

# **Environmental Noise Control Study Proposed Residential Building**

230-232 Lisgar Street  
Ottawa, Ontario

Prepared for 230 Lisgar Street Inc.

Report PG6402-1 dated September 16, 2022

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## Table of Contents

	<b>PAGE</b>
<b>1.0 Introduction.....</b>	<b>1</b>
<b>2.0 Proposed Development .....</b>	<b>1</b>
<b>3.0 Methodology and Noise Assessment Criteria.....</b>	<b>2</b>
<b>4.0 Analysis.....</b>	<b>6</b>
<b>5.0 Results.....</b>	<b>8</b>
<b>6.0 Discussion and Recommendations .....</b>	<b>9</b>
6.1 Outdoor Living Areas.....	9
6.2 Indoor Living Areas and Ventilation.....	9
<b>7.0 Summary of Findings .....</b>	<b>10</b>
<b>8.0 Statement of Limitations .....</b>	<b>11</b>

## Appendices

<b>Appendix 1</b>	Table 8 - Summary of Reception Points and Geometry Drawing PG6402-1 - Site Plan Drawing PG6402-2 - Receptor Location Plan Drawing PG6402-3 - Site Geometry Drawing PG6402-3A - Site Geometry - REC 1-1 and REC 1-9 Drawing PG6402-3B - Site Geometry - REC 2-1 and REC 2-9 Drawing PG6402-3C - Site Geometry - REC 3-1 and REC 3-9 Drawing PG6402-3D - Site Geometry - REC 4 Drawing PG6402-3E - Site Geometry - REC 5
<b>Appendix 2</b>	STAMSON Results

## 1.0 Introduction

Paterson Group (Paterson) was commissioned by 230 Lisgar Street Inc. to conduct an environmental noise control study for the proposed residential building to be located at 230-232 Lisgar Street, 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 nine (9) storey residential building with two (2) levels of basement. The building will consist of 49 units and rise 28 metres above grade. Associated walkways, driveways, and landscaped areas are further anticipated. Outdoor living areas – rooftop terrace and at-grade amenity area 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:

<b>Table 1 – Noise Level Limit for Outdoor Living Areas</b>	
<b>Time Period</b>	<b>L<sub>eq</sub> Level (dBA)</b>
Daytime, 7:00-23:00	55
<ul style="list-style-type: none"> <li>➤ Standard taken from Table 2.2a; Sound Level Limit for Outdoor Living Areas – Road and Rail</li> </ul>	

<b>Table 2 – Noise Level Limits for Indoor Living Areas</b>			
<b>Type of Space</b>	<b>Time Period</b>	<b>L<sub>eq</sub> Level (dBA)</b>	
		<b>Road</b>	<b>Rail</b>
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 <b>residences</b> , hospitals, nursing/retirement homes, schools, day-care centres	Daytime 7:00-23:00	45	40
Living/dining/den areas of <b>residences</b> , 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 <b>residences</b> , hospitals, nursing/retirement homes, etc.	Nighttime 23:00-7:00	40	35
<ul style="list-style-type: none"> <li>➤ 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</li> </ul>			

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 ( $55 \text{ dBA} < L_{eq} \leq 60 \text{ dBA}$ ), 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 ( $L_{eq} > 60 \text{ dBA}$ ), noise control measures are required to reduce  $L_{eq}$  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:

<b>Table 3 – Warning Clauses for Outdoor Living Areas</b>		
<b>Leq (dBA)</b>	<b>Warning Clause</b>	<b>Description</b>
$55 \text{ dBA} < L_{eq(16)} \leq 60 \text{ dBA}$	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."
$60 \text{ dBA} < L_{eq(16)}$	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."
<ul style="list-style-type: none"> <li>➤ Clauses taken from section C8 Warning Clauses; Environmental Noise Guidelines for Stationary and Transportation Sources - NPC-300</li> </ul>		

<b>Table 4 – Warning Clauses for Indoor Living Areas</b>		
<b>Leq (dBA)</b>	<b>Warning Clause</b>	<b>Description</b>
$55 \text{ dBA} < L_{\text{eq}(16)} \leq 65 \text{ dBA}$ $50 \text{ dBA} < L_{\text{eq}(8)} \leq 60 \text{ dBA}$	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."
$65 \text{ dBA} < L_{\text{eq}(16)}$ $60 \text{ dBA} < L_{\text{eq}(8)}$	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 Lisgar Street followed by residential dwellings and Nepean Street, to the east by residential dwellings and commercial building followed by Metcalfe Street, to the south by residential dwellings, commercial buildings, and Cooper Street, and to the west by residential dwellings, commercial buildings, and parking lot. Lisgar Street, Nepean Street, Metcalfe Street, and Cooper Street are identified within the 100 m radius of proposed development.

Based on the City of Ottawa’s Official Plan, Schedule F, Metcalfe Street is considered a 2-lane urban arterial road (2-UAU). 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 Metcalfe Street to the east of the proposed development.

All noise sources are presented in Drawing PG6402-3 - 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.

<b>Table 5 – Traffic and Road Parameters</b>						
<b>Segment</b>	<b>Roadway Classification</b>	<b>AADT Veh/Day</b>	<b>Speed Limit (km/h)</b>	<b>Day/Night Split %</b>	<b>Medium Truck %</b>	<b>Heavy Truck %</b>
Metcalfe Street	2-UAU	15,000	50	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.



<b>Floor Number</b>	<b>Elevation at Centre of Window (m)</b>	<b>Floor Use</b>	<b>Daytime / Nighttime Analysis</b>
First Floor	1.5	Living Area/Bedroom	Daytime / Nighttime
Nineth Floor	25.5	Living Area/Bedroom	Daytime / Nighttime
Rooftop Terrace	29.5	--	Outdoor Living Area
At-Grade Amenity Area	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 amenity area are anticipated at the proposed building. One receptor (REC 4) was selected in the centre of rooftop terrace, 29.5 m, and one receptor (REC 5) was selected in the centre of at-grade amenity area, 1.5 m. Reception points are detailed on Drawing PG6402-2 - 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 PG6402-3A 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 the building facade are considered, as stipulated by the ENGC.

The subject site is generally levelled 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.

<b>Reception Point</b>	<b>Height Above Grade (m)</b>	<b>Receptor Location</b>	<b>Daytime <math>L_{eq(16)}</math> (dBA)</b>	<b>Nighttime <math>L_{eq(8)}</math> (dBA)</b>
REC 1-1	1.5	Northern Elevation, 1st Floor	54	46
REC 1-9	25.5	Northern Elevation, 9th Floor	58	50
REC 2-1	1.5	Eastern Elevation, 1st Floor	57	49
REC 2-9	25.5	Eastern Elevation, 9th Floor	60	53
REC 3-1	1.5	Southern Elevation, 1st Floor	52	45
REC 3-9	25.5	Southern Elevation, 9th Floor	57	49
REC 4	29.5	Rooftop Terrace	46	--
REC 5	1.5	At-Grade Amenity Area	48	--

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## **6.0 Discussion and Recommendations**

### **6.1 Outdoor Living Areas**

Outdoor living areas – rooftop terrace and at-grade amenity area 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 amenity area will only be utilized as outdoor living areas provided that the proposed residential building is constructed. Utilizing the exteriors of proposed residential dwelling and adjacent existing residential building as noise barriers, the proposed Leq(16) at the rooftop terrace and the at-grade amenity area will be 46 dBA and 48 dBA, respectively, which are below the 55 dBA threshold value specified by the ENCG. Therefore, no further 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 residential building will range between 52 dBA and 60 dBA during the daytime period (07:00-23:00) and between 45 dBA and 53 dBA during the nighttime period (23:00-07:00). The noise levels on the northern, eastern, and southern elevations of proposed building will exceed the limit for the exterior of the pane of glass (55 dBA) specified by the ENCG. Therefore, the units on the northern, eastern, and southern elevations of this building should be designed with the provision of a central air conditioning unit, along with the warning clause Type C, as outlined in Table 3. It is also noted that the results of STAMSON modeling indicate that the noise levels at proposed building will be below 65 dBA, and therefore standard building materials are acceptable to provide adequate soundproofing.

## 7.0 Summary of Findings

The subject site is located at 230-232 Lisgar Street, in the City of Ottawa. It is understood that the proposed development will consist of a nine (9) storey residential building with two (2) levels of basement. The building will rise 28 metres above grade. There is a single major source of surface transportation noise to the proposed building: Metcalfe Street.

The surface transportation noise analysis was completed at the Outdoor Living Areas – rooftop terrace and at-grade amenity area. Utilizing the exteriors of proposed residential building as noise barriers, the results of STAMSON modeling indicate that the noise level at rooftop terrace and at-grade amenity area are expected to be 46 dBA and 48 dBA, respectively, during the daytime period, which are below the 55 dBA threshold specified by the ENCG. Therefore, further noise attenuation measure is not 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, eastern, and southern elevations of the proposed building are expected to exceed the 55 dBA threshold specified by the ENCG. Therefore, design with the provision for a central air conditioning unit, along with a warning clause Type C, will be required for the units on the northern, eastern, and southern elevations of the proposed building. It is also noted that the modeling indicates that the noise levels are below 65 dBA, and therefore standard building materials are acceptable to provide adequate soundproofing.

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

" 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."

## 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 230 Lisgar Street Inc. 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.**

Yolanda Tang, M.A.Sc



Stephanie A. Boisvenue, P.Eng.

### Report Distribution:

- 230 Lisgar Street Inc. (email copy)
- Paterson Group (1 copy)

# **APPENDIX 1**

## **Table 8 - Summary of Reception Points and Geometry**

**Drawing PG6402-1 - Site Plan**

**Drawing PG6402-2 - Receptor Location Plan**

**Drawing PG6402-3 - Site Geometry**

**Drawing PG6402-3A - Site Geometry (REC 1-1 and REC 1-9)**

**Drawing PG6402-3B - Site Geometry (REC 2-1 and REC 2-9)**

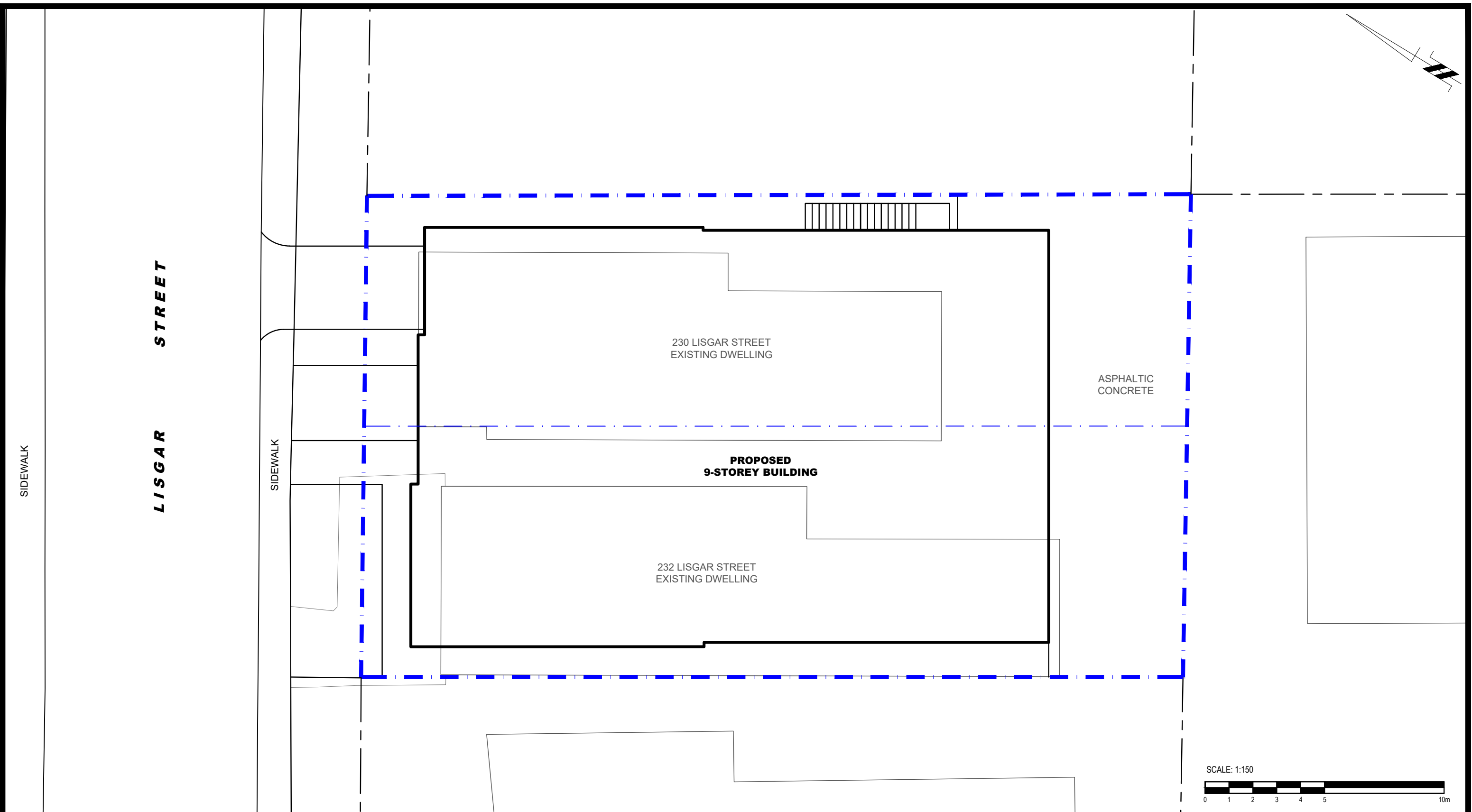
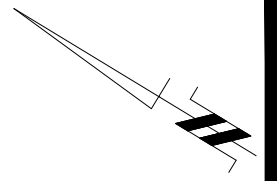
**Drawing PG6402-3C - Site Geometry (REC 3-1 and REC 3-9)**

**Drawing PG6402-3D - Site Geometry (REC 4)**

**Drawing PG6402-3E – Site Geometry (REC 5)**

**Table 8 - Summary of Reception Points and Geometry**  
**230-232 Lisgar Street**

Point of Reception	Location	Leq Day (dBA)	Metcalf Street														
			Horizontal (m)	Vertical (m)	Total (m)	Local Angle (degree)	Number of Rows of Houses	Density (%)									
REC 1-1	Northern Elevation, 1st Floor	54	50	1.5	50.0	-62, 0	1	20									
REC 1-9	Northern Elevation, 9th Floor	58	50	25.5	56.1	-62, 0	1	20									
REC 2-1	Eastern Elevation, 1st Floor	57	45	1.5	45.0	-68, 69	1	40									
REC 2-9	Eastern Elevation, 9th Floor	60	45	25.5	51.7	-68, 69	1	40									
REC 3-1	Southern Elevation, 1st Floor	52	50	1.5	50.0	0, 61	1	40									
REC 3-9	Southern Elevation, 9th Floor	57	50	25.5	56.1	0, 61	1	40									
REC 4	Rooftop Terrace	46	50	29.5	58.1	-64, 65	1	40									
REC 5	At-Grade Amenity Area	48	50	1.5	50.0	-18, 0	1	40									



SIDEWALK

LIGGAR STREET

SIDEWALK

230 LISGAR STREET  
EXISTING DWELLING

**PROPOSED  
9-STOREY BUILDING**

232 LISGAR STREET  
EXISTING DWELLING

ASPHALTIC  
CONCRETE

SCALE: 1:150



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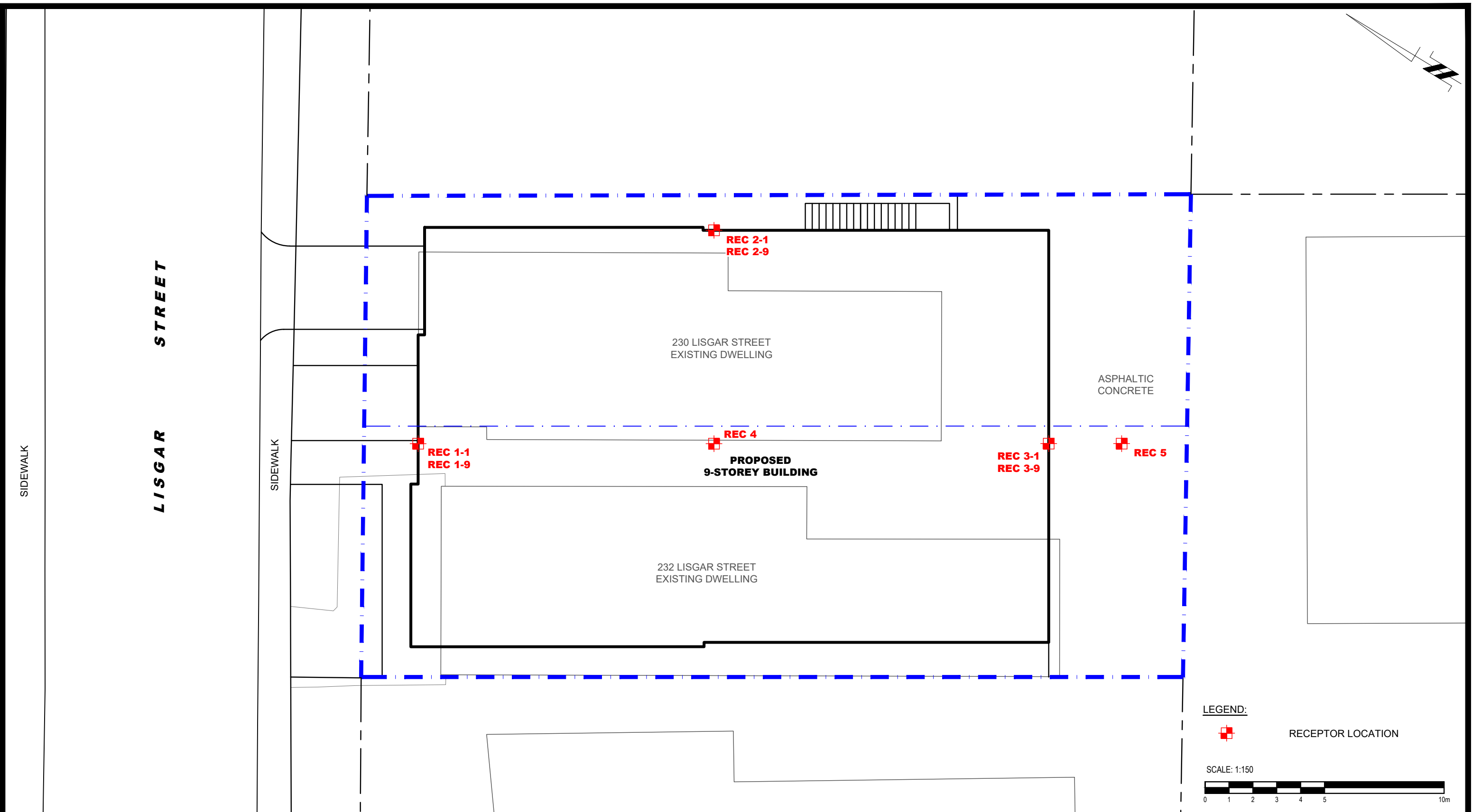
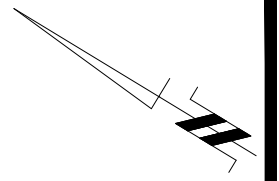
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230 LISGAR STREET INC.  
NOISE ATTENUATION STUDY  
PROPOSED RESIDENTIAL BUILDING  
230 - 232 LISGAR STREET  
OTTAWA, ONTARIO

Title: **SITE PLAN**

Scale:	1:150	Date:	09/2022
Drawn by:	YA	Report No.:	PG6402-1
Checked by:	YT	Dwg. No.:	<b>PG6402-1</b>
Approved by:	SB	Revision No.:	





**LEGEND:**

 RECEPTOR LOCATION

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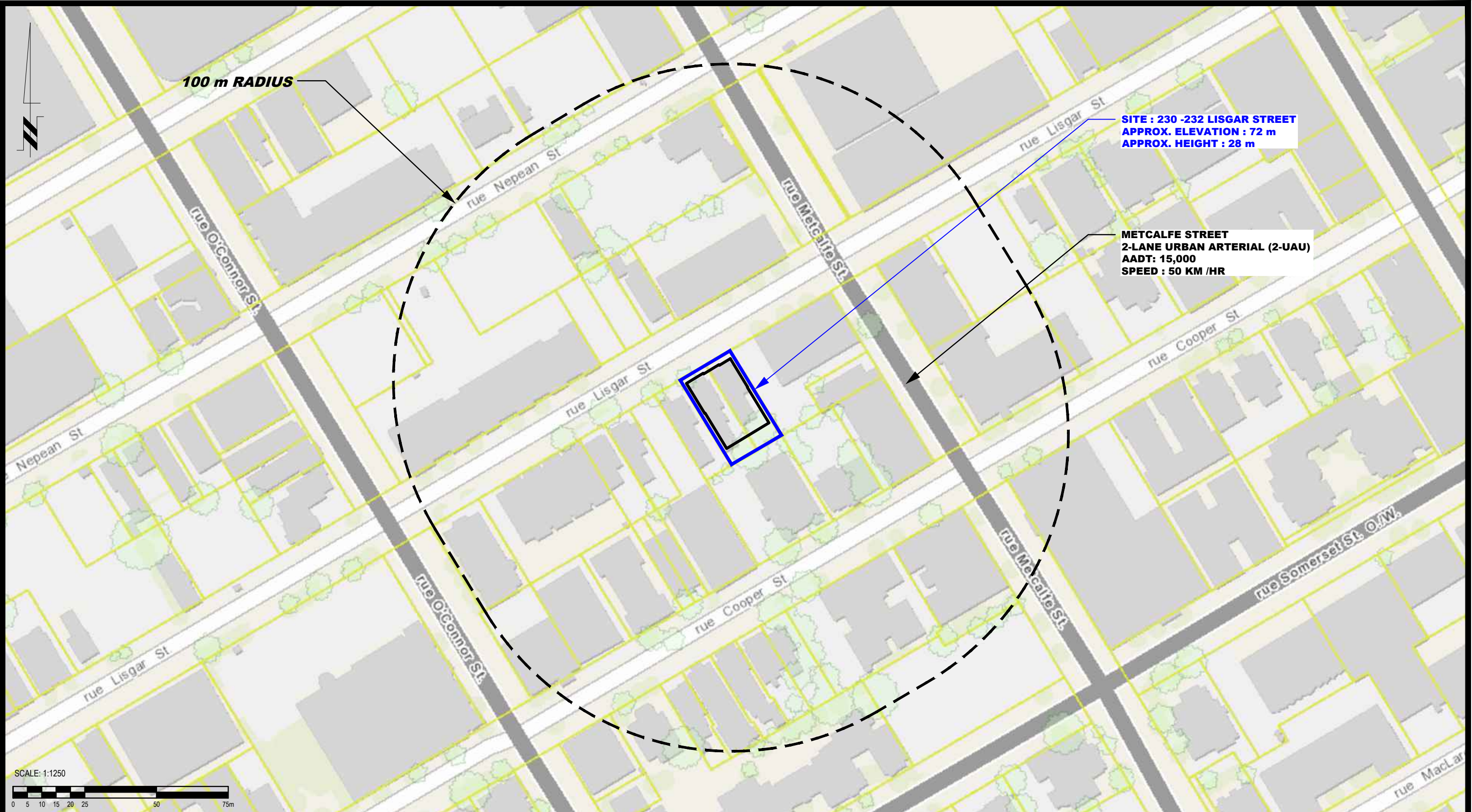



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230 LISGAR STREET INC.  
**NOISE ATTENUATION STUDY**  
**PROPOSED RESIDENTIAL BUILDING**  
 230 - 232 LISGAR STREET  
 OTTAWA, ONTARIO  
**RECEPTOR LOCATION PLAN**

Scale:	1:150	Date:	09/2022
Drawn by:	YA	Report No.:	PG6402-1
Checked by:	YT	Dwg. No.:	<b>PG6402-2</b>
Approved by:	SB	Revision No.:	



SCALE: 1:1250  
 0 5 10 15 20 25 50 75m

**SITE : 230 -232 LISGAR STREET**  
**APPROX. ELEVATION : 72 m**  
**APPROX. HEIGHT : 28 m**

**METCALFE STREET**  
**2-LANE URBAN ARTERIAL (2-UAU)**  
**AADT: 15,000**  
**SPEED : 50 KM /HR**

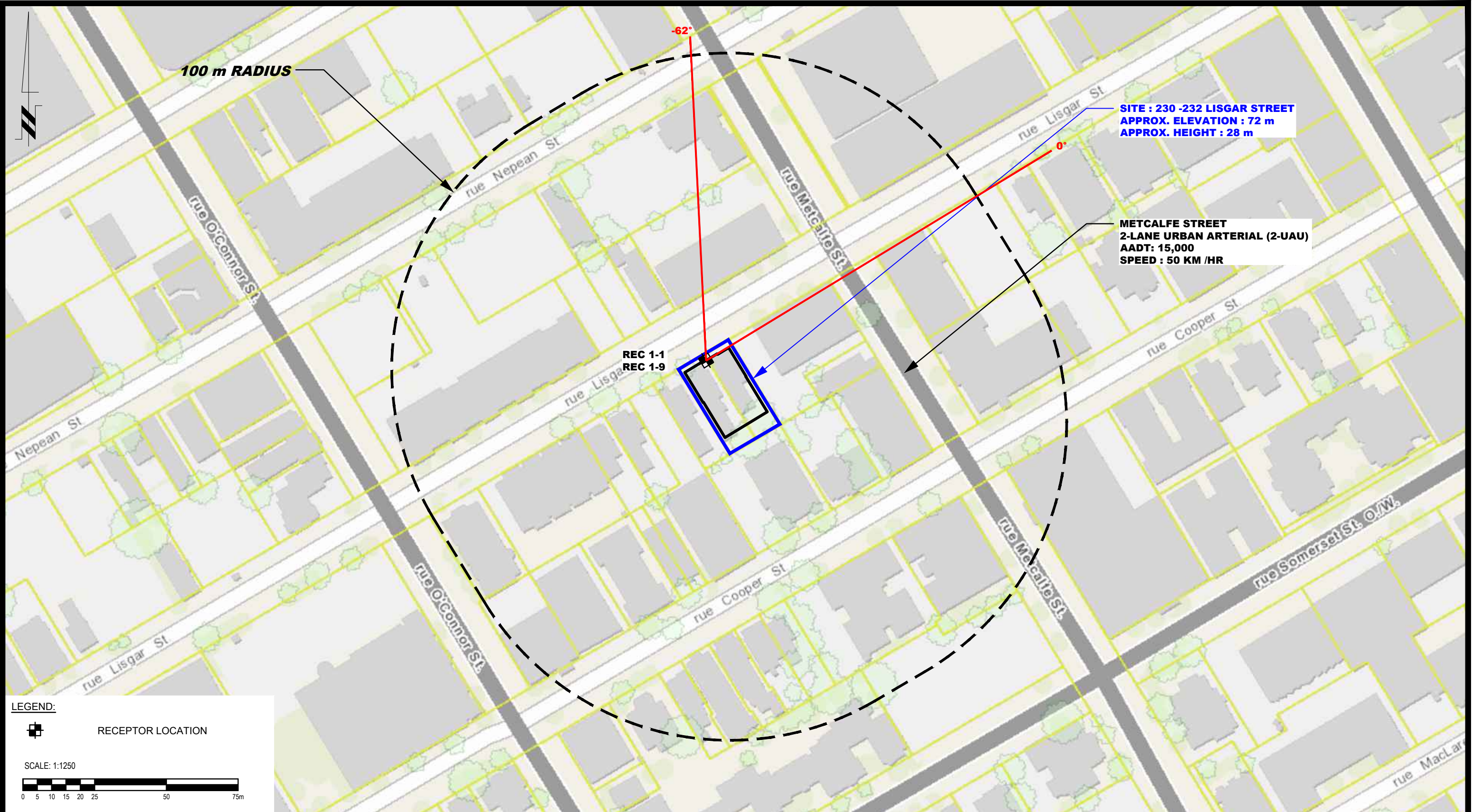
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**230 LISGAR STREET INC.**  
**NOISE ATTENUATION STUDY**  
**PROPOSED RESIDENTIAL BUILDING**  
**230 - 232 LISGAR STREET**  
**SITE GEOMETRY**

OTTAWA,  
 Title: **ONTARIO**


Scale:	1:1250	Date:	09/2022
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Approved by:	SB	Revision No.:	



**LEGEND:**

 RECEPTOR LOCATION

SCALE: 1:1250





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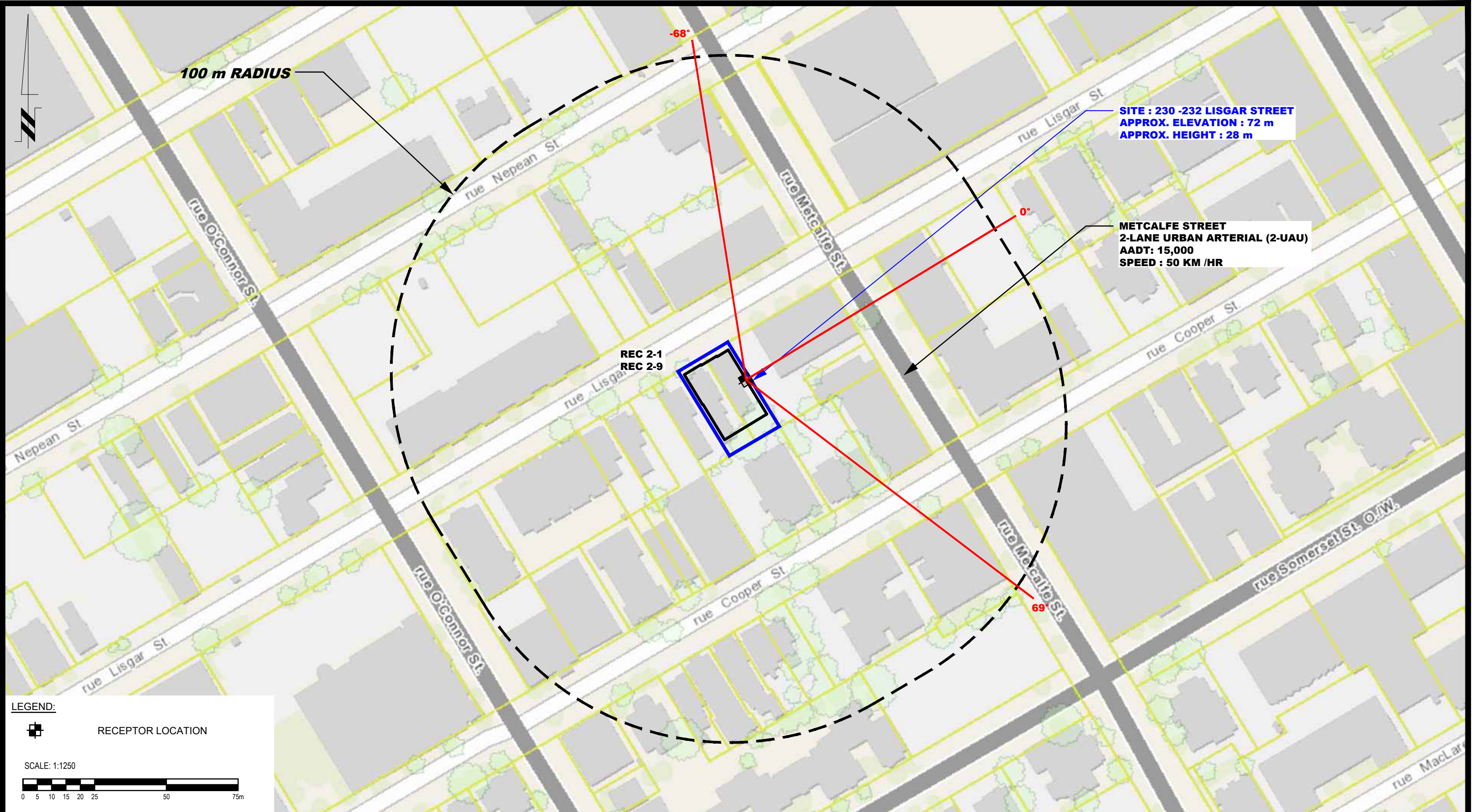
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**230 LISGAR STREET INC.**  
**NOISE ATTENUATION STUDY**  
**PROPOSED RESIDENTIAL BUILDING**  
**230 - 232 LISGAR STREET**

OTTAWA, ONTARIO

**Title: SITE GEOMETRY - REC 1-1 AND REC 1-9**

Scale:	1:1250	Date:	09/2022
Drawn by:	YA	Report No.:	PG6402-1
Checked by:	YT	Dwg. No.:	<b>PG6402-3A</b>
Approved by:	SB	Revision No.:	



**LEGEND:**

RECEPTOR LOCATION

SCALE: 1:1250

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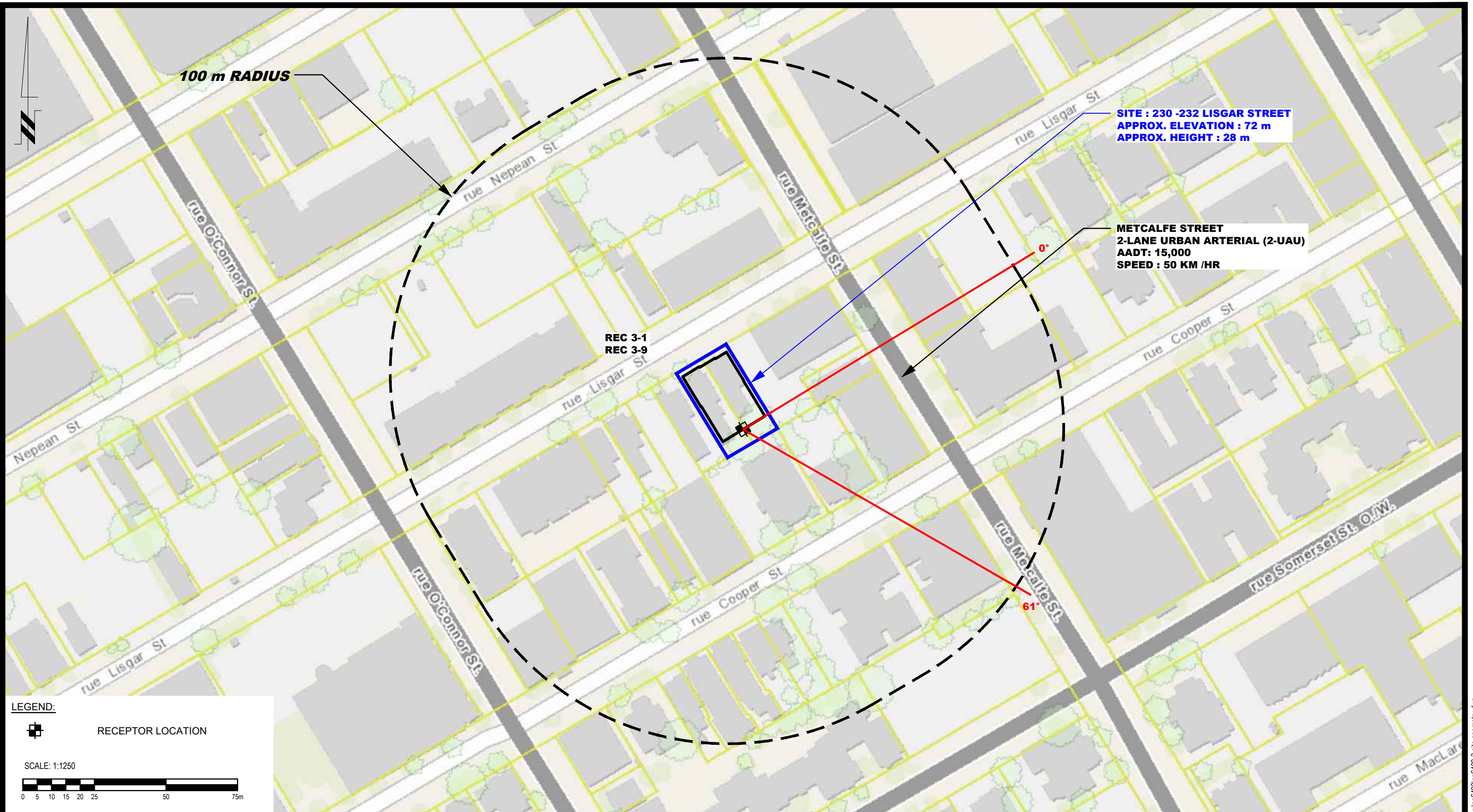
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**230 LISGAR STREET INC.**  
**NOISE ATTENUATION STUDY**  
**PROPOSED RESIDENTIAL BUILDING**  
**230 - 232 LISGAR STREET**

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Title: **SITE GEOMETRY - REC 2-1 AND REC 2-9**

Scale:	1:1250	Date:	09/2022
Drawn by:	YA	Report No.:	PG6402-1
Checked by:	YT	Dwg. No.:	<b>PG6402-3B</b>
Approved by:	SB	Revision No.:	



**LEGEND:**

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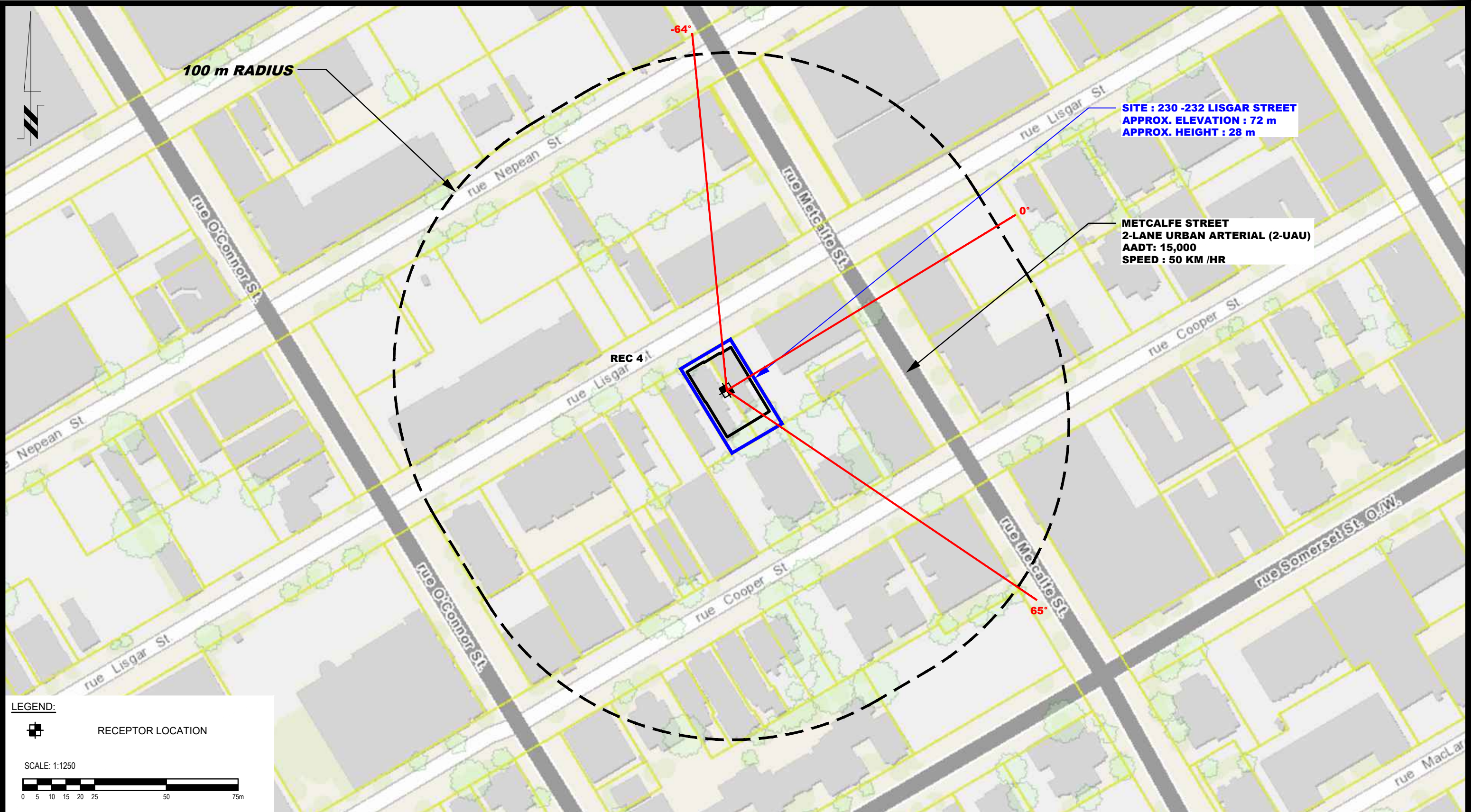
NO.	REVISIONS	DATE	INITIAL

**230 LISGAR STREET INC.**  
**NOISE ATTENUATION STUDY**  
**PROPOSED RESIDENTIAL BUILDING**  
**230 - 232 LISGAR STREET**

OTTAWA, ONTARIO

Title: **SITE GEOMETRY - REC 3-1 AND REC 3-9**

Scale:	1:1250	Date:	09/2022
Drawn by:	YA	Report No.:	PG6402-1
Checked by:	YT	Dwg. No.:	<b>PG6402-3C</b>
Approved by:	SB	Revision No.:	



**LEGEND:**

RECEPTOR LOCATION

SCALE: 1:1250

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 K2E 7S9  
 TEL: (613) 226-7381

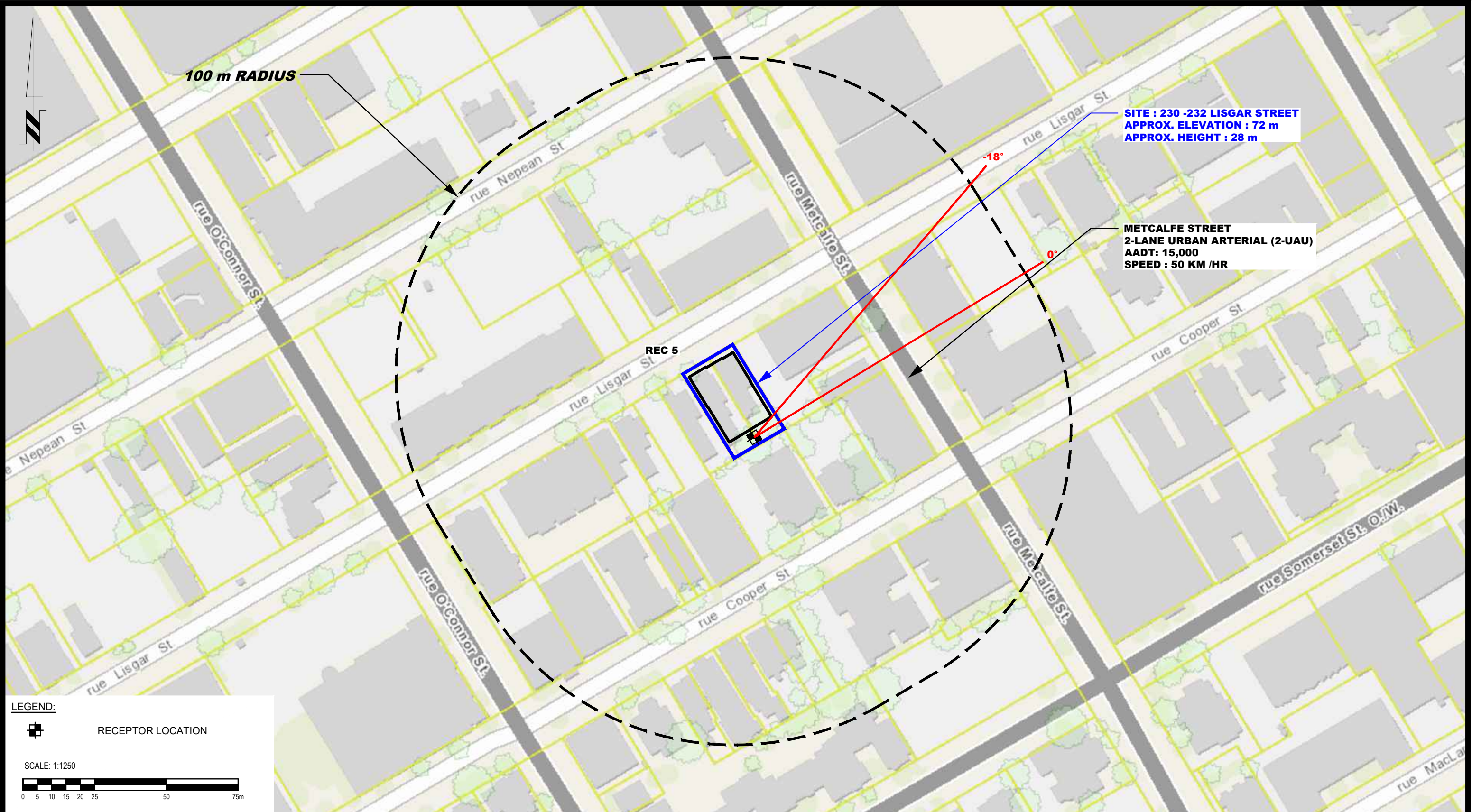
NO.	REVISIONS	DATE	INITIAL

**230 LISGAR STREET INC.**  
**NOISE ATTENUATION STUDY**  
**PROPOSED RESIDENTIAL BUILDING**  
**230 - 232 LISGAR STREET**

OTTAWA, ONTARIO

**SITE GEOMETRY - REC 4**

Scale:	1:1250	Date:	09/2022
Drawn by:	YA	Report No.:	PG6402-1
Checked by:	YT	Dwg. No.:	<b>PG6402-3D</b>
Approved by:	SB	Revision No.:	



**LEGEND:**

RECEPTOR LOCATION

SCALE: 1:1250

**PATERSON GROUP**  
 9 AURIGA DRIVE  
 OTTAWA, ON  
 K2E 7S9  
 TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

**230 LISGAR STREET INC.**  
**NOISE ATTENUATION STUDY**  
**PROPOSED RESIDENTIAL BUILDING**  
**230 - 232 LISGAR STREET**

OTTAWA, ONTARIO

**SITE GEOMETRY - REC 5**

Scale:	1:1250	Date:	09/2022
Drawn by:	YA	Report No.:	PG6402-1
Checked by:	YT	Dwg. No.:	<b>PG6402-3E</b>
Approved by:	SB	Revision No.:	

# **APPENDIX 2**

## **STAMSON RESULTS**



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

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

```
-----
Car traffic volume : 12144/1056 veh/TimePeriod *
Medium truck volume : 966/84 veh/TimePeriod *
Heavy truck volume : 690/60 veh/TimePeriod *
Posted speed limit : 50 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): 15000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00
```

Data for Segment # 1: Metcalfe St (day/night)

```
-----
Angle1 Angle2 : -62.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 20 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 50.00 / 50.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00
```

↑  
 Results segment # 1: Metcalfe St (day)

Source height = 1.50 m

ROAD (0.00 + 53.67 + 0.00) = 53.67 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-62	0	0.66	68.48	0.00	-8.68	-5.23	0.00	-0.90	0.00	53.67

Segment Leq : 53.67 dBA

Total Leq All Segments: 53.67 dBA

↑

Results segment # 1: Metcalfe St (night)

-----

Source height = 1.50 m

ROAD (0.00 + 46.07 + 0.00) = 46.07 dBA

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

-----

-62 0 0.66 60.88 0.00 -8.68 -5.23 0.00 -0.90 0.00 46.07

-----

Segment Leq : 46.07 dBA

Total Leq All Segments: 46.07 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 53.67  
(NIGHT): 46.07

↑

↑

Filename: rec19.te                            Time Period: Day/Night 16/8 hours  
 Description: Receptor Point 1-9

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

-----  
 Car traffic volume : 12144/1056 veh/TimePeriod \*  
 Medium truck volume : 966/84 veh/TimePeriod \*  
 Heavy truck volume : 690/60 veh/TimePeriod \*  
 Posted speed limit : 50 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): 15000  
 Percentage of Annual Growth : 0.00  
 Number of Years of Growth : 0.00  
 Medium Truck % of Total Volume : 7.00  
 Heavy Truck % of Total Volume : 5.00  
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Metcalfe St (day/night)

-----  
 Angle1 Angle2 : -62.00 deg 0.00 deg  
 Wood depth : 0 (No woods.)  
 No of house rows : 1 / 1  
 House density : 20 %  
 Surface : 1 (Absorptive ground surface)  
 Receiver source distance : 50.00 / 50.00 m  
 Receiver height : 25.50 / 25.50 m  
 Topography : 1 (Flat/gentle slope; no barrier)  
 Reference angle : 0.00

↑  
 Results segment # 1: Metcalfe St (day)

-----  
 Source height = 1.50 m

ROAD (0.00 + 57.72 + 0.00) = 57.72 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-62	0	0.00	68.48	0.00	-5.23	-4.63	0.00	-0.90	0.00	57.72

-----

Segment Leq : 57.72 dBA

Total Leq All Segments: 57.72 dBA

↑

Results segment # 1: Metcalfe St (night)

-----

Source height = 1.50 m

ROAD (0.00 + 50.13 + 0.00) = 50.13 dBA

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

-----

-62	0	0.00	60.88	0.00	-5.23	-4.63	0.00	-0.90	0.00	50.13
-----	---	------	-------	------	-------	-------	------	-------	------	-------

-----

Segment Leq : 50.13 dBA

Total Leq All Segments: 50.13 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 57.72

(NIGHT): 50.13

↑

↑

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

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

-----  
 Car traffic volume : 12144/1056 veh/TimePeriod \*  
 Medium truck volume : 966/84 veh/TimePeriod \*  
 Heavy truck volume : 690/60 veh/TimePeriod \*  
 Posted speed limit : 50 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): 15000  
 Percentage of Annual Growth : 0.00  
 Number of Years of Growth : 0.00  
 Medium Truck % of Total Volume : 7.00  
 Heavy Truck % of Total Volume : 5.00  
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Metcalfe St (day/night)

-----  
 Angle1 Angle2 : -68.00 deg 69.00 deg  
 Wood depth : 0 (No woods.)  
 No of house rows : 1 / 1  
 House density : 40 %  
 Surface : 1 (Absorptive ground surface)  
 Receiver source distance : 45.00 / 45.00 m  
 Receiver height : 1.50 / 1.50 m  
 Topography : 1 (Flat/gentle slope; no barrier)  
 Reference angle : 0.00

↑  
 Results segment # 1: Metcalfe St (day)

-----  
 Source height = 1.50 m

ROAD (0.00 + 56.57 + 0.00) = 56.57 dBA  

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-68	69	0.66	68.48	0.00	-7.92	-1.94	0.00	-2.05	0.00	56.57

 -----

Segment Leq : 56.57 dBA

Total Leq All Segments: 56.57 dBA

↑

Results segment # 1: Metcalfe St (night)

-----

Source height = 1.50 m

ROAD (0.00 + 48.98 + 0.00) = 48.98 dBA

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

-----

-68	69	0.66	60.88	0.00	-7.92	-1.94	0.00	-2.05	0.00	48.98
-----	----	------	-------	------	-------	-------	------	-------	------	-------

-----

Segment Leq : 48.98 dBA

Total Leq All Segments: 48.98 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 56.57  
(NIGHT): 48.98

↑

↑

Filename: rec29.te                            Time Period: Day/Night 16/8 hours  
 Description: Receptor Point 2-9

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

```
-----
Car traffic volume : 12144/1056 veh/TimePeriod *
Medium truck volume : 966/84 veh/TimePeriod *
Heavy truck volume : 690/60 veh/TimePeriod *
Posted speed limit : 50 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): 15000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00
```

Data for Segment # 1: Metcalfe St (day/night)

```
-----
Angle1 Angle2 : -68.00 deg 69.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 40 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 45.00 / 45.00 m
Receiver height : 25.50 / 25.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00
```

↑  
 Results segment # 1: Metcalfe St (day)

Source height = 1.50 m

ROAD (0.00 + 60.47 + 0.00) = 60.47 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-68	69	0.00	68.48	0.00	-4.77	-1.19	0.00	-2.05	0.00	60.47

Segment Leq : 60.47 dBA

Total Leq All Segments: 60.47 dBA

↑

Results segment # 1: Metcalfe St (night)

-----

Source height = 1.50 m

ROAD (0.00 + 52.88 + 0.00) = 52.88 dBA

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

-----

-68 69 0.00 60.88 0.00 -4.77 -1.19 0.00 -2.05 0.00 52.88

-----

Segment Leq : 52.88 dBA

Total Leq All Segments: 52.88 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 60.47  
(NIGHT): 52.88

↑

↑



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

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

-----  
 Car traffic volume : 12144/1056 veh/TimePeriod \*  
 Medium truck volume : 966/84 veh/TimePeriod \*  
 Heavy truck volume : 690/60 veh/TimePeriod \*  
 Posted speed limit : 50 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): 15000  
 Percentage of Annual Growth : 0.00  
 Number of Years of Growth : 0.00  
 Medium Truck % of Total Volume : 7.00  
 Heavy Truck % of Total Volume : 5.00  
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Metcalfe St (day/night)

-----  
 Angle1 Angle2 : 0.00 deg 61.00 deg  
 Wood depth : 0 (No woods.)  
 No of house rows : 1 / 1  
 House density : 40 %  
 Surface : 1 (Absorptive ground surface)  
 Receiver source distance : 50.00 / 50.00 m  
 Receiver height : 1.50 / 1.50 m  
 Topography : 1 (Flat/gentle slope; no barrier)  
 Reference angle : 0.00

↑  
 Results segment # 1: Metcalfe St (day)

-----  
 Source height = 1.50 m

ROAD (0.00 + 52.49 + 0.00) = 52.49 dBA  

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	61	0.66	68.48	0.00	-8.68	-5.28	0.00	-2.03	0.00	52.49

 -----

Segment Leq : 52.49 dBA

Total Leq All Segments: 52.49 dBA

↑

Results segment # 1: Metcalfe St (night)

-----

Source height = 1.50 m

ROAD (0.00 + 44.89 + 0.00) = 44.89 dBA

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

-----

0	61	0.66	60.88	0.00	-8.68	-5.28	0.00	-2.03	0.00	44.89
---	----	------	-------	------	-------	-------	------	-------	------	-------

-----

Segment Leq : 44.89 dBA

Total Leq All Segments: 44.89 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 52.49

(NIGHT): 44.89

↑

↑

Filename: rec39.te                            Time Period: Day/Night 16/8 hours  
 Description: Receptor Point 3-9

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

```
-----
Car traffic volume : 12144/1056 veh/TimePeriod *
Medium truck volume : 966/84 veh/TimePeriod *
Heavy truck volume : 690/60 veh/TimePeriod *
Posted speed limit : 50 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): 15000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00
```

Data for Segment # 1: Metcalfe St (day/night)

```
-----
Angle1 Angle2 : 0.00 deg 61.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 40 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 50.00 / 50.00 m
Receiver height : 25.50 / 25.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00
```

↑  
 Results segment # 1: Metcalfe St (day)

Source height = 1.50 m

ROAD (0.00 + 56.52 + 0.00) = 56.52 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	61	0.00	68.48	0.00	-5.23	-4.70	0.00	-2.03	0.00	56.52

Segment Leq : 56.52 dBA

Total Leq All Segments: 56.52 dBA

↑

Results segment # 1: Metcalfe St (night)

-----

Source height = 1.50 m

ROAD (0.00 + 48.92 + 0.00) = 48.92 dBA

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

-----

0	61	0.00	60.88	0.00	-5.23	-4.70	0.00	-2.03	0.00	48.92
---	----	------	-------	------	-------	-------	------	-------	------	-------

-----

Segment Leq : 48.92 dBA

Total Leq All Segments: 48.92 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 56.52

(NIGHT): 48.92

↑

↑

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

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

-----  
Car traffic volume : 12144/1056 veh/TimePeriod \*  
Medium truck volume : 966/84 veh/TimePeriod \*  
Heavy truck volume : 690/60 veh/TimePeriod \*  
Posted speed limit : 50 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): 15000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Metcalfe St (day/night)

-----  
Angle1 Angle2 : -64.00 deg 65.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 1 / 1  
House density : 40 %  
Surface : 1 (Absorptive ground surface)  
Receiver source distance : 50.00 / 50.00 m  
Receiver height : 29.50 / 29.50 m  
Topography : 2 (Flat/gentle slope; with barrier)  
Barrier angle1 : -64.00 deg Angle2 : 65.00 deg  
Barrier height : 28.00 m  
Barrier receiver distance : 10.00 / 10.00 m  
Source elevation : 72.00 m  
Receiver elevation : 72.00 m  
Barrier elevation : 72.00 m  
Reference angle : 0.00

↑  
Results segment # 1: Metcalfe St (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 !          29.50 !          23.90 !          95.90

```

ROAD (0.00 + 46.38 + 0.00) = 46.38 dBA

```

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----
   -64    65   0.00  68.48   0.00  -5.23  -1.45   0.00  -2.03   0.00  59.77
   -64    65   0.00  68.48   0.00  -5.23  -1.45   0.00   0.00 -15.42  46.38
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----

```

Segment Leq : 46.38 dBA

Total Leq All Segments: 46.38 dBA

↑  
Results segment # 1: Metcalfe St (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 !          29.50 !          23.90 !          95.90

```

ROAD (0.00 + 38.79 + 0.00) = 38.79 dBA

```

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----
   -64    65   0.00  60.88   0.00  -5.23  -1.45   0.00  -2.03   0.00  52.17
   -64    65   0.00  60.88   0.00  -5.23  -1.45   0.00   0.00 -15.42  38.79
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----

```

Segment Leq : 38.79 dBA

Total Leq All Segments: 38.79 dBA

↑  
  
TOTAL Leq FROM ALL SOURCES (DAY): 46.38  
                                  (NIGHT): 38.79

↑  
↑

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

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

```
-----
Car traffic volume : 12144/1056 veh/TimePeriod *
Medium truck volume : 966/84 veh/TimePeriod *
Heavy truck volume : 690/60 veh/TimePeriod *
Posted speed limit : 50 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): 15000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00
```

Data for Segment # 1: Metcalfe St (day/night)

```
-----
Angle1 Angle2 : -18.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 40 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 50.00 / 50.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00
```

↑  
 Results segment # 1: Metcalfe St (day)

Source height = 1.50 m

ROAD (0.00 + 47.72 + 0.00) = 47.72 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-18	0	0.66	68.48	0.00	-8.68	-10.05	0.00	-2.03	0.00	47.72

Segment Leq : 47.72 dBA

Total Leq All Segments: 47.72 dBA

↑

Results segment # 1: Metcalfe St (night)

-----

Source height = 1.50 m

ROAD (0.00 + 40.12 + 0.00) = 40.12 dBA

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

-----

-18 0 0.66 60.88 0.00 -8.68 -10.05 0.00 -2.03 0.00 40.12

-----

Segment Leq : 40.12 dBA

Total Leq All Segments: 40.12 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 47.72  
(NIGHT): 40.12

↑

↑