REPORT

24 Hawthorne Avenue

Ottawa, Ontario

Noise Impact Study

SACL #B7-295.A0

September 21, 2018

Submitted to:

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PROVINCE OF ONTARIO

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1. Introduction

At the request of TC United Group, Swallow Acoustic Consultants Ltd. (SACL) presents this Noise Impact Study (NIS) for the proposed 3-storey apartment building (Project) to be located at 24 Hawthorne Avenue in Ottawa, Ontario. The building will contain 12 residential units. A single bay auto repair shop is located across the street from the Project. All other buildings in the immediate area are 1-2 storey residential or mixed-use buildings. A site plan and satellite photo showing the site and surrounding area are provided in Appendix A.

2. Noise Sources

This NIS will assess noise impacts from nearby surface transportation sources on the Project. The surface transportation sources impacting the Project are road traffic on Hawthorne Avenue, which is designated an arterial road by Schedule E of the City of Ottawa Official Plan[1], and road traffic on Ontario Highway 417, which is a provincial highway. Highway 417 is also designated as a Bus Transit Priority Corridor in this area by Schedule D of the City of Ottawa Official Plan[2]. There are no railway corridors that may impact the Project.

Based on a review of satellite photos of the area and a site visit conducted by a representative of SACL on August 30, 2018, there are no significant stationary noise sources at the auto repair shop or elsewhere nearby that may impact the Project.

3. Noise Assessment Criteria

The City of Ottawa requirements for environmental noise impact studies are outlined in the City's *Environmental Noise Control Guidelines*[3] (ENCG) and are based on the Ontario Ministry of the Environment, Conservation and Parks (MOECP) document *Environmental Noise Guideline: Stationary and Transportation Sources – Approval and Planning*[4] (NPC-300).

3.1 Surface Transportation Noise Assessment Criteria

Sound level limits outlined in ENCG for road traffic noise impacting on noise-sensitive areas applicable to the Project are summarized in Table 1. Sound level limits are given in A-weighted, equivalent sound levels (L_{eq}, dBA), defined in both ENCG and NPC-300.

Additionally, ENCG and NPC-300 provide requirements for building components, ventilation, and warning clauses to be used in sale and lease agreements. These requirements are based on calculated sound levels at Outdoor Living Areas (OLAs) and the plane-of-window of bedrooms and living/dining rooms. Sound level limits and associated requirements applicable to the Project are summarized in Tables 2 and 3. Warning clause types are defined in NPC-300.

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Table 1: Sound Level Limits for Noise-Sensitive Areas

Type of Space	Time Period	Maximum L_{eq} (dBA)
Outdoor Living Area	Daytime (07:00 to 23:00)	55
Living/dining, den areas of residences (indoor)	Daytime (07:00 to 23:00)	45
	Nighttime (23:00 to 07:00)	45
Sleeping quarters of residences (indoor)	Daytime (07:00 to 23:00)	45
	Nighttime (23:00 to 07:00)	40

Table 2: Building Component and Ventilation Requirements

Time Period	Sound Level, L_{eq} (dBA), at Bedroom or Living/Dining Room Plane-of-Window	Building Component Requirement	Ventilation Requirement
Daytime (07:00 – 23:00)	$55 < L_{eq} \leq 65$	Building components must be compliant with the Ontario Building Code (OBC)	Forced air heating with provision for central air conditioning
	$L_{eq} > 65$	Building components (walls, windows, etc.) should be designed to achieve indoor sound level criteria in Table 1	Central air conditioning
Nighttime (23:00 – 07:00)	$50 < L_{eq} \leq 60$	Building components must be compliant with the Ontario Building Code (OBC)	Forced air heating with provision for central air conditioning
	$L_{eq} > 60$	Building components (walls, windows, etc.) should be designed to achieve indoor sound level criteria in Table 1	Central air conditioning

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Table 3: Warning Clause Requirements

Assessment Location	Time Period	Sound Level, L_{eq} (dBA)	Warning Clause Requirement
Bedroom or Living/Dining Room Plane-of-Window	Daytime (07:00 – 23:00)	$55 < L_{eq} \leq 65$	Type C Required
		$L_{eq} > 65$	Type D Required
	Nighttime (23:00 – 07:00)	$50 < L_{eq} \leq 60$	Type C Required
		$L_{eq} > 60$	Type D Required
Outdoor Living Areas	Daytime (07:00 – 23:00)	$55 < L_{eq} \leq 60$	If noise control measures are not provided, Type A is required
		$L_{eq} > 60$	Noise control measures must be provided to reduce levels to 60 dBA or lower, Type B is required

4. Sound Level Calculations

4.1 Points of Reception

Points of reception (PORs) were chosen at points on the Project that were determined to be most exposed to the noise sources identified in Section 2. The rear yard communal amenity space is the only outdoor living area assessed and the front yard is not considered to be an OLA. Site plans showing the locations of the PORs are provided in Appendix B. The locations of the PORs are summarized in Table 4.

Table 4: Points of Reception

Point of Reception (POR)	Floor	Elevation (m)	Location	Notes/Comments
POR1	3	7.5	North façade	Plane-of-window, Unit Type D Living Room/Bedroom
POR2	3	7.5	West façade	Worst-case scenario for exterior wall construction on west façade, Unit Type D Bedroom
POR3	3	7.5	West façade	Worst-case scenario for exterior glazing on west façade, Unit Type E Bedroom
POR4	3	7.5	East façade	Exterior wall, Unit Type D Living Room
POR5	3	7.5	South façade	Plane-of-window, Unit Type D Living Room/Bedroom
OLA1	-	1.5	Backyard	Rear Yard Amenity Outdoor Living Area

4.2 Traffic Noise Parameters

The "ultimate" road and traffic data information for the traffic noise source identified in Section 2, including the Annual Average Daily Traffic (AADT), were obtained from the ENCG based on the road classification provided in the City of Ottawa Official Plan and are summarized in Table 5.

Table 5: Traffic Parameters

Road	Implied Roadway Class	Speed Limit (km/h)	Ultimate AADT (Vehicles per day)	Day/Night Split (%)	Medium Trucks (%)	Heavy Trucks (%)
Hawthorne Avenue	4-Lane Urban Arterial-Undivided (4-UAU)	50	30,000	92/8	7	5
Highway 417 Eastbound	Provincial Highway	100	54,999[1]	92/8	7	5
Highway 417 Westbound	Provincial Highway	100	54,999[1]	92/8	7	5

1. Note that highway AADTs are based on 3 traffic lanes in each direction. Highway 417 has additional on/off ramp lanes in this area which are not included in the calculation of AADT.

4.3 Calculated Sound Levels

Sound levels were calculated at each POR using software developed by the MOECP for the assessment of road and rail noise, STAMSON 5.04. Details of these calculations are provided in Appendix C. Calculated sound levels are summarized in Table 6.

Table 6: Calculated Sound Levels at PORs

POR	Daytime L_{eq} (dBA)	Nighttime L_{eq} (dBA)	Building Component Requirement	Ventilation Requirement	Warning Clause Requirement
POR1	72	65	Components designed to achieve indoor sound level criteria	Central air conditioning required	Type D required
POR2	68	61	Components designed to achieve indoor sound level criteria	Central air conditioning required	Type D required
POR3	66	58	Components designed to achieve indoor sound level criteria	Central air conditioning required	Type D required
POR4	69	62	Components designed to achieve indoor sound level criteria	Central air conditioning required	Type D required
POR5	60	53	Components compliant with OBC	Forced air heating with provision for central A/C required	Type C required
OLA1	56[1]	-	N/A	N/A	N/A[2]

1. Noise level prediction does not account for the 3m barrier along the south side of the Highway 417, due to limitations of the STAMSON software (cannot model two or more barriers in series). Therefore, actual daytime noise level prediction at OLA1 is expected to be at or below 55 dBA.
2. Warning clause is not required per Note 1, above.

5. Noise Control Requirements

5.1 Building Component Requirements

Based on the calculated plane-of-window sound levels, the building components on the north, east, and west sides of the building must be designed to ensure that the indoor sound level limits in Table 1 are met. The Sound Transmission Class (STC) ratings required to meet these sound level limits for each façade are summarized in Table 7. These STC ratings are calculated based on the plane-of-window sound levels and current floor plans (dated September 12, 2018). Changes in window sizes or unit layouts will change these requirements. Any building components which meet OBC requirements are expected to be sufficient on the south side of the building.

Sample constructions expected to meet the minimum required STC ratings are also provided in Table 7. Sample exterior wall constructions are based on materials shown in the current elevation drawings (undated). Sample glazing constructions are given in the format *x (y) z* to denote *x* mm glass (*y* mm airspace) *z* mm glass. Note that these constructions are provided for reference only. STC ratings of all building components should be confirmed by the component supplier.

Table 7: Building Component STC Requirements and Sample Constructions

Building Component	Required Minimum STC	Sample Minimum Construction
North façade exterior wall	39	- 1 layer 6 mm fibre cement panel - 1 layer OSB sheathing - 89 mm framing studs with acoustic batt insulation - 1 layer 13 mm GWB Estimated STC 45
East and West façade exterior wall	37	
North façade fixed glazing	38	- 9 (13) 9 Estimated STC 38
North façade operable glazing	32	- 6 (13) 3 Estimated STC 32
West façade fixed glazing	33	- 6 (13) 6 Estimated STC 34
West façade operable glazing	27	- 3 (6) 3 Estimated STC 28

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5.2 Ventilation and Warning Clause Requirements

It is determined from the plane-of-window sound levels that all residential units should be designed to include central air conditioning. Warning Clause Type D is also required to be included in agreements of Offers of Purchase and Sale, lease/rental agreements, and condominium declarations for all residential units. Warning Clause Type D is as follows:

> "This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks."

As discussed in Note 1 of Table 6, the daytime noise level prediction at OLA1 is expected to be at or below 55 dBA, which meets the sound level limit in Table 1. Therefore, no mitigation measures or warning clauses are required.

6. Impact of the Project on Surrounding Area

Mechanical equipment within the Project may also be considered as a stationary noise source which may impact nearby noise-sensitive areas. Mechanical equipment selections have not yet been made, precluding a detailed analysis at this time. The final mechanical design will be required to comply with ENCG sound level limits from a stationary source at all nearby noise-sensitive areas.

7. Concluding Comments

The noise impact of Hawthorne Avenue and Ontario Highway 417 on the proposed 3-storey residential development to be located at 24 Hawthorne Avenue is expected to be such that interior sound level requirements of the City of Ottawa and MOECP can be achieved by meeting the minimum STC requirements presented in Table 7; providing central air conditioning for all units; and including Warning Clauses A and D in all sale and lease agreements. There are currently no significant stationary noise sources that impact the development and no stationary noise sources associated with the development that impact the surrounding area. SACL therefore recommends that the proposed development be approved from a noise perspective.

---------- End ----------

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References

1. **City of Ottawa.** Official Plan, Schedule E - Urban Road Network. 2017.

2. **City of Ottawa.** Official Plan, Schedule D - Rapid Transit and Transit Priority Network. 2017.

3. **City of Ottawa.** Environmental Noise Control Guidelines. January 2016.

4. **Ontario Ministry of the Environment, Conservation and Parks**. Environmental Noise Guideline, Stationary and Transportation Sources - Approval and Planning, Publication NPC-300. August 2013.

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Appendix A: Site Plan and Surrounding Area

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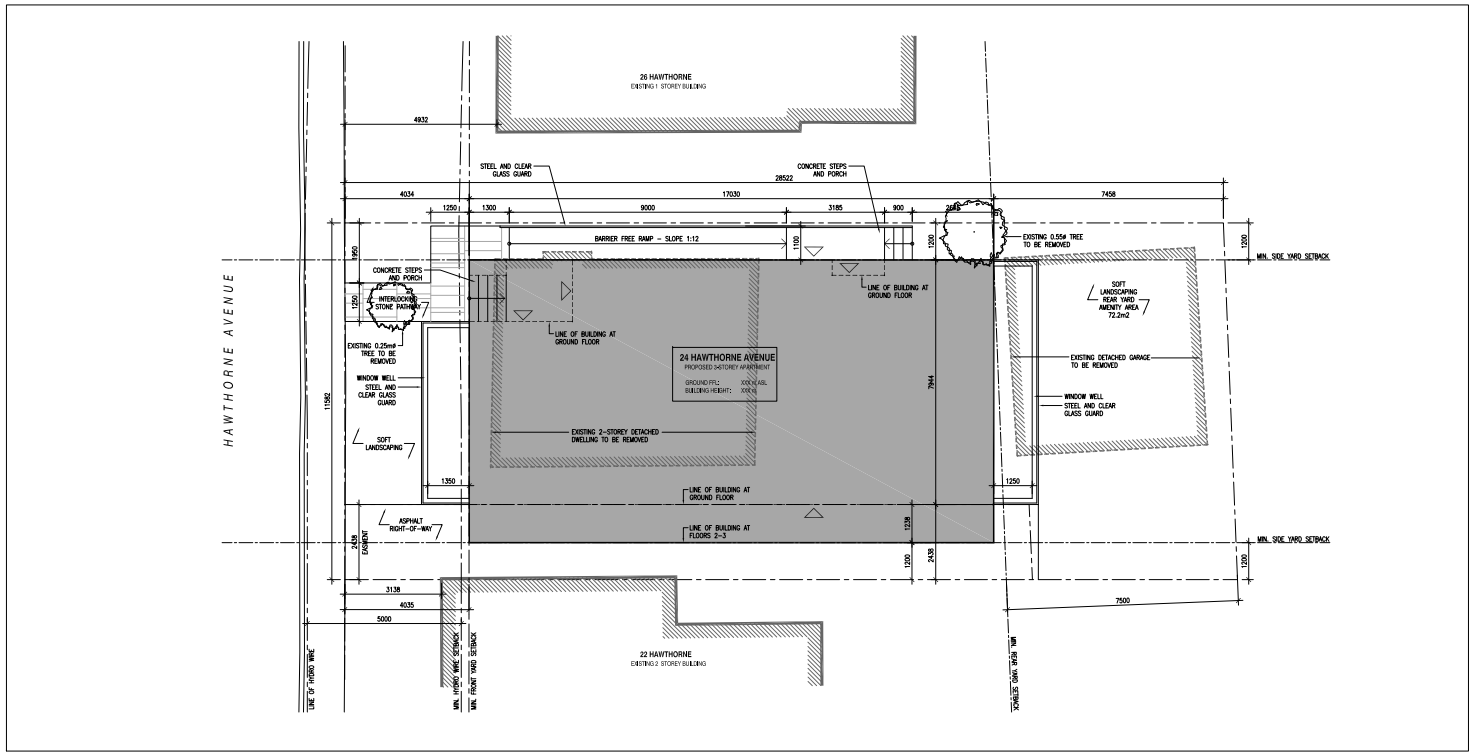
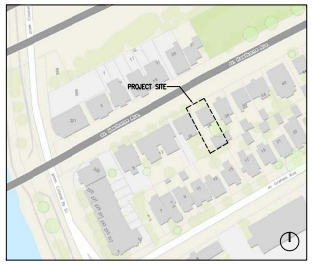


1 SITE PLAN
SP-01 SCALE: 1:75



2 LOCATION PLAN
SP-01 SCALE: NTS

TOPOGRAPHIC PLAN OF SURVEY OF
PART OF LOTS 5 AND 6
REGISTERED PLAN 220
CITY OF OTTAWA

SURVEYED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

STATISTICS AND ZONING INFORMATION

ZONING DESIGNATION: TM12[1839] H(14.5)

ZONING REQUIREMENTS: APARTMENT DWELLING, LOW-RISE

MIN. LOT AREA:	N/A
MIN. LOT WIDTH	N/A
MAX. BUILDING HEIGHT:	14.5m
MIN. BUILDING HEIGHT:	6.7m for 20m from front lot line
MIN. FRONT YARD:	The average of the front walls of the abutting properties.
MIN. REAR YARD:	7.5m
MIN. INTERIOR SIDE YARD:	1.2m
AVG. EXISTING GRADE:	The average of grade elevations taken along both side lot lines at the minimum required front yard setback and at the minimum rear yard setback.

PROJECT STATISTICS

LOT WIDTH:	11.6m
LOT AREA:	333m2
BUILDING HEIGHT:	XX.XXm
FRONT YARD SETBACK:	4.035m
REAR YARD SETBACK:	7.5m
SIDE YARD SETBACK:	1.2m
DWELLING UNITS:	12 units

BICYCLE PARKING CALCULATION
As per Table 111A

REQUIRED PARKING: 6 spaces
0.5sp/dwelling unit [111A(b)(i)]

TOTAL PARKING PROVIDED: 6 spaces

PARKING CALCULATION
As per Sections 101 & 102

PARKING SPACE RATE AREA: Area X

REQUIRED PARKING: 0 space
0.5sp/dwelling unit beyond 12
PARKING PROVIDED: 0 space

REQUIRED VISITOR PARKING: 0 space
0.1sp/dwelling unit beyond 12
VISITOR PARKING PROVIDED: 0 space

TOTAL PARKING REQUIRED: 0 space
TOTAL PARKING PROVIDED: 0 space

AMENITY AREA CALCULATION
As per Table 137

TOTAL AMENITY REQUIRED: 72m2
6m2/dwelling unit & 10% of gross floor area of each rooming unit

COMMUNAL AMENITY REQUIRED: 36m2
50% of Total Amenity Area

COMMUNAL AMENITY PROVIDED: 72.2m2

TOTAL AMENITY PROVIDED: 72.2m2

PROJECT STATISTICS
SCALE: NTS

REVISION RECORD

ISSUED FOR COORDINATION	2018-09-05
ISSUED FOR COORDINATION	2017-04-18

ISSUE RECORD

project1 studio
Project1 Studio Incorporated
613.231.8030 | info@project1studio.ca

24 HAWTHORNE

24 Hawthorne Avenue
Ottawa, ON

PROJ	SCALE	DRAWN	REVIEWED
1711	1:75	DP	RMK

SITE PLAN

SP-01


24 Hawthorne Ave
Google Earth
© 2018 Google
100 m
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Appendix B: Point of Reception Locations

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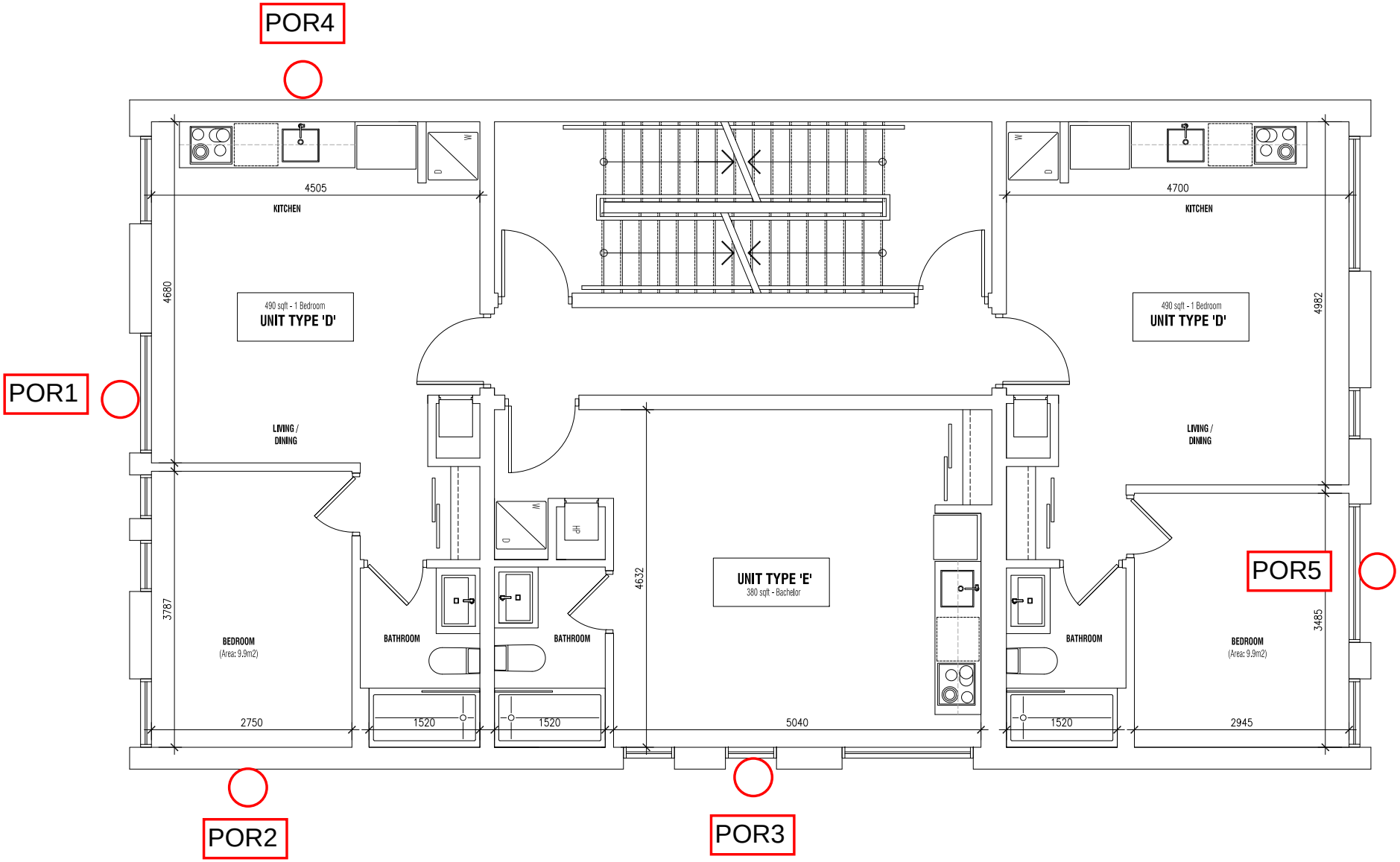
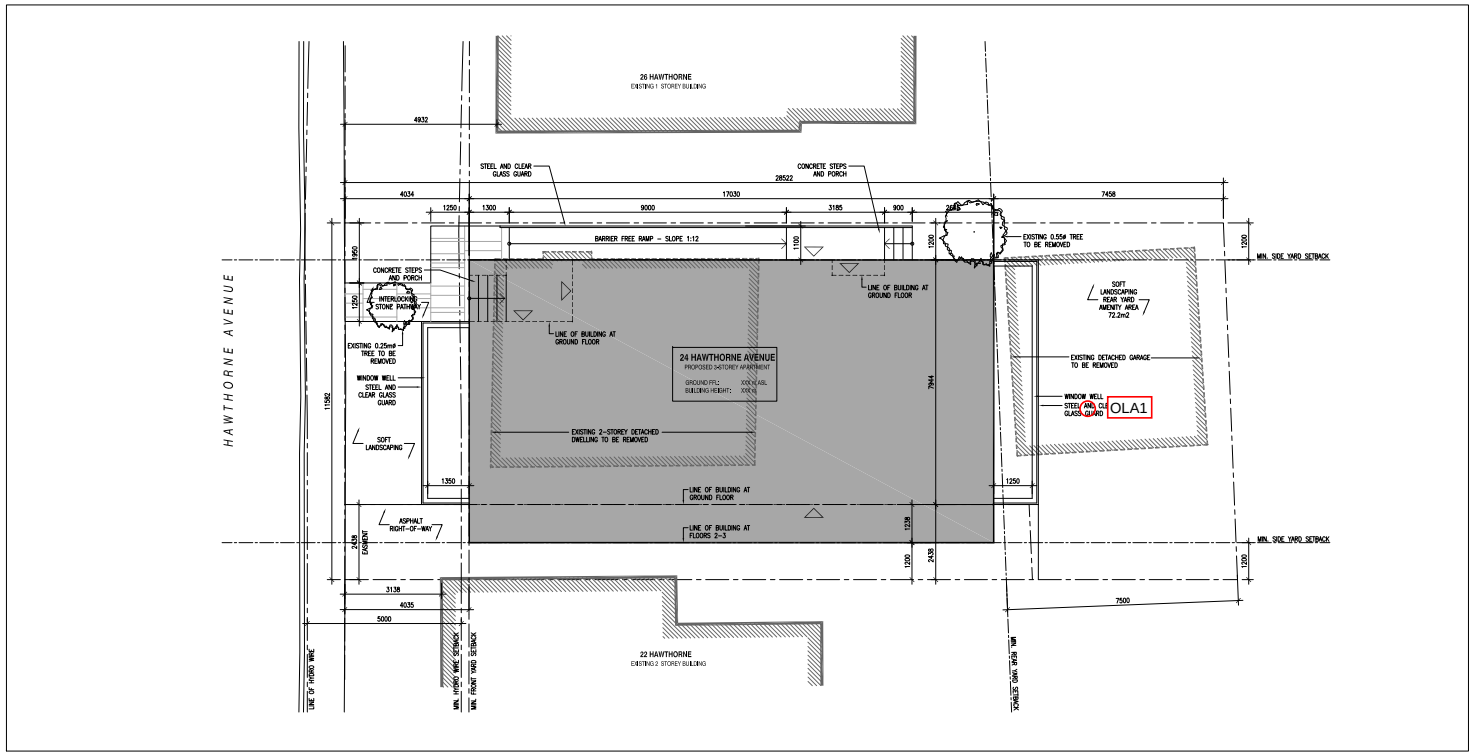


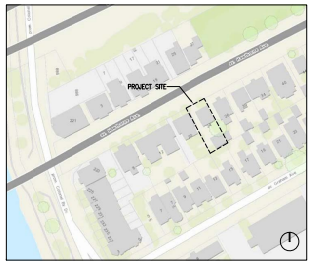
24 HAWTHORNE AVENUE PROPOSED TYPICAL FLOOR PLAN

| 1711 | SCALE 1:50 | 12 SEPTEMBER 2018

project11 studio



1 SITE PLAN
SP-01 SCALE: 1:75



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SP-01 SCALE: NTS

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SURVEYED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

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MIN. LOT WIDTH N/A
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TOTAL AMENITY PROVIDED: 72.2m2

PROJECT STATISTICS
SCALE: NTS

GENERAL ARCHITECTURAL NOTES:

1. This drawing is the property of the Architect and may not be reproduced or used without the expressed consent of the Architect.
2. Drawings are not to be scaled. The Contractor is responsible for checking and verifying all levels and dimensions and shall report all discrepancies to the Architect and obtain clarification prior to commencing work.
3. Upon notice in writing, the Architect will provide written/graphic clarification or supplementary information regarding the intent of the Contract Documents.
4. The Architectural drawings are to be read in conjunction with other Contract Documents including Project Manuals and the Structural, Mechanical and Electrical Drawings.
5. Positions of exposed or finished Mechanical or Electrical devices, fittings and fixtures are indicated on the Architectural Drawings. Locations shown on the Architectural Drawings shall govern over Mechanical and Electrical Drawings. Mechanical and Electrical items not clearly located will be located as directed by the Architect.
6. These documents are not to be used for construction unless specifically noted for such purposes.

REVISION RECORD

ISSUED FOR COORDINATION	2018-09-05
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24 HAWTHORNE

24 Hawthorne Avenue
Ottawa, ON

PROJ	SCALE	DRAWN	REVIEWED
1711	1:75	DP	RMK

SITE PLAN

SP-01

Appendix C: STAMSON 5.04 Calculations

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```
STAMSON 5.0        NORMAL REPORT        Date: 19-09-2018 17:20:56
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por1b.te             Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Hawthorne (day/night)
---------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod
Medium truck volume :  1932/168   veh/TimePeriod
Heavy truck volume  :  1380/120   veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Hawthorne (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           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

↑
Road data, segment # 2: 417 E (day/night)
-----------------------------------------
Car traffic volume  : 44527/3872  veh/TimePeriod
Medium truck volume :  3542/308   veh/TimePeriod
Heavy truck volume  :  2530/220   veh/TimePeriod
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: 417 E (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  80.00 / 80.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  10.00 m
Barrier receiver distance :  67.00 / 67.00  m
Source elevation          :   7.00 m
```

```
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

↑
Road data, segment # 3: 417 W (day/night)
-----------------------------------------
Car traffic volume  : 44527/3872  veh/TimePeriod
Medium truck volume :  3542/308   veh/TimePeriod
Heavy truck volume  :  2530/220   veh/TimePeriod
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 3: 417 W (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  95.00 / 95.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  10.00 m
Barrier receiver distance :  67.00 / 67.00  m
Source elevation          :   7.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

↑
Results segment # 1: Hawthorne (day)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 70.35 + 0.00) = 70.35 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90     90   0.48  71.49   0.00   0.00  -1.14   0.00   0.00   0.00  70.35
--------------------------------------------------------------------------------

Segment Leq : 70.35 dBA

↑
Results segment # 2: 417 E (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 !        7.50 !        8.33 !         8.33

ROAD (0.00 + 64.99 + 0.00) = 64.99 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90     90   0.00  80.15   0.00  -7.27   0.00   0.00   0.00  -7.88  64.99
--------------------------------------------------------------------------------

Segment Leq : 64.99 dBA

↑
Results segment # 3: 417 W (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 !        7.50 !        8.20 !         8.20

ROAD (0.00 + 65.05 + 0.00) = 65.05 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90     90   0.00  80.15   0.00  -8.02   0.00   0.00   0.00  -7.09  65.05
--------------------------------------------------------------------------------

Segment Leq : 65.05 dBA

Total Leq All Segments: 72.35 dBA

↑
Results segment # 1: Hawthorne (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 62.76 + 0.00) = 62.76 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90     90   0.48  63.89   0.00   0.00  -1.14   0.00   0.00   0.00  62.76
--------------------------------------------------------------------------------
```

```
Segment Leq : 62.76 dBA

↑
Results segment # 2: 417 E (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 !        7.50 !        8.33 !         8.33

ROAD (0.00 + 57.40 + 0.00) = 57.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90     90   0.00  72.55   0.00  -7.27   0.00   0.00   0.00  -7.88  57.40
--------------------------------------------------------------------------------

Segment Leq : 57.40 dBA

↑
Results segment # 3: 417 W (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 !        7.50 !        8.20 !         8.20

ROAD (0.00 + 57.45 + 0.00) = 57.45 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90     90   0.00  72.55   0.00  -8.02   0.00   0.00   0.00  -7.09  57.45
--------------------------------------------------------------------------------

Segment Leq : 57.45 dBA

Total Leq All Segments: 64.76 dBA

↑
```

```
TOTAL Leq FROM ALL SOURCES (DAY): 72.35
                          (NIGHT): 64.76
```

```
STAMSON 5.0        NORMAL REPORT        Date: 20-09-2018 16:54:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por2.te              Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Hawthorne (day/night)
---------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod
Medium truck volume :  1932/168   veh/TimePeriod
Heavy truck volume  :  1380/120   veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Hawthorne (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           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -28.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :   2.30 / 2.30   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

↑
Road data, segment # 2: 417 E (day/night)
-----------------------------------------
Car traffic volume  : 44527/3872  veh/TimePeriod
Medium truck volume :  3542/308   veh/TimePeriod
Heavy truck volume  :  2530/220   veh/TimePeriod
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: 417 E (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  :  81.40 / 81.40  m
```

```
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 0.00 deg
Barrier height            :  10.00 m
Barrier receiver distance :  68.40 / 68.40  m
Source elevation          :   7.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

↑
Road data, segment # 3: 417 W (day/night)
-----------------------------------------
Car traffic volume  : 44527/3872  veh/TimePeriod
Medium truck volume :  3542/308   veh/TimePeriod
Heavy truck volume  :  2530/220   veh/TimePeriod
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 3: 417 W (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  :  96.40 / 96.40  m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 0.00 deg
Barrier height            :  10.00 m
Barrier receiver distance :  68.40 / 68.40  m
Source elevation          :   7.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

↑
Results segment # 1: Hawthorne (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 !        7.50 !        6.58 !         6.58
```

```
ROAD (0.00 + 60.73 + 63.32) = 65.23 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90    -28   0.06  71.49   0.00   0.00  -4.88   0.00   0.00  -5.88  60.73
--------------------------------------------------------------------------------
   -28      0   0.48  71.49   0.00   0.00  -8.17   0.00   0.00   0.00  63.32
--------------------------------------------------------------------------------

Segment Leq : 65.23 dBA

↑
Results segment # 2: 417 E (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 !        7.50 !        8.34 !         8.34

ROAD (0.00 + 61.92 + 0.00) = 61.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90      0   0.00  80.15   0.00  -7.35  -3.01   0.00   0.00  -7.87  61.92
--------------------------------------------------------------------------------

Segment Leq : 61.92 dBA

↑
Results segment # 3: 417 W (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 !        7.50 !        8.21 !         8.21

ROAD (0.00 + 61.99 + 0.00) = 61.99 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90      0   0.00  80.15   0.00  -8.08  -3.01   0.00   0.00  -7.07  61.99
--------------------------------------------------------------------------------
```

Segment Leq : 61.99 dBA

Total Leq All Segments: 68.11 dBA

↑
Results segment # 1: Hawthorne (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	7.50	6.58	6.58

ROAD (0.00 + 53.14 + 55.73) = 57.63 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-28	0.06	63.89	0.00	0.00	-4.88	0.00	0.00	-5.88	53.14
-28	0	0.48	63.89	0.00	0.00	-8.17	0.00	0.00	0.00	55.73

Segment Leq : 57.63 dBA

↑
Results segment # 2: 417 E (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	7.50	8.34	8.34

ROAD (0.00 + 54.32 + 0.00) = 54.32 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	72.55	0.00	-7.35	-3.01	0.00	0.00	-7.87	54.32

Segment Leq : 54.32 dBA

↑
Results segment # 3: 417 W (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 !        7.50 !        8.21 !         8.21

ROAD (0.00 + 54.39 + 0.00) = 54.39 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90      0   0.00  72.55   0.00  -8.08  -3.01   0.00   0.00  -7.07  54.39
--------------------------------------------------------------------------------

Segment Leq : 54.39 dBA

Total Leq All Segments: 60.51 dBA

↑



TOTAL Leq FROM ALL SOURCES (DAY): 68.11
                         (NIGHT): 60.51
↑
↑
```

```
STAMSON 5.0        NORMAL REPORT        Date: 20-09-2018 16:56:41
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por3.te              Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Hawthorne (day/night)
---------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod
Medium truck volume :  1932/168   veh/TimePeriod
Heavy truck volume  :  1380/120   veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Hawthorne (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  :  20.50 / 20.50  m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -8.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :   9.00 / 9.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

↑
Road data, segment # 2: 417 E (day/night)
-----------------------------------------
Car traffic volume  : 44527/3872  veh/TimePeriod
Medium truck volume :  3542/308   veh/TimePeriod
Heavy truck volume  :  2530/220   veh/TimePeriod
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: 417 E (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  :  88.00 / 88.00  m
```

```
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 0.00 deg
Barrier height            :  10.00 m
Barrier receiver distance :  75.00 / 75.00  m
Source elevation          :   7.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

↑
Road data, segment # 3: 417 W (day/night)
-----------------------------------------
Car traffic volume  : 44527/3872  veh/TimePeriod
Medium truck volume :  3542/308   veh/TimePeriod
Heavy truck volume  :  2530/220   veh/TimePeriod
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 3: 417 W (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  : 103.00 / 103.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 0.00 deg
Barrier height            :  10.00 m
Barrier receiver distance :  75.00 / 75.00  m
Source elevation          :   7.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

↑
Results segment # 1: Hawthorne (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 !        7.50 !        4.86 !         4.86
```

```
ROAD (0.00 + 55.91 + 55.95) = 58.94 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90     -8   0.06  71.49   0.00  -1.44  -3.61   0.00   0.00 -10.54  55.91
--------------------------------------------------------------------------------
    -8      0   0.48  71.49   0.00  -2.01 -13.53   0.00   0.00   0.00  55.95
--------------------------------------------------------------------------------

Segment Leq : 58.94 dBA

↑
Results segment # 2: 417 E (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 !        7.50 !        8.35 !         8.35

ROAD (0.00 + 61.64 + 0.00) = 61.64 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90      0   0.00  80.15   0.00  -7.68  -3.01   0.00   0.00  -7.81  61.64
--------------------------------------------------------------------------------

Segment Leq : 61.64 dBA

↑
Results segment # 3: 417 W (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 !        7.50 !        8.22 !         8.22

ROAD (0.00 + 61.78 + 0.00) = 61.78 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90      0   0.00  80.15   0.00  -8.37  -3.01   0.00   0.00  -6.99  61.78
--------------------------------------------------------------------------------
```

```
Segment Leq : 61.78 dBA

Total Leq All Segments: 65.74 dBA

↑
Results segment # 1: Hawthorne (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 !        7.50 !        4.86 !         4.86

ROAD (0.00 + 48.31 + 48.36) = 51.35 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90     -8   0.06  63.89   0.00  -1.44  -3.61   0.00   0.00 -10.54  48.31
--------------------------------------------------------------------------------
    -8      0   0.48  63.89   0.00  -2.01 -13.53   0.00   0.00   0.00  48.36
--------------------------------------------------------------------------------

Segment Leq : 51.35 dBA

↑
Results segment # 2: 417 E (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 !        7.50 !        8.35 !         8.35

ROAD (0.00 + 54.04 + 0.00) = 54.04 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90      0   0.00  72.55   0.00  -7.68  -3.01   0.00   0.00  -7.81  54.04
--------------------------------------------------------------------------------

Segment Leq : 54.04 dBA

↑
Results segment # 3: 417 W (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 !        7.50 !        8.22 !         8.22

ROAD (0.00 + 54.18 + 0.00) = 54.18 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90      0   0.00  72.55   0.00  -8.37  -3.01   0.00   0.00  -6.99  54.18
--------------------------------------------------------------------------------

Segment Leq : 54.18 dBA

Total Leq All Segments: 58.14 dBA

↑



TOTAL Leq FROM ALL SOURCES (DAY): 65.74
                         (NIGHT): 58.14
↑
↑
```

```
STAMSON 5.0        NORMAL REPORT        Date: 20-09-2018 16:58:42
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por4.te              Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Hawthorne (day/night)
---------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod
Medium truck volume :  1932/168   veh/TimePeriod
Heavy truck volume  :  1380/120   veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Hawthorne (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           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  66.00 deg   Angle2 : 90.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :   1.80 / 1.80   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: 417 E (day/night)
-----------------------------------------
Car traffic volume  : 44527/3872  veh/TimePeriod
Medium truck volume :  3542/308   veh/TimePeriod
Heavy truck volume  :  2530/220   veh/TimePeriod
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: 417 E (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  :  82.40 / 82.40  m
```

```
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :  10.00 m
Barrier receiver distance :  69.40 / 69.40  m
Source elevation          :   7.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

↑
Road data, segment # 3: 417 W (day/night)
-----------------------------------------
Car traffic volume  : 44527/3872  veh/TimePeriod
Medium truck volume :  3542/308   veh/TimePeriod
Heavy truck volume  :  2530/220   veh/TimePeriod
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 3: 417 W (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  :  97.40 / 97.40  m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :  10.00 m
Barrier receiver distance :  69.40 / 69.40  m
Source elevation          :   7.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

↑
Results segment # 1: Hawthorne (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 !        7.50 !        6.78 !         6.78
```

```
ROAD (66.62 + 57.12 + 0.00) = 67.08 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
     0     66   0.48  71.49   0.00   0.00  -4.87   0.00   0.00   0.00  66.62
--------------------------------------------------------------------------------
    66     90   0.06  71.49   0.00   0.00  -9.23   0.00   0.00  -5.14  57.12
--------------------------------------------------------------------------------

Segment Leq : 67.08 dBA

↑
Results segment # 2: 417 E (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 !        7.50 !        8.34 !         8.34

ROAD (0.00 + 61.88 + 0.00) = 61.88 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
     0     90   0.00  80.15   0.00  -7.40  -3.01   0.00   0.00  -7.86  61.88
--------------------------------------------------------------------------------

Segment Leq : 61.88 dBA

↑
Results segment # 3: 417 W (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 !        7.50 !        8.21 !         8.21

ROAD (0.00 + 61.96 + 0.00) = 61.96 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
     0     90   0.00  80.15   0.00  -8.12  -3.01   0.00   0.00  -7.06  61.96
--------------------------------------------------------------------------------
```

Segment Leq : 61.96 dBA

Total Leq All Segments: 69.15 dBA

↑
Results segment # 1: Hawthorne (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	7.50	6.78	6.78

ROAD (59.02 + 49.52 + 0.00) = 59.48 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	66	0.48	63.89	0.00	0.00	-4.87	0.00	0.00	0.00	59.02
66	90	0.06	63.89	0.00	0.00	-9.23	0.00	0.00	-5.14	49.52

Segment Leq : 59.48 dBA

↑
Results segment # 2: 417 E (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	7.50	8.34	8.34

ROAD (0.00 + 54.28 + 0.00) = 54.28 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	72.55	0.00	-7.40	-3.01	0.00	0.00	-7.86	54.28

Segment Leq : 54.28 dBA

↑
Results segment # 3: 417 W (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 !        7.50 !        8.21 !         8.21

ROAD (0.00 + 54.36 + 0.00) = 54.36 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
     0     90   0.00  72.55   0.00  -8.12  -3.01   0.00   0.00  -7.06  54.36
--------------------------------------------------------------------------------

Segment Leq : 54.36 dBA

Total Leq All Segments: 61.55 dBA

↑



TOTAL Leq FROM ALL SOURCES (DAY): 69.15
                         (NIGHT): 61.55
↑
↑
```

```
STAMSON 5.0        NORMAL REPORT        Date: 19-09-2018 17:21:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por5.te              Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Hawthorne (day/night)
---------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod
Medium truck volume :  1932/168   veh/TimePeriod
Heavy truck volume  :  1380/120   veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Hawthorne (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  :  29.00 / 29.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   9.15 m
Barrier receiver distance :   0.10 / 0.10   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: 417 E (day/night)
-----------------------------------------
Car traffic volume  : 44527/3872  veh/TimePeriod
Medium truck volume :  3542/308   veh/TimePeriod
Heavy truck volume  :  2530/220   veh/TimePeriod
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: 417 E (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  :  97.00 / 97.00  m
```

```
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   9.15 m
Barrier receiver distance :   0.10 / 0.10   m
Source elevation          :   7.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

↑
Road data, segment # 3: 417 W (day/night)
-----------------------------------------
Car traffic volume  : 44527/3872  veh/TimePeriod
Medium truck volume :  3542/308   veh/TimePeriod
Heavy truck volume  :  2530/220   veh/TimePeriod
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 3: 417 W (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  : 112.00 / 112.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   9.15 m
Barrier receiver distance :   0.10 / 0.10   m
Source elevation          :   7.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

↑
Results segment # 1: Hawthorne (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 !        7.50 !        7.48 !         7.48
```

```
ROAD (0.00 + 52.90 + 0.00) = 52.90 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90     90   0.00  71.49   0.00  -2.86   0.00   0.00   0.00 -15.73  52.90
--------------------------------------------------------------------------------

Segment Leq : 52.90 dBA

↑
Results segment # 2: 417 E (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 !        7.50 !        7.50 !         7.50

ROAD (0.00 + 56.93 + 0.00) = 56.93 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90     90   0.00  80.15   0.00  -8.11   0.00   0.00   0.00 -15.11  56.93
--------------------------------------------------------------------------------

Segment Leq : 56.93 dBA

↑
Results segment # 3: 417 W (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 !        7.50 !        7.50 !         7.50

ROAD (0.00 + 56.31 + 0.00) = 56.31 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90     90   0.00  80.15   0.00  -8.73   0.00   0.00   0.00 -15.11  56.31
--------------------------------------------------------------------------------

Segment Leq : 56.31 dBA
```

Total Leq All Segments: 60.48 dBA

↑
Results segment # 1: Hawthorne (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	7.50	7.48	7.48

ROAD (0.00 + 45.30 + 0.00) = 45.30 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	63.89	0.00	-2.86	0.00	0.00	0.00	-15.73	45.30

Segment Leq : 45.30 dBA

↑
Results segment # 2: 417 E (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	7.50	7.50	7.50

ROAD (0.00 + 49.34 + 0.00) = 49.34 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	72.55	0.00	-8.11	0.00	0.00	0.00	-15.11	49.34

Segment Leq : 49.34 dBA

↑
Results segment # 3: 417 W (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 !        7.50 !        7.50 !         7.50

ROAD (0.00 + 48.71 + 0.00) = 48.71 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------
   -90     90   0.00  72.55   0.00  -8.73   0.00   0.00   0.00 -15.11  48.71
--------------------------------------------------------------------------

Segment Leq : 48.71 dBA

Total Leq All Segments: 52.88 dBA
```

↑

TOTAL Leq FROM ALL SOURCES (DAY): 60.48
(NIGHT): 52.88

↑
↑

```
STAMSON 5.0        NORMAL REPORT        Date: 21-09-2018 10:00:44
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por6.te              Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Hawthorne (day/night)
---------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod
Medium truck volume :  1932/168   veh/TimePeriod
Heavy truck volume  :  1380/120   veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Hawthorne (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  :  32.00 / 32.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   9.15 m
Barrier receiver distance :   3.00 / 3.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: 417 E (day/night)
-----------------------------------------
Car traffic volume  : 44527/3872  veh/TimePeriod
Medium truck volume :  3542/308   veh/TimePeriod
Heavy truck volume  :  2530/220   veh/TimePeriod
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: 417 E (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  : 100.00 / 100.00 m
```

```
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   9.15 m
Barrier receiver distance :   3.00 / 3.00   m
Source elevation          :   7.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

↑
Road data, segment # 3: 417 W (day/night)
-----------------------------------------
Car traffic volume  : 44527/3872  veh/TimePeriod
Medium truck volume :  3542/308   veh/TimePeriod
Heavy truck volume  :  2530/220   veh/TimePeriod
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 3: 417 W (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  : 115.00 / 115.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   9.15 m
Barrier receiver distance :   3.00 / 3.00   m
Source elevation          :   7.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

↑
Results segment # 1: Hawthorne (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 + 49.31 + 0.00) = 49.31 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90     90   0.11  71.49   0.00  -3.66  -0.31   0.00   0.00 -18.21  49.31
--------------------------------------------------------------------------------

Segment Leq : 49.31 dBA

↑
Results segment # 2: 417 E (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 !        1.71 !         1.71

ROAD (0.00 + 52.82 + 0.00) = 52.82 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90     90   0.11  80.15   0.00  -9.15  -0.31   0.00   0.00 -17.86  52.82
--------------------------------------------------------------------------------

Segment Leq : 52.82 dBA

↑
Results segment # 3: 417 W (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 !        1.68 !         1.68

ROAD (0.00 + 52.13 + 0.00) = 52.13 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90     90   0.11  80.15   0.00  -9.83  -0.31   0.00   0.00 -17.87  52.13
--------------------------------------------------------------------------------

Segment Leq : 52.13 dBA
```

Total Leq All Segments: 56.43 dBA

↑
Results segment # 1: Hawthorne (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	1.50	1.50	1.50

ROAD (0.00 + 41.71 + 0.00) = 41.71 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.11	63.89	0.00	-3.66	-0.31	0.00	0.00	-18.21	41.71

Segment Leq : 41.71 dBA

↑
Results segment # 2: 417 E (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	1.50	1.71	1.71

ROAD (0.00 + 45.22 + 0.00) = 45.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.11	72.55	0.00	-9.15	-0.31	0.00	0.00	-17.86	45.22

Segment Leq : 45.22 dBA

↑
Results segment # 3: 417 W (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 !        1.50 !        1.68 !         1.68

ROAD (0.00 + 44.54 + 0.00) = 44.54 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------
   -90     90   0.11  72.55   0.00  -9.83  -0.31   0.00   0.00 -17.87  44.54
--------------------------------------------------------------------------

Segment Leq : 44.54 dBA

Total Leq All Segments: 48.84 dBA

↑



TOTAL Leq FROM ALL SOURCES (DAY): 56.43
                         (NIGHT): 48.84
↑
↑
```