

REPORT

Project: 116780-5.2.2

ENVIRONMENTAL NOISE IMPACT ASSESSMENT
MHI VETERANS HOUSE
745 MIKINAK ROAD
OTTAWA, ON



Prepared for CSV ARCHITECTS
by IBI GROUP

JUNE 2018

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1 INTRODUCTION

On behalf of CSV Architects, this study has been prepared to determine the impact of the roadway traffic on a proposed development that lies in Block 23 of the Wateridge Village subdivision. This report deals with the expected noise levels in the development and any required noise control measures.

The proposed development is a three storey residential building with an outdoor living area and is located in Phase 1B of the Wateridge Village development. The proposed development is bounded to the north by Hemlock Road, to the east by residential land containing back to back townhouses, to the south by Mikinak Road and to the west by a future development as shown on Figure N1.

2 BACKGROUND

2.1 Noise Sources

The study area is primarily subject to roadway noise from Hemlock Road and Mikinak Road. Aircraft noise from the Ottawa International Airport is not a factor as the airport is not in close proximity to the study area and there are no rail lines within 500 meters of the site. Potential noise sources are the Rockcliffe Airport, located approximately one kilometre north of the site, and the National Research Council (NRC) complex to the east. There are no existing stationary noise sources within 100 metres of the site.

2.2 Sound Level Limits for Road Traffic

Sound level criteria for road traffic is taken from the City of Ottawa Environmental Noise Control Guidelines hereafter referred to as the guidelines. Noise levels are expressed in the form Leq (T) which refers to a weighted level of a steady sound carrying the same total energy in the time period T (in hours) as the observed fluctuation sound.

2.2.1 Indoor Sound Level Criterion

The recommended indoor sound level criteria from Table 2.2b of the guidelines are:

- Bedrooms – 23:00 to 07:00 – 40 dBA Leq (8)
- Other areas – 07:00 to 23:00 – 45 dBA Leq (16)

The sound levels are based on the windows and doors to an indoor space being closed.

For the purpose of assessing indoor sound levels, the outdoor sound levels are observed at the plane of the living room window at 1.5 meters above the ground for daytime noise and at the plane of the bedroom window 4.5 meters above the ground for nighttime noise as per the guidelines.

As per NPC-300 C7.1.3 when the outdoor sound levels are less than or equal to 65 dBA at the living room window and/or less than or equal to 60 dBA at the bedroom level then the building must be compliant with the Ontario Building Code. Should the outdoor sound levels exceed this criteria then the building component (walls, windows etc.) must be designed to achieve indoor sound level criteria.

As per NPC-300 C7.1.2.1 and C7.1.2.2 when the outdoor noise levels at the living room are greater than 55 dBA and less than or equal to 65 dBA and/or greater than 50 dBA and less than or equal to 60 dBA at the bedroom window then a warning clause is required and forced air heating with provision for air conditioning is required. Should the outdoor sound levels exceed the criteria air conditioning is mandatory and a warning clause is required.

2.2.2 Outdoor Sound Level Criterion

As per Table 2.2a of the guidelines the sound level criterion for the outdoor living area (OLA) for the daytime period between 07:00 and 23:00 hours is 55 dBA Leq (16). Sound levels for the OLA are calculated 3 meters from the building face at the center of the unit or within the center of the OLA at a height of 1.5 meters above the ground.

If the Leq sound level is less than or equal to the above criteria then no further action is required by the developer. If the sound level exceeds the criteria by less than 5 dBA then the developer may either provide a warning clause to prospective purchasers or install physical attenuation. For sound levels greater than 5 dBA above the criteria, control measures are required to reduce the noise levels as close to 55 dBA as technically, economically and administratively possible. Should the sound levels with the barrier in place exceed 55 dBA a warning clause is also required.

2.3 Sound Level Limits for Aircraft Noise

Aircraft noise impact assessment is based on Noise Exposure Forecast/Noise Exposure Projection (NEF/NEP) contours determined by methods approved by Transport Canada. Indoor noise control requirements for aircraft noise are included in Table 1.4 of the guidelines and summarized as follow:

At any location on the subject property or lot, if the NEF/NEP contour is less than 25, then no action is required. Should the NEF/NEP be between 25 and 30, provision for central air conditioning is required, the building components (walls, windows, etc...) must be designed to achieve indoor sound level criteria, and a warning clause is required. For NEF/NEP above 30, then central air conditioning is required along with building component design and warning clauses. No new land uses with noise sensitive outdoor living areas will be permitted above 30 NEF/NEP.

2.4 Stationary Noise

The proposed residential development is located in an existing urban area of the City of Ottawa. In accordance with MOE publication NPC-300, the development is classified as a Class 1 area which means an area with an acoustical environment typical of a major population centre, where the background sound level is determined by the activities of people, usually road traffic, often referred to as 'urban hum'.

Sound level limits for new noise sensitive land uses in proximity to existing stationary sources is outlined in Table 1.11 of the guidelines and summarized as follows:

- Bedrooms – 23:00 – 07:00 – 45 dBA Log (1)
- Outdoor point of reception or plane of indoor – 07:00 – 23:00 – 50 dBA (1)

3 ROADWAY NOISE

3.1 Road Traffic Data

The major source of road noise impacting the site is the traffic moving along Hemlock Road, located to the north of the site, and Mikinak Road, located to the south of the site. Hemlock Road is a two-lane major collector with a posted speed limit of 50 km/hr. Mikinak Road is a two-lane collector with a posted speed limit of 40 km/hr. **Table 3.1** summarizes the traffic and road parameters used to assess the noise. Traffic volume parameters are taken from Appendix B, Table B1, of the guidelines, 2-UMCU for Hemlock Road and 2-UCU for Mikinak Road.

TABLE 3.1 – TRAFFIC AND ROAD DATA SUMMARY

	HEMLOCK ROAD	MIKINAK ROAD
Annual Average Daily Traffic (AADT)	12,000	8,000
Posted Speed Limit (km/hr)	50	40
% Medium Trucks	7%	7%
% Heavy Trucks	5%	5%
% Daytime Traffic	92%	92%

3.2 Calculation Methods

Indoor noise level calculations were performed on all corners of the building at the ground level and top floor (third floor). Ground level calculations were performed at a height of 1.5m and third floor calculations were performed at a height of 7.5m.

The outdoor living area noise levels were calculated at the point closest to Mikinak Road in order to determine the highest possible outdoor noise levels that can be experienced.

Roadway noise is calculated using the STAMSON 5.04 computer program from the Ontario Ministry of the Environment.

Parameters used for calculating the noise levels, the perpendicular distance from source to receiver and the roadway segment angles are also indicated in the tables. Unattenuated daytime and nighttime noise levels at the building face (for determining indoor sound levels) are shown on **Table 3.2**.

**TABLE 3.2
 UNATTENUATED NOISE LEVELS AT BUILDING FACE**

LOCATION	ROADWAY	SOURCE - RECEIVER DISTANCE (m)	SEGMENT ANGLES		INDOOR NOISE LEVELS (dBa)			
			LEFT	RIGHT	GROUND FLOOR		3rd FLOOR	
					DAY	NIGHT	DAY	NIGHT
(1) SW Corner	Hemlock Rd.	137.0	-90	-20	61.52	53.92	62.02	54.42
	Mikinak Rd.	17.5	-90	90				
(2) NW Corner	Hemlock Rd.	118.0	-90	-30	53.72	46.13	54.98	47.38
	Mikinak Rd.	37.5	0	90				
(3) NE Corner	Hemlock Rd.	108.0	5	15	49.57	41.98	50.63	43.04
	Mikinak Rd.	47.5	-40	0				
(4) SE Corner	Mikinak Rd.	17.5	-90	90	61.39	53.79	61.83	54.23

As indicated in **Table 3.2**, the recommended indoor sound levels are exceeded at the SE and SW corners.

**TABLE 3.3
 UNATTENUATED NOISE LEVELS AT OLA**

LOCATION	ROADWAY	SOURCE - RECEIVER DISTANCE (m)	SEGMENT ANGLES		DAYTIME NOISE LEVEL (dBa)
			LEFT	RIGHT	
Kitchen & Bar OLA	Hemlock Rd.	128.0	-90	-15	57.69
	Mikinak Rd.	27.5	-25	90	

As indicated in **Table 3.3**, the recommended outdoor sound level is exceeded in the outdoor living area.

4 AIRCRAFT NOISE

The Rockcliffe Airport is located approximately one kilometer north of Phase 1B and is currently operated by the Rockcliffe Flying Club which provides flying lessons using 2 and 4 seat Cessna planes. There are no NEF/NEP noise contours available for this airport so no analysis can be completed. Based on the type of aircraft, it is reasonable to suggest that the development is well outside the NEF 25 contour line so that no action is required. Regardless, Transport Canada recommends that a warning clause is to be provided to advise occupants of the proximity of the airport to the proposed development.

5 STATIONARY NOISE

As noted in Section 2.1, the closest potential source for stationary noise is the National Research Council (NRC) complex to the east of the site. Institutional buildings are not usually considered sources of stationary noise. Parking lots and the occasional movement of delivery trucks are excluded sources of stationary noise per the guidelines.

The proposed land use adjacent to the NRC complex is identified as commercial (high rise employment). As this land use is not as noise sensitive as residential lands, noise from the NRC complex is not expected to impact the proposed development.

6 RESULTS

6.1 Indoor Sound Levels

All units fronting Mikinak Road experience daytime indoor noise levels above 55 dBA but below 65 dBA, and nighttime noise levels above 50 dBA but below 60 dBA. These units will require alternative means of ventilation, as well as a type 'C' warning clause. Alternative means of ventilation usually consists of a forced air heating system with ducts sized for future installation of air conditioning.

6.2 Outdoor Sound Levels

The outdoor living area experiences daytime noise levels above 55 dBA but below 60 dBA. A Type 'A' warning clause is recommended at this location in lieu of a noise barrier.

7 SUMMARY OF ATTENUATION MEASURES

7.1 Warning Clauses

The following are the locations of the warning clauses required for the development.

Type 'A' - All outdoor living areas

Type 'C' - All units on the south side of the building fronting Mikinak Road

The following warning clauses are taken from Section C8.1 of NPC-300.

Type A	"Purchasers/tenants are advised that sound levels due to increasing Mikinak and Hemlock Roads traffic may occasionally 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 has been designed with the provision for adding air conditioning at the occupant's discretion. Installation of air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment"

The suggested aircraft noise warning clause is as follows:

"Purchasers/tenants are advised that due to the proximity of this development to the nearby Rockcliffe Airport, sound levels from the facility may at times be audible."

7.2 Ventilation Requirements and Building Components

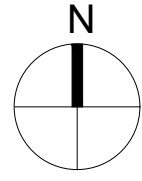
All units requiring a type 'C' warning clause listed in Section 5.1 require a forced air heating system sized to accommodate an air conditioning system.

Prepared by:

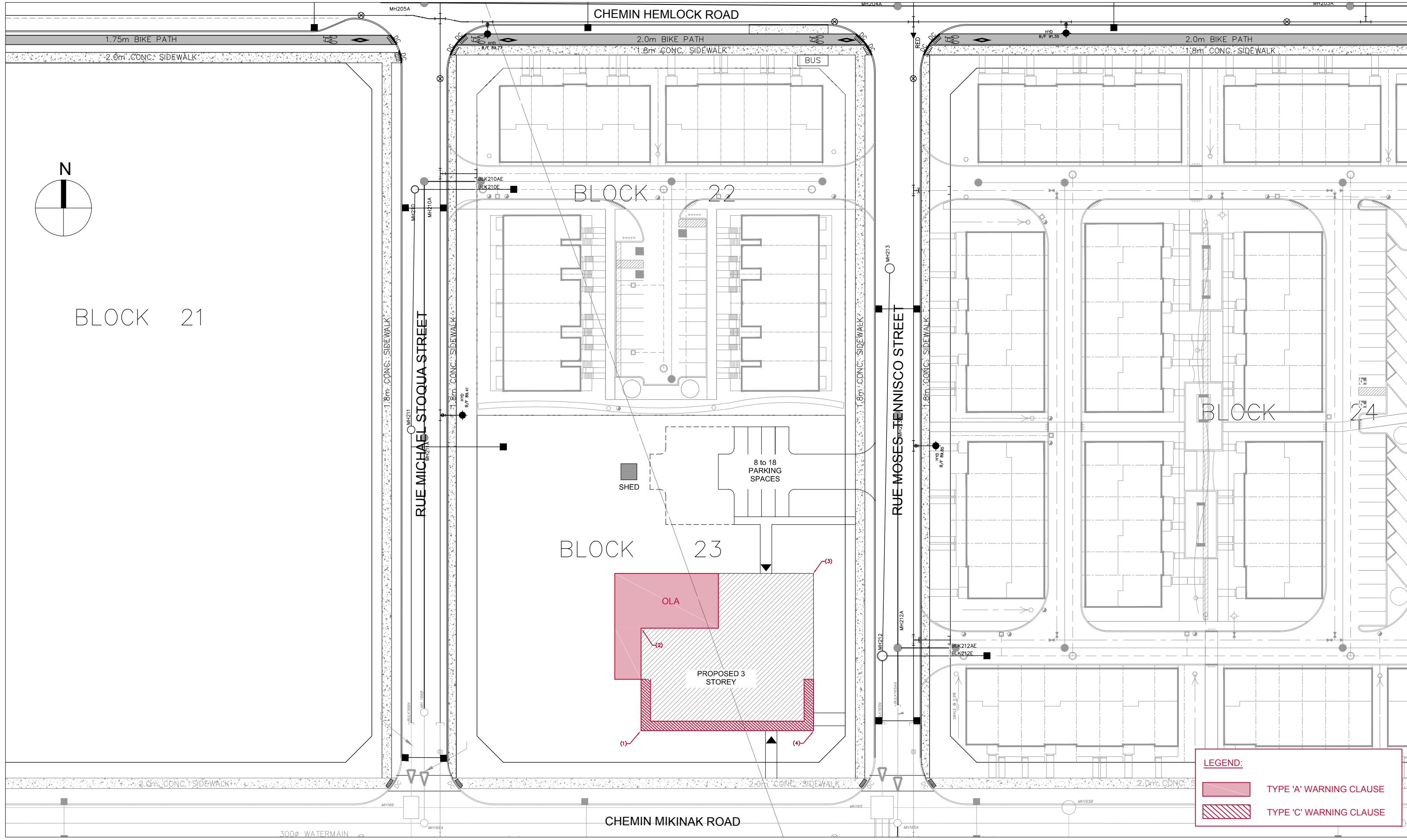
Michael Black, B. Eng.

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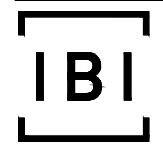


BLOCK 21



LEGEND:

-  TYPE 'A' WARNING CLAUSE
-  TYPE 'C' WARNING CLAUSE



Scale
N.T.S.

Project Title
745 MIKINAK ROAD

Drawing Title
NOISE PLAN

Sheet No.
N1

Filename: lground.te Time Period: Day/Night 16/8 hours
Description: Southwest Corner - Ground Level Indoor

Road data, segment # 1: Hemlock (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 : 2 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 12000
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: Hemlock (day/night)

Angle1 Angle2 : -90.00 deg -20.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 137.00 / 137.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 40 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): 8000
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: Mikinak (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 : 17.50 / 17.50 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hemlock (day)

Source height = 1.50 m

ROAD (0.00 + 46.13 + 0.00) = 46.13 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-20	0.66	68.14	0.00	-15.95	-6.06	0.00	0.00	0.00	46.13

Segment Leq : 46.13 dBA

Results segment # 2: Mikinak (day)

Source height = 1.50 m

ROAD (0.00 + 61.39 + 0.00) = 61.39 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	63.96	0.00	-1.11	-1.46	0.00	0.00	0.00	61.39

Segment Leq : 61.39 dBA

Total Leq All Segments: 61.52 dBA

Results segment # 1: Hemlock (night)

Source height = 1.50 m

ROAD (0.00 + 38.54 + 0.00) = 38.54 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-20	0.66	60.54	0.00	-15.95	-6.06	0.00	0.00	0.00	38.54

Segment Leq : 38.54 dBA

Results segment # 2: Mikinak (night)

Source height = 1.50 m

ROAD (0.00 + 53.79 + 0.00) = 53.79 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	56.36	0.00	-1.11	-1.46	0.00	0.00	0.00	53.79

Segment Leq : 53.79 dBA

Total Leq All Segments: 53.92 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.52
(NIGHT): 53.92

Filename: ltop.te Time Period: Day/Night 16/8 hours
Description: Southwest Corner - Third Storey Indoor

Road data, segment # 1: Hemlock (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 : 2 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 12000
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: Hemlock (day/night)

Angle1 Angle2 : -90.00 deg -20.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 137.00 / 137.00 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 40 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): 8000
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: Mikinak (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 : 17.50 / 17.50 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hemlock (day)

Source height = 1.50 m

ROAD (0.00 + 48.31 + 0.00) = 48.31 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------	--------

-90	-20	0.48	68.14	0.00	-14.22	-5.61	0.00	0.00	0.00	48.31
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Segment Leq : 48.31 dBA

Results segment # 2: Mikinak (day)

Source height = 1.50 m

ROAD (0.00 + 61.83 + 0.00) = 61.83 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------	--------

-90	90	0.48	63.96	0.00	-0.99	-1.14	0.00	0.00	0.00	61.83
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Segment Leq : 61.83 dBA

Total Leq All Segments: 62.02 dBA

Results segment # 1: Hemlock (night)

Source height = 1.50 m

ROAD (0.00 + 40.71 + 0.00) = 40.71 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------	--------

-90	-20	0.48	60.54	0.00	-14.22	-5.61	0.00	0.00	0.00	40.71
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Segment Leq : 40.71 dBA

Results segment # 2: Mikinak (night)

Source height = 1.50 m

ROAD (0.00 + 54.23 + 0.00) = 54.23 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------	--------

-90	90	0.48	56.36	0.00	-0.99	-1.14	0.00	0.00	0.00	54.23
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Segment Leq : 54.23 dBA

Total Leq All Segments: 54.42 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.02
(NIGHT): 54.42

Filename: 2ground.te Time Period: Day/Night 16/8 hours
Description: Northwest Corner - Ground Level Indoor

Road data, segment # 1: Hemlock (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 : 2 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 12000
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: Hemlock (day/night)

Angle1 Angle2 : -90.00 deg -30.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 118.00 / 118.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 40 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): 8000
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: Mikinak (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 : 37.50 / 37.50 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Segment # 1: Hemlock (day)

Source height = 1.50 m

ROAD (0.00 + 46.19 + 0.00) = 46.19 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-30	0.66	68.14	0.00	-14.87	-7.08	0.00	0.00	0.00	46.19

Segment Leq : 46.19 dBA

Segment # 2: Mikinak (day)

Source height = 1.50 m

ROAD (0.00 + 52.88 + 0.00) = 52.88 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.66	63.96	0.00	-6.61	-4.47	0.00	0.00	0.00	52.88

Segment Leq : 52.88 dBA

Total Leq All Segments: 53.72 dBA

Segment # 1: Hemlock (night)

Source height = 1.50 m

ROAD (0.00 + 38.59 + 0.00) = 38.59 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-30	0.66	60.54	0.00	-14.87	-7.08	0.00	0.00	0.00	38.59

Segment Leq : 38.59 dBA

Segment # 2: Mikinak (night)

Source height = 1.50 m

ROAD (0.00 + 45.29 + 0.00) = 45.29 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.66	56.36	0.00	-6.61	-4.47	0.00	0.00	0.00	45.29

Segment Leq : 45.29 dBA

Total Leq All Segments: 46.13 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.72
(NIGHT): 46.13

Filename: 2top.te Time Period: Day/Night 16/8 hours
Description: Northwest Corner - Third Storey Indoor

Road data, segment # 1: Hemlock (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 : 2 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 12000
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: Hemlock (day/night)

Angle1 Angle2 : -90.00 deg -30.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 118.00 / 118.00 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 40 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): 8000
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: Mikinak (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 : 37.50 / 37.50 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Segment # 1: Hemlock (day)

Source height = 1.50 m

ROAD (0.00 + 48.34 + 0.00) = 48.34 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-30	0.48	68.14	0.00	-13.26	-6.54	0.00	0.00	0.00	48.34

Segment Leq : 48.34 dBA

Segment # 2: Mikinak (day)

Source height = 1.50 m

ROAD (0.00 + 53.92 + 0.00) = 53.92 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.48	63.96	0.00	-5.89	-4.15	0.00	0.00	0.00	53.92

Segment Leq : 53.92 dBA

Total Leq All Segments: 54.98 dBA

Segment # 1: Hemlock (night)

Source height = 1.50 m

ROAD (0.00 + 40.74 + 0.00) = 40.74 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-30	0.48	60.54	0.00	-13.26	-6.54	0.00	0.00	0.00	40.74

Segment Leq : 40.74 dBA

Segment # 2: Mikinak (night)

Source height = 1.50 m

ROAD (0.00 + 46.32 + 0.00) = 46.32 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.48	56.36	0.00	-5.89	-4.15	0.00	0.00	0.00	46.32

Segment Leq : 46.32 dBA

Total Leq All Segments: 47.38 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 54.98
(NIGHT): 47.38

Filename: 3ground.te Time Period: Day/Night 16/8 hours
Description: Northeast Corner - Ground Level Indoor

Road data, segment # 1: Hemlock (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 : 2 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 12000
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: Hemlock (day/night)

Angle1 Angle2 : 5.00 deg 15.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 108.00 / 108.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 40 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): 8000
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: Hemlock (day/night)

Angle1 Angle2 : -40.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 47.50 / 47.50 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hemlock (day)

Source height = 1.50 m

ROAD (0.00 + 41.31 + 0.00) = 41.31 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------	--------

5	15	0.66	68.14	0.00	-14.23	-12.60	0.00	0.00	0.00	41.31
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Segment Leq : 41.31 dBA

Results segment # 2: Hemlock (day)

Source height = 1.50 m

ROAD (0.00 + 48.87 + 0.00) = 48.87 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------	--------

-40	0	0.66	63.96	0.00	-8.31	-6.77	0.00	0.00	0.00	48.87
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Segment Leq : 48.87 dBA

Total Leq All Segments: 49.57 dBA

Results segment # 1: Hemlock (night)

Source height = 1.50 m

ROAD (0.00 + 33.71 + 0.00) = 33.71 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------	--------

5	15	0.66	60.54	0.00	-14.23	-12.60	0.00	0.00	0.00	33.71
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Segment Leq : 33.71 dBA

Results segment # 2: Hemlock (night)

Source height = 1.50 m

ROAD (0.00 + 41.28 + 0.00) = 41.28 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------	--------

-40	0	0.66	56.36	0.00	-8.31	-6.77	0.00	0.00	0.00	41.28
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Segment Leq : 41.28 dBA

Total Leq All Segments: 41.98 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 49.57

(NIGHT): 41.98

Filename: 3top.te Time Period: Day/Night 16/8 hours
Description: Northeast Corner - Third Storey Indoor

Road data, segment # 1: Hemlock (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 : 2 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 12000
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: Hemlock (day/night)

Angle1 Angle2 : 5.00 deg 15.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 108.00 / 108.00 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 40 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): 8000
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: Hemlock (day/night)

Angle1 Angle2 : -40.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 47.50 / 47.50 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hemlock (day)

Source height = 1.50 m

ROAD (0.00 + 42.86 + 0.00) = 42.86 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
5	15	0.48	68.14	0.00	-12.69	-12.59	0.00	0.00	0.00	42.86

Segment Leq : 42.86 dBA

Results segment # 2: Hemlock (day)

Source height = 1.50 m

ROAD (0.00 + 49.84 + 0.00) = 49.84 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-40	0	0.48	63.96	0.00	-7.41	-6.71	0.00	0.00	0.00	49.84

Segment Leq : 49.84 dBA

Total Leq All Segments: 50.63 dBA

Results segment # 1: Hemlock (night)

Source height = 1.50 m

ROAD (0.00 + 35.26 + 0.00) = 35.26 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
5	15	0.48	60.54	0.00	-12.69	-12.59	0.00	0.00	0.00	35.26

Segment Leq : 35.26 dBA

Results segment # 2: Hemlock (night)

Source height = 1.50 m

ROAD (0.00 + 42.25 + 0.00) = 42.25 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-40	0	0.48	56.36	0.00	-7.41	-6.71	0.00	0.00	0.00	42.25

Segment Leq : 42.25 dBA

Total Leq All Segments: 43.04 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 50.63
(NIGHT): 43.04

Filename: 4ground.te Time Period: Day/Night 16/8 hours
 Description: Southeast Corner - Ground Level Indoor

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

```
-----
Car traffic volume : 6477/563   veh/TimePeriod *
Medium truck volume : 515/45   veh/TimePeriod *
Heavy truck volume : 368/32    veh/TimePeriod *
Posted speed limit : 40 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): 8000
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: Mikinak (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 : 17.50 / 17.50 m
Receiver height : 1.50 / 1.50 m
Topography      : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00
```

Segment # 1: Mikinak (day)

Source height = 1.50 m

ROAD (0.00 + 61.39 + 0.00) = 61.39 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	63.96	0.00	-1.11	-1.46	0.00	0.00	0.00	61.39

Segment Leq : 61.39 dBA

Total Leq All Segments: 61.39 dBA

Segment # 1: Mikinak (night)

Source height = 1.50 m

ROAD (0.00 + 53.79 + 0.00) = 53.79 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	56.36	0.00	-1.11	-1.46	0.00	0.00	0.00	53.79

Segment Leq : 53.79 dBA

Total Leq All Segments: 53.79 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.39
 (NIGHT): 53.79

Filename: 4top.te Time Period: Day/Night 16/8 hours
 Description: Southeast Corner - Third Storey Indoor

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

```
-----
Car traffic volume : 6477/563    veh/TimePeriod *
Medium truck volume : 515/45    veh/TimePeriod *
Heavy truck volume : 368/32    veh/TimePeriod *
Posted speed limit : 40 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): 8000
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: Mikinak (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          : 17.50 / 17.50 m
Receiver height                   : 7.50 / 7.50 m
Topography                        : 1            (Flat/gentle slope; no barrier)
Reference angle                    : 0.00
```

Segment # 1: Mikinak (day)

Source height = 1.50 m

ROAD (0.00 + 61.83 + 0.00) = 61.83 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.48	63.96	0.00	-0.99	-1.14	0.00	0.00	0.00	61.83

Segment Leq : 61.83 dBA

Total Leq All Segments: 61.83 dBA

Segment # 1: Mikinak (night)

Source height = 1.50 m

ROAD (0.00 + 54.23 + 0.00) = 54.23 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.48	56.36	0.00	-0.99	-1.14	0.00	0.00	0.00	54.23

Segment Leq : 54.23 dBA

Total Leq All Segments: 54.23 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.83
 (NIGHT): 54.23

Filename: ola.te Time Period: Day/Night 16/8 hours
Description: Outdoor Kitchen with Bar OLA

Road data, segment # 1: Hemlock (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 : 2 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 12000
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: Hemlock (day/night)

Angle1 Angle2 : -90.00 deg -15.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 128.00 / 128.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 40 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): 8000
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: Mikinak (day/night)

Angle1 Angle2 : -45.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 27.50 / 27.50 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hemlock (day)

Source height = 1.50 m

ROAD (0.00 + 47.07 + 0.00) = 47.07 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------	--------

-90	-15	0.66	68.14	0.00	-15.46	-5.61	0.00	0.00	0.00	47.07
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Segment Leq : 47.07 dBA

Results segment # 2: Mikinak (day)

Source height = 1.50 m

ROAD (0.00 + 57.30 + 0.00) = 57.30 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------	--------

-45	90	0.66	63.96	0.00	-4.37	-2.29	0.00	0.00	0.00	57.30
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Segment Leq : 57.30 dBA

Total Leq All Segments: 57.69 dBA

Results segment # 1: Hemlock (night)

Source height = 1.50 m

ROAD (0.00 + 39.47 + 0.00) = 39.47 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------	--------

-90	-15	0.66	60.54	0.00	-15.46	-5.61	0.00	0.00	0.00	39.47
-----	-----	------	-------	------	--------	-------	------	------	------	-------

Segment Leq : 39.47 dBA

Results segment # 2: Mikinak (night)

Source height = 1.50 m

ROAD (0.00 + 49.70 + 0.00) = 49.70 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------	--------

-45	90	0.66	56.36	0.00	-4.37	-2.29	0.00	0.00	0.00	49.70
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Segment Leq : 49.70 dBA

Total Leq All Segments: 50.09 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.69

(NIGHT): 50.09