



## **Stationary Noise Feasibility Assessment**

**99 Fifth Avenue**

**Ottawa, Ontario**

REPORT: GWE17-148 – Stationary Noise R1

### **Prepared For:**

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June 6, 2019

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## EXECUTIVE SUMMARY

This document describes a stationary noise feasibility assessment performed for a proposed mixed-use development located at 99 Fifth Avenue, in Ottawa, Ontario. GWE's scope of work involved assessing exterior noise levels generated by on-site and off-site stationary sources, such as proposed mechanical equipment. The development comprises a seven-storey building connected by an enclosed atrium to a row of existing heritage buildings oriented along Bank Street. The development includes amenity space in the form of balconies, terraces, and a ground level amenity space west of the building. The major sources of stationary noise impacting the development are rooftop mechanical equipment associated with adjacent heritage building and other surrounding properties. This study also considered the impacts from proposed mechanical equipment associated with the development on the surroundings. Figure 1 illustrates a complete site plan with surrounding context.

The assessment is based on: (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) vehicular traffic volumes based on the City of Ottawa counts; and (iv) architectural drawings and mechanical information received from Minto Communities.

The results of the current analysis indicate that stationary noise levels fall below ENCG criteria during all hours of the day. Since the noise levels fall below ENCG criteria, the proposed development is expected to be compatible with the existing and future noise sensitive land uses, provided the assumptions in Section 4.2.1 are adhered to in the detailed design. This includes replacement of the existing RTU S15, as per Section 4.2.1. A review of final equipment selection and locations by a qualified acoustical engineer will be required prior to installation of the equipment.

## TABLE OF CONTENTS

	<b>PAGE</b>
<b>1. INTRODUCTION</b>	<b>1</b>
<b>2. TERMS OF REFERENCE</b>	<b>1</b>
<b>3. OBJECTIVES</b>	<b>2</b>
<b>4. METHODOLOGY</b>	<b>2</b>
<b>4.1 Background</b>	<b>2</b>
<b>4.2 Stationary Noise</b>	<b>2</b>
<b>4.2.1 Assumptions</b>	<b>2</b>
<b>4.2.2 Stationary Noise Source Assessment and Criteria</b>	<b>3</b>
<b>4.2.3 Determination of Noise Source Power Levels</b>	<b>4</b>
<b>4.2.4 Stationary Source Noise Predictions</b>	<b>6</b>
<b>5. RESULTS AND DISCUSSION</b>	<b>8</b>
<b>5.1 Stationary Noise Levels</b>	<b>8</b>
<b>6. CONCLUSIONS AND RECOMMENDATIONS</b>	<b>11</b>

### **FIGURES**

### **APPENDICES:**

**Appendix A – Predictor Lima Sample Output**

**Appendix B – Background Noise Calculations**

## 1. INTRODUCTION

Gradient Wind Engineering Inc. (GWE) was retained by Minto Communities – Canada to undertake a stationary noise feasibility assessment of a proposed mixed-use development located at 99 Fifth Avenue in Ottawa, Ontario. This report summarizes the methodology, results and recommendations related to a stationary noise feasibility assessment. GWE's scope of work involved assessing exterior noise levels generated by on-site and off-site stationary sources, such as existing and proposed mechanical equipment. The assessment was performed on the basis of theoretical noise calculation methods conforming to the City of Ottawa<sup>1</sup> and Ministry of the Environment, Conservation and Parks (MECP)<sup>2</sup> guidelines. Noise calculations were based on architectural drawings and mechanical information received from Minto Communities, with traffic count data provided by the City of Ottawa.

## 2. TERMS OF REFERENCE

The focus of this stationary noise feasibility assessment is a proposed mixed-use development to be located at 99 Fifth Avenue in Ottawa, Ontario. The development is located on a parcel of land bounded by Fifth Avenue to the south, Bank Street to the west, Fourth Avenue to the north, and existing residential developments to the east. The site is surrounded by commercial buildings to the west along Bank Street, and mainly residential areas to the east and south. The major sources of stationary noise impacting the development are rooftop mechanical equipment associated with the development and surrounding properties. Figure 1 illustrates a complete site plan with surrounding context.

The proposed development comprises a seven-storey building connected by an enclosed atrium to a row of existing heritage buildings oriented along Bank Street. The development includes amenity space in the form of balconies, terraces, and a ground level amenity space west of the building.

The heritage building adjacent to the development has a number of rooftop pieces of mechanical equipment, these pieces of equipment are considered as stationary sources of noise. The study also considered the impact of new pieces of mechanical equipment associated with the development. On the

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<sup>1</sup> City of Ottawa Environmental Noise Control Guidelines, January 2016

<sup>2</sup> Ontario Ministry of the Environment, Conservation and Parks – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013

north end of the upper floor is a mechanical penthouse, which is assumed to house a majority of the mechanical equipment including Make-up air handling units, cooling towers, and emergency generators.

### **3. OBJECTIVES**

The main goals of this work are to: (i) calculate the future noise levels on surrounding noise-sensitive properties, as well as the study building, produced by stationary noise sources associated with the development, and (ii) ensure that interior and exterior noise levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines as outlined in Section 4 of this report.

### **4. METHODOLOGY**

#### **4.1 Background**

Noise can be defined as any obtrusive sound. It is created at a source, transmitted through a medium, such as air, and intercepted by a receiver. Noise may be characterized in terms of the power of the source or the sound pressure at a specific distance. While the power of a source is characteristic of that particular source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Measurement of noise is based on the decibel unit, dBA, which is a logarithmic ratio referenced to a standard noise level ( $2 \times 10^{-5}$  Pascals). The 'A' suffix refers to a weighting scale, which better represents how the noise is perceived by the human ear. With this scale, a doubling of power results in a 3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

#### **4.2 Stationary Noise**

##### **4.2.1 Assumptions**

Mechanical information for the development has been provided by Minto Communities. A review of final equipment selection and locations by a qualified acoustical engineer will be required prior to installation of the equipment. The following assumptions have been included in the analysis:

- (i) The locations, quantity and tonnage of rooftop units have been assumed based on direction from Minto Communities and GWE's experience with similar developments.
- (ii) The sound data of rooftop units is based on manufacture's data.

- (iii) During the daytime and evening period (07:00 – 23:00), the rooftop mechanical units (RTU) on the building are in full operation.
- (iv) During the nighttime period (23:00 – 07:00), the rooftop mechanical units on the building are in operation 50% of the time.
- (v) Screening effects of buildings and parapets have been considered in the modelling.
- (vi) The existing RTU S15 will be replaced with a quieter unit, possessing an overall sound power level no greater than 76 dBA if at the current location.

#### 4.2.2 Stationary Noise Source Assessment and Criteria

For stationary sources, the  $L_{eq}$  is calculated on an hourly interval, while for roadways, the  $L_{eq}$  is calculated on the basis of a 16-hour daytime / 8-hour nighttime split. Noise criteria taken from the ENCG apply to points of reception (POR). A POR is defined under ENCG as “any location on a noise sensitive land use where noise from a stationary source is received”, this can be an outdoor point of reception or at the plane of window. A POR can be located on an existing or zoned for future use premises of permanent or seasonal residences, hotels/motels, nursing/retirement homes, rental residences, hospitals, camp grounds, and noise sensitive buildings such as schools, places of worship and daycare facilities. According to the ENCG, the recommended maximum noise level for an urban (Class 1) environment at a POR is either the lowest one-hour background noise level due to other sources, or the exclusionary limits outlined in Table 3, whichever is higher. These criteria are applicable for both on-site and off-site points of receptor.

**TABLE 3: EXCLUSIONARY LIMITS FOR CLASS 2 AREA**

Time of Day	Outdoor Points of Reception	Plane of Window
07:00 – 19:00	50	50
19:00 – 23:00	50	50
23:00 – 07:00	N/A	45

As the subject site is located adjacent to an arterial roadway, which produces a high level of ambient noise, calculations were performed to determine appropriate background noise levels due to traffic to compare against the noise impacts from the stationary source. Traffic data was obtained from the City of Ottawa for the intersection of Bank Street and Fifth Avenue; however, data was limited to daytime traffic volumes. GWE has performed calculations using the STAMSON software at receptors along the north and west façade, representing Receptor 1 and 2 respectively. Calculations were based on the lowest hourly

traffic data of 876 vehicles on Bank Street and 200 vehicles on Fifth Avenue. The mix of vehicles was assumed to be comprised of 7% medium trucks and 5% heavy trucks as per ENCG Table B1. For the source to receiver path, hard/reflective ground was assumed given the majority of the ground surface will be covered by asphalt. Nighttime background noise levels were assumed to be 10 dBA below daytime levels. Details of the calculations are presented in Appendix B.

### **4.2.3 Determination of Noise Source Power Levels**

Table 4 summarizes the sound power levels of each source assumed in our analysis. Source locations are illustrated in Figure 2. The analysis is split into impacts from off-site and on-site equipment separately. Off-site equipment, located atop the adjacent heritage building, impacts on-site receptors only. Rooftop equipment sound power data is from the manufacturer's test data.

**TABLE 4: EQUIPMENT SOUND POWER LEVELS (dBA)**

Source ID	Height above roof (m)	Type	Make	Model	Frequency (Hz)								
					63	125	250	500	1000	2000	4000	8000	Total
Off-site sources													
S1	1	RTU	Lennox	GC516-823-135-1J					86				86
S2	1	RTU	Lennox	KGAG36S4DM2p		63	66	70	71	68	62	53	76
S3	1	RTU	Carrier	24ABB330A310		53	60	68	70	68	63	59	75
S4	1	RTU	Lennox	TGA024S2DS1P					75				75
S5	1	RTU	York	D2NZ024N05606A									
S6	0.85	RTU	Carrier	38TKB024300					80				80
S7	1	RTU	Lennox	GCS16-024-50-5P					80				80
S8	1	RTU	Lennox	13ACX-024-230-13					76				76
S9	1	RTU	York	D6NZ024N05606NXA		64	66	68	73	65	61	49	76
S10	1	RTU	Lennox	XC13-024-330-04		70	66	69	66	61	62	59	75
S11	0.8	RTU	York	TCGD2454153A					76				76
S12	0.5	RTU	Lennox	GCS16-060-120-4P					82				82
S13	0.6	RTU	Lennox	XC13-024-230-02		70	66	69	66	61	62	59	75
S14	0.7	RTU	Lennox	13ACX-024-230-15					76				76
S15	0.7	RTU	Lennox	GCS16-030-75N-5P					80				80
S16	0.7	Fan	N/A	N/A	46	65	83	76	71	70	67	60	84
S17	1	Fan	N/A	N/A	46	65	83	76	71	70	67	60	84
On-site sources													
S18	3	CT	N/A	N/A	77	84	84	87	88	87	85	93	97
S19	2	AHU	N/A	N/A	61	65	74	72	72	66	61	55	78
S20	2	AHU	N/A	N/A	61	65	74	72	72	66	61	55	78
S21	2	AHU	N/A	N/A	61	65	74	72	72	66	61	55	78
S25	2	Gen	N/A	N/A	84	93	97	100	97	95	88	81	104



#### 4.2.4 Stationary Source Noise Predictions

The impact of the stationary noise sources on the nearby residential areas was determined by Predictor-Lima. A total of sixteen (16) receptor locations were chosen around the site to measure the noise impact at points of reception (POR) during the daytime and evening period (07:00 – 23:00), as well as the nighttime period (23:00 – 07:00). POR locations included outdoor points of reception (OPOR) and the plane of windows (POW) of the adjacent residential properties, as well as on-site locations. Sensor locations are described in Table 5 and illustrated in Figure 3. All RTUs, CTs and generator exhausts were represented as point sources in the Predictor model, while AHUs and generator intakes were represented as emitting façades along the mechanical penthouse. Table 6 below contains Predictor-Lima calculation settings. These settings are typical and have been based on ISO 9613 standards and guidance from the MECP.

Ground absorption over the study area was determined based on topographical features (such as water, concrete, grassland, etc.). An absorption value of 0 is representative of hard ground, while a value of 1 represents grass, and similar soft surface conditions. Existing and proposed buildings were added to the model to account for screening and reflection effects from building façades. A Predictor-Lima sample output is available in Appendix A, further modelling data is available upon request.

**TABLE 5: RECEPTOR LOCATIONS**

Receptor Number	Location	Height Above Grade (m)
On-site Receptors		
R1	North Façade (North Wing) - POW	17.5
R2A	West Façade (North Wing) - POW	11.5
R2B		17.5
R3	Southeast Terrace - OPOR	20.5
R4	West Façade (Center) - POW	20.5
R5	Ground Level Amenity - OPOR	1.5
R6	West Façade (South Wing) - POW	11.5
R6B		17.5
R7	South Façade (South Wing) - POW	20.5
R8	Southwest Terrace - OPOR	20.5
R9	South Façade (South Wing) - POW	17.5
Off-site Receptors		
R1	109 Fourth Avenue - POW	10
R2	109 Fourth Avenue - POW	10
R3	107 Fourth Avenue - POW	7.5
R4	88 Fourth Avenue - POW	7.5
R5	93 Fifth Avenue - POW	7.5
R6	93 Fifth Avenue - OPOR	1.5
R7	90 Fifth Avenue - POW	7.5

**TABLE 6: CALCULATION SETTINGS**

Parameter	Setting
Meteorological correction method	Single value for C0
Value C0	2
Default ground attenuation factor	1
Ground attenuation factor for roadways and paved areas	0
Temperature (K)	283.15
Pressure (kPa)	101.33
Air humidity (%)	70

## 5. RESULTS AND DISCUSSION

### 5.1 Stationary Noise Levels

As Table 7-9 (below) summarize, noise levels fall below ENCG criteria during all hours of the day, at all receptors. Noise contours at 7.5 m above grade can be seen in Figure 4 and 5 for daytime and nighttime conditions, due to on-site HVAC sources. The main contributor of on-site noise from off-site sources at Receptor 2 is the S15 RTU. The main contributor of noise from on-site sources at on-site Receptor 3 is the S18 Cooling Tower (CT). Since the noise levels fall below the ENCG criteria, the proposed development is expected to be compatible with the existing and future noise sensitive land uses, provided the assumptions in Section 4.2.1 are adhered to in the detailed design.

**TABLE 7: ON-SITE NOISE LEVELS FROM OFF-SITE STATIONARY SOURCES**

Receptor Number	Receptor Location	1-HR L <sub>EQ</sub> (dBA)		ENCG Criteria (dBA)		Meets ENCG
		Daytime/Evening	Night	Daytime/Evening	Night	
R1	North Façade (North Wing) - POW	49	22	50	45	Yes
R2A	West Façade (North Wing) - POW	61	54	65*	55*	Yes
R2B		57	49	65*	55*	Yes
R3	Southeast Terrace - OPOR	23	20	50	N/A	Yes
R4	West Façade (Center) - POW	52	49	65*	55*	Yes
R5	Ground Level Amenity - OPOR	42	37	50	N/A	Yes
R6A	West Façade (South Wing) - POW	57	54	65*	55*	Yes
R6B		55	52	65*	55*	Yes
R7	South Façade (South Wing) - POW	31	27	50	45	Yes
R8	Southwest Terrace - OPOR	43	39	50	N/A	Yes
R9	South Façade (South Wing) - POW	37	33	50	45	Yes

\* - Background noise level due to roadway traffic (see Appendix B)

**TABLE 8: NOISE LEVELS FROM ON-SITE HVAC STATIONARY SOURCES**

Receptor Number	Receptor Location	1-HR L <sub>EQ</sub> (dBA)		ENCG Criteria (dBA)		Meets ENCG
		Daytime/ Evening	Night	Daytime/ Evening	Night	
On-site Receptors						
R1	North Façade (North Wing) - POW	53	51	61*	51*	Yes
R2A	West Façade (North Wing) - POW	51	47	65*	55*	Yes
R2B		54	51	65*	55*	Yes
R3	Southeast Terrace - OPOR	45	43	50	N/A	Yes
R4	West Façade (Center) - POW	42	42	65*	55*	Yes
R5	Ground Level Amenity - OPOR	35	35	50	N/A	Yes
R6A	West Façade (South Wing) - POW	27	26	65*	55*	Yes
R6B		32	30	65*	55*	Yes
R7	South Façade (South Wing) - POW	36	36	50	45	Yes
R8	Southwest Terrace - OPOR	38	37	50	N/A	Yes
R9	South Façade (South Wing) - POW	37	36	50	45	Yes
Off-site Receptors						
R1	109 Fourth Avenue - POW	44	44	50	45	Yes
R2	109 Fourth Avenue - POW	44	43	50	45	Yes
R3	107 Fourth Avenue - POW	45	44	50	45	Yes
R4	88 Fourth Avenue - POW	45	43	50	45	Yes
R5	93 Fifth Avenue - POW	43	41	50	45	Yes
R6	93 Fifth Avenue - OPOR	41	39	50	N/A	Yes

\* - Background noise level due to roadway traffic (see Appendix B)

**TABLE 9: NOISE LEVELS FROM ON-SITE EMERGENCY STATIONARY SOURCES**

Receptor Number	Receptor Location	1-HR L <sub>EQ</sub> (dBA)		ENCG Criteria (dBA)		Meets ENCG
		Daytime/ Evening	Night	Daytime/ Evening	Night	
On-site Receptors						
R1	North Façade (North Wing) - POW	60	N/A	61*	N/A	Yes
R2A	West Façade (North Wing) - POW	48	N/A	65*	N/A	Yes
R2B		54	N/A	65*	N/A	Yes
R3	Southeast Terrace - OPOR	54	N/A	60	N/A	Yes
R4	West Façade (Center) - POW	52	N/A	65*	N/A	Yes
R5	Ground Level Amenity - OPOR	44	N/A	60	N/A	Yes
R6A	West Façade (South Wing) - POW	35	N/A	65*	N/A	Yes
R6B		35	N/A	65*	N/A	Yes
R7	South Façade (South Wing) - POW	46	N/A	60	N/A	Yes
R8	Southwest Terrace - OPOR	47	N/A	60	N/A	Yes
R9	South Façade (South Wing) - POW	45	N/A	60	N/A	Yes
Off-site Receptors						
R1	109 Fourth Avenue - POW	53	N/A	60	N/A	Yes
R2	109 Fourth Avenue - POW	52	N/A	60	N/A	Yes
R3	107 Fourth Avenue - POW	55	N/A	60	N/A	Yes
R4	88 Fourth Avenue - POW	49	N/A	60	N/A	Yes
R5	93 Fifth Avenue - POW	50	N/A	60	N/A	Yes
R6	93 Fifth Avenue - OPOR	48	N/A	60	N/A	Yes

\* - Background noise level due to roadway traffic (see Appendix B)

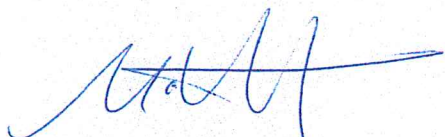
## 6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that stationary noise levels fall below ENCG criteria during all hours of the day. Since the noise levels fall below ENCG criteria, the proposed development is expected to be compatible with the existing and future noise sensitive land uses, provided the assumptions in Section 4.2.1 are adhered to in the detailed design. This includes replacement of the existing RTU S15, as per Section 4.2.1. A review of final equipment selection and locations by a qualified acoustical engineer will be required prior to installation of the equipment.

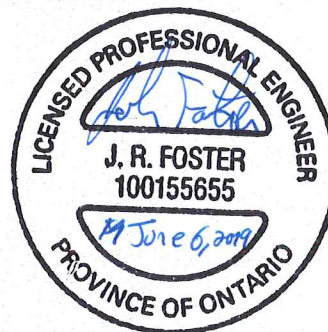
This concludes our assessment and report. If you have any questions or wish to discuss our findings please advise us. In the interim, we thank you for the opportunity to be of service.

Yours truly,

**Gradient Wind Engineering Inc.**




Michael Lafortune, C.E.T.  
Environmental Scientist  
*GWE17-148 – Stationary Noise R1*




Joshua Foster, P.Eng.  
Principal



 <b>GRADIENTWIND</b> ENGINEERING INC	127 Walgreen Road Ottawa, Ontario (613) 836 0934	PROJECT	99 FIFTH AVENUE	DESCRIPTION	<b>FIGURE 1:</b> SITE PLAN AND SURROUNDING CONTEXT
	SCALE	1:1000 (APPROX.)	DRAWING NO.	GWE17-148-1	
	DATE	SEPTEMBER 6, 2018	DRAWN BY	M.L.	



 <b>GRADIENTWIND</b> ENGINEERING INC	127 Walgreen Road Ottawa, Ontario (613) 836 0934		PROJECT <b>99 FIFTH AVENUE</b>	DESCRIPTION <b>STATIONARY NOISE FEASIBILITY ASSESSMENT</b>
	SCALE	1:1000 (APPROX.)	DRAWING NO.	GWE17-148-2
	DATE	SEPTEMBER 6, 2018	DRAWN BY	M.L.
	<b>FIGURE 2: SOURCE LOCATIONS</b>			





- 1 ON-SITE RECEPTORS
- 1 OFF-SITE RECEPTORS



**GRADIENTWIND**  
ENGINEERING INC

127 Walgreen Road  
Ottawa, Ontario  
(613) 836 0934

PROJECT

99 FIFTH AVENUE  
STATIONARY NOISE FEASIBILITY ASSESSMENT

SCALE

1:1000 (APPROX.)

DRAWING NO.

GWE17-148-3

DATE

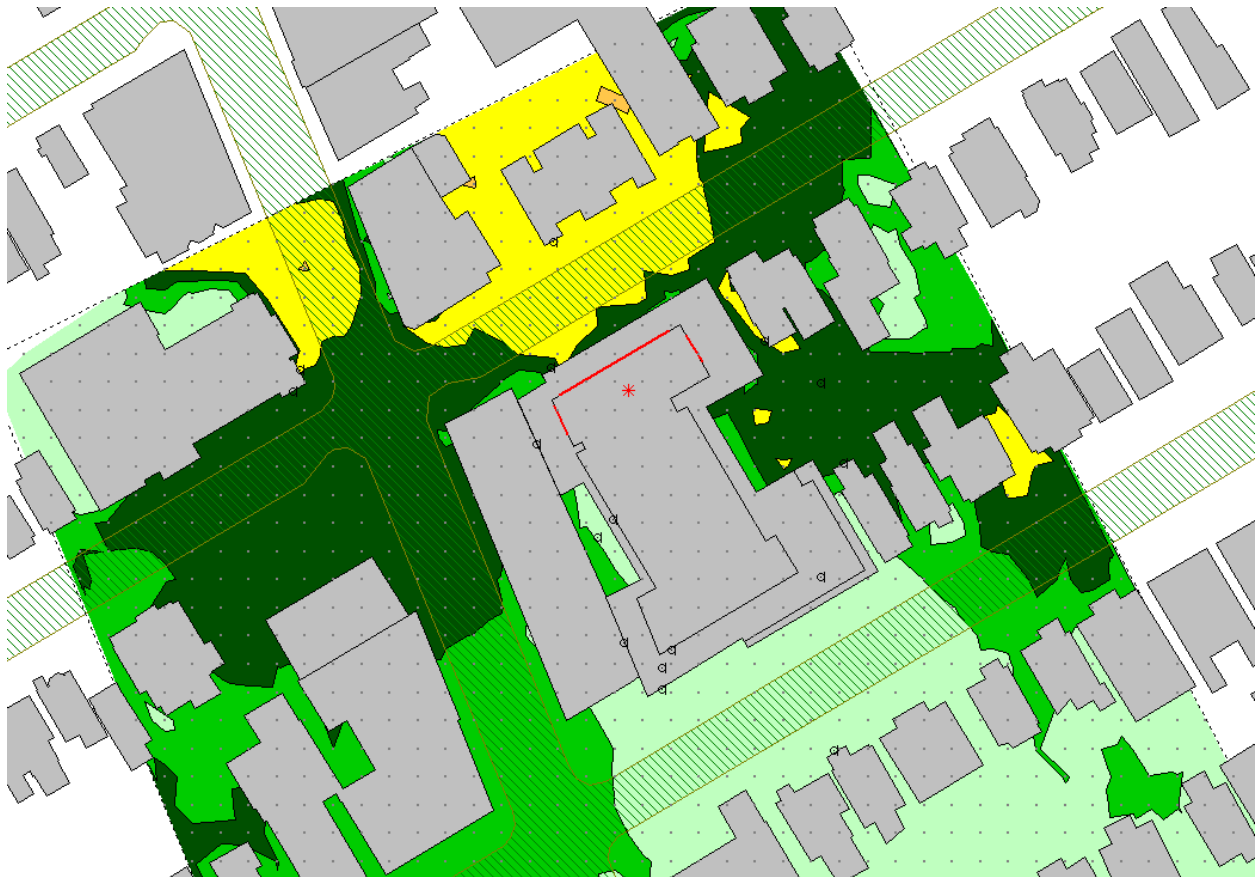
SEPTEMBER 6, 2018

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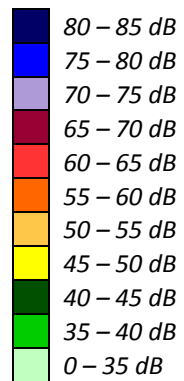
M.L.

DESCRIPTION

FIGURE 3:  
RECEPTOR LOCATIONS

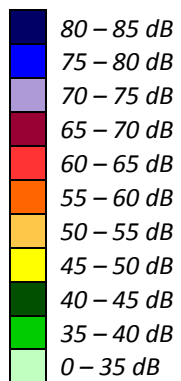


**FIGURE 4: DAYTIME NOISE CONTOURS – ON-SITE HVAC SOURCES (7.5 METERS ABOVE GRADE)**





**FIGURE 5: NIGHTTIME NOISE CONTOURS – ON-SITE HVAC SOURCES (7.5 METERS ABOVE GRADE)**



## **APPENDIX A**

### **PREDICTOR LIMA - OUTPUT DATA**

=====

Testfile    openend: #####    3:31:12 PM

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Cross    section    for    receiver    R2    (Id=-802)    and    source    S15    (Id=13106)

ItemType	Id	Distance	X	Y	Hgrnd	Height	GrndFact	Cluster
Receiver	R2	0	368395.2	5029471	69.36	11.5	1	
Barrier	Id=13109	0.635	368394.6	5029471	77.82	2.2	1	266
Pointsources	S15	1.715	368393.5	5029471	77.82	0.7	1	

L(wr)	--	--	--	--	--	80	--	--	--
A(ground)		-3	-3	0.01	0.28	0.38	0.11	0	0    0
A(barrier)		7.77	7.77	4.76	4.5	4.4	4.68	4.8	4.82    4.87
A(veg)		0	0	0	0	0	0	0	0    0
A(sit)		0	0	0	0	0	0	0	0    0
A(bld)		0	0	0	0	0	0	0	0    0
A(air)		0	0	0	0	0.01	0.01	0.03	0.1    0.34
A(geo)		20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25    20.25
C(meteo)		0	0	0	0	0	0	0	0    0

L(p)    --    --    --    --    --    54.95    --    --    --    |    54.95

-----

Cross    section    for    receiver    R2    (Id=-802)    and    source    S15    (Id=13106)

[Reflection in    facade    POLYLINE    (Id=659)]

ItemType	Id	Distance	X	Y	Hgrnd	Height	GrndFact	Cluster
Receiver	R2	0	368395.2	5029471	69.36	11.5	1	
Barrier	Id=13109	0.598	368394.7	5029471	77.82	2.2	1	266
Building	LWPOLYLINE	13.85	368383.4	5029464	69.82	8	1	266
Ground	LWPOLYLINE	16.542	368381	5029462	24.53	0	0	
Ground	LWPOLYLINE	29.161	368370.2	5029456	24.53	0	1	
Heightline	LWPOLYLINE	64.115	368340.3	5029438	70	0	1	
Heightline	LWPOLYLINE	64.54	368339.9	5029438	70	0	1	
Heightline	LWPOLYLINE	65.02	368339.5	5029437	70	0	1	
Building(R)	POLYLINE	69.027	368336.1	5029435	70	9.88	1	
Heightline	LWPOLYLINE	73.025	368339.5	5029437	70	0	1	
Heightline	LWPOLYLINE	73.495	368339.9	5029438	70	0	1	
Heightline	LWPOLYLINE	73.908	368340.2	5029438	70	0	1	
Ground	LWPOLYLINE	108.967	368370.1	5029456	24.53	0	0	
Ground	LWPOLYLINE	121.611	368380.8	5029463	24.53	0	1	
Building	LWPOLYLINE	124.309	368383.1	5029464	69.82	8	1	266
Pointsources	S15	136.546	368393.5	5029471	77.82	0.7	1	

L(wr)	--	--	--	--	--	80	--	--	--
A(ground)		-3	-3	-0.28	4.76	6.72	1.43	-0.71	-0.71    -0.71
A(barrier)		0	0	0	0	0	0	0	0    0
A(veg)		0	0	0	0	0	0	0	0    0
A(sit)		0	0	0	0	0	0	0	0    0
A(bld)		0	0	0	0	0	0	0	0    0
A(air)		0	0.02	0.06	0.14	0.26	0.5	1.32	4.48    15.96
A(geo)		53.7	53.7	53.7	53.7	53.7	53.7	53.7	53.7    53.7
A(refl)	--	--	--	--	--	-0.97	-0.97	-0.97	-0.97    -0.97
C(meteo)		0	0	0	0	0	0	0	0    0

L(p)    --    --    --    --    --    23.4    --    --    --    |    23.4

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Cross    section    for    receiver    R2    (Id=-802)    and    source    S15    (Id=13106)

[Reflection in    facade    POLYLINE    (Id=661)]

ItemType	Id	Distance	X	Y	Hgrnd	Height	GrndFact	Cluster
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Receiver	R2	0	368395.2	5029471	69.36	11.5	1	
Barrier	Id=13109	0.597	368394.7	5029471	77.82	2.2	1	266
Building	LWPOLYLI	13.806	368383.2	5029464	69.82	8	1	266
Ground	LWPOLYLI	16.49	368380.9	5029463	24.53	0	0	
Ground	LWPOLYLI	29.07	368370	5029456	24.53	0	1	
Heightline	LWPOLYLI	61.318	368342	5029440	70	0	1	
Heightline	LWPOLYLI	63.423	368340.2	5029439	70	0	1	
Heightline	LWPOLYLI	64.895	368338.9	5029439	70	0	1	
Heightline	LWPOLYLI	65.087	368338.7	5029439	70	0	1	
Heightline	LWPOLYLI	65.303	368338.5	5029438	70	0	1	
Building	POLYLINE	69.054	368335.3	5029437	70	9.88	1	40
Building	POLYLINE	83.432	368322.8	5029429	70	9.88	1	40
Heightline	LWPOLYLI	91.578	368315.7	5029425	70	0	1	
Building(R)	POLYLINE	92.004	368315.4	5029425	70	10.47	1	
Heightline	LWPOLYLI	92.413	368315.7	5029425	70	0	1	
Building	POLYLINE	100.575	368322.8	5029430	70	9.88	1	40
Building	POLYLINE	114.949	368335.2	5029437	70	9.88	1	40
Heightline	LWPOLYLI	118.659	368338.4	5029439	70	0	1	
Heightline	LWPOLYLI	118.832	368338.5	5029439	70	0	1	
Heightline	LWPOLYLI	118.986	368338.7	5029439	70	0	1	
Heightline	LWPOLYLI	120.152	368339.7	5029439	70	0	1	
Heightline	LWPOLYLI	122.662	368341.8	5029441	70	0	1	
Ground	LWPOLYLI	155.008	368369.8	5029457	24.53	0	0	
Ground	LWPOLYLI	167.605	368380.7	5029463	24.53	0	1	
Building	LWPOLYLI	170.292	368383	5029465	69.82	8	1	266
Pointsources	S15	182.482	368393.5	5029471	77.82	0.7	1	

L(wr)	--	--	--	--	--	80	--	--	--
A(ground)		-3	-3	-0.06	5.03	7.07	1.58	-0.64	-0.64
A(barrier)	7.77	7.77	4.83	0	0	0	3.2	5.42	5.42
A(veg)	0	0	0	0	0	0	0	0	0
A(sit)	0	0	0	0	0	0	0	0	0
A(bld)	0	0	0	0	0	0	0	0	0
A(air)	0.01	0.02	0.07	0.19	0.35	0.67	1.76	5.98	21.33
A(geo)	56.22	56.22	56.22	56.22	56.22	56.22	56.22	56.22	56.22
A(refl)	--	--	--	--	-0.97	-0.97	-0.97	-0.97	-0.97
C(meteo)	0	0	0	0	0	0	0	0	0

L(p) -- -- -- -- -- 17.37 -- -- -- | 17.37

Cross section for receiver R2 (Id=-802) and source S15 (Id=13106)  
[Reflection in facade POLYLINE (Id=667)]

ItemType	Id	Distance	X	Y	Hgrnd	Height	GrndFact	Cluster
Receiver	R2	0	368395.2	5029471	69.36	11.5	1	
Barrier	Id=13109	0.596	368394.7	5029471	77.82	2.2	1	266
Building	LWPOLYLI	13.785	368383.2	5029464	69.82	8	1	266
Ground	LWPOLYLI	16.466	368380.8	5029463	24.53	0	0	
Ground	LWPOLYLI	29.029	368369.9	5029457	24.53	0	1	
Heightline	LWPOLYLI	61.402	368341.6	5029441	70	0	1	
Heightline	LWPOLYLI	64.805	368338.6	5029439	70	0	1	
Heightline	LWPOLYLI	65.325	368338.1	5029439	70	0	1	
Heightline	LWPOLYLI	65.392	368338.1	5029439	70	0	1	
Heightline	LWPOLYLI	65.466	368338	5029439	70	0	1	
Heightline	LWPOLYLI	68.538	368335.3	5029438	70	0	1	
Building	POLYLINE	69.082	368334.8	5029437	70	9.88	1	40
Building	POLYLINE	83.457	368322.3	5029430	70	9.88	1	40
Building	POLYLINE	92.015	368314.8	5029426	70	10.47	1	42
Building	POLYLINE	99.103	368308.6	5029423	70	10.47	1	42
Building	POLYLINE	100.537	368307.4	5029422	70	9.47	1	43
Building	POLYLINE	114.199	368295.4	5029415	70	9.47	1	43
Building	POLYLINE	116.537	368293.4	5029414	70.02	7.61	1	44
Building	POLYLINE	122.31	368288.3	5029411	70.02	7.61	1	44
Building	POLYLINE	122.681	368288	5029411	70.04	7.12	1	45
Building	POLYLINE	131.293	368280.5	5029407	70.04	7.12	1	45

Building	POLYLINE	133.166	368278.8	5029406	70.08	8.78	1	46
Building	POLYLINE	141.509	368271.6	5029402	70.08	8.78	1	46
Building	POLYLINE	179.914	368238	5029383	70.44	9.85	1	48
Building	POLYLINE	183.12	368235.2	5029382	70.44	9.85	1	48
Building(R)	POLYLINE	184.218	368234.2	5029381	70.44	9.85	1	
Building	POLYLINE	185.316	368235.2	5029382	70.44	9.85	1	48
Building	POLYLINE	188.522	368238	5029383	70.44	9.85	1	48
Building	POLYLINE	226.923	368271.5	5029402	70.08	8.78	1	46
Building	POLYLINE	235.266	368278.7	5029406	70.08	8.78	1	46
Building	POLYLINE	237.136	368280.4	5029407	70.04	7.12	1	45
Building	POLYLINE	245.748	368287.9	5029411	70.04	7.12	1	45
Building	POLYLINE	246.119	368288.2	5029412	70.02	7.61	1	44
Building	POLYLINE	251.89	368293.2	5029414	70.02	7.61	1	44
Building	POLYLINE	254.23	368295.3	5029416	70	9.47	1	43
Building	POLYLINE	267.89	368307.2	5029422	70	9.47	1	43
Building	POLYLINE	269.328	368308.4	5029423	70	10.47	1	42
Building	POLYLINE	276.416	368314.6	5029427	70	10.47	1	42
Building	POLYLINE	284.967	368322.1	5029431	70	9.88	1	40
Building	POLYLINE	299.336	368334.6	5029438	70	9.88	1	40
Heightline	LWPOLYLI	303.063	368337.8	5029440	70	0	1	
Heightline	LWPOLYLI	306.973	368341.3	5029441	70	0	1	
Ground	LWPOLYLI	339.482	368369.6	5029457	24.53	0	0	
Ground	LWPOLYLI	352.054	368380.6	5029464	24.53	0	1	
Building	LWPOLYLI	354.735	368382.9	5029465	69.82	8	1	266
Pointsources	S15	366.899	368393.5	5029471	77.82	0.7	1	

L(wr)	--	--	--	--	--	80	--	--	--
A(ground)	-3.01	-3.01	0.93	5.29	7.37	1.75	-0.53	-0.53	-0.53
A(barrier)	7.78	7.78	3.84	0	0	3.02	5.3	5.3	5.3
A(veg)	0	0	0	0	0	0	0	0	0
A(sit)	0	0	0	0	0	0	0	0	0
A(bld)	0	0	0	0	0	0	0	0	0
A(air)	0.01	0.04	0.15	0.38	0.71	1.34	3.55	12.02	42.89
A(geo)	62.28	62.28	62.28	62.28	62.28	62.28	62.28	62.28	62.28
A(refl)	--	--	--	--	--	--	--	--	--
C(meteo)	0	0	0	0	0	0	0	0	0
L(p)	--	--	--	--	--	--	--	--	

-200

Cross section for receiver R2 (Id=-802) and source S15 (Id=13106)  
[Reflection in facade POLYLINE (Id=667)]

ItemType	Id	Distance	X	Y	Hgrnd	Height	GrndFact	Cluster
Receiver	R2	0	368395.2	5029471	69.36	11.5	1	
Barrier	Id=13109	0.596	368394.7	5029471	77.82	2.2	1	266
Building	LWPOLYLI	13.785	368383.2	5029464	69.82	8	1	266
Ground	LWPOLYLI	16.465	368380.8	5029463	24.53	0	0	
Ground	LWPOLYLI	29.029	368369.9	5029457	24.53	0	1	
Heightline	LWPOLYLI	61.403	368341.6	5029441	70	0	1	
Heightline	LWPOLYLI	64.811	368338.6	5029439	70	0	1	
Heightline	LWPOLYLI	65.327	368338.1	5029439	70	0	1	
Heightline	LWPOLYLI	65.393	368338.1	5029439	70	0	1	
Heightline	LWPOLYLI	65.467	368338	5029439	70	0	1	
Heightline	LWPOLYLI	68.513	368335.3	5029438	70	0	1	
Building	POLYLINE	69.082	368334.8	5029437	70	9.88	1	40
Building	POLYLINE	83.457	368322.3	5029430	70	9.88	1	40
Building	POLYLINE	92.015	368314.8	5029426	70	10.47	1	42
Building	POLYLINE	99.104	368308.6	5029423	70	10.47	1	42
Building	POLYLINE	100.537	368307.4	5029422	70	9.47	1	43
Building	POLYLINE	114.199	368295.4	5029415	70	9.47	1	43
Building	POLYLINE	116.537	368293.4	5029414	70.02	7.61	1	44
Building	POLYLINE	122.31	368288.3	5029411	70.02	7.61	1	44
Building	POLYLINE	122.681	368288	5029411	70.04	7.12	1	45
Building	POLYLINE	131.294	368280.5	5029407	70.04	7.12	1	45
Building	POLYLINE	133.166	368278.8	5029406	70.08	8.78	1	46

Building	POLYLINE	141.509	368271.5	5029402	70.08	8.78	1	46
Building(R)	POLYLINE	179.914	368238	5029383	70.44	9.85	1	
Building	POLYLINE	218.316	368271.5	5029402	70.08	8.78	1	46
Building	POLYLINE	226.658	368278.7	5029406	70.08	8.78	1	46
Building	POLYLINE	228.529	368280.4	5029407	70.04	7.12	1	45
Building	POLYLINE	237.14	368287.9	5029411	70.04	7.12	1	45
Building	POLYLINE	237.512	368288.2	5029412	70.02	7.61	1	44
Building	POLYLINE	243.283	368293.2	5029414	70.02	7.61	1	44
Building	POLYLINE	245.622	368295.3	5029416	70	9.47	1	43
Building	POLYLINE	259.283	368307.2	5029422	70	9.47	1	43
Building	POLYLINE	260.72	368308.4	5029423	70	10.47	1	42
Building	POLYLINE	267.808	368314.6	5029426	70	10.47	1	42
Building	POLYLINE	276.36	368322.1	5029431	70	9.88	1	40
Building	POLYLINE	290.729	368334.6	5029438	70	9.88	1	40
Heightline	LWPOLYLI	294.449	368337.8	5029440	70	0	1	
Heightline	LWPOLYLI	298.366	368341.3	5029441	70	0	1	
Ground	LWPOLYLI	330.875	368369.6	5029457	24.53	0	0	
Ground	LWPOLYLI	343.447	368380.6	5029464	24.53	0	1	
Building	LWPOLYLI	346.128	368382.9	5029465	69.82	8	1	266
Pointsources	S15	358.292	368393.5	5029471	77.82	0.7	1	

L(wr)	--	--	--	--	--	80	--	--	--
A(ground)		-3	-3	0.86	5.26	7.34	1.72	-0.55	-0.55
A(barrier)		7.77	7.77	3.91	0	0	3.05	5.32	5.32
A(veg)		0	0	0	0	0	0	0	0
A(sit)		0	0	0	0	0	0	0	0
A(bld)		0	0	0	0	0	0	0	0
A(air)		0.01	0.04	0.15	0.37	0.69	1.31	3.46	11.74
A(geo)		62.08	62.08	62.08	62.08	62.08	62.08	62.08	62.08
A(refl)	--	--	--	--	--	--	--	--	--
C(meteo)		0	0	0	0	0	0	0	0

L(p) -- -- -- -- -- -- -- -- -- -- |

-200

Cross section for receiver R2 (Id=-802) and source S15 (Id=13106)  
[Reflection in facade POLYLINE (Id=668)]

ItemType	Id	Distance	X	Y	Hgrnd	Height	GrndFact	Cluster
Receiver	R2		0	368395.2	5029471	69.36	11.5	1
Barrier	Id=13109	0.599	368394.7	5029471	77.82	2.2	1	266
Building	LWPOLYLI	13.864	368383.4	5029464	69.82	8	1	266
Ground	LWPOLYLI	16.56	368381.1	5029462	24.53	0	0	
Ground	LWPOLYLI	29.19	368370.3	5029456	24.53	0	1	
Heightline	LWPOLYLI	63.895	368340.7	5029438	70	0	1	
Heightline	LWPOLYLI	64.386	368340.3	5029437	70	0	1	
Heightline	LWPOLYLI	64.943	368339.8	5029437	70	0	1	
Building	POLYLINE	69.025	368336.3	5029435	70	9.88	1	40
Building	POLYLINE	83.421	368324	5029427	70	9.88	1	40
Building	POLYLINE	86.069	368321.8	5029426	70	6.33	1	41
Building	POLYLINE	91.634	368317	5029423	70	6.33	1	41
Building	POLYLINE	92.032	368316.7	5029423	70	10.47	1	42
Building	POLYLINE	99.121	368310.6	5029419	70	10.47	1	42
Building	POLYLINE	100.505	368309.5	5029418	70	9.47	1	43
Building	POLYLINE	114.163	368297.8	5029411	70	9.47	1	43
Building	POLYLINE	116.48	368295.8	5029410	70.02	7.61	1	44
Building	POLYLINE	122.25	368290.9	5029407	70.02	7.61	1	44
Building	POLYLINE	122.617	368290.6	5029407	70.04	7.12	1	45
Building	POLYLINE	131.225	368283.3	5029402	70.04	7.12	1	45
Building	POLYLINE	133.141	368281.6	5029401	70.08	8.78	1	46
Building	POLYLINE	141.483	368274.5	5029397	70.08	8.78	1	46
Building	POLYLINE	147.191	368269.6	5029394	70.43	7.56	1	47
Building	POLYLINE	166.22	368253.4	5029384	70.43	7.56	1	47
Building	POLYLINE	176.574	368244.6	5029379	70.44	9.85	1	48
Building	POLYLINE	190.159	368233	5029372	70.44	9.85	1	48
Building(R)	POLYLINE	191.87	368231.5	5029371	70.57	9.63	1	



Building	POLYLINE	193.58	368233	5029372	70.44	9.85	1	48
Building	POLYLINE	207.169	368244.5	5029379	70.44	9.85	1	48
Building	POLYLINE	217.522	368253.3	5029384	70.43	7.56	1	47
Building	POLYLINE	236.552	368269.5	5029394	70.43	7.56	1	47
Building	POLYLINE	242.261	368274.4	5029397	70.08	8.78	1	46
Building	POLYLINE	250.603	368281.5	5029402	70.08	8.78	1	46
Building	POLYLINE	252.518	368283.1	5029403	70.04	7.12	1	45
Building	POLYLINE	261.126	368290.4	5029407	70.04	7.12	1	45
Building	POLYLINE	261.493	368290.8	5029407	70.02	7.61	1	44
Building	POLYLINE	267.263	368295.7	5029410	70.02	7.61	1	44
Building	POLYLINE	269.582	368297.6	5029412	70	9.47	1	43
Building	POLYLINE	283.24	368309.3	5029419	70	9.47	1	43
Building	POLYLINE	284.629	368310.4	5029420	70	10.47	1	42
Building	POLYLINE	291.72	368316.5	5029423	70	10.47	1	42
Building	POLYLINE	292.104	368316.8	5029423	70	6.33	1	41
Building	POLYLINE	297.669	368321.5	5029426	70	6.33	1	41
Building	POLYLINE	300.325	368323.8	5029428	70	9.88	1	40
Building	POLYLINE	314.716	368336	5029435	70	9.88	1	40
Heightline	LWPOLYLI	318.703	368339.4	5029437	70	0	1	
Heightline	LWPOLYLI	319.161	368339.8	5029438	70	0	1	
Heightline	LWPOLYLI	319.564	368340.2	5029438	70	0	1	
Ground	LWPOLYLI	354.661	368370	5029456	24.53	0	0	
Ground	LWPOLYLI	367.303	368380.8	5029463	24.53	0	1	
Building	LWPOLYLI	370	368383.1	5029464	69.82	8	1	266
Pointsources	S15	382.235	368393.5	5029471	77.82	0.7	1	

L(wr)	--	--	--	--	--	80	--	--	--
A(ground)	-3.13	-3.13	1.01	5.31	7.4	1.75	-0.54	-0.54	-0.54
A(barrier)	7.9	7.9	3.76	0	0	3.02	5.31	5.31	5.31
A(veg)	0	0	0	0	0	0	0	0	0
A(sit)	0	0	0	0	0	0	0	0	0
A(bld)	0	0	0	0	0	0	0	0	0
A(air)	0.01	0.05	0.16	0.4	0.74	1.4	3.69	12.53	44.68
A(geo)	62.64	62.64	62.64	62.64	62.64	62.64	62.64	62.64	62.64
A(refl)	--	--	--	--	--	-0.97	-0.97	-0.97	-0.97
C(meteo)	0	0	0	0	0	0	0	0	0
L(p)	--	--	--	--	--	10.22	--	--	--

10.22

Cross section for receiver R2 (Id=-802) and source S15 (Id=13106)  
[Reflection in facade POLYLINE (Id=776)]

ItemType	Id	Distance	X	Y	Hgrnd	Height	GrndFact	Cluster
Receiver	R2	0	368395.2	5029471	69.36	11.5	1	
Building	LWPOLYLI	0.807	368395.6	5029470	69.82	8	1	266
Building	LWPOLYLI	2.028	368396.2	5029469	69.67	10	1	266
Building	LWPOLYLI	2.028	368396.2	5029469	69.3	18.8	1	266
Building	LWPOLYLI	11.986	368401.2	5029461	69.67	10	1	266
Building	LWPOLYLI	11.986	368401.2	5029461	69.3	18.8	1	266
Building	LWPOLYLI	31.824	368411.1	5029443	69.3	18.8	1	266
Building	LWPOLYLI	31.825	368411.1	5029443	69.67	10	1	266
Building	LWPOLYLI	34.301	368412.3	5029441	69.67	15.71	1	266
Building	LWPOLYLI	34.519	368412.4	5029441	69.67	15.71	1	266
Building	LWPOLYLI	50.497	368420.4	5029427	69.67	10	1	266
Building	LWPOLYLI	50.497	368420.4	5029427	69.3	18.8	1	266
Ground	LWPOLYLI	59.717	368425	5029419	24.53	0	0	
Ground	LWPOLYLI	69.375	368429.8	5029411	24.53	0	1	
Heightline	LWPOLYLI	73.04	368431.6	5029408	70	0	1	
Building	POLYLINE	73.823	368432	5029407	70.57	11.3	1	251
Building	POLYLINE	109.17	368449.7	5029376	70.57	11.3	1	251
Building(R)	POLYLINE	117.4	368453.8	5029369	70.92	11.38	1	
Building	POLYLINE	125.629	368449.6	5029376	70.57	11.3	1	251
Building	POLYLINE	160.976	368431.5	5029407	70.57	11.3	1	251
Heightline	LWPOLYLI	161.665	368431.2	5029407	70	0	1	
Ground	LWPOLYLI	165.419	368429.3	5029410	24.53	0	0	

Ground	LWPOLYLI	175.072	368424.4	5029419	24.53	0	1		
Building	LWPOLYLI	184.288	368419.7	5029427	69.67	10	1	266	
Building	LWPOLYLI	184.288	368419.7	5029427	69.3	18.8	1	266	
Building	LWPOLYLI	203.006	368410.1	5029443	69.67	10	1	266	
Building	LWPOLYLI	203.007	368410.1	5029443	69.3	18.8	1	266	
Building	LWPOLYLI	220.096	368401.4	5029457	69.82	8	1	266	
Pointsourc	S15	235.588	368393.5	5029471	77.82	0.7	1		

L(wr)	--	--	--	--	--	80	--	--	--
A(ground)		-3	-3	1	8.03	10.95	3.07	-0.12	-0.12
A(barrier)		13.85	16.74	15.56	11.44	11.46	21.93	25	25
A(veg)		0	0	0	0	0	0	0	0
A(sit)		0	0	0	0	0	0	0	0
A(bld)		0	0	0	0	0	0	0	0
A(air)		0.01	0.03	0.1	0.25	0.45	0.86	2.28	7.72
A(geo)		58.44	58.44	58.44	58.44	58.44	58.44	58.44	58.44
A(refl)	--	--	--	--	--	--	--	-0.97	-0.97
C(meteo)		0	0	0	0	0	0	0	0

L(p) -- -- -- -- -- -- -- -- -- -- | -200

Cross section for receiver R2 (Id=-802) and source S15 (Id=13106)  
[Reflection in facade POLYLINE (Id=815)]

ItemType	Id	Distance	X	Y	Hgrnd	Height	GrndFact	Cluster	
Receiver	R2		0	368395.2	5029471	69.36	11.5	1	
Building	LWPOLYLI	0.077	368395.3	5029471	69.82	8	1	266	
Building	LWPOLYLI	0.218	368395.4	5029471	69.67	10	1	266	
Building	LWPOLYLI	0.218	368395.4	5029471	69.3	18.8	1	266	
Building	LWPOLYLI	5.86	368400.3	5029474	88.1	3.25	1	266	
Building	LWPOLYLI	32.465	368423.1	5029487	88.1	3.25	1	266	
Building	LWPOLYLI	40.708	368430.2	5029492	69.67	10	1	266	
Building	LWPOLYLI	40.708	368430.2	5029492	69.3	18.8	1	266	
Building	POLYLINE	43.903	368433	5029493	69.05	9.84	1	197	
Building	POLYLINE	56.591	368443.9	5029500	69.05	9.84	1	197	
Building(R)	POLYLINE	61.585	368448.2	5029502	69.14	11.35	1		
Building	POLYLINE	66.58	368443.8	5029500	69.05	9.84	1	197	
Building	POLYLINE	79.04	368433	5029494	69.05	9.84	1	197	
Building	LWPOLYLI	82.465	368430.1	5029492	69.67	10	1	266	
Building	LWPOLYLI	82.465	368430.1	5029492	69.3	18.8	1	266	
Building	LWPOLYLI	90.708	368422.9	5029488	88.1	3.25	1	266	
Building	LWPOLYLI	117.238	368400	5029475	88.1	3.25	1	266	
Building	LWPOLYLI	122.863	368395.1	5029472	69.3	18.8	1	266	
Building	LWPOLYLI	122.863	368395.1	5029472	69.67	10	1	266	
Building	LWPOLYLI	123.013	368395	5029472	69.82	8	1	266	
Barrier	Id=13109	123.677	368394.4	5029471	77.82	2.2	1	266	
Pointsourc	S15	124.692	368393.5	5029471	77.82	0.7	1		

L(wr)	--	--	--	--	--	80	--	--	--
A(ground)		-3	-3	0.55	7.55	10.25	2.95	0	0
A(barrier)		21.63	25	24.45	17.45	14.75	22.05	25	25
A(veg)		0	0	0	0	0	0	0	0
A(sit)		0	0	0	0	0	0	0	0
A(bld)		0	0	0	0	0	0	0	0
A(air)		0	0.02	0.05	0.13	0.24	0.46	1.21	4.09
A(geo)		52.91	52.91	52.91	52.91	52.91	52.91	52.91	52.91
A(refl)	--	--	--	--	--	--	-0.97	-0.97	-0.97
C(meteo)		0	0	0	0	0	0	0	0

L(p) -- -- -- -- -- -- 0.66 -- -- -- -- | 0.66

Cross section for receiver R2 (Id=-802) and source S15 (Id=13106)  
[Reflection in facade POLYLINE (Id=870)]

ItemType	Id	Distance	X	Y	Hgrnd	Height	GrndFact	Cluster
Receiver	R2		0	368395.2	5029471	69.36	11.5	1
Building	LWPOLYLIN	0.833	368395.6	5029470	69.82	8	1	266
Building	LWPOLYLIN	2.086	368396.3	5029469	69.67	10	1	266
Building	LWPOLYLIN	2.086	368396.3	5029469	69.3	18.8	1	266
Building	LWPOLYLIN	11.986	368401.2	5029460	69.67	10	1	266
Building	LWPOLYLIN	11.986	368401.2	5029460	69.3	18.8	1	266
Building	LWPOLYLIN	31.822	368411	5029443	69.3	18.8	1	266
Building	LWPOLYLIN	31.823	368411	5029443	69.67	10	1	266
Building	LWPOLYLIN	34.302	368412.2	5029441	69.67	15.71	1	266
Building	LWPOLYLIN	34.519	368412.3	5029441	69.67	15.71	1	266
Building	LWPOLYLIN	50.5	368420.3	5029427	69.67	10	1	266
Building	LWPOLYLIN	50.5	368420.3	5029427	69.3	18.8	1	266
Ground	LWPOLYLIN	59.721	368424.8	5029419	24.53	0	0	
Ground	LWPOLYLIN	69.378	368429.6	5029411	24.53	0	1	
Heightline	LWPOLYLIN	73.077	368431.5	5029407	70	0	1	
Building(R)	POLYLINE	73.825	368431.8	5029407	70.57	11.3	1	
Heightline	LWPOLYLIN	74.569	368431.5	5029407	70	0	1	
Ground	LWPOLYLIN	78.27	368429.6	5029411	24.53	0	0	
Ground	LWPOLYLIN	87.925	368424.6	5029419	24.53	0	1	
Building	LWPOLYLIN	97.141	368419.9	5029427	69.67	10	1	266
Building	LWPOLYLIN	97.141	368419.9	5029427	69.3	18.8	1	266
Building	LWPOLYLIN	113.138	368411.6	5029441	69.67	15.71	1	266
Building	LWPOLYLIN	113.342	368411.5	5029441	69.67	15.71	1	266
Building	LWPOLYLIN	115.851	368410.3	5029443	69.67	10	1	266
Building	LWPOLYLIN	115.852	368410.3	5029443	69.3	18.8	1	266
Building	LWPOLYLIN	133.576	368401.1	5029458	69.82	8	1	266
Pointsources	S15	148.439	368393.5	5029471	77.82	0.7	1	

L(wr)	--	--	--	--	--	80	--	--	--
A(ground)	-3	-3	0.46	7.61	10.41	2.86	-0.2	-0.2	-0.2
A(barrier)	13	16.36	16.05	11.91	12.09	22.14	25	25	25
A(veg)	0	0	0	0	0	0	0	0	0
A(sit)	0	0	0	0	0	0	0	0	0
A(bld)	0	0	0	0	0	0	0	0	0
A(air)	0	0.02	0.06	0.15	0.29	0.54	1.43	4.87	17.35
A(geo)	54.42	54.42	54.42	54.42	54.42	54.42	54.42	54.42	54.42
A(refl)	--	--	--	--	--	-0.97	-0.97	-0.97	-0.97
C(meteo)	0	0	0	0	0	0	0	0	0

L(p) -- -- -- -- -- -0.94 -- -- -- | -0.94

Cross section for receiver R2 (Id=-802) and source S15 (Id=13106)  
[Reflection in facade LWPOLYLIN (Id=13025)]

ItemType	Id	Distance	X	Y	Hgrnd	Height	GrndFact	Cluster
Receiver	R2		0	368395.2	5029471	69.36	11.5	1
Building	LWPOLYLIN	1.564	368395.9	5029470	69.82	8	1	266
Building	LWPOLYLIN	3.566	368396.9	5029468	69.67	10	1	266
Building	LWPOLYLIN	3.566	368396.9	5029468	69.3	18.8	1	266
Building	LWPOLYLIN	12	368400.7	5029460	69.67	10	1	266
Building	LWPOLYLIN	12	368400.7	5029460	69.3	18.8	1	266
Building(R)	LWPOLYLIN	31.826	368409.8	5029443	69.3	18.8	1	
Building	LWPOLYLIN	47.143	368402.1	5029456	69.82	8	1	266
Pointsources	S15	64.397	368393.5	5029471	77.82	0.7	1	

L(wr)	--	--	--	--	--	80	--	--	--
A(ground)	-3	-3	0.31	5.96	8.09	2.33	0	0	0
A(barrier)	12.07	14.18	13.32	10.4	11.12	17.67	20	20	20
A(veg)	0	0	0	0	0	0	0	0	0
A(sit)	0	0	0	0	0	0	0	0	0
A(bld)	0	0	0	0	0	0	0	0	0
A(air)	0	0.01	0.03	0.07	0.12	0.24	0.62	2.11	7.53

A(geo)	47.18	47.18	47.18	47.18	47.18	47.18	47.18	47.18	47.18
A(refl)	--	--	--	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97
C(meteo)	0	0	0	0	0	0	0	0	0

Cross section for receiver R2 (Id=-803) and source S15 (Id=13106)

L(wr)      --      --      --      --      --      80 --      --      --

A(barrier)	0	0	0	0	0	0	0	0
A(veg)	0	0	0	0	0	0	0	0
A(sit)	0	0	0	0	0	0	0	0
A(bld)	0	0	0	0	0	0	0	0
A(air)	0	0	0	0.01	0.02	0.03	0.08	1
A(geo)	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.6
C(meteo)	0	0	0	0	0	0	0	0

Cross section for receiver R2 (Id=-803) and source S15 (Id=13106)  
[Reflection in facade LWPOLYLIN (Id=13025)]

L(wr)      --      --      --      --      --      80      --      --      --

[illegible][illegible]

Height	Per	LAeq	32	63	125	250	500	1000	2000	4000	8000
11.5	1	54.96	--	--	--	--	--	54.96	--	--	--
11.5	2	--	--	--	--	--	--	--	--	--	--
11.5	3	51.95	--	--	--	--	--	51.95	--	--	--
11.5	4	--	--	--	--	--	--	--	--	--	--
17.5	1	50.26	--	--	--	--	--	50.26	--	--	--
17.5	2	--	--	--	--	--	--	--	--	--	--
17.5	3	47.25	--	--	--	--	--	47.25	--	--	--
17.5	4	--	--	--	--	--	--	--	--	--	--

0.0006;	1104;	0.0000005;TTimerSet - overhead
0.0025;	552;	0.0000045;WriteTestString

Testfile closed: ##### 3:31:12 PM

## **APPENDIX B**

### **BACKGROUND NOISE CALCULATIONS**

STAMSON 5.0    NORMAL REPORT    Date: 06-09-2018 15:43:50  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r1.te            Time Period: 1 hours  
Description:

Road data, segment # 1: Bank Street  
-----

Car traffic volume : 771 veh/TimePeriod  
Medium truck volume : 61 veh/TimePeriod  
Heavy truck volume : 44 veh/TimePeriod  
Posted speed limit : 40 km/h  
Road gradient : 0 %  
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Bank Street  
-----

Angle1 Angle2 : 0.00 deg 90.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0  
Surface : 2 (Reflective ground surface)  
Receiver source distance : 30.00 m  
Receiver height : 23.25 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00

# Results segment # 1: Bank Street

Source height = 1.50 m

ROAD (0.00 + 60.74 + 0.00) = 60.74 dBA

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

0	90	0.00	66.76	0.00	-3.01	-3.01	0.00	0.00	0.00	60.74
---	----	------	-------	------	-------	-------	------	------	------	-------

Segment Leq : 60.74 dBA

Total Leq All Segments: 60.74 dBA

TOTAL Leq FROM ALL SOURCES: 60.74 daytime = 51 dBA nighttime (-10 dB)





STAMSON 5.0    NORMAL REPORT    Date: 06-09-2018 15:43:56  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r2.te            Time Period: 1 hours  
Description:

Road data, segment # 1: Fifth Avenue  
-----

Car traffic volume : 176 veh/TimePeriod  
Medium truck volume : 14 veh/TimePeriod  
Heavy truck volume : 10 veh/TimePeriod  
Posted speed limit : 40 km/h  
Road gradient : 0 %  
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Fifth Avenue  
-----

Angle1 Angle2 : 0.00 deg 90.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0  
Surface : 2 (Reflective ground surface)  
Receiver source distance : 20.00 m  
Receiver height : 23.25 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00

---

Road data, segment # 2: Bank Street

-----  
 Car traffic volume : 771 veh/TimePeriod  
 Medium truck volume : 61 veh/TimePeriod  
 Heavy truck volume : 44 veh/TimePeriod  
 Posted speed limit : 40 km/h  
 Road gradient : 0 %  
 Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: Bank Street

-----  
 Angle1 Angle2 : -90.00 deg 90.00 deg  
 Wood depth : 0 (No woods.)  
 No of house rows : 0  
 Surface : 2 (Reflective ground surface)  
 Receiver source distance : 27.00 m  
 Receiver height : 23.25 m  
 Topography : 1 (Flat/gentle slope; no barrier)  
 Reference angle : 0.00

---

Results segment # 1: Fifth Avenue

Source height = 1.50 m

ROAD (0.00 + 56.08 + 0.00) = 56.08 dBA

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

0	90	0.00	60.34	0.00	-1.25	-3.01	0.00	0.00	0.00	56.08
---	----	------	-------	------	-------	-------	------	------	------	-------

Segment Leq : 56.08 dBA

## Results segment # 2: Bank Street

Source height = 1.50 m

ROAD (0.00 + 64.21 + 0.00) = 64.21 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.76	0.00	-2.55	0.00	0.00	0.00	0.00	64.21

Segment Leq : 64.21 dBA

Total Leq All Segments: 64.83 dBA

TOTAL Leq FROM ALL SOURCES: 64.83 daytime = 55 dBA nighttime (-10 dB)