Environmental Noise Control Study
Proposed Residential Development

222 Baseline Road
Ottawa, Ontario

Prepared for HP Urban

Report PG6277-1 dated September 23, 2022

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Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by HP Urban to conduct an environmental noise control study for the proposed residential development to be located at 222 Baseline Road, in the City of Ottawa.

The objective of the current study is to:

- Determine the primary noise sources impacting the site and compare the projected sound levels to guidelines set out by the Ministry of Environment and Climate Change (MOECC) and the City of Ottawa.

- Review the projected noise levels and offer recommendations regarding warning classes, construction materials or alternative sound barriers.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and includes acoustical recommendations pertaining to the design and construction of the subject development as they are understood at the time of writing this report.

This study has been conducted according to City of Ottawa document - Engineering Noise Control Guidelines (ENCG), dated January 2016, and the Ontario Ministry of the Environment Guideline NPC-300.

2.0 Proposed Development

It is understood that the proposed development will consist of a three-storey residential building. The building will consist of 9 or more units and rise 11 metres above grade. Associated walkways, driveways, bicycle parking area, and landscaped areas are further anticipated. Outdoor living areas – rooftop terrace and at-grade rear yard are identified on the proposed site plan.

3.0 Methodology and Noise Assessment Criteria

The City of Ottawa outlines three (3) sources of environmental noise that must be analyzed separately:

- Surface Transportation Noise
- Stationary Noise
  - new noise-sensitive development applications (noise receptors) in proximity to existing or approved stationary sources of noise, and
  - new stationary sources of noise (noise generating) in proximity to existing or approved noise-sensitive developments
- Aircraft Noise

Surface Transportation Noise

Surface roadway traffic noise, equivalent to sound level energy L_{eq}, provides a measure of the time varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of 16-hour (L_{eq16}) daytime (07:00-23:00) and 8-hour (L_{eq8}) nighttime (23:00-7:00) split to assess its impact on residential, commercial and institutional buildings.

The City of Ottawa's Official Plan dictates that the influence area must contain any of following conditions to classify as a surface transportation noise source for a subject site:

- Within 100 m of the right-of-way of an existing or proposed arterial, collector or major collector road; a light rail transit corridor; bus rapid transit, or transit priority corridor
- Within 250 m of the right-of-way for an existing or proposed highway or secondary rail line
- Within 300 m from the right of way of a proposed or existing rail corridor or a secondary main railway line
- Within 500 m of an existing 400 series provincial highway, freeway or principle main railway line.

The Environmental Noise Guidelines for Stationary and Transportation Sources – NPC-300 outlines the limitations of noise levels in relation to the location of the receptors. These can be found in the following tables:

Table 1 – Noise Level Limit for Outdoor Living Areas

Time Period	L_{eq} Level (dBA)
Daytime, 7:00-23:00	55

- Standard taken from Table 2.2a; Sound Level Limit for Outdoor Living Areas – Road and Rail

Table 2 – Noise Level Limits for Indoor Living Areas

Type of Space	Time Period	L_{eq} Level (dBA)	
		Road	Rail
General offices, reception areas, retail stores, etc.	Daytime 7:00-23:00	50	45
Theatres, places of worship, libraries, individual or semi-private offices, conference rooms, reading rooms, etc.	Daytime 7:00-23:00	45	40
Living/dining/den areas of **residences**, hospitals, nursing/retirement homes, schools, day-care centres	Daytime 7:00-23:00	45	40
Living/dining/den areas of **residences**, hospitals, nursing/retirement homes etc. (except schools or day-care centres)	Nighttime 23:00-7:00	45	40
Sleeping quarters of hotels/motels	Nighttime 23:00-7:00	45	40
Sleeping quarters of **residences**, hospitals, nursing/retirement homes, etc.	Nighttime 23:00-7:00	40	35

- Standards taken from Table 2.2b, Sound Level Limit for Indoor Living Areas – Road and Rail and Table 2.2c, Supplementary Sound Level Limits for Indoor Spaces – Road and Rail

Predicted noise levels at the pane of window dictate the action required to achieve recommended noise levels. It is noted in ENCG that the limits outlined in Table 2 are for the noise levels on the interior of the window glass pane. An open window is considered to provide a 10 dBA noise reduction, while a standard closed window is capable to provide a minimum 20 dBA noise reduction. The noise level limits of residential building are 45 dBA daytime and 40 dBA nighttime. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation for the building should consider the provision for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, central air conditioning will be required, and the building components will require higher levels of sound attenuation.

When the noise levels are equal to or less than the specified criteria, no noise attenuation (control) measures are required.

When the exceedance of the recommended noise level limits is between 1 dBA and 5 dBA for outdoor living areas (55 dBA < Leq ≤ 60 dBA), the proposed development can be completed with no noise control measures incorporated into the site, but the prospective purchasers / tenants should be made aware by suitable Warning Clauses. When the exceedance of recommended noise level limits is more than 5 dBA for outdoor living areas (Leq > 60 dBA), noise control measures are required to reduce Leq to below 60 dBA and as close as 55 dBA as it is technically and economically feasible.

Noise attenuation (control) measures include any or all of the following:

- Noise attenuation barrier
- Provisions for the installation of central air conditioning
- Central air conditioning
- Architectural components designed to provide additional acoustic insulation

In addition to the implementation of noise attenuation features, if required, the following Warning Clauses may be recommended to advise the prospective purchasers / tenants of affected units of potential environmental noise problem:

Table 3 – Warning Clauses for Outdoor Living Areas

Leq (dBA)	Warning Clause	Description
55 dBA < $L_{eq(16)}$ ≤ 60 dBA	Warning Clause Type A	"Purchasers/tenants are advised that sound levels due to increasing road traffic (rail traffic) (air traffic) may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."
60 dBA < $L_{eq(16)}$	Warning Clause Type B	"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road traffic (rail traffic) (air traffic) may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."

- Clauses taken from section C8 Warning Clauses; Environmental Noise Guidelines for Stationary and Transportation Sources - NPC-300

Table 4 – Warning Clauses for Indoor Living Areas		
Leq (dBA)	**Warning Clause**	**Description**
55 dBA < $L_{eq(16)}$ ≤ 65 dBA 50 dBA < $L_{eq(8)}$ ≤ 60 dBA	Warning Clause Type C	"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central 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."
65 dBA < $L_{eq(16)}$ 60 dBA < $L_{eq(8)}$	Warning Clause Type D	"This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."
➢ Clauses taken from section C8 Warning Clauses; Environmental Noise Guidelines for Stationary and Transportation Sources - NPC-300		

Stationary Noise

Stationary noise sources include sources or facilities that are fixed or mobile and can cause a combination of sound and vibration levels emitted beyond the property line. These sources may include commercial air conditioner units, generators and fans. Facilities that may contribute to stationary noise may include car washes, snow disposal sites, transit stations and manufacturing facilities.

The subject site is not in proximity to existing or approved stationary sources of noise. Therefore, a stationary noise analysis will not be required.

Aircraft / Airport Noise

The subject site is not located within the Airport Vicinity Development Zone. Therefore this project will not require an aircraft/airport noise analysis. No warning clauses regarding aircraft or airport noise will be required.

4.0 Analysis

Surface Transportation Noise

The subject development is bordered to the north by Baseline Road followed by the Experimental Farm, to the east by residential dwellings, to the south by residential dwellings and Wilshire Avenue, and to the west by Lexington Street followed by residential dwellings. Baseline Road, Wilshire Avenue, and Lexington Street are identified within the 100 m radius of proposed development.

Based on the City of Ottawa's Official Plan, Schedule E, Baseline Road is considered a 4-lane urban arterial road - divided (4-UAD). Other roads within the 100 m radius of the proposed development are not classified as either arterial, collector or major collector roads and therefore are not included in this study. The major source of traffic noise is due to the Baseline Road to the north of the proposed development.

All noise sources are presented in Drawing PG6277-3 - Site Geometry located in Appendix 1.

The noise levels from road traffic are provided by the City of Ottawa, taking into consideration the right-of-way width and the implied roadway classification. It is understood that these values represent the maximum allowable capacity of the proposed roadways. The parameters to be used for sound level predictions can be found below.

Table 5 – Traffic and Road Parameters

Segment	Roadway Classification	AADT Veh/Day	Speed Limit (km/h)	Day/Night Split %	Medium Truck %	Heavy Truck %
Baseline Road	4-UAD	35000	60	92/8	7	5
➢ Data obtained from the City of Ottawa document ENCG						

Four (4) levels of reception points were selected for this analysis. The following elevations were selected from the heights provided on the survey plan for the subject building.

Table 6 – Elevations of Reception Points			
Floor Number	**Elevation at Centre of Window (m)**	**Floor Use**	**Daytime / Nighttime Analysis**
First Floor	1.5	Living Area/Bedroom	Daytime / Nighttime
Third Floor	8.5	Living Area/Bedroom	Daytime / Nighttime
Rooftop Terrace	12.5	--	Outdoor Living Area
At-Grade Rear Yard	1.5	--	Outdoor Living Area

For this analysis, a reception point was taken at the centre of each floor, at the first floor and top floor. Outdoor living areas –rooftop terrace and at-grade rear yard are anticipated at the proposed development. One receptor (REC 4) was selected in the centre of rooftop terrace, 12.5 m, and one receptor (REC 5) was selected in the centre of rear yard, 1.5 m. Reception points are detailed on Drawing PG6277-2 - Receptor Locations presented in Appendix 1.

All horizontal distances have been measured from the reception point to the edge of the right-of-way. The roadway was analyzed where it intersected the 100 m buffer zone, which is reflected in the local angles described in Paterson Drawings PG6277-3A to 3E - Site Geometry in Appendix 1.

Table 8 - Summary of Reception Points and Geometry, located in Appendix 1, provides a summary of the points of reception and their geometry with respect to the noise sources. The analysis is completed so that no effects of sound reflection off of the building facade are considered, as stipulated by the ENGC.

The subject site is gently sloping down to the east and at grade with the neighbouring roads within the 100 m radius.

The analysis was completed using STAMSON version 5.04, a computer program which uses the road and rail traffic noise prediction methods using ORNAMENT (Ontario Road Noise Analysis Method for Environment and Transportation) and STEAM (Sound from Trains Environment Analysis Method), publications from the Ontario Ministry of Environment and Energy.

5.0 Results

Surface Transportation Noise

The primary descriptors are the 16-hour daytime (7:00-23:00) and the 8-hour nighttime (23:00-7:00) equivalent sound levels, $L_{eq(16)}$ and $L_{eq(8)}$ for City roads.

The exterior noise levels due to roadway traffic sources were analyzed with the STAMSON version 5.04 software at all reception points. The input and output data of the STAMSON modeling can be found in Appendix 2, and the summary of the results can be found in Table 7.

Table 7: Exterior Noise Levels due to Roadway Traffic Sources

Reception Point	Height Above Grade (m)	Receptor Location	Daytime $L_{eq(16)}$ (dBA)	Nighttime $L_{eq(8)}$ (dBA)
REC 1-1	1.5	Northern Elevation, 1st Floor	72	65
REC 1-3	8.5	Northern Elevation, 3rd Floor	73	65
REC 2-1	1.5	Western Elevation, 1st Floor	66	58
REC 2-3	8.5	Western Elevation, 3rd Floor	66	59
REC 3-1	1.5	Eastern Elevation, 1st Floor	66	59
REC 3-3	8.5	Eastern Elevation, 3rd Floor	67	59
REC 4	12.5	Rooftop Terrace	55	--
REC 5	1.5	At-Grade Rear Yard	44	--

6.0 Discussion and Recommendations

6.1 Outdoor Living Areas

Outdoor living areas – rooftop terrace and at-grade rear yard are anticipated at the proposed development. Two (2) receptor points were selected for the analysis at outdoor living areas (REC 4 and REC 5). It is assumed that both rooftop terrace and at-grade rear yard will only be utilized as outdoor living areas provided that the proposed residential building is constructed. Utilizing the exteriors of proposed residential building and adjacent existing residential building as noise barriers, the proposed Leq(16) at the rooftop terrace will be 55 dBA, which is at the 55 dBA threshold value specified by the ENCG. The proposed Leq(16) at the rear yard will be 44 dBA, which is below the 55 dBA threshold value specified by the ENCG. Therefore, no additional noise attenuation measures are required.

6.2 Indoor Living Areas and Ventilation

The results of the STAMSON modeling indicate that the noise levels at proposed building will range between 66 dBA and 73 dBA during the daytime period (07:00-23:00) and between 58 dBA and 65 dBA during the nighttime period (23:00-7:00). The noise levels on the northern, western, and eastern elevations of proposed building will exceed the limit for the exterior of the pane of glass (55 dBA) specified by the ENCG. It is also noted that the noise levels on the northern, western, and eastern elevations will exceed 65 dBA. Therefore, units on the northern, western, and eastern elevations of this building should be supplied with a central air conditioning unit, along with the warning clause Type D, as outlined in Table 3.

This building does exceed the 65 dBA threshold for noise on the northern, western, and eastern elevations. Therefore, an analysis of the building materials will be required. However, at the time of issuing this report, the building materials and exterior wall construction details had not been finalized.

Proposed Construction Specifications

It is assumed that typical window and wall details are proposed for the residential buildings. The effectiveness of the noise insulation can be expressed as the Acoustical Insulation Factor (AIF), calculated as follows:

$$AIF = L_{eq(16)(Exterior)} - L_{eq(16)(Interior)} + 10\log_{10}(N) + 2 \text{ dBA}$$

Where:

$L_{eq(16)(Exterior)}$ = Calculated value at the window pane
$L_{eq(16)(Interior)}$ = 45 dBA
N = number of components in the room

No floor plans or detailed design drawings were provided for this portion of the review. A conservative approach is to assume that there are 2 components per room. Therefore, the AIF would need to be at least 33 dBA.

A conversion from AIF to a Standard Transmission Class (STC) rating will require the knowledge of room dimensions in addition to the wall and window dimensions. However, a conservative approach would be to increase the AIF by 3. **Therefore, provided the building materials of either the windows and/or exterior walls have an STC rating of 36 or higher, this would be a sufficient noise attenuation device.**

A review of industry standards for construction material indicates that, as long as the exterior cladding of the northern, western, and eastern elevations consist of brick or concrete panels, and that all windows consist of double pane glass, these materials have an STC rating of greater than 36 and are considered acceptable. If alternative materials are to be utilized on the northern, western, and eastern elevations, then a review should be completed once design details are finalized.

7.0 Summary of Findings

The subject site is located at 222 Baseline Road, in the City of Ottawa. It is understood that the proposed development will consist of a three-storey residential building, that will rise 11 metres above grade. There is a single major source of surface transportation noise to the proposed development: Baseline Road.

The surface transportation noise analysis was completed at the Outdoor Living Areas – rooftop terrace and at-grade rear yard. Utilizing the exteriors of proposed residential building and adjacent existing residential building as noise barriers, the results of STAMSON modeling indicate that the noise level at the rooftop terrace is expected to be 55 dBA, during the daytime period, which is at the 55 dBA threshold value specified by the ENCG. The noise level at the rear yard is expected to be 44 dBA, during the daytime period, which is below the 55 dBA threshold value specified by the ENCG. Therefore, no further noise attenuation measures are required.

Several reception points were selected for the surface transportation noise analysis, consisting of the centre of first level and top level. The results of STAMSON modeling indicate that the northern, western, and eastern elevations of the proposed building are expected to exceed the 55 dBA threshold specified by the ENCG. It is also noted that the noise level on the northern, western, and eastern elevations will exceed 65 dBA. Therefore, the installation of a central air conditioning unit, along with a warning clause Type D, will be required for the units on the northern, western, and eastern elevations of proposed building. A review of industry standards for construction material indicates that, provided the exterior cladding of the northern, western, and eastern elevations consist of brick or concrete panels and that all windows consist of double pane glass, these materials have an STC rating of greater than 36 and are considered acceptable.

The following warning clause is to be included on all Offers of Purchase and Sale and/or lease agreements:

> " 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."

"Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."

8.0 Statement of Limitations

The recommendations made in this report are in accordance with our present understanding of the project. Our recommendations should be reviewed when the project drawings and specifications are complete.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than HP Urban or their agent(s) is not authorized without review by this firm for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

September 23, 2022

Yolanda Tang, M.A.Sc. Stephanie A. Boisvenue, P.Eng.

Report Distribution:

- ❑ HP Urban (email copy)
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APPENDIX 1

Table 8 - Summary of Reception Points and Geometry

Drawing PG6277-1 - Site Plan

Drawing PG6277-2 - Receptor Location Plan

Drawing PG6277-3 - Site Geometry

Drawing PG6277-3A - Site Geometry (REC 1-1 and REC 1-3)

Drawing PG6277-3B - Site Geometry (REC 2-1 and REC 2-3)

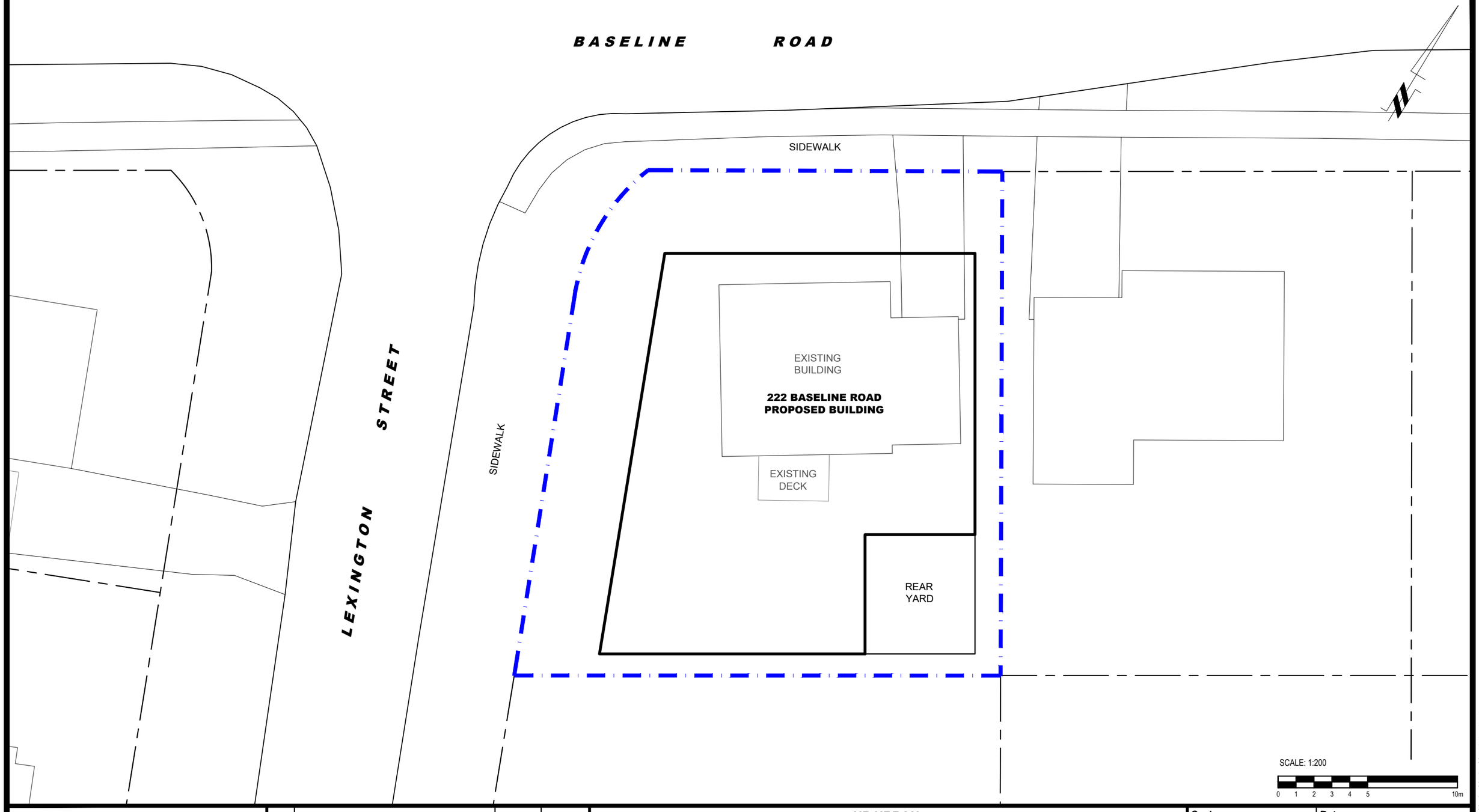
Drawing PG6277-3C - Site Geometry (REC 3-1 and REC 3-3)

Drawing PG6277-3D - Site Geometry (REC 4)

Drawing PG6277-3E - Site Geometry (REC 5)

Table 8 - Summary of Reception Points and Geometry
222 Baseline Road

Point of Reception	Location	Leq Day (dBA)	Baseline Road							
			Horizontal (m)	Vertical (m)	Total (m)	Local Angle (degree)	Number of Rows of Houses	Density (%)	Barrier Height (m)	Barrier Distance (m)
REC 1-1	Northern Elevation, 1st Floor	72	15	1.5	15.1	-86, 87	n/a	n/a	n/a	n/a
REC 1-3	Northern Elevation, 3rd Floor	73	15	8.5	17.2	-86, 87	n/a	n/a	n/a	n/a
REC 2-1	Western Elevation, 1st Floor	66	25	1.5	25.0	-90, 0	n/a	n/a	n/a	n/a
REC 2-3	Western Elevation, 3rd Floor	66	25	8.5	26.4	-90, 0	n/a	n/a	n/a	n/a
REC 3-1	Eastern Elevation, 1st Floor	66	20	1.5	20.1	0, 82	1	20	n/a	n/a
REC 3-3	Eastern Elevation, 3rd Floor	67	20	8.5	21.7	0, 82	1	20	n/a	n/a
REC 4	Rooftop Terrace	55	30	12.5	32.5	-77, 78	n/a	n/a	n/a	n/a
REC 5	At-Grade Rear Yard	44	40	1.5	40.03	38, 76	n/a	n/a	7	10



patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

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NOISE ATTENUATION STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
222 BASELINE ROAD

OTTAWA, ONTARIO

Title:

SITE PLAN

Scale: 1:200	Date: 06/2022
Drawn by: YA	Report No.: PG6277-1
Checked by: YT	Dwg. No.: PG6277-1
Approved by: SB	Revision No.:

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BASELINE ROAD

SIDEWALK

REC 1-1
REC 1-3

EXISTING BUILDING

222 BASELINE ROAD
PROPOSED BUILDING

REC 3-1
REC 3-3

REC 2-1
REC 2-3

EXISTING DECK

REC 4

REAR YARD

REC 5

SIDEWALK

LEXINGTON STREET

LEGEND:

RECEPTOR LOCATION

SCALE: 1:200

0 1 2 3 4 5 10m

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OTTAWA, ONTARIO

Title:

RECEPTOR LOCATION PLAN

Scale: 1:200	Date: 06/2022
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Checked by: YT	Dwg. No.: PG6277-2
Approved by: SB	Revision No.:

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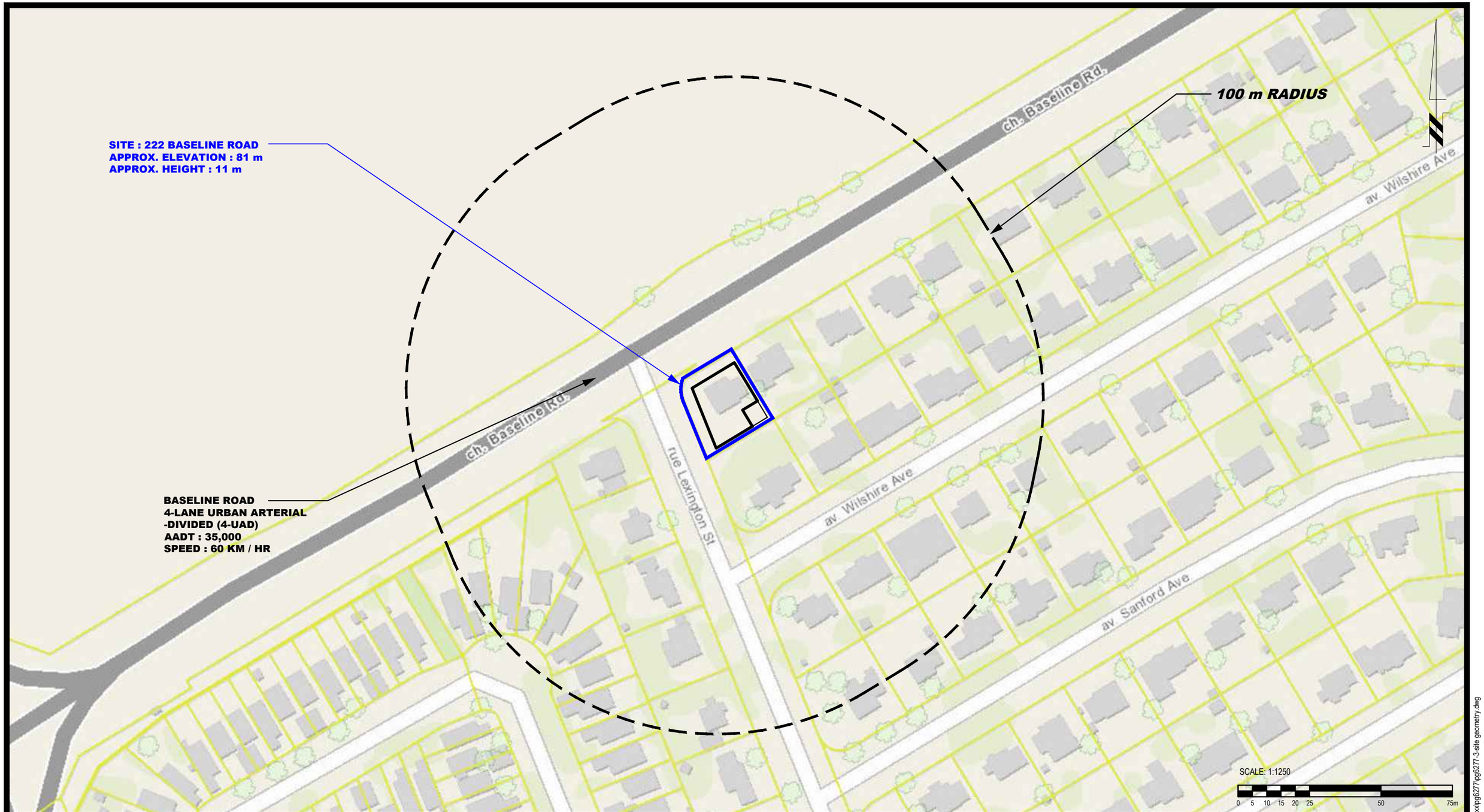

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NOISE ATTENUATION STUDY
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OTTAWA, ONTARIO

Title:

SITE GEOMETRY

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Approved by: SB	Revision No.:

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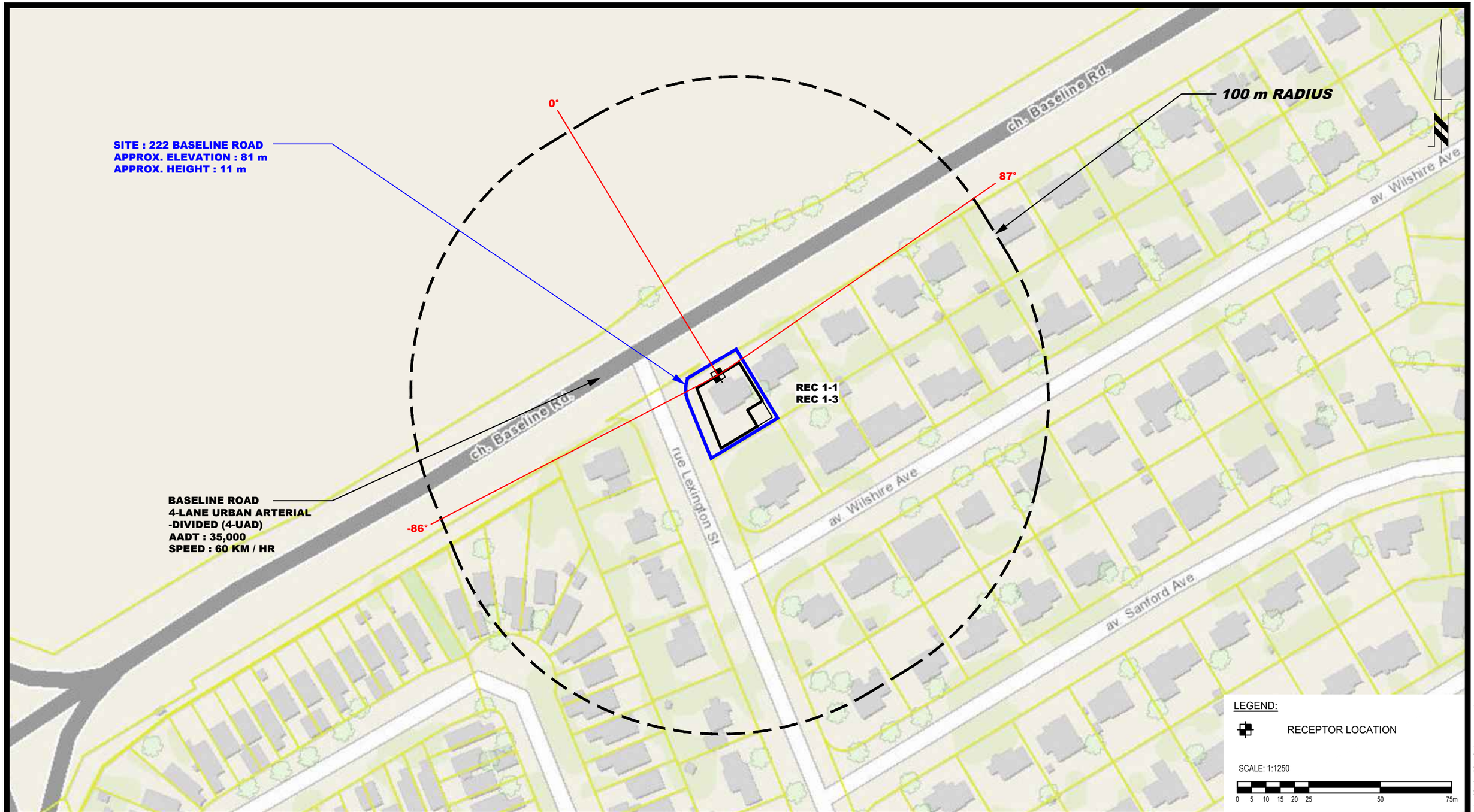

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154 Colonnade Road South
Ottawa, Ontario K2E 7J5
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NOISE ATTENUATION STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
222 BASELINE ROAD

OTTAWA, ONTARIO

Title:

SITE GEOMETRY - REC 1-1 AND REC 1-3

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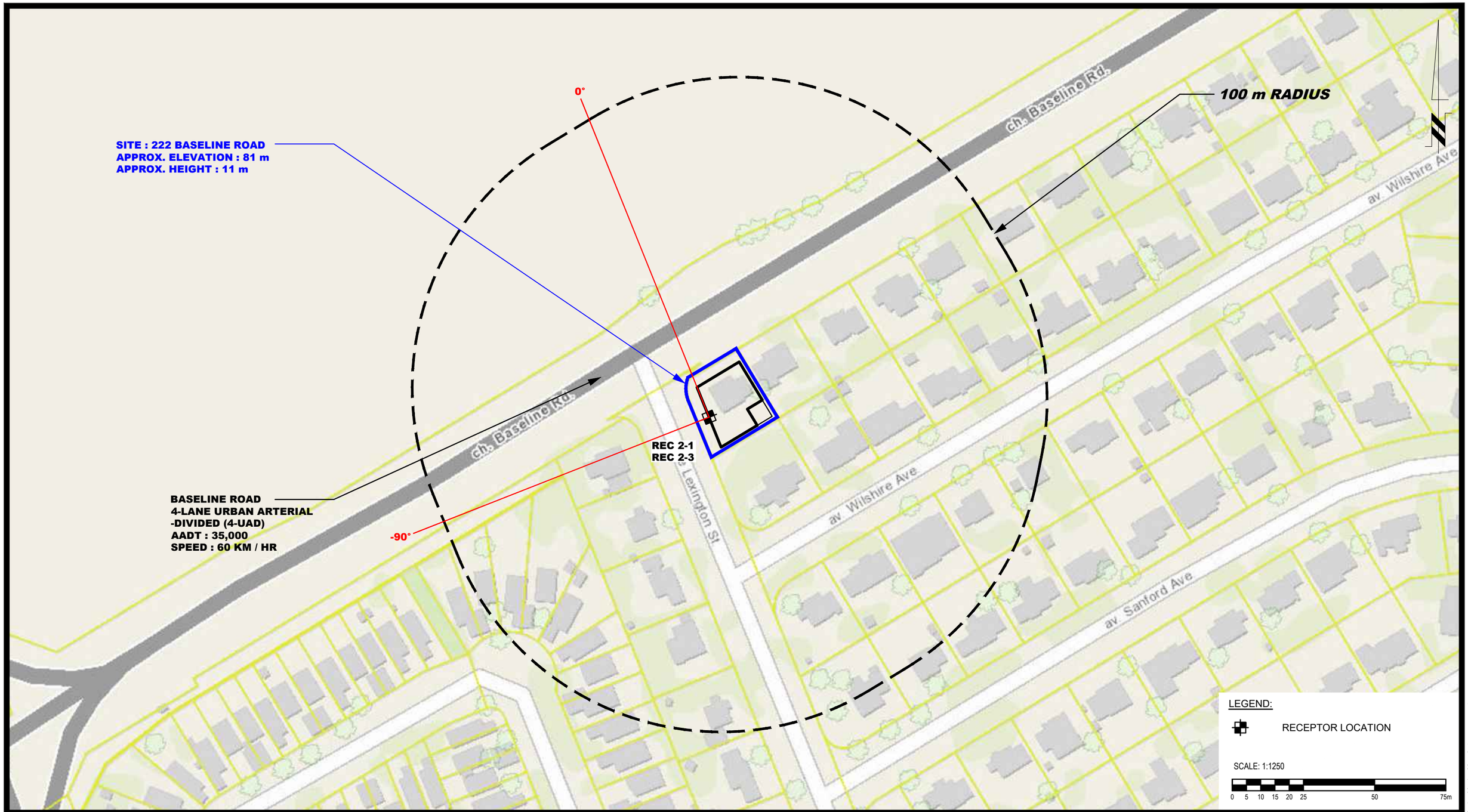

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consulting engineers

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Ottawa, Ontario K2E 7J5
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SITE GEOMETRY - REC 2-1 AND REC 2-3

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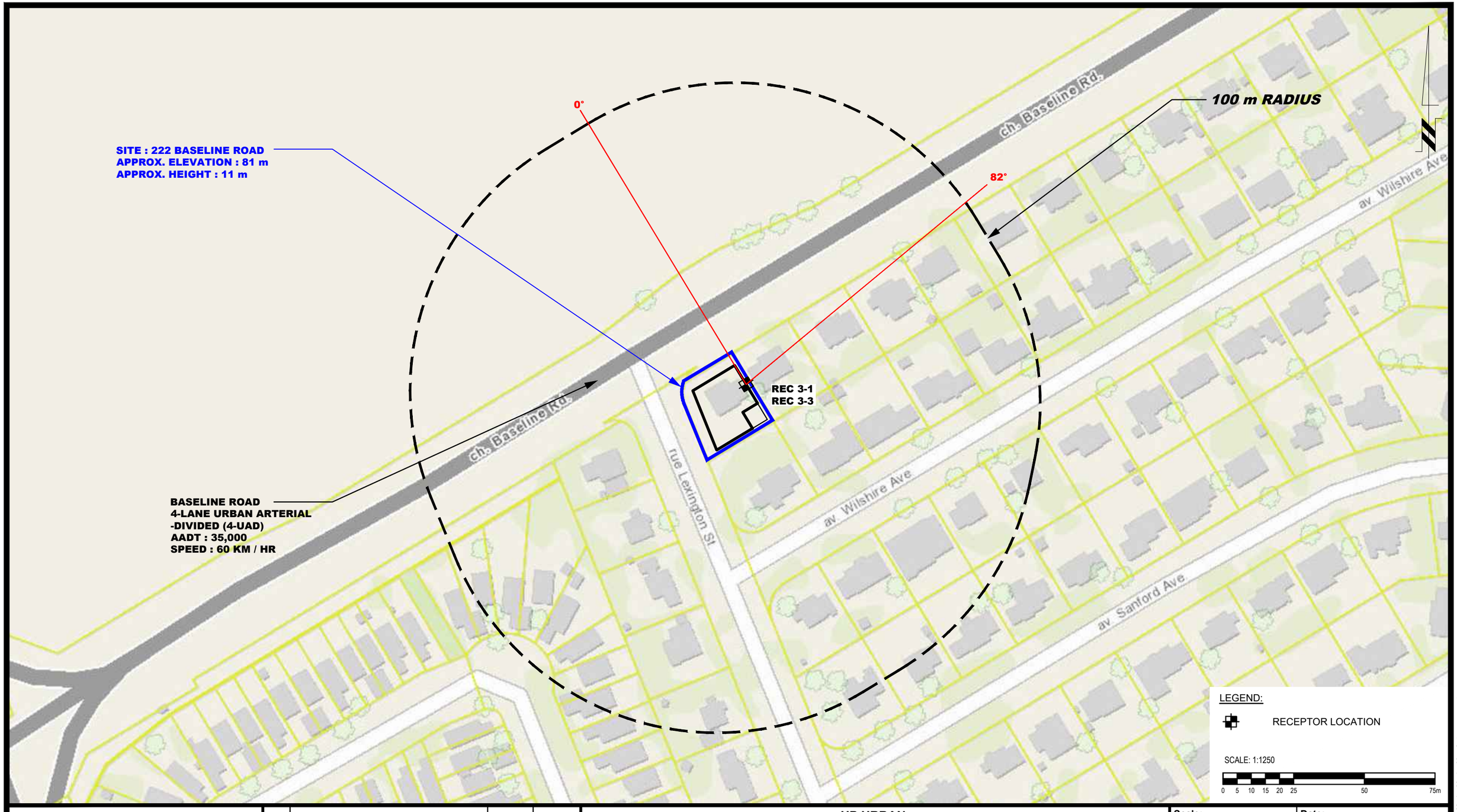

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PROPOSED RESIDENTIAL DEVELOPMENT
222 BASELINE ROAD

OTTAWA, ONTARIO

Title:

SITE GEOMETRY - REC 3-1 AND REC 3-3

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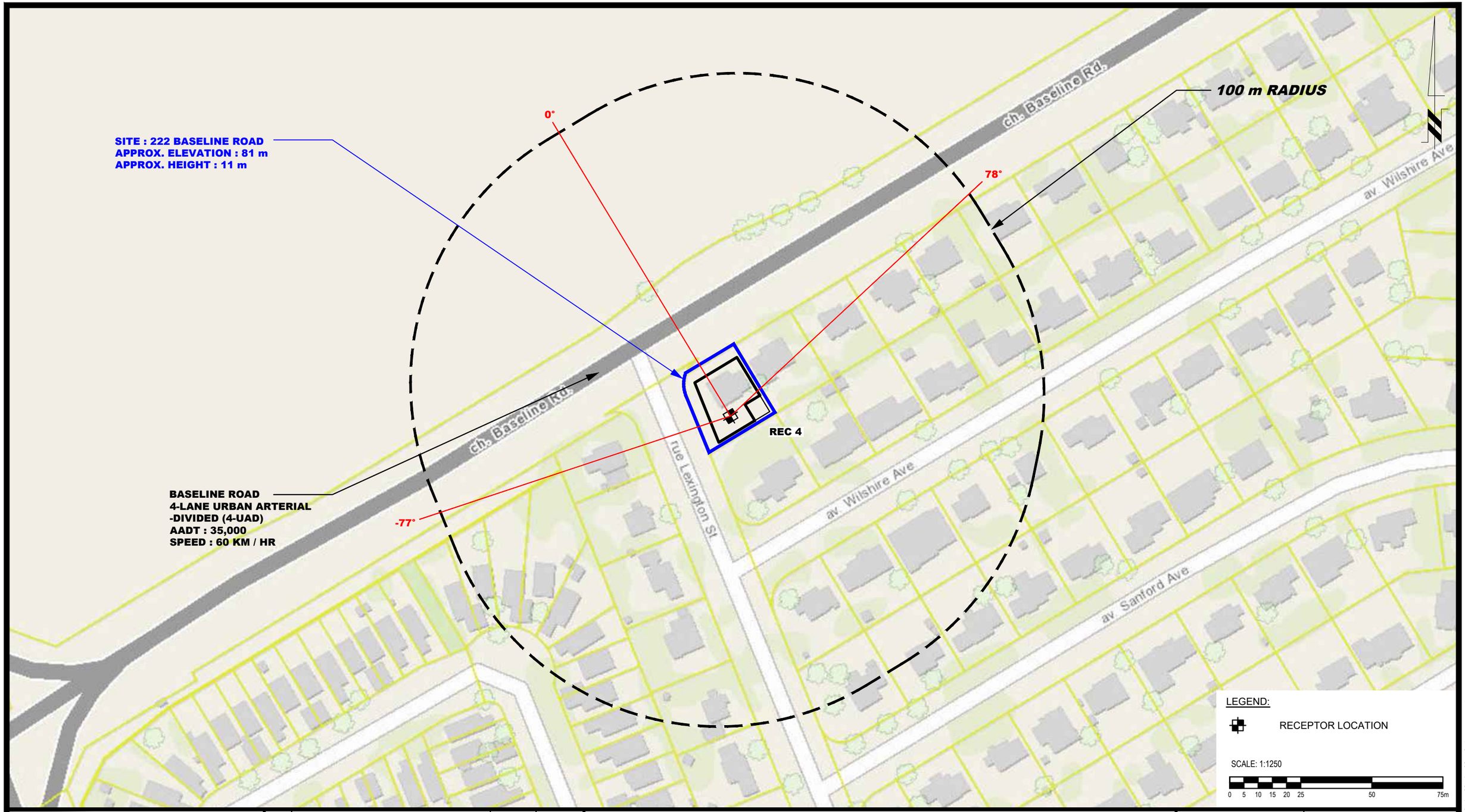

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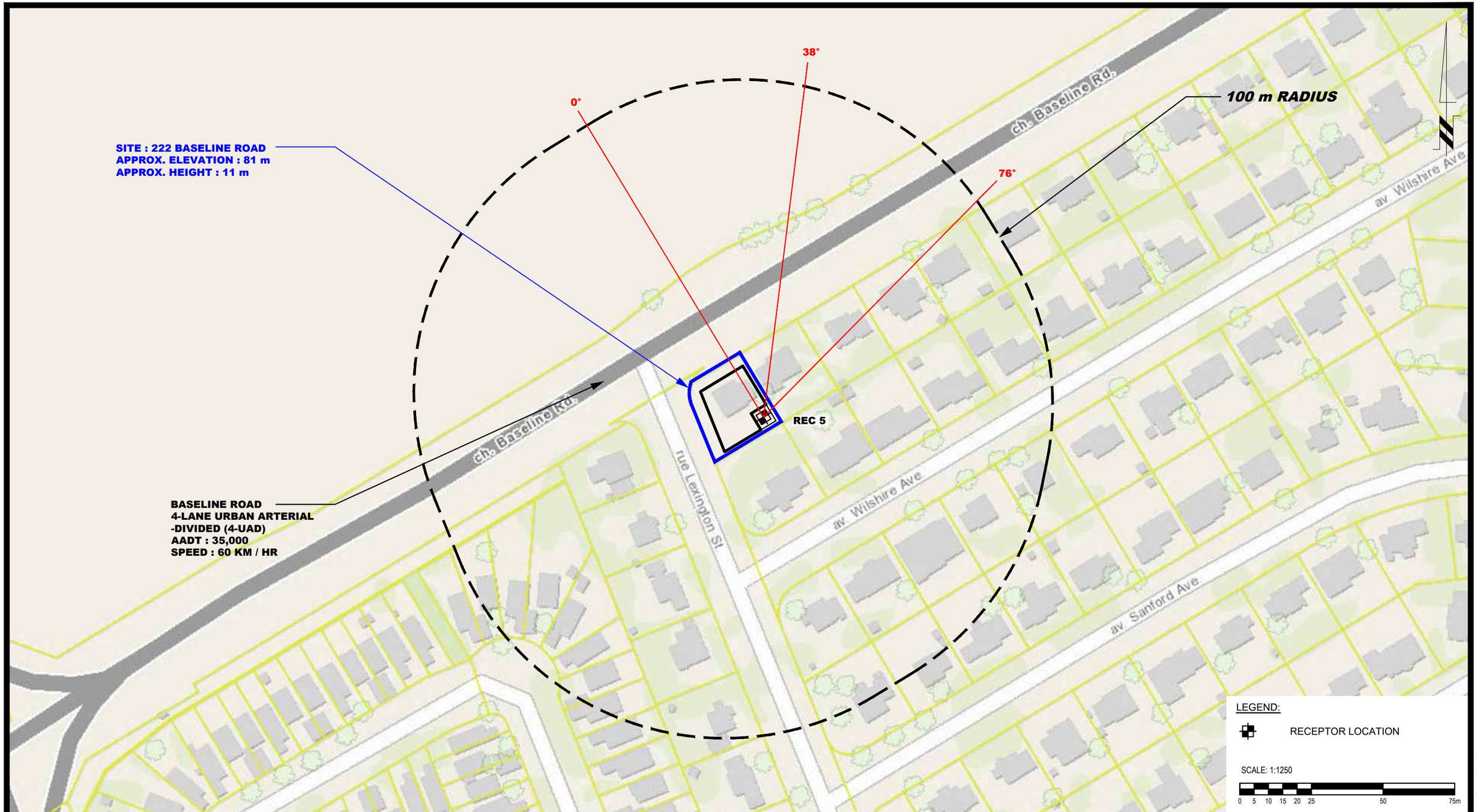

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OTTAWA, ONTARIO

Title:

SITE GEOMETRY - REC 5

Scale: 1:1250	Date: 06/2022
Drawn by: YA	Report No.: PG6277-1
Checked by: YT	Dwg. No.: PG6277-3E
Approved by: SB	Revision No.:

p:\autocad drawings\geotechnical\pg62xx\pg6277\pg6277-3-site geometry.dwg

APPENDIX 2

STAMSON RESULTS

STAMSON 5.0 NORMAL REPORT Date: 20-06-2022 11:05:30
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec11.te Time Period: Day/Night 16/8 hours
Description: Receptor Point 1-1

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

Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 35000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 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: Baseline Rd (day/night)

Angle1 Angle2 : -86.00 deg 87.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 15.00 / 15.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Baseline Rd (day)

Source height = 1.50 m

ROAD (0.00 + 72.20 + 0.00) = 72.20 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-86	87	0.66	73.68	0.00	0.00	-1.48	0.00	0.00	0.00	72.20

Segment Leq : 72.20 dBA

Total Leq All Segments: 72.20 dBA

↟
Results segment # 1: Baseline Rd (night)

Source height = 1.50 m

ROAD (0.00 + 64.60 + 0.00) = 64.60 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-86	87	0.66	66.08	0.00	0.00	-1.48	0.00	0.00	0.00	64.60

Segment Leq : 64.60 dBA

Total Leq All Segments: 64.60 dBA

↟

TOTAL Leq FROM ALL SOURCES (DAY): 72.20
(NIGHT): 64.60
↟
↟

STAMSON 5.0 NORMAL REPORT Date: 20-06-2022 11:08:36
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec13.te Time Period: Day/Night 16/8 hours
Description: Receptor Point 1-3

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

Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 35000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 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: Baseline Rd (day/night)

Angle1 Angle2 : -86.00 deg 87.00 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 : 8.50 / 8.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Baseline Rd (day)

Source height = 1.50 m

ROAD (0.00 + 72.55 + 0.00) = 72.55 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-86	87	0.45	73.68	0.00	0.00	-1.12	0.00	0.00	0.00	72.55

Segment Leq : 72.55 dBA

Total Leq All Segments: 72.55 dBA

↟
Results segment # 1: Baseline Rd (night)

Source height = 1.50 m

ROAD (0.00 + 64.96 + 0.00) = 64.96 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-86	87	0.45	66.08	0.00	0.00	-1.12	0.00	0.00	0.00	64.96

Segment Leq : 64.96 dBA

Total Leq All Segments: 64.96 dBA

↟

TOTAL Leq FROM ALL SOURCES (DAY): 72.55
(NIGHT): 64.96
↟
↟

STAMSON 5.0 NORMAL REPORT Date: 20-06-2022 11:23:42
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec21.te Time Period: Day/Night 16/8 hours
Description: Receptor Point 2-1

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

Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 35000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 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: Baseline Rd (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 : 25.00 / 25.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑
Results segment # 1: Baseline Rd (day)

Source height = 1.50 m

ROAD (0.00 + 65.53 + 0.00) = 65.53 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.66	73.68	0.00	-3.68	-4.47	0.00	0.00	0.00	65.53

Segment Leq : 65.53 dBA

Total Leq All Segments: 65.53 dBA

↟
Results segment # 1: Baseline Rd (night)

Source height = 1.50 m

ROAD (0.00 + 57.93 + 0.00) = 57.93 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.66	66.08	0.00	-3.68	-4.47	0.00	0.00	0.00	57.93

Segment Leq : 57.93 dBA

Total Leq All Segments: 57.93 dBA

↟

TOTAL Leq FROM ALL SOURCES (DAY): 65.53
(NIGHT): 57.93
↟
↟

STAMSON 5.0 NORMAL REPORT Date: 20-06-2022 11:25:19
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec23.te Time Period: Day/Night 16/8 hours
Description: Receptor Point 2-3

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

Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 35000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 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: Baseline Rd (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 : 25.00 / 25.00 m
Receiver height : 8.50 / 8.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑
Results segment # 1: Baseline Rd (day)

Source height = 1.50 m

ROAD (0.00 + 66.37 + 0.00) = 66.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.45	73.68	0.00	-3.22	-4.09	0.00	0.00	0.00	66.37

Segment Leq : 66.37 dBA

Total Leq All Segments: 66.37 dBA

↟
Results segment # 1: Baseline Rd (night)

Source height = 1.50 m

ROAD (0.00 + 58.77 + 0.00) = 58.77 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.45	66.08	0.00	-3.22	-4.09	0.00	0.00	0.00	58.77

Segment Leq : 58.77 dBA

Total Leq All Segments: 58.77 dBA

↟

TOTAL Leq FROM ALL SOURCES (DAY): 66.37
(NIGHT): 58.77
↟
↟

STAMSON 5.0 NORMAL REPORT Date: 20-06-2022 15:31:14
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec31.te Time Period: Day/Night 16/8 hours
Description: Receptor Point 3-1

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

Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 35000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 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: Baseline Rd (day/night)

Angle1 Angle2 : 0.00 deg 82.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 20 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 20.00 / 20.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Baseline Rd (day)

Source height = 1.50 m

ROAD (0.00 + 66.15 + 0.00) = 66.15 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	82	0.66	73.68	0.00	-2.07	-4.56	0.00	-0.90	0.00	66.15

Segment Leq : 66.15 dBA

Total Leq All Segments: 66.15 dBA

↟
Results segment # 1: Baseline Rd (night)

Source height = 1.50 m

ROAD (0.00 + 58.55 + 0.00) = 58.55 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	82	0.66	66.08	0.00	-2.07	-4.56	0.00	-0.90	0.00	58.55

Segment Leq : 58.55 dBA

Total Leq All Segments: 58.55 dBA

↟

TOTAL Leq FROM ALL SOURCES (DAY): 66.15
(NIGHT): 58.55
↟
↟

STAMSON 5.0 NORMAL REPORT Date: 20-06-2022 15:32:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec33.te Time Period: Day/Night 16/8 hours
Description: Receptor Point 3-3

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

Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 35000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 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: Baseline Rd (day/night)

Angle1 Angle2 : 0.00 deg 82.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 20 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 20.00 / 20.00 m
Receiver height : 8.50 / 8.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Baseline Rd (day)

Source height = 1.50 m

ROAD (0.00 + 66.73 + 0.00) = 66.73 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	82	0.45	73.68	0.00	-1.81	-4.23	0.00	-0.90	0.00	66.73

Segment Leq : 66.73 dBA

Total Leq All Segments: 66.73 dBA

↟
Results segment # 1: Baseline Rd (night)

Source height = 1.50 m

ROAD (0.00 + 59.13 + 0.00) = 59.13 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	82	0.45	66.08	0.00	-1.81	-4.23	0.00	-0.90	0.00	59.13

Segment Leq : 59.13 dBA

Total Leq All Segments: 59.13 dBA

↟

TOTAL Leq FROM ALL SOURCES (DAY): 66.73
(NIGHT): 59.13
↟
↟

STAMSON 5.0 NORMAL REPORT Date: 20-06-2022 15:44:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec4.te Time Period: Day/Night 16/8 hours
Description: Receptor Point 4

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

Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 35000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 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: Baseline Rd (day/night)

Angle1 Angle2 : -77.00 deg 78.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 30.00 / 30.00 m
Receiver height : 12.50 / 12.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -77.00 deg Angle2 : 78.00 deg
Barrier height : 11.00 m
Barrier receiver distance : 15.00 / 15.00 m
Source elevation : 81.00 m
Receiver elevation : 81.00 m
Barrier elevation : 81.00 m
Reference angle : 0.00

Results segment # 1: Baseline Rd (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 !       12.50 !        7.00 !        88.00

ROAD (0.00 + 55.00 + 0.00) = 55.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -77     78   0.00  73.68   0.00  -3.01  -0.65   0.00   0.00 -15.01  55.00
-------------------------------------------------------------------------------

Segment Leq : 55.00 dBA

Total Leq All Segments: 55.00 dBA

↟
Results segment # 1: Baseline Rd (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 !       12.50 !        7.00 !        88.00

ROAD (0.00 + 47.41 + 0.00) = 47.41 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -77     78   0.00  66.08   0.00  -3.01  -0.65   0.00   0.00 -15.01  47.41
-------------------------------------------------------------------------------

Segment Leq : 47.41 dBA

Total Leq All Segments: 47.41 dBA

↟



TOTAL Leq FROM ALL SOURCES (DAY): 55.00
                          (NIGHT): 47.41
↟
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STAMSON 5.0 NORMAL REPORT Date: 30-06-2022 08:55:20
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rec5.te Time Period: Day/Night 16/8 hours
Description: Receptor Point 5

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

Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 35000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 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: Baseline Rd (day/night)

Angle1 Angle2 : 38.00 deg 76.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 40.00 / 40.00 m
Receiver height : 1.50 / 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 38.00 deg Angle2 : 76.00 deg
Barrier height : 7.00 m
Barrier receiver distance : 10.00 / 10.00 m
Source elevation : 81.00 m
Receiver elevation : 81.00 m
Barrier elevation : 81.00 m
Reference angle : 0.00

Results segment # 1: Baseline Rd (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 !        82.50

ROAD (0.00 + 43.67 + 0.00) = 43.67 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    38     76   0.24  73.68   0.00  -5.28  -7.45   0.00   0.00 -17.28  43.67
-------------------------------------------------------------------------------

Segment Leq : 43.67 dBA

Total Leq All Segments: 43.67 dBA

↟
Results segment # 1: Baseline Rd (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 !        1.50 !        82.50

ROAD (0.00 + 36.07 + 0.00) = 36.07 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    38     76   0.24  66.08   0.00  -5.28  -7.45   0.00   0.00 -17.28  36.07
-------------------------------------------------------------------------------

Segment Leq : 36.07 dBA

Total Leq All Segments: 36.07 dBA

↟



TOTAL Leq FROM ALL SOURCES (DAY): 43.67
                          (NIGHT): 36.07
↟
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