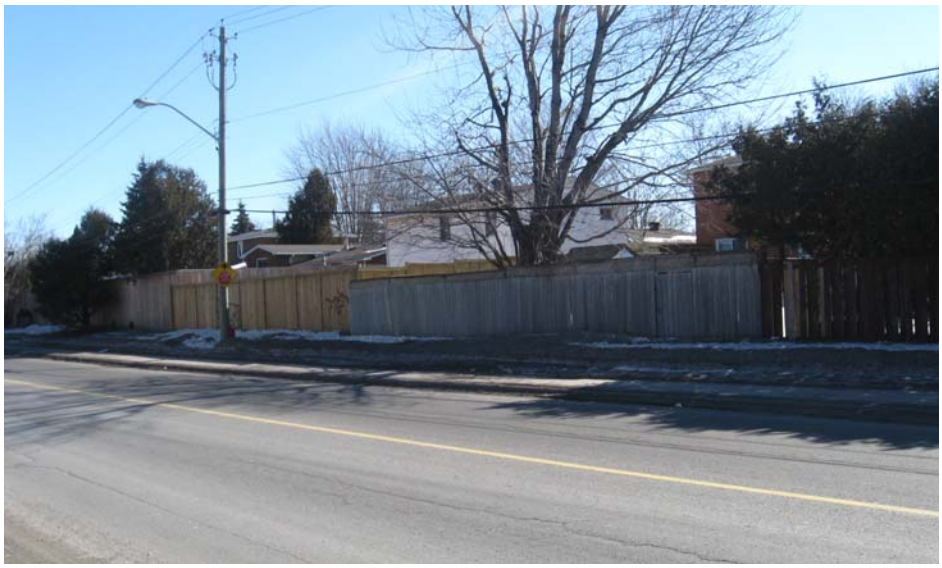
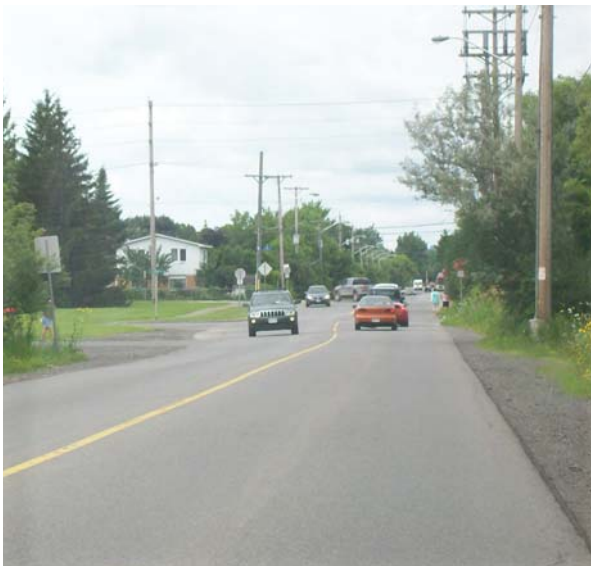
Prepared for:
City of Ottawa







Johnston Road Noise Report

Between Southgate Road and Albion Road

GENIVAR File No. OT-08-025-00-OT

GENIVAR

April 15, 2010

Johnston Road
Albion Road to Conroy Road

City of Ottawa

NOISE REPORT

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PROVINCE OF ONTARIO

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April 15, 2010

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EXECUTIVE SUMMARY

GENIVAR, on behalf of the City of Ottawa, conducted a noise impact assessment of the Johnston Road Land Use Study to assess the future conditions along Fernwood Drive and Viking Drive. The modelling of future noise levels was conducted using acoustical modelling software, STAMSON, version 5.03. Future sound levels were based on traffic projections and the City of Ottawa Environmental Noise Guidelines parameters.

This report documents the noise assessment and analysis including receiver site locations for necessary Noise Sensitive Areas (NSAs) and noise impacts of the development north of Johnston Road.

Along Fernwood Drive and Viking Drive, four (4) receiver sites were selected based on maximum exposure to potential noise sources. Two receivers were modelled at the same locations as a previous study conducted by SS Wilson Associates (May 2008) and the other two were modelled for maximum exposure to surface transportation noise. All 4 receiver sites experienced sound levels above the 55 dBA limit for the City's and Ministry of the Environment's noise criteria, requiring mitigation along Johnson Road.

As a result, a 3.0m noise barrier is recommended to be implemented along the south side of Johnston Road, between Southgate Road and Albion Road to mitigate sound levels by up to 10 dBA.

1.0 INTRODUCTION

GENIVAR was retained by the City of Ottawa to conduct a noise analysis for the Johnston Road Land Use Study (JRLUS), forecasting noise impacts of the proposed development north of Johnston Road on the existing residential neighbourhoods along Fernwood Drive and Viking Drive.

Johnston Road runs east-west. The existing residential housing is located on the south side of Johnston Road. Chain link and wood slat fencing exists along the back of the lots.

Albion Road borders the east side of the study area, running north and south of Johnston Road. No barriers exist along the right-of-way of the road.

Southgate Road runs south of Johnston Road on the west side of the study area.

See **Figure 1** for the study area location.

1.1 Noise Sensitive Areas

A Noise Sensitive Area (NSA) is defined as a land use that has an associated Outdoor Living Area (OLA). There is no minimum number of residences to define a NSA.

Examples of a NSA include a group of private homes such as single family residences, townhouses, apartments with OLA's for use by all occupants, and hospitals/nursing homes where there are OLA's for the patients.

Four receivers were modelled in two NSA's (**Figure 2**) as follow:

NSA 1: residential development located south of Johnston Road on Fernwood Drive.

NSA 2: residential development located south of Johnston Road and west of Albion Road, on Viking Drive.

2.0 METHODOLOGY

This evaluation was conducted to determine the impact of development of the lands north of Johnston Road, between Albion Road and Conroy Road on the NSA's south of Johnston Road. The analysis will also determine whether the previously recommended noise barriers along Johnston Road[1] are sufficient to meet the Municipal criteria for sound level mitigation goals.

The assessment was performed in accordance with the City of Ottawa's Environmental Noise Control Guidelines (approved May 10, 2006) and Official Plan Policies on Noise, and the City of Ottawa's Noise Bylaw (September 2004).

The STAMSON noise software program was utilized to determine existing 16-hour equivalent daytime and 8-hour equivalent night-time sound levels. The sound levels were calculated using STAMSON with the input of data, such as traffic and topographical characteristics.

[1] Noise Assessment Study for Noise Barruer Retrofit, Houses Along Fernwood Drive & Viking Drive, Johnston Road West of Albion Road, SS Wilson Associates Consulting Engineers, May 15, 2008

Figure 1: Study Area

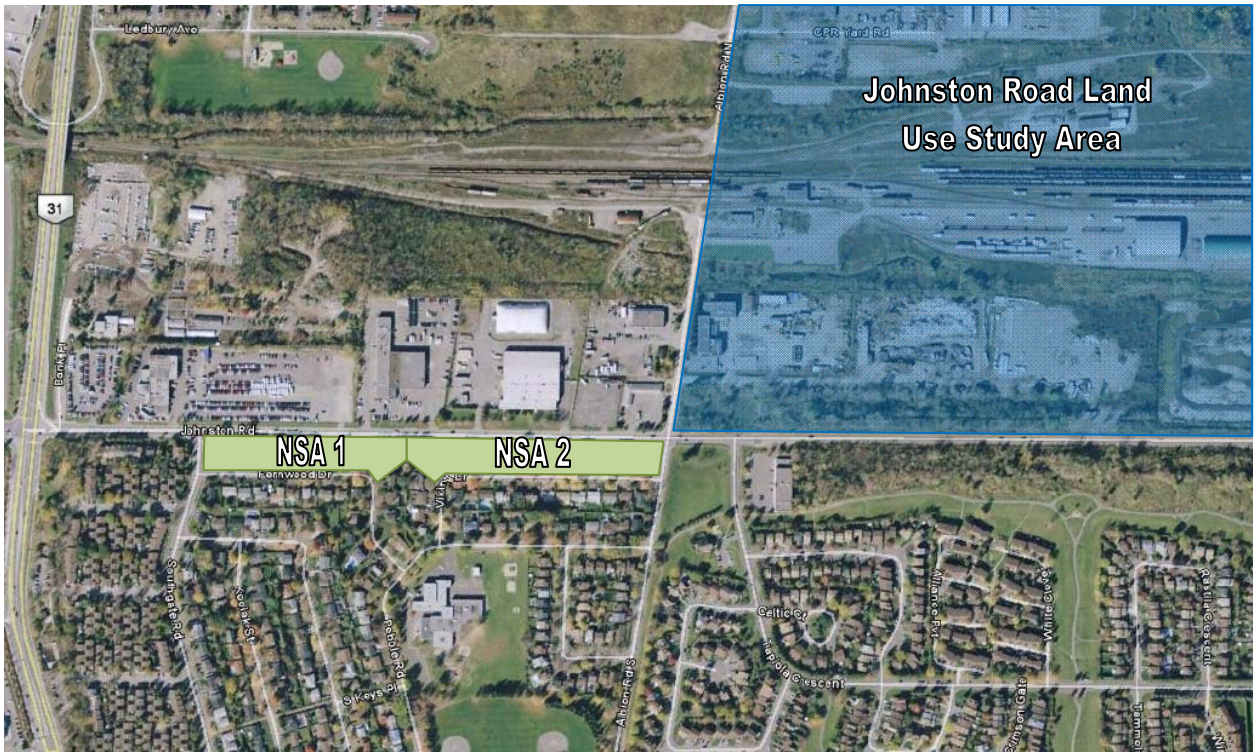
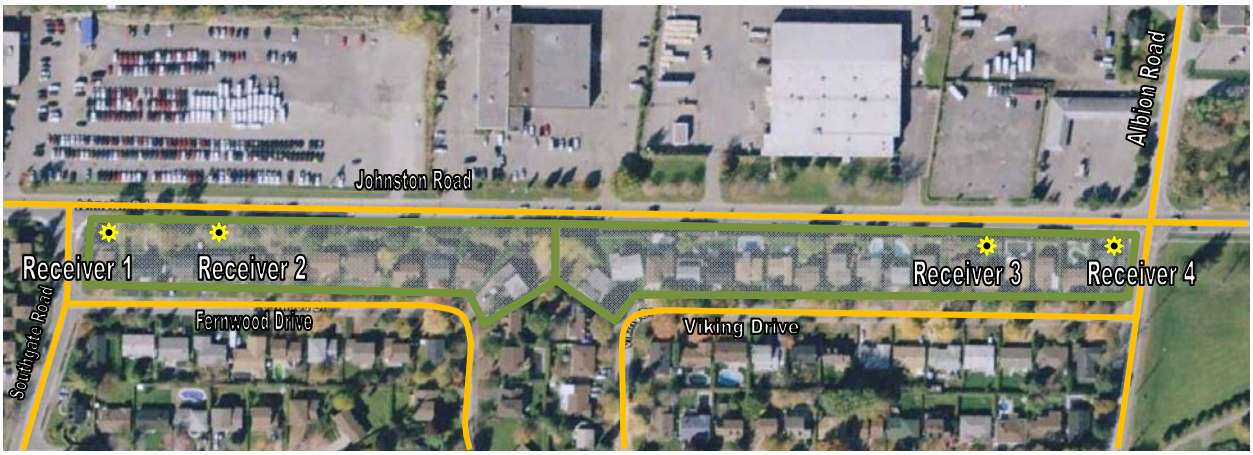


Figure 2: Receiver Locations and Noise Sensitive Areas



Legend:

Road Receiver NSA Area

2.1 Traffic Input Data

For City roads, the Noise Control Guidelines[2] indicate the use of the ultimate roadway cross section corresponding to build-out, or the data corresponding to the "mature state of development" in the City's Official Plan, for noise prediction purposes.

The existing volumes on Johnston Road were estimated from historic City traffic counts and are approaching the 12,000 vehicle Average Annual Daily Traffic (AADT) provided in the Noise Control Guidelines' parameters for a 2-lane major collector. To account for the growth expected on Johnston Road and the development traffic, Johnston Road was conservatively modelled as a 4-lane road with an AADT of 24,000 vehicles, based on the JLRUS traffic projections.

Albion Road traffic was also estimated from City traffic counts and found to have an AADT in the range of 6,000 – 8,800 vehicles. Within the study area, an AADT of 8,300 vehicles was predicted for Albion Road north of Johnston Road and an AADT of 8,000 vehicles south of Johnston Road.

The AADT on Southgate Road was below the minimum volume (i.e. 960 vehicles/day) required for input into STAMSON and was therefore excluded from the noise analysis.

The future traffic volumes for each roadway were assigned a vehicle classification mix of 88/7/5, that is 88% cars, 7% medium trucks, and 5% heavy trucks, as required by the City.

The day/night split of traffic used for the analysis was 92/8 for each of the roadways in the study area, also as required by the City.

The input data is summarized in **Table 1**.

2.2 Additional Input Variables

In addition to traffic volumes and vehicle split, the following STAMSON input variables were used or considered for the calculation of future sound levels:

- Topography (hills, flatlands)
- Existing attenuation due to shielding from barriers (natural or man-made)
- The intermediate ground surface (hard surface reflects sound, soft surface absorbs sound)
- Distance, in metres, from source to receiver, using the centreline of the road (or road segment) as the source
- The angle at which the receiver (house) intercepts the source (roadway), measured relative to the perpendicular line between the source and the receiver
- Receiver height (standard is 1.5 m above ground level)
- Posted speed limit - A posted speed of 50 km/h was used for both Johnston Road and Albion Road.
- Depth of woods (0-30m, 30-60m, 60m or more); and
- Roadway grade (slope).

All existing intersections within the study area are controlled with stop signs.

[2] Table 1.7: Traffic and Road Parameters To be Used For Sound level Predictions, Cit of Ottawa Environmental Noise Control Guidelines, pg 15

Table 1: Traffic and Road Parameters For Future Sound Level Predictions[3]

Roadways at *ultimate development* Build-out	**Implied Roadway Class**	**Build-out AADT (Vehicles/ day)**	**Posted Speed (km/h)**	**Day/ Night Split %**	**Medium Trucks %**	**Heavy Trucks %**
Johnston Road	4 – lane Major Collector	24,000	50	92/8	7	5
Albion Road (north of Johnston)	2 – lane Major Collector	8,300	50	92/8	7	5
Albion Road (south of Johnston Road)	2 – lane Major Collector	8,800	50	92/8	7	5

[3] Table 1.7, City of Ottawa Environmental Noise Control Guidelines

3.0 ANALYSIS OF FUTURE SOUND LEVELS

Equivalent day-time 16-hour and night-time 8-hour sound levels for the 4 receiver sites, outputted using the STAMSON noise software program, are shown in **Table 2.**

For the STAMSON output of the results, refer to **Appendix A**.

The future sound levels with the future development will increase, due in increased traffic volumes on Johnston Road and Albion Road.

Table 2: Future Day-time/Night-time Sound Levels (Leq 16h/8h, dBA)

Receiver	2010 Existing Noise Level, Leq (dBA)		Future Noise Level, Leq (dBA)		Comparison to Sound Level Criteria for OLA (▲dBA)
	Day-Time	Night-Time	Day-Time (16 hour)	Night-Time (8 hour)	Day-Time > 5dBA Leq16h
R1	65.59	58.13	68.45	61.51	+13.45
R2	63.12	55.84	66.9	60.35	+11.9
R3	63.57	55.29	67.40	62.05	+12.4
R4	66.95	59.51	69.84	62.94	+14.84

4.0 NOISE IMPACTS

The significance of a noise impact for daytime outdoor living area noise levels is qualified by using the objective of 55 dBA (7 a.m. to 11 p.m.), or the future ambient based on the City's Environmental Noise Control Guidelines. This 55 dBA level is established as an acceptable noise level for outdoor recreation areas of noise sensitive land uses adjacent to surface transportation noise (i.e. roads).

In addition, Table 2.1 of the City's Noise Guidelines (See **Table 5**) indicates that in cases where the sound levels are above 60 dBA, mitigation to achieve the retrofit criteria of a minimum 6 dBA attenuation shall be investigated.

The City's Noise Guidelines provides a standard for sound barrier height and location. The preferred barrier height, from the barrier base, is 2.5m to a maximum height of 3.0m, for retrofit purposes. Higher noise barriers may be allowed by the City of Ottawa, subject to aesthetics of the installation and availability within the right-of-way.

NSA 1 (R1 and R2): The section of Johnston Road approaching Bank Street will have an increased volume of traffic travelling from the new development lands in the JRLUS. This traffic was estimated to be an additional 2,500 vehicles per day. No sound barriers exist along Johnston Road.

The future sound levels exceed the 60 dBA for both R1 and R2 and will require noise mitigation to be implemented. GENIVAR recommends a 3.0 metre noise barrier to provide the following attenuation:

Table 3: Recommended Barrier for NSA 1, 3.0 m

Receiver	Mitigated Daytime (16hr) Sound
	Attenuation
R1	-9.6
R2	-8.66

NSA 2 (R3 and R4): The increased traffic on Albion Road and Johnston Road has the greatest impact on the residential area, in particular, Receiver 3. The traffic increases approximately 2,500 vehicles per day east, west and south, and 7,200 vehicles north on Albion Road.

As future sound levels exceed 60 dBA, noise mitigation will be required for both R3 and R4. GENIVAR recommends a 3.0 m barrier be implemented. **Table 4** identifies the attenuation that will be achieved with this barrier.

Table 4: Recommended Barrier for NSA 2, 3.0 m

Receiver	Mitigated Daytime (16hr) Sound
	Attenuation
R3	-9.21
R4	-10.52

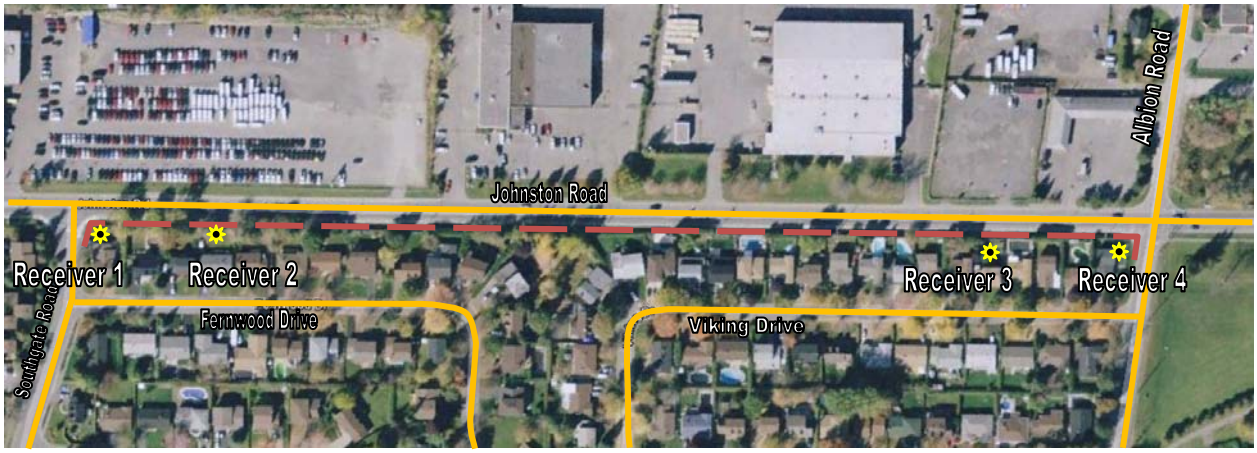
Table 5: Summary of Impact Rating and Action for Mitigation			
Future Sound Level, Leq $_{16hr}$	**Change Above Ambient, dBA**	**Impact Rating**	**Mitigation[1]**
Greater than 55 dBA and less than or equal to 60 dBA	0-3	Insignificant	None
	3-5	Noticeable	None
	5-10	Significant	Investigate noise control measures and mitigate to achieve retrofit criteria (minimum attenuation is 6 dBA)
	10+	Very Significant	
Greater than 60 dBA	0-3	Insignificant	Investigate noise control measures and mitigate to achieve retrofit criteria (minimum attenuation is 6 dBA)
	3-5	Noticeable	
	5-10	Significant	
	10+	Very Significant	
[1]Mitigate to future do-nothing ambient as administratively, economically, and technically feasible.			

5.0 SUMMARY AND RECOMMENDATIONS

The existing noise levels for the outdoor living areas along Fernwood Drive and Viking Drive are approximately 62 dBA during the day-time hours[4]. Upon build-out of the new development lands, an increase of 3 to 4 dBA will be experienced along both local roads. The anticipated noise levels are consistent with the SS Wilson study, which had predicted sound levels of 65-66 dBA.

To meet the minimum 6 dBA abatement outlined in the City of Ottawa Environmental Noise Control Guidelines, GENIVAR recommends a 3.0m barrier be installed along Johnston Road shown in **Figure 3**. Study area photos are provided in **Appendix B**.

Figure 3: Proposed Noise Barrier Location



Legend:

Road Sound Barrier Receiver

[4] Noise Assessment Study for Noise Barruer Retrofit, Houses Along Fernwood Drive & Viking Drive, Johnston Road West of Albion Road, SS Wilson Associates Consulting Engineers, May 15, 2008

GLOSSARY OF TERMS

AADT — **A**nnual **A**verage **D**aily **T**raffic – the average 24-hour, two-way traffic for the period from January 1st to December 31st.

(DBA) — 'A' weighted sound level; the human ear cannot hear the very high and the very low sound frequencies as well as the mid-frequencies of sound, and hence the predicted sound levels, measured in dBA, are a reasonable accurate approximation of sound levels heard by the human ear. The resulting value is in decibels and is commonly labelled dBA.

Acoustical analysis — An acoustical analysis involves the input of variables (traffic volumes, roadway gradient, presence of barriers, posted speed) to generate output (sound levels) from a noise software program.

Adjacent — Adjacent indicates lying near Ministry highway rights-of-way, although not necessarily contiguous to them.

Aesthetics — Aesthetics refers to methods of providing visual relief and appealing characteristics to planned noise barriers through the application of landscaping designs.

Ambient/Existing/ Background Noise Level — Ambient is the all-encompassing noise associated with a given environment, usually consisting of a composite of sounds from many sources. It is the noise level prior to construction of an undertaking.

Attenuation — See Noise Attenuation

Automobile — See Vehicle Classification

Barrier — A noise barrier is a physical structure, which is located between a noise source and a noise sensitive receiver. These include walls, berms, and combinations of the two, which are effective in reducing sound level transmission from the source to the receiver.

Berm — Earth land form used to shield residential areas (NSA's) from noise.

Decibel (dB)	Decibel is a logarithmic unit of measure used for expressing level of sound.
Environmental Report	This includes all reports prepared in compliance with the Environmental Assessment Act requirements and submitted to the Ministry of the Environment for acceptance, approval, informational or monitoring purposes and the public record. These include Environmental Assessment Reports, Environmental Study Reports, Environmental Status Statements, and Design and Construction Reports.
Equivalent Sound Level (Leq)	The level of a continuous sound having the same energy as a fluctuating sound in a given time period. In this report Leq refers to 24-hour average (Leq, 24h).
First Row Receiver	First row receivers are those adjacent receivers where noise level differences are imperceptible (within 3 dBA) from the noisiest receiver.
Freeway	Freeway is defined as an existing completed, partially developed (staged) or proposed divided highway with full control of access, grade separated intersections. This definition may include some highways that are not officially designated as freeways.
GVW	**G**ross **V**ehicle **W**eight is the total weight (in kilograms) transmitted to the highway by a vehicle or combination of vehicles, and load.
Heavy Truck	See Vehicle Classification
Medium Truck	See Vehicle Classification
Mitigation Measures	Actions taken to reduce the effects of noise increases. These measures include walls, berms, adjustments to horizontal and vertical alignments and pavement types that are designated to result in reduced noise levels in NSA's.
Noise	Undesirable and/or unwanted sound.

Noise Attenuation	A mitigation measure used to lessen the intensity of the noise level (dBA) where the noise level is increased in a noise sensitive area by more than 5 dBA, 10 years after completion.
Noise Impact Assessment	The difference (delta) between ambient (before construction) and noise level with construction of the undertaking, both projected 10 years after construction.
NSA	**N**oise **S**ensitive **A**rea is a noise sensitive land use, which has an outdoor living area (OLA) associated with the residential unit. Private homes, townhouses, apartments, and hospitals are classified as NSA's.
OLA	**O**utdoor **L**iving **A**rea is adjacent to a noise sensitive area (NSA) and is the part of an outdoor amenity area provided for the quiet enjoyment of the outdoor environment.
Protocol (Noise)	An agreement between the Ministry of the Environment and the Ministry of Transportation. Full title is "A Protocol for Dealing with Noise Concerns During the Preparation, Review and Evaluation of Provincial Highways' Environmental Assessments".
Receiver	The location *to* which the noise/sound emits.
Retrofit (Barrier)	A barrier candidate site, which satisfies all warrants for construction and therefore qualifies for inclusion on the capital construction program when priorities dictate and funds become available.
SADT	**S**ummer **A**verage **D**aily **T**raffic – the average 24-hour, two-way traffic for the period from July 1st to August 31st including weekends.
Sound	A dynamic (fluctuating) pressure that transmits by means of rapid air fluctuation from a source to a receiver.

Source	The location *from* which the noise/sound emits.
Vehicle Classification	For noise calculations, vehicular traffic is segregated into three types: automobiles, medium trucks and heavy trucks. **Automobiles –** two axles and four wheels designed primarily for the transportation of nine or fewer passengers, or transportation of cargo (light trucks), including motorcycles. The gross vehicle weight (GVW) is less than 4500 kilograms. **Medium trucks –** two axles and six wheels designed for the transportation of cargo. The gross vehicle weight is 4500 kg > GVW < 12,000 kg **Heavy trucks –** three or more axles and designed for the transportation of cargo. GVW >12,000 kg.

Appendix A
STAMSON Output

```
STAMSON 5.0        NORMAL REPORT        Date: 25-02-2010 09:30:59
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r1.te               Time Period: Day/Night 16/8 hours
Description: Receiver 1 - Existing, No Barrier


Road data, segment # 1: Johnston (day/night)
-----------------------------------------------
Car traffic volume  :  9209/801   veh/TimePeriod  *
Medium truck volume :   733/64    veh/TimePeriod  *
Heavy truck volume  :   523/45    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  11375
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :  10.00
    Medium Truck % of Total Volume      :   7.00
    Heavy Truck  % of Total Volume      :   5.00
    Day (16 hrs) % of Total Volume      :  92.00

Data for Segment # 1: Johnston (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  :  15.50 / 15.50  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

♀
Results segment # 1: Johnston (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 65.59 + 0.00) = 65.59 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.66  67.28   0.00  -0.24  -1.46   0.00   0.00   0.00  65.59
-------------------------------------------------------------------------------

Segment Leq : 65.59 dBA

Total Leq All Segments: 65.59 dBA

♀
Results segment # 1: Johnston (night)
-------------------------------------

Source height = 1.49 m

ROAD (0.00 + 58.13 + 0.00) = 58.13 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.57  59.66   0.00  -0.22  -1.30   0.00   0.00   0.00  58.13
-------------------------------------------------------------------------------
```



```
Segment Leq : 58.13 dBA

Total Leq All Segments: 58.13 dBA

♀


TOTAL Leq FROM ALL SOURCES (DAY): 65.59
                           (NIGHT): 58.13
♀
♀
```

STAMSON 5.0 NORMAL REPORT Date: 25-02-2010 09:31:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r2.te Time Period: Day/Night 16/8 hours
Description: Receiver 2 - Existing, No Barrier

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

Car traffic volume : 9209/801 veh/TimePeriod *
Medium truck volume : 733/64 veh/TimePeriod *
Heavy truck volume : 523/45 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 11375
Percentage of Annual Growth : 0.00
Number of Years of Growth : 10.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Johnston (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 : 20.50 / 23.50 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

♀
Results segment # 1: Johnston (day)

Source height = 1.50 m

ROAD (0.00 + 63.57 + 0.00) = 63.57 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	67.28	0.00	-2.25	-1.46	0.00	0.00	0.00	63.57

Segment Leq : 63.57 dBA

Total Leq All Segments: 63.57 dBA

♀
Results segment # 1: Johnston (night)

Source height = 1.49 m

ROAD (0.00 + 55.29 + 0.00) = 55.29 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.57	59.66	0.00	-3.06	-1.30	0.00	0.00	0.00	55.29

Segment Leq : 55.29 dBA

Total Leq All Segments: 55.29 dBA

♀

TOTAL Leq FROM ALL SOURCES (DAY): 63.57
(NIGHT): 55.29
♀
♀

STAMSON 5.0 NORMAL REPORT Date: 25-02-2010 09:33:32
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r3.te Time Period: Day/Night 16/8 hours
Description: Receiver 3 - Existing, No Barrier

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

Car traffic volume : 9361/814 veh/TimePeriod *
Medium truck volume : 745/65 veh/TimePeriod *
Heavy truck volume : 532/46 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 11562
Percentage of Annual Growth : 0.00
Number of Years of Growth : 10.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Johnston (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 : 22.50 / 22.50 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Car traffic volume : 5194/452 veh/TimePeriod *
Medium truck volume : 413/36 veh/TimePeriod *
Heavy truck volume : 295/26 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 6415
Percentage of Annual Growth : 0.00
Number of Years of Growth : 10.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Albion S (day/night)

Angle1 Angle2 : 0.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 79.00 / 79.00 m
Receiver height : 1.50 / 4.50 m

Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

♀
Results segment # 1: Johnston (day)

Source height = 1.50 m

ROAD (0.00 + 62.97 + 0.00) = 62.97 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	67.35	0.00	-2.92	-1.46	0.00	0.00	0.00	62.97

Segment Leq : 62.97 dBA

♀
Results segment # 2: Albion S (day)

Source height = 1.50 m

ROAD (0.00 + 48.35 + 0.00) = 48.35 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.66	64.79	0.00	-11.98	-4.47	0.00	0.00	0.00	48.35

Segment Leq : 48.35 dBA

Total Leq All Segments: 63.12 dBA

♀
Results segment # 1: Johnston (night)

Source height = 1.49 m

ROAD (0.00 + 55.67 + 0.00) = 55.67 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.57	59.74	0.00	-2.76	-1.30	0.00	0.00	0.00	55.67

Segment Leq : 55.67 dBA

♀
Results segment # 2: Albion S (night)

Source height = 1.50 m

ROAD (0.00 + 41.59 + 0.00) = 41.59 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.57	57.23	0.00	-11.33	-4.31	0.00	0.00	0.00	41.59

Segment Leq : 41.59 dBA

Total Leq All Segments: 55.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.12
(NIGHT): 55.84

STAMSON 5.0 NORMAL REPORT Date: 25-02-2010 09:34:40
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r4.te Time Period: Day/Night 16/8 hours
Description: Receiver 4 - Existing, No Barrier

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

Car traffic volume	9361/814	veh/TimePeriod *
Medium truck volume	745/65	veh/TimePeriod *
Heavy truck volume	532/46	veh/TimePeriod *
Posted speed limit	50 km/h	
Road gradient	1 %	
Road pavement	1 (Typical asphalt or concrete)	

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

24 hr Traffic Volume (AADT or SADT)	11562
Percentage of Annual Growth	0.00
Number of Years of Growth	10.00
Medium Truck % of Total Volume	7.00
Heavy Truck % of Total Volume	5.00
Day (16 hrs) % of Total Volume	92.00

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

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

Car traffic volume	5193/452	veh/TimePeriod *
Medium truck volume	413/36	veh/TimePeriod *
Heavy truck volume	295/26	veh/TimePeriod *
Posted speed limit	50 km/h	
Road gradient	1 %	
Road pavement	1 (Typical asphalt or concrete)	

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

24 hr Traffic Volume (AADT or SADT)	6414
Percentage of Annual Growth	0.00
Number of Years of Growth	10.00
Medium Truck % of Total Volume	7.00
Heavy Truck % of Total Volume	5.00
Day (16 hrs) % of Total Volume	92.00

Data for Segment # 2: Albion S (day/night)

Angle1 Angle2	0.00 deg	90.00 deg
Wood depth	0	(No woods.)
No of house rows	0 / 0	
Surface	1	(Absorptive ground surface)
Receiver source distance	15.00 / 15.00	m
Receiver height	1.50 / 4.50	m

Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Johnston (day)

Source height = 1.50 m

ROAD (0.00 + 65.89 + 0.00) = 65.89 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	67.35	0.00	0.00	-1.46	0.00	0.00	0.00	65.89

Segment Leq : 65.89 dBA

Results segment # 2: Albion S (day)

Source height = 1.50 m

ROAD (0.00 + 60.32 + 0.00) = 60.32 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.66	64.79	0.00	0.00	-4.47	0.00	0.00	0.00	60.32

Segment Leq : 60.32 dBA

Total Leq All Segments: 66.95 dBA

Results segment # 1: Johnston (night)

Source height = 1.49 m

ROAD (0.00 + 58.44 + 0.00) = 58.44 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.57	59.74	0.00	0.00	-1.30	0.00	0.00	0.00	58.44

Segment Leq : 58.44 dBA

Results segment # 2: Albion S (night)

Source height = 1.50 m

ROAD (0.00 + 52.92 + 0.00) = 52.92 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.57	57.23	0.00	0.00	-4.31	0.00	0.00	0.00	52.92

Segment Leq : 52.92 dBA

Total Leq All Segments: 59.51 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.95
(NIGHT): 59.51

```
STAMSON 5.0        NORMAL REPORT        Date: 25-02-2010 11:57:55
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r1bar.te             Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Johnston WB (day/night)
-----------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

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

Data for Segment # 1: Johnston WB (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  :  15.00 / 15.50  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            :   3.00 m
Barrier receiver distance :   5.50 / 10.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

♀
Road data, segment # 2: Johnston EB (day/night)
-----------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

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

Data for Segment # 2: Johnston EB (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  :  18.00 / 15.00  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            :   3.00 m
Barrier receiver distance :   5.50 / 10.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

♀
Results segment # 1: Johnston WB (day)
---------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+-------------
       1.50 !        1.50 !        1.50 !          1.50

ROAD (0.00 + 56.28 + 0.00) = 56.28 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.48  67.51   0.00   0.00  -1.14   0.00   0.00 -10.09  56.28
-------------------------------------------------------------------------------

Segment Leq : 56.28 dBA

♀
Results segment # 2: Johnston EB (day)
---------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+-------------
       1.50 !        1.50 !        1.50 !          1.50

ROAD (0.00 + 55.36 + 0.00) = 55.36 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.48  67.51   0.00  -1.17  -1.14   0.00   0.00  -9.84  55.36
-------------------------------------------------------------------------------

Segment Leq : 55.36 dBA

Total Leq All Segments: 58.85 dBA

♀
Results segment # 1: Johnston WB (night)
-----------------------------------------
```

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	2.56	2.56

ROAD (0.00 + 52.98 + 0.00) = 52.98 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.39	59.91	0.00	-0.20	-0.96	0.00	0.00	-5.78	52.98

Segment Leq : 52.98 dBA

Results segment # 2: Johnston EB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	2.50	2.50

ROAD (0.00 + 52.91 + 0.00) = 52.91 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.39	59.91	0.00	0.00	-0.96	0.00	0.00	-6.04	52.91

Segment Leq : 52.91 dBA

Total Leq All Segments: 55.96 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.85
(NIGHT): 55.96

STAMSON 5.0 NORMAL REPORT Date: 25-02-2010 12:40:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r2bar.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Johnston WB (day/night)

Car traffic volume	9715/845	veh/TimePeriod *
Medium truck volume	773/67	veh/TimePeriod *
Heavy truck volume	552/48	veh/TimePeriod *
Posted speed limit	50 km/h	
Road gradient	1 %	
Road pavement	1 (Typical asphalt or concrete)	

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

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

Data for Segment # 1: Johnston WB (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	23.50 / 23.50 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	3.00 m
Barrier receiver distance	10.00 / 10.00 m
Source elevation	0.00 m
Receiver elevation	0.00 m
Barrier elevation	0.00 m
Reference angle	0.00

Road data, segment # 2: Johnston EB (day/night)

Car traffic volume	9715/845	veh/TimePeriod *
Medium truck volume	773/67	veh/TimePeriod *
Heavy truck volume	552/48	veh/TimePeriod *
Posted speed limit	50 km/h	
Road gradient	1 %	
Road pavement	1 (Typical asphalt or concrete)	

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

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

Data for Segment # 2: Johnston EB (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  :  18.00 / 15.00  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            :   3.00 m
Barrier receiver distance :  10.00 / 10.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

♀

Results segment # 1: Johnston WB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.50	1.50

ROAD (0.00 + 54.66 + 0.00) = 54.66 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.48	67.51	0.00	-2.89	-1.14	0.00	0.00	-8.83	54.66

Segment Leq : 54.66 dBA

♀

Results segment # 2: Johnston EB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.50	1.50

ROAD (0.00 + 55.74 + 0.00) = 55.74 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.48	67.51	0.00	-1.17	-1.14	0.00	0.00	-9.46	55.74

Segment Leq : 55.74 dBA

Total Leq All Segments: 58.24 dBA

♀

Results segment # 1: Johnston WB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	3.22	3.22

ROAD (0.00 + 55.55 + 0.00) = 55.55 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.39	59.91	0.00	-2.71	-0.96	0.00	0.00	-4.86	51.38*
-90	90	0.57	59.91	0.00	-3.06	-1.30	0.00	0.00	0.00	55.55

 * Bright Zone !

Segment Leq : 55.55 dBA

♀

Results segment # 2: Johnston EB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	2.50	2.50

ROAD (0.00 + 52.91 + 0.00) = 52.91 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.39	59.91	0.00	0.00	-0.96	0.00	0.00	-6.04	52.91

Segment Leq : 52.91 dBA

Total Leq All Segments: 57.44 dBA

♀

TOTAL Leq FROM ALL SOURCES (DAY): 58.24
(NIGHT): 57.44

♀
♀

STAMSON 5.0 NORMAL REPORT Date: 25-02-2010 11:49:18
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r3bar.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Johnston EB (day/night)

Car traffic volume : 9715/845 veh/TimePeriod *
Medium truck volume : 773/67 veh/TimePeriod *
Heavy truck volume : 552/48 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

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

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

Data for Segment # 1: Johnston EB (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 : 20.00 / 22.50 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 : 3.00 m
Barrier receiver distance : 11.50 / 10.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

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

Car traffic volume : 7136/621 veh/TimePeriod *
Medium truck volume : 568/49 veh/TimePeriod *
Heavy truck volume : 405/35 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 8814
Percentage of Annual Growth : 0.00
Number of Years of Growth : 10.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Albion S (day/night)

Angle1 Angle2 : 0.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 79.00 / 79.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 0.00 deg Angle2 : 90.00 deg
Barrier height : 3.00 m
Barrier receiver distance : 69.50 / 69.50 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

♀
Road data, segment # 3: Albion N (day/night)

Car traffic volume : 6743/586 veh/TimePeriod *
Medium truck volume : 536/47 veh/TimePeriod *
Heavy truck volume : 383/33 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 8329
Percentage of Annual Growth : 0.00
Number of Years of Growth : 10.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 3: Albion N (day/night)

Angle1 Angle2 : -90.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 79.00 / 79.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 0.00 deg
Barrier height : 3.00 m
Barrier receiver distance : 69.50 / 69.50 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

♀
Road data, segment # 4: Johnston WB (day/night)

Car traffic volume : 9715/845 veh/TimePeriod *
Medium truck volume : 773/67 veh/TimePeriod *
Heavy truck volume : 552/48 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

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

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

Data for Segment # 4: Johnston WB (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  :  25.00 / 15.00  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            :   3.00 m
Barrier receiver distance :  11.50 / 10.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

♀
Results segment # 1: Johnston EB (day)
--------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 55.30 + 0.00) = 55.30 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.48  67.51   0.00  -1.85  -1.14   0.00   0.00  -9.22  55.30
-------------------------------------------------------------------------------

Segment Leq : 55.30 dBA

♀
Results segment # 2: Albion S (day)
-----------------------------------

Source height = 1.49 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.49 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 43.34 + 0.00) = 43.34 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.48  66.17   0.00 -10.68  -4.15   0.00   0.00  -8.00  43.34
-------------------------------------------------------------------------------
```



```
Segment Leq : 43.34 dBA

♀
Results segment # 3: Albion N (day)
-----------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 43.10 + 0.00) = 43.10 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.48  65.92   0.00 -10.68  -4.15   0.00   0.00  -8.00  43.10
-------------------------------------------------------------------------------

Segment Leq : 43.10 dBA

♀
Results segment # 4: Johnston WB (day)
--------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 54.44 + 0.00) = 54.44 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.48  67.51   0.00  -3.28  -1.14   0.00   0.00  -8.65  54.44
-------------------------------------------------------------------------------

Segment Leq : 54.44 dBA

Total Leq All Segments: 58.19 dBA

♀
Results segment # 1: Johnston EB (night)
----------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        4.50 !        3.16 !         3.16

ROAD (0.00 + 55.84 + 0.00) = 55.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
```

-90	90	0.39	59.91	0.00	-2.45	-0.96	0.00	0.00	-4.92	51.58*
-90	90	0.57	59.91	0.00	-2.76	-1.30	0.00	0.00	0.00	55.84

* Bright Zone !

Segment Leq : 55.84 dBA

♀

Results segment # 2: Albion S (night)

Source height = 1.49 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.49	4.50	1.85	1.85

ROAD (0.00 + 37.54 + 0.00) = 37.54 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.39	58.55	0.00	-10.03	-3.97	0.00	0.00	-7.01	37.54

Segment Leq : 37.54 dBA

♀

Results segment # 3: Albion N (night)

Source height = 1.49 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.49	4.50	1.85	1.85

ROAD (0.00 + 37.30 + 0.00) = 37.30 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.39	58.31	0.00	-10.03	-3.97	0.00	0.00	-7.01	37.30

Segment Leq : 37.30 dBA

♀

Results segment # 4: Johnston WB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	2.50	2.50

ROAD (0.00 + 52.91 + 0.00) = 52.91 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.39	59.91	0.00	0.00	-0.96	0.00	0.00	-6.04	52.91

Segment Leq : 52.91 dBA

Total Leq All Segments: 57.71 dBA

♀

TOTAL Leq FROM ALL SOURCES (DAY): 58.19
(NIGHT): 57.71

♀
♀

```
STAMSON 5.0        NORMAL REPORT        Date: 25-02-2010 12:03:23
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r4bar.te             Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Johnston EB (day/night)
-----------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

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

Data for Segment # 1: Johnston EB (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  :  15.00 / 15.00  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            :   3.00 m
Barrier receiver distance :   2.50 / 2.50   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

♀
Road data, segment # 2: Albion S (day/night)
-----------------------------------------------
Car traffic volume  :  7136/621   veh/TimePeriod  *
Medium truck volume :   568/49    veh/TimePeriod  *
Heavy truck volume  :   405/35    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8814
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :  10.00
    Medium Truck % of Total Volume      :   7.00
    Heavy Truck  % of Total Volume      :   5.00
    Day (16 hrs) % of Total Volume      :  92.00

Data for Segment # 2: Albion S (day/night)
-----------------------------------------------
```



```
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :   3.00 m
Barrier receiver distance :   7.00 / 7.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

♀
Road data, segment # 3: Albion N (day/night)
-----------------------------------------------
Car traffic volume  :  6743/586   veh/TimePeriod  *
Medium truck volume :   536/47    veh/TimePeriod  *
Heavy truck volume  :   383/33    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8329
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :  10.00
    Medium Truck % of Total Volume      :   7.00
    Heavy Truck  % of Total Volume      :   5.00
    Day (16 hrs) % of Total Volume      :  92.00

Data for Segment # 3: Albion N (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 0.00 deg
Barrier height            :   3.00 m
Barrier receiver distance :   7.00 / 7.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

♀
Road data, segment # 4: Johnston WB (day/night)
-----------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

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

Data for Segment # 4: Johnston WB (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  :  19.00 / 15.00  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            :   3.00 m
Barrier receiver distance :   2.50 / 10.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

♀
Results segment # 1: Johnston EB (day)
--------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 54.95 + 0.00) = 54.95 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.48  67.51   0.00   0.00  -1.14   0.00   0.00 -11.42  54.95
-------------------------------------------------------------------------------

Segment Leq : 54.95 dBA

♀
Results segment # 2: Albion S (day)
-----------------------------------

Source height = 1.49 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.49 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 52.10 + 0.00) = 52.10 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.48  66.17   0.00   0.00  -4.15   0.00   0.00  -9.92  52.10
-------------------------------------------------------------------------------
```



```
Segment Leq : 52.10 dBA

♀
Results segment # 3: Albion N (day)
-----------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 51.86 + 0.00) = 51.86 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.48  65.92   0.00   0.00  -4.15   0.00   0.00  -9.92  51.86
-------------------------------------------------------------------------------

Segment Leq : 51.86 dBA

♀
Results segment # 4: Johnston WB (day)
--------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 53.57 + 0.00) = 53.57 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.48  67.51   0.00  -1.52  -1.14   0.00   0.00 -11.29  53.57
-------------------------------------------------------------------------------

Segment Leq : 53.57 dBA

Total Leq All Segments: 59.32 dBA

♀
Results segment # 1: Johnston EB (night)
----------------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        4.50 !        4.00 !         4.00

ROAD (0.00 + 58.61 + 0.00) = 58.61 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
```

-90	90	0.39	59.91	0.00	0.00	-0.96	0.00	0.00	-0.41	58.54*
-90	90	0.57	59.91	0.00	0.00	-1.30	0.00	0.00	0.00	58.61

* Bright Zone !

Segment Leq : 58.61 dBA

♀

Results segment # 2: Albion S (night)

Source height = 1.49 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.49	4.50	3.10	3.10

ROAD (0.00 + 54.24 + 0.00) = 54.24 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.39	58.55	0.00	0.00	-3.97	0.00	0.00	-4.96	49.62*
0	90	0.57	58.55	0.00	0.00	-4.31	0.00	0.00	0.00	54.24

* Bright Zone !

Segment Leq : 54.24 dBA

♀

Results segment # 3: Albion N (night)

Source height = 1.49 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.49	4.50	3.10	3.10

ROAD (0.00 + 54.00 + 0.00) = 54.00 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.39	58.31	0.00	0.00	-3.97	0.00	0.00	-4.96	49.38*
-90	0	0.57	58.31	0.00	0.00	-4.31	0.00	0.00	0.00	54.00

* Bright Zone !

Segment Leq : 54.00 dBA

♀

Results segment # 4: Johnston WB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	2.50	2.50

ROAD (0.00 + 52.91 + 0.00) = 52.91 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.39	59.91	0.00	0.00	-0.96	0.00	0.00	-6.04	52.91

Segment Leq : 52.91 dBA

Total Leq All Segments: 61.58 dBA

♀

TOTAL Leq FROM ALL SOURCES (DAY): 59.32
(NIGHT): 61.58

♀
♀

Appendix B
Study Area Photographs

Exhibit 1: Corner of Johnston Road & Southgate Road, Receiver Site #1

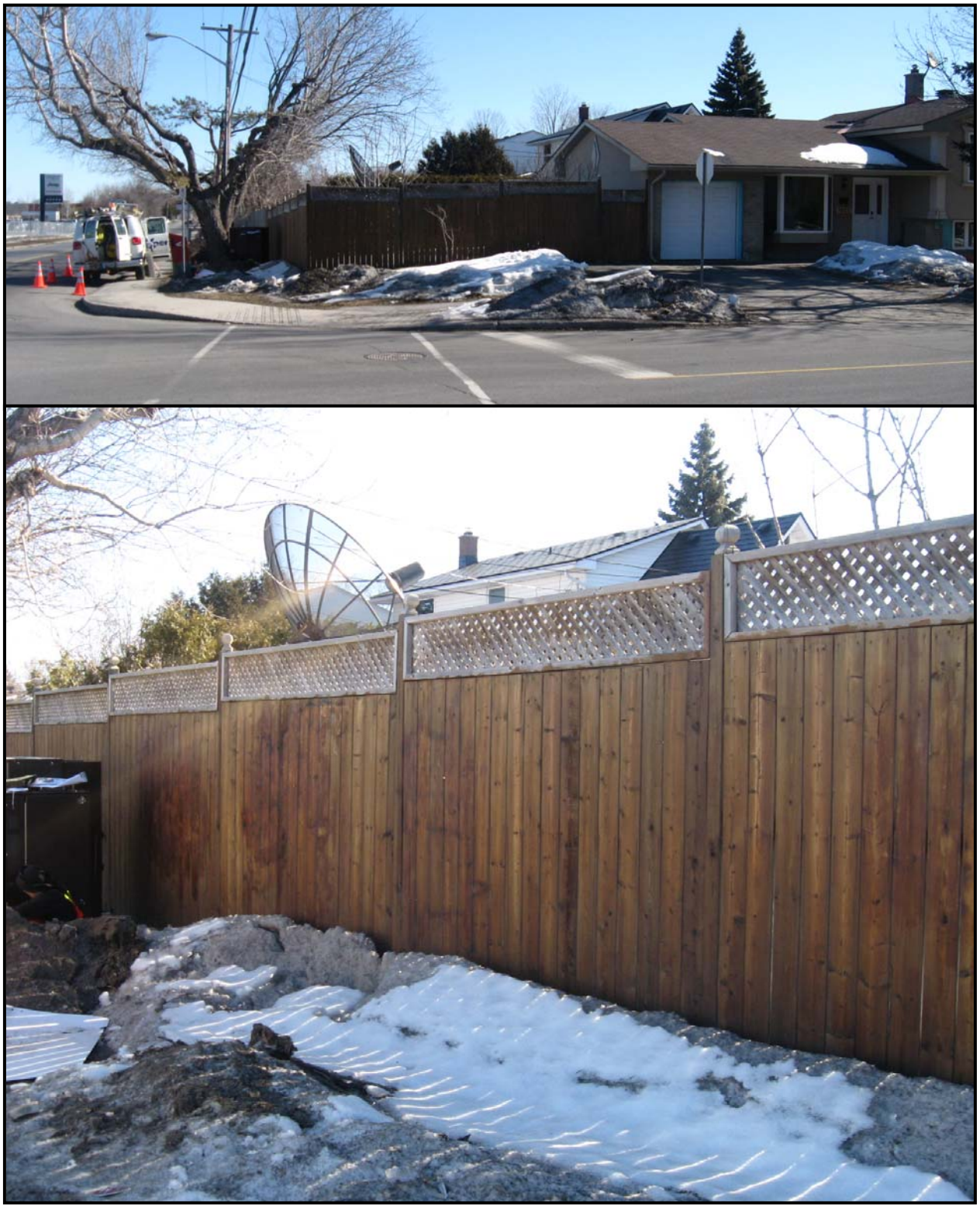


Exhibit 2: Fence at Receiver Site #2, Fernwood Drive

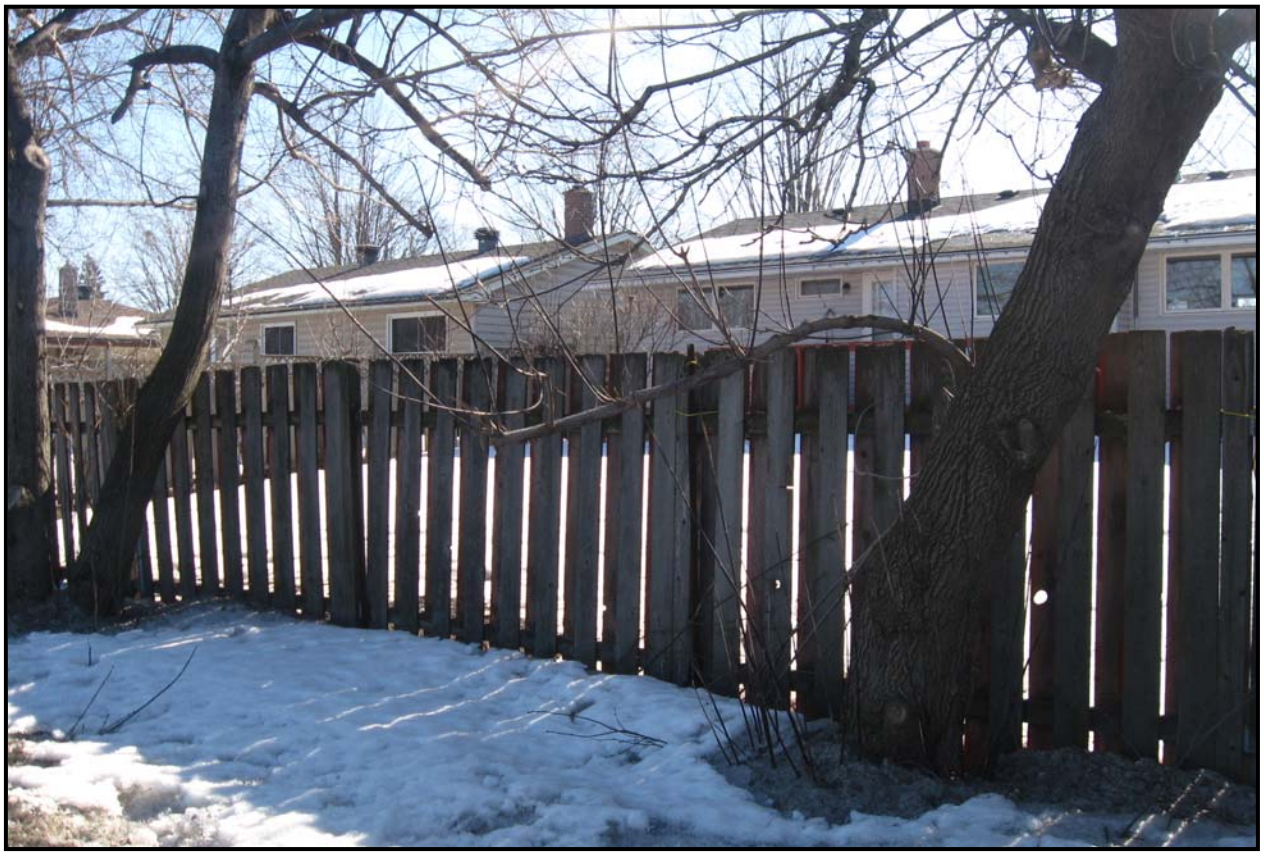


Exhibit 3: Fence at Receiver Site #3, Viking Drive

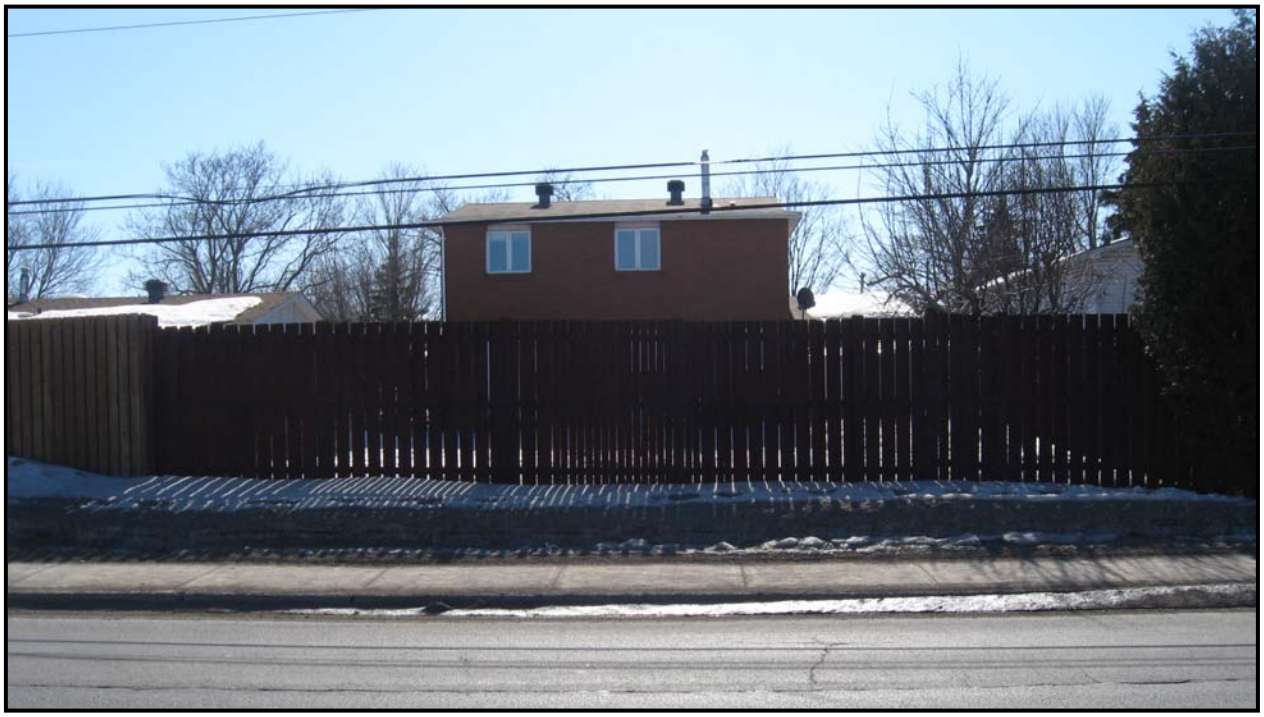


Exhibit 4: Corner of Johnston Road & Albion Road, Receiver Site #4

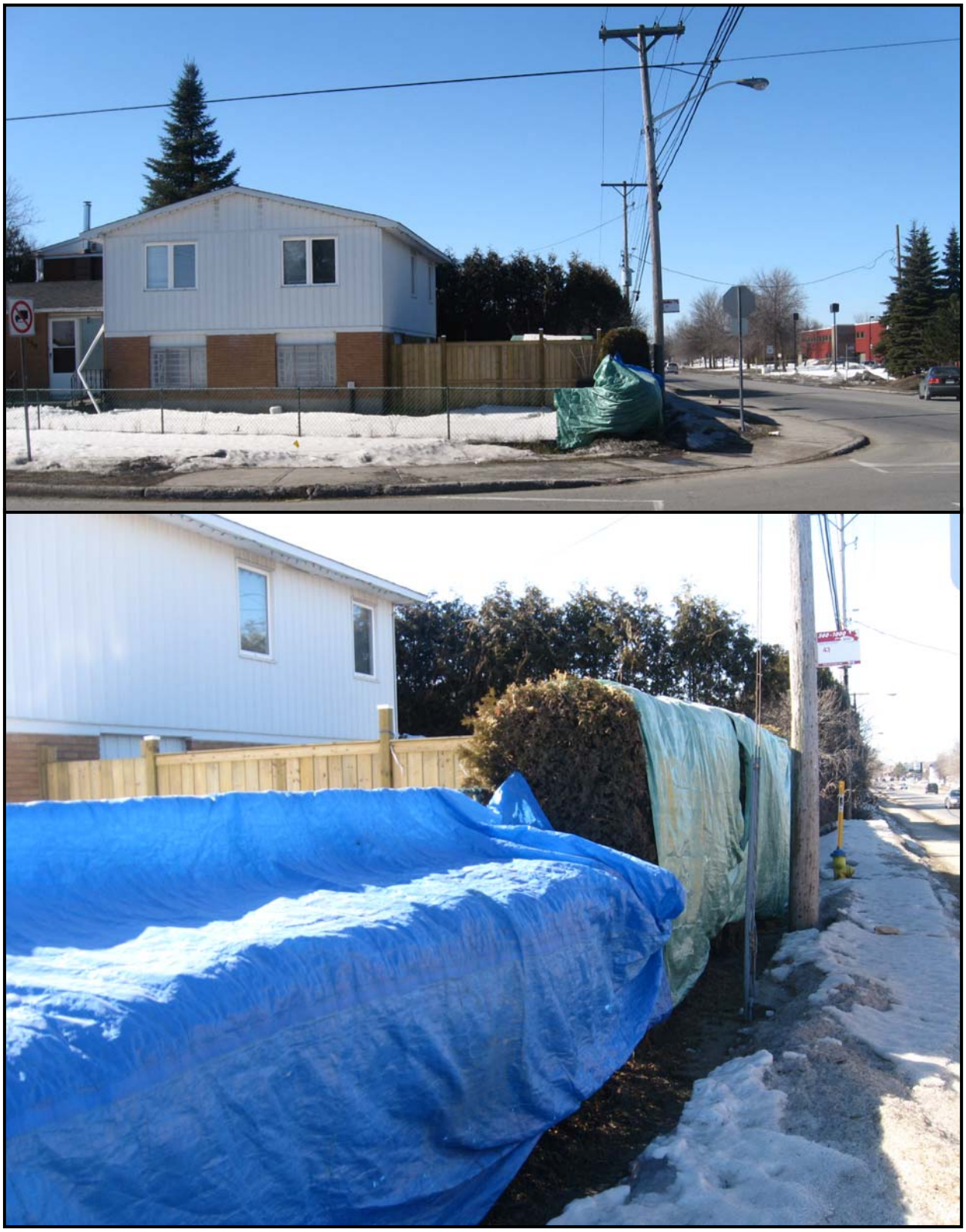


Exhibit 5: Example of Fencing along Johnston Road