NOISE IMPACT ASSESSMENT STUDY

917 Merivale Apartment Building

Development Address:
Merivale Apartment Building
917 Merivale Road
Ottawa, Ontario

Client:
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EXECUTIVE SUMMARY

In accordance with the City of Ottawa Environmental Noise Control Guideline, this Report and associated study present an assessment of the environmental noise impacting the proposed noise-sensitive development identified as Merivale Apartment Building, located at 917 Merivale Road in Ottawa, Ontario. This development proposal is made by Marc Amyote on behalf of 15096332 Canada Inc.

The assessment indicates that the following noise control measures are required to meet the applicable indoor sound level limits due to transportation noise sources.

- Air conditioning must be included for some residential units. This will allow windows to remain closed, reducing indoor noise from transportation sources.
- Building envelope components (exterior walls, windows, balcony doors) must be evaluated to ensure that they provide the sound insulation required to meet indoor sound level limits in some units. This evaluation and resulting minimum glazing requirements for windows and balcony doors are included in this Report.

The transportation noise assessment also indicates that the proposed outdoor living area will be exposed to noise in excess of the requirements, however no practical measures exist to mitigate this noise. The worst-case outdoor noise level is within a 5 dB tolerance of the limit. Deletion of the outdoor living area is not recommended.

Two Stationary Sources of environmental noise have been identified proximate to the proposed development: W.E. Gowling Public School at 250 Anna Avenue, and St. Teklehaimanot Ethiopian Orthodox Tewahedo Church at 915 Merivale Road. This Report includes an assessment of Stationary Source noise impacts upon the proposed development. It is concluded that the proposed development will not be subjected to Stationary Source noise in excess of the applicable limits.

It is concluded that the project can be developed in a manner which meets all requirements of the City of Ottawa Environmental Noise Control Guideline.

1.0 INTRODUCTION

In accordance with the City of Ottawa Environmental Noise Control Guideline (ENCG) and Ontario Ministry of the Environment publication NPC-300 (NPC-300), this Report presents a detailed study of the environmental noise impact upon the development proposed by Marc Amyote and located at 917 Merivale Road in Ottawa, Ontario.

The proposed development is a new 7-storey (6 storeys and loft) apartment building including a total of 20 residential units on floors 2 through 6. The ground floor will feature a common indoor amenity space, and parking will be provided on-grade. A common outdoor amenity space is proposed behind the building along the east property line. The project will involve the removal of the existing building at 917 Merivale Road.

This Report assesses environmental noise impacts from multiple sources of environmental noise upon the noise-sensitive portions of the proposed development. This Report is organized by type of environmental noise source.

- Section 2.0 assesses noise impacts from surface transportation sources (roadways)
- Section 3.0 assess noise impacts from off-site Stationary Sources of noise

No other environmental noise sources (rail, airport) meet the proximity requirements for inclusion in this Noise Study.

This Report further includes an assessment of the potential Stationary Source noise impacts of the proposed development upon adjacent noise-sensitive land uses. The assessment is included as Section 3.3.

Site Plans including the assessment locations and noise sources are included in the Figures section.

1.1 REFERENCES

This Report makes reference to the following documents and software.

1 City of Ottawa Environmental Noise Control Guidelines updated January 2016 (ENCG)

2 City of Ottawa Transportation Master Plan, November 2013 (TMP)

3 Ontario Ministry of the Environment, Conservation and Parks publication NPC-300: Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning, updated 24 August 2017

4 Ontario Ministry of the Environment, Conservation and Parks (MECP) modelling tool STAMSON, version 5.04

5 Ontario Ministry of the Environment, Conservation and Parks (MECP) Technical Document ORNAMENT (Ontario Road Noise Analysis Method for Environment and Transportation), dated October 1989 and prepared by V. Schroter and C. Chiu

6 BR/NRC Building Research Note BRN148: Acoustic Insulation Factor, dated June 1980 (BRN148)

7 City of Ottawa Noise By-law No. 217-255

8 CadnaA environmental noise modelling software by DataKustik GmbH, Version 2023 MR 2 (64 Bit) (build 201.5366)

9 ISO Standard 9613: Acoustics – Attenuation of Sound During Propagation Outdoors

1. Part 1: Calculation of the Absorption of Sound by the Atmosphere, First Edition dated 1 June 1993

2. Part 2: General Method of Calculation, First Edition dated 15 December 1996

10 “For Estimation” project drawings prepared by Biosis Designs, received 2024-02-27

11 City of Ottawa GeoOttawa map, at URL maps.ottawa.ca/geoottawa

12 Aerial imagery from Google, using Google Earth Pro software

In this Report:

- noise levels are reported in terms of sound pressure levels (SPL), in decibels (dB), with the reference sound pressure equal to $2x10^{-5}$ pascals; and
- sound levels described as dBA Leq represent the equivalent (average) A-weighted sound pressure level over a specified time period.

- sound power levels are reported in decibels (dB), with the reference sound power equal to 10^{-12} watts.

1.2 PURPOSE

The purpose of this Report is to demonstrate that the Merivale Apartment Building can be developed in a manner that meets all applicable requirements with respect to environmental noise.

1.3 SCOPE

This Noise Impact Assessment Study presents a detailed study of the issues, as defined by the ENCG. No further study is required or proposed.

This Report considers only the objective criteria as defined in the ENCG and NPC-300, and does not consider subjective responses to environmental noise.

2.0 SURFACE TRANSPORTATION NOISE

2.1 CRITERIA

ENCG and NPC-300 define sound level requirements from surface transportation noise sources separately for outdoor and indoor noise-sensitive spaces. The requirements applicable to the Merivale Apartment Building are summarized in the sub-sections that follow.

2.1.1 Outdoor Spaces

The sound level limit for Outdoor Living Areas (OLAs) per the ENCG is provided in Table 1 below.

Table 1: Sound Level Limit for Outdoor Living Areas

Type of Space	Time Period	Surface Transportation dBA L_{eq} (Road and Rail noise combined, without rail whistle noise)
Outdoor Living Area	16 hours between 07:00-23:00	55*
	8 hours between 23:00-07:00	No requirement

*Where it can be demonstrated to the satisfaction of the City of Ottawa that achieving the outdoor 55 dBA L_{eq} is not technically or economically feasible, a tolerance of not more than 5 dB above the stated limit may be acceptable.

Of note, the proposed balconies and rooftop terrace areas are all less than 4 metres deep, and therefore do not qualify as OLAs per the ENCG.

2.1.2 Indoor Spaces

The applicable indoor sound level limits are summarized in Table 2. Supplemental, good-practice design objectives for additional noise-sensitive indoor spaces are summarized in Table 3, per the ENCG.

Table 2: Sound Level Limits for Indoor Living Areas

Type of Space	Time Period	Road L_{eq} dBA
Living/dining, den areas of residences, hospitals, nursing homes schools, daycare centres, etc. rooms and dens of residences	16 hours between 07:00-23:00	45
Living/dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres	8 hours between 23:00-07:00	45
Sleeping quarters	16 hours between 07:00-23:00	45
	8 hours between 23:00-07:00	40

Table 3: Supplementary Sound Level Limits for Indoor Spaces

Type of Space	Time Period	Road L_{eq} dBA
General offices, reception areas, retail stores, etc.	16 hours between 07:00-23:00	50
Theatres, places of worship, libraries, individual or semi-private offices, conference rooms, reading rooms, etc.	16 hours between 07:00-23:00	45
Sleeping quarters of hotels/motels	8 hours between 23:00-07:00	45
Sleeping quarters of hospitals, nursing/retirement homes, etc.	16 hours between 07:00-23:00	40

For the purposes of assessing compliance with these limits, sound levels are predicted at the Plane Of Window (POW) of noise sensitive spaces. The predicted sound levels determine the measures required to ensure that indoor limits are met. Specifically:

1. Ventilation measures may be required to allow occupants to keep windows closed (reducing noise transmission to the indoor space). The ventilation requirements per NPC-300 are summarized in Table 4.
2. An analysis of building components (exterior walls, windows, and doors as applicable) may be required to ensure that the building facade provides sound attenuation sufficient to meet the indoor sound level limits. The building component requirements per ENCG are summarized in Table 5.

Table 4: Ventilation Requirements

Assessment Location	Noise Source	Daytime Noise Level (L_{eq} 16 hr, 07:00-23:00)	Nighttime Noise Level (L_{eq} 8 hr, 23:00-07:00)	Ventilation Requirements
Plane of a bedroom or living/dining room window	Combined Road and Rail noise, excluding whistles	Up to 55 dBA	Up to 50 dBA	None
		Up to 65 dBA	Up to 60 dBA	Provision for the installation of central air conditioning* in the future, at occupant's discretion
		Above 65 dBA	Above 60 dBA	Central air conditioning

*Per NPC-300 (C7.8.1), forms of mechanical ventilation other than ducted central air may be available which satisfy the requirements.

Table 5: Building Component Requirements

Assessment Location	Noise Source	Daytime Noise Level (Leq 16 hr, 07:00-23:00)	Nighttime Noise Level (Leq 8 hr, 23:00-07:00)	Building Component Requirements
Plane of a bedroom or living/dining room window	Road	Up to 65 dBA	Up to 60 dBA	Per the Ontario Building Code
		Above 65 dBA	Above 60 dBA	Must be designed to ensure indoor criteria are met*

* Per the ENCG (Section 5.2, page 14), the preferred assessment method is the Acoustic Insulation Factor (AIF) method.

2.1.3 Road Traffic Information

The City of Ottawa Transportation Master Plan has been used to identify significant roadways within the vicinity of the project that must be included in noise level calculations. The significant roadways are Merivale Road and the eastbound lanes of Highway 417, as identified on the Scaled Area Location Plan (Figure 1 in the Figures section). The westbound lanes of highway 417 are beyond the 500 metre limit for highways. On a practical level, their inclusion would make almost no difference to the results.

The roadway segments used for roadway traffic noise predictions are identified on Figure 1. Merivale Road has been divided into north and south portions, to account for the roadway's change in direction south of the site. The north and south portions are further divided into roadway segments by direction of travel (northbound and southbound lanes). A single roadway segment has been used for the eastbound lanes of highway 417. Average Annual Daily Traffic (AADT) volumes have been assigned and divided by time-of-day and vehicle categories per ENCG requirements (ENCG, Appendix B). The traffic data used for noise level calculations are summarized in Table 6.

Table 6: Roadway Traffic Flow Data

Roadway Segment	Roadway Class	Speed Limit	Total AADT	AADT by Vehicle Type and Time of Day (Daytime / Nighttime)		
				Cars	Medium Trucks	Heavy Trucks
Merivale Road, northbound	4-Lane Urban Arterial Undivided	50 km/h	30000	12144/1056	966/84	690/60
Merivale Road, southbound				12144/1056	966/84	690/60
Highway 417, eastbound	4-Lane Highway Segment	100 km/h	73332	59370/5163	4723/411	3373/293

Traffic flow was presumed to be at the centre of the lanes represented by each roadway segment, as is normal practice.

2.2 POINTS OF ASSESSMENT

The following Points of Assessment (POA) form part of this Noise Study. These locations have been selected due to their potential to be worst-case locations in terms of noise levels or building component requirements. The assessment locations are shown on Figures 2 through 4.

- POA 'W3a' is located at a third-storey window on the west façade (unit 302), with significant exposure to Merivale Road and Highway 417. The assessment height is 7.93 m above ground, corresponding to the centre height of the third floor. The calculated sound level is also representative of sound levels at the same location on the floors immediately below and above (units 202 and 402).

- POA 'W3b' is located at a third storey window on the west façade (unit 301), with significant exposure to Merivale Road and Highway 417. The assessment height is 7.93 m above ground, corresponding to the centre height of the third floor. The calculated sound level is also representative of sound levels at the same location on the floors immediately below and above (units 201 and 401).

- POA 'W5a' is located at a fifth storey window on the west façade (unit 502), with significant exposure to Merivale Road and Highway 417. The assessment height is 14.02 m above ground, corresponding to the centre height of the fifth floor. The calculated sound level is also representative of sound levels at the same location on the floor above (unit 602), and at west façade windows in units 501 and 601.

- POA 'N5' is located at a at a fifth storey window on the south façade (unit 502 bedroom), with partial exposure to Merivale Road and Highway 417. The assessment height is 14.02 m above ground, corresponding to the centre height of the fifth floor. The calculated sound level is also representative of sound levels at the same location on the floor above (unit 602 lower bedroom), at the loft level (unit 602 upper bedroom), and the upper bedroom window in unit 601.

- POA 'G' is located on the northwest corner of the indoor common area on the ground floor, with significant exposure to Merivale Road and Highway 417. The assessment height is 1.68 m above ground, corresponding to the centre height of the ground floor.

- POA 'OLA' is located in the central portions of the proposed OLA (identified as “Proposed Softscape Area” on the project drawings, Reference 10), at a height of 1.5 m above grade. The proposed building acts as a significant noise barrier between this POA and a large portion of Merivale Road.

The calculations assume a flat topography for all POAs.

2.3 ANALYSIS

2.3.1 STAMSON Calculations

Noise level calculations were made at each POA using the MECP tool STAMSON, version 5.04. The following table summarizes the inputs used for each STAMSON POA sound level calculation. The topography value is set at 1 (for flat/gentle slope, no barrier) for all POAs except for the OLA, which is set at 5 (flat/gentle slope, with barrier). Reference angles are set at 0.00 degrees in all cases.

Detailed drawings showing POA exposure angles and distances to roadway segments are included as Figures 5 through 10.

Table 7: STAMSON Calculation Inputs

POA		Roadway Segments						Noise Barriers			
ID	H	Name	Exposure	House Rows	House Density	Surface Type	D	ID	Angles	H	D
W3a	7.93	MerivaleNBn	-41 to 89	0	(n/a)	2	15.0*				
		MerivaleSBn	-41 to 89	0	(n/a)	2	19.7				
		417EB	-69 to 61	6	50	2	500.0^				
W3b	7.93	MerivaleNBn	-66 to 63	0	(n/a)	2	15.0*				
		MerivaleSBn	-66 to 63	0	(n/a)	2	17.8				
		417EB	-90 to 35	6	50	2	500.0^				
W5a	14.02	MerivaleNBs	-85 to 78	0	(n/a)	2	21.6				
		MerivaleNBn	-83 to 90	0	(n/a)	2	15.0*				
		MerivaleSBs	-85 to -75	0	(n/a)	2	28.0				
		MerivaleSBn	-80 to 90	0	(n/a)	2	19.4				
		417EB	-90 to 62	6	50	2	500.0^				
N5	14.02	MerivaleNBn	-1 to 90	0	(n/a)	1	23.6				
		MerivaleSBn	-1 to 90	0	(n/a)	1	30.1				
		417EB	-29 to 90	6	50	2	500.0^				
G	1.68	MerivaleNBs	-86 to -79	0	(n/a)	2	19.4				
		MerivaleNBn	-84 to 90	0	(n/a)	2	15.0*				
		MerivaleSBs	-86 to 76	0	(n/a)	2	25.8				
		MerivaleSBn	-80 to 90	0	(n/a)	2	17.4				
		417EB	-90 to 90	6	50	2	500.0^				
OLA	1.5	MerivaleNBs	-90 to 62	1	50	1	50.4				
		MerivaleNBn	-67 to 83	1	50	1	42.1	Bldg	-43 to 38	18.29	6.5
		MerivaleSBs	-90 to -60	1	50	1	56.8				
		MerivaleSBn	-64 to 82	1	50	1	48.6	Bldg	-43 to 38	18.29	6.5
		417EB	-90 to 90	7	50	2	500.0^	Bldg	-71 to 10	18.29	5.6

Table 7 Notes:

H = height above grade, in metres. In all cases the same value is used during the day and night.
Exposure = Exposure angles, in degrees
House Rows = Number of rows of houses between the POA and roadway segment

House Density = Density of the first row of houses
Surface Types = ground absorption between the POA and roadway segment
- Surface Type 1 = sound-absorptive
- Surface Type 2 = sound-reflective

D = Horizontal distance in metres between the POA and roadway segment.
* Indicates that the actual distance is less than 15.0 m (see Section 2.3.2)
^ Indicates that the actual distance is greater than 500.0 m (see Section 2.3.2)

2.3.2 Roadway Distance Adjustments

STAMSON requires a minimum distance of 15 metres to calculate sound levels between POAs and roadways. West façade POAs are less than 15 metres from the northbound lanes of Merivale Road. To avoid under-estimating noise emissions at affected POAs, the distance was set at 15 metres in STAMSON, and an adjustment was applied to MerivaleNBn roadway segment noise level calculations as follows:

$$Adjustment\,(dB) = 10\log_{10}(d_{ref}/d_{true})$$

Where d_{ref} is the reference distance, equal to 15 metres, and d_{true} is the true distance to the roadway segment. This adjustment is consistent with the distance correction factor specified within the ORNAMENT procedure used by STAMSON (see References 4 and 5 in Section 1.1).

Table 8 below summarizes the sound levels calculated using STAMSON for each POA for roadway segment MerivaleNBn, and the adjustments applied based on the actual distance to the roadway segment. Note that no correction was applied to POA N5 or POA OLA, since their distances to MerivaleNBn exceed the STAMSON minimum of 15 metres.

Table 8: Distance Adjustments, Roadway Segment MerivaleNBn

POA	STAMSON Calculations			Adjustments			
	Distance Entered (m)	Sound Levels (dBA Leq)		Actual Distance (m)	Adjustment (dB)	Sound Levels (dBA Leq)	
		Day	Night			Day	Night
W3a	15.0	67.03	59.44	13.2	0.56	67.59	60.00
W3b	15.0	67.03	59.44	11.3	1.23	68.26	60.67
W5a	15.0	68.26	60.66	12.9	0.66	68.92	61.32
N5	23.6	62.18	54.58	23.6	0.00	62.18	54.58
G	15.0	68.28	(n/a)	10.9	1.39	69.67	(n/a)
OLA	42.1	52.42	(n/a)	42.1	0.00	52.42	(n/a)

STAMSON further limits distances to no more than 500 metres. Each POA is marginally above this distance limit (by 4 to 33 metres), relative to the eastbound lanes of Highway 417. To ensure a conservative analysis, the STAMSON limit of 500 metres was used for all Highway 417 noise calculations. No further adjustment was applied.

2.4 RESULTS

The roadway sound level calculation results are summarized below.

Table 9: Summary of Traffic Noise Level Calculation Results

Location	Calculated Noise Level Daytime (dBA Leq16 hrs)	Calculated Noise Level Nighttime (dBA Leq 8 hrs)
POA W3a: west window in units 202, 302, 402	69.94*	62.34*
POA W3b: west window in units 201, 301, 401	70.51*	62.92*
POA W5a: west window in units 501, 502, 601, and 602	71.34*	63.74*
POA N5: unit 502 bedroom window, upper and lower bedroom windows in unit 602, upper bedroom window in unit 601	64.96	57.36
POA G: Ground floor indoor amenity space windows	71.98*	(n/a)
POA OLA: Proposed Softscape Area	57.38	(n/a)

*Includes a manual adjustment to the STAMSON calculation for roadway segment MerivaleNBn due to its distance less than 15 m, per Table 8

2.4.1 Requirements for the Outdoor Living Area

The noise level calculation at at the Softscaped Area exceeds the 55 dBA limit for transportation noise. The location of the OLA at the rear of the building means it is nonetheless significantly screened from Merivale Road. Given the context of the site, there are no practical noise mitigation options to further reduce noise levels at the Softscaped Area. The predicted sound level is within the 5 dB tolerance limited noted in the ENCG.

No noise control measures are recommended for the Softscaped Area. A Notice-on-Title is required to alert occupants of the potential for disturbance. Recommended wording is included in Section 4.0.

2.4.2 Requirements for Indoor Residential Spaces

The POW noise level calculation results show that some POAs require noise control for surface transportation noise. Where measures have been included for noise control, Notices-on-Title are also required. The requirements are listed in Table 10 below.

Table 10: Surface Transportation Noise Requirement for Indoor Residential Spaces

Units (Representative POAs)	Central Air Conditioning*	Building Envelope Components	Notices-on-Title
All units with west or north-facing windows to living areas or bedrooms: Units 201, 202, 301, 302, 401, 402, 501, 502, 601, 602. (POAs W3a, W3b, W5a, N5)	Required	Designed to meet indoor noise limits (see Section 2.5)	Required (see Section 4.0)
All other units: 203, 204, 303, 304, 403, 404, 503, 504, 603, 604	Not required	Per OBC	Not required

* Or other suitable mechanical ventilation meeting NPC-300 requirements

2.4.3 Requirements for Indoor Non-Residential Noise-Sensitive Spaces

The POW noise level calculation at POA G confirms that the ENCG supplemental indoor noise limits (Table 3) will only be met in the ground floor indoor amenity space with its doors closed. Central air conditioning is recommended for the indoor amenity space. The calculations also confirm that an evaluation of building envelope components is required to ensure that the ENCG supplemental sound level limits are met.

2.5 ACOUSTIC INSULATION FACTOR ANALYSIS

An Acoustic Insulation Factor (AIF) analysis was performed according to BRN148 (Reference 9) in order to confirm building façade component construction requirements that will ensure indoor sound level limits are met within apartment

units and the ground floor indoor amenity space. The façade components include the exterior wall, windows that are fixed and sealed to the frame, and operable windows. Balcony doors and the entry doors to the ground floor amenity space are treated as operable windows. With reference to Table 3, the best-practice indoor sound level limit for the indoor amenity space was set at 50 dBA Leq 16hrs.

Intermediate calculation results for the AIF analysis are provided in Appendix B.

2.5.1 Exterior Wall Construction

The project drawings show exterior wall construction types W2, W2a, and W3 at the façades where the AIF analysis is required. Wall type W2 is described as follows (from inside to outside).

- 12.5 mm (1/2”) gypsum wall board
- 6 mil. poly air/vapour barrier
- 139 mm (5 3/4”) wood studs @ 400 mm (16”) O.C.
- 139 mm (5 3/4”) batt insulation in framing cavities
- 13 mm (1/2”) gypsum wall board
- 13 mm (1/2”) plywood sheathing
- air/moisture barrier
- 75 mm (3”) rigid insulation
- 1” x 3” wood furring c/w sloped top edge
- cement board panelling

Wall type W2a includes 190 mm concrete masonry blocks, and will provide superior acoustic performance compared to wall type W2. Wall type W3 is similar to wall type W2, except that vertical wood siding is specified as the exterior cladding material (rather than cement board panelling).

In order to determine window construction requirements, the exterior wall performance was set as equivalent to NRC exterior wall type EW2 as defined in BRN 148 (Reference 6). The construction details for NRC exterior wall type EW2 are also included in Appendix B. Project wall types W2, W2a, and W3 will achieve superior acoustic performance compared to NRC wall type EW2.

The detailed results of the AIF results are included in Appendix B. These show that the exterior wall AIF performance exceeds the average AIF requirement in all cases. Therefore, no upgrades to the proposed exterior wall constructions are required to meet indoor sound level limits.

2.5.2 Fixed Windows and Glass Doors

Table 11 describes the minimum window construction requirements in order to meet indoor sound level limits for the noise-sensitive areas of the building. The noise isolation requirements can be met with double-glazed units at all locations.

The window requirements are determined based on the floor area of the indoor space and the total area of each type of its associated façade components. Therefore, any change to floor plans and/or the size or composition of façade components may change these requirements. Window units which include thicker glass panes and/or greater interpane space(s) than indicated in Table 11 will also meet the noise isolation requirements.

Table 11: Minimum Window Requirements

Indoor Location	Fixed Windows	Operable Windows (Balcony Doors)
Bachelor apartments 202, 302, 402	Double glazing, 2-6-2*	Double glazing, 2-6-2*
Bedrooms, units 201, 301, 401	Double glazing, 2-15-2*, or Double glazing, 3-6-3*	
Bachelor apartment 502, Loft 602	Double glazing, 2-15-2*, or Double glazing, 3-6-3*	Double glazing, 2-15-2*, or Double glazing, 3-6-3*
Bachelor apartments 501 and 601	Double glazing, 2-15-2*, or Double glazing, 3-6-3*	Double glazing, 2-15-2*, or Double glazing, 3-6-3*
Unit 502 bedroom, unit 602 upper and lower bedrooms, upper bedroom Unit 603	Double glazing, 2-6-2*	
Ground floor indoor amenity space	Double glazing, 2-6-2*	Double glazing, 2-6-2*

*Double glazing entries are in the format “a-b-c”, where:
a is the thickness of the first pane of glass, in mm
b is the interpane thickness, in mm
c is the thickness of the second pane of glass, in mm

3.0 STATIONARY SOURCE NOISE

3.1 CRITERIA

The proposed development is located within a Class 1 area, which is the acoustical environment typical of a major population centre. The surrounding environment can be characterized as a mix of low-rise residences, institutional uses, and small businesses. In the following table, sound level exclusion limits for stationary and varying sound from Stationary Sources are extracted from NPC-300.

Table 12: Exclusion Limits for Class 1 Area

Receiver Area (Class #)	Time Period	Exclusion Limit Value, 1-hour L_{eq}, dBA	
		Outdoor Point of Reception	*Plane of Window of Noise Sensitive Space*
Class 1 (Ref: MECP NPC-300)	Day: 07:00 – 19:00	50	50
	Evening: 19:00 – 23:00	50	50
	Night: 23:00 – 07:00	(n/a)	45

The sound level limit is set as the higher of either the applicable exclusion limit, or the minimum background sound level at the point of reception. For the present analysis, background sound levels are conservatively assumed to be less than the exclusion limit values. The exclusion limit values therefore set the sound level limits, both for off-site Stationary Sources (impacting the proposed development), and for the operation of the proposed development as a Stationary Source (impacting adjacent noise-sensitive land uses). Because the applicable criteria are identical during the day and evening, a single Day-Evening time period (between 07:00 and 23:00) is used for the Stationary Source acoustic assessment.

Per NPC-300, Stationary Source noise impacts shall be assessed separately from transportation noise impacts. Except for special circumstances not applicable to the proposed development, the noise control measures applicable to surface transportation noise (ventilation and building component requirements) are not applicable to noise from Stationary Sources.

3.2 ASSESSMENT OF OFF-SITE STATIONARY SOURCES

A site visit was conducted on 01 March 2024 to review the site and its surroundings. Three pieces of outdoor equipment were identified which warranted an investigation into Stationary Source noise impacts. A small air conditioner is located on the lower roof of St. Teklehaimanot Ethiopian Orthodox Tewahedo Church adjacent to the site to the north (at 915 Merivale Road), and two larger rooftop HVAC units are located on nearby roofs of W.E. Gowling Public School, across the east property line (250 Anna Avenue).

No other potentially significant stationary noise sources were identified in the vicinity of the proposed development.

3.2.1 Noise Source Summary

A small air conditioning unit was identified on the lower roof of the St. Teklehaimanot Ethiopian Orthodox Tewahedo Church. The equipment was manufactured by Goodman Air Conditioning and Heating. While the model number of the equipment is not known, sound level data was found on the manufacturer's website for a range of similar air conditioners. Of these, the highest noise-emitting model was identified, representing a 4-ton unit. The sound power level was assigned to a single point source at the approximate location of the condenser fan atop the unit. The sound power data per octave band are included in Appendix C.

Two rooftop HVAC units were identified on the roof of W.E. Gowlings Public School. The make and model number of both units were provided by the Ottawa-Carleton Disctrict School Board (OCDSB): both HVAC units are manufactured by AAON, and feature 8-ton and 18-ton condensing sections. The condenser fans are expected to be the primary sources of environmental noise emissions. Representative condenser fan inlet and outlet sound level data were provided by Total HVAC, a local distributor of AAON equipment. The condenser fan exhaust sound power levels were assigned to point sources at the locations of each condenser fan (a single fan for the 8-ton unit, and two fans for the 18-ton unit). The fan inlet sound power was assigned to a point noise source at the approximate location of the condenser section air inlet. Relevant email correspondence and per-octave band sound power levels are included in Appendix C.

The OCDSB representative further confirmed that the condensing section of both AAON units do not operate between 20:00 and 07:00. As such, noise emissions from these units is expected to be insignificant overnight.

A summary of the individual off-site noise sources assessed is included below.

Table 13: Stationary Noise Source Summary Table

Source ID [1]	Source Description	Sound Power Level (dBA) [2]	Source Location [3]	Sound Characteristics [4]	Noise Control Measures [5]
GM	Goodman AC unit at St. Teklehaimanot Ethiopian Orthodox Tewahedo Church	75.3	O	S	U
RN018.CondIn	18-ton AAON unit condensing section	87.3	O	S	U
RN018.Fan1		84.8	O	S	U
RN018.Fan2		84.8	O	S	U
RN08.CondIn	8-ton AAON unit condensing section	84.3	O	S	U
RN08.Fan	8-ton AAON unit condensing section	84.8	O	S	U

Table 13 Notes

[1] Assigned source IDs. Where the acoustic assessment includes multiple noise sources representing a single piece of equipment, the Source ID is appended with a period (.) followed by a short descriptor of the noise-generating component and/or condition represented.
[2] Overall A-weighted sound power level. Supporting information is included in Appendix C
[3] Source Location
O: located/installed Outside of the building, including on the roof
I: located/installed Inside the building
[4] Sound Characteristics.
S: Steady
Q: Quasi steady impulsive
I: Impulsive
B: Buzzing
T: Tonal
C: Cyclic
[5] Noise Control Measures
S: Silencer, acoustic louvre, muffler
A: Acoustic lining, plenum
B: Barrier, berm, screening
L: Lagging
E: acoustic Enclosure
O: Other
U: Uncontrolled
AC: Administrative Controls

3.2.2 Point of Reception Summary

The worst-case Points of Reception (PORs) are summarized below. Plane of Window (POW) and Outdoor Point of Reception (OPORs) locations have been

selected based on their worst-case proximity and exposure to the identified off-site noise sources.

POR ID	Type	Height	Description
SSG	OPOR	1.5 m	Rear yard
SSE4a	POW	11.0 m	4th floor window, east (unit 403)
SSE4b	POW	11.0 m	4th floor window, east (unit 404 bedroom)
SSE6	POW	16.9 m	6th floor window, east (unit 604)
SSN5	POW	14.0 m	5th floor window, north (unit 502 bedroom)
SSN7	POW	19.1 m	5th floor window, north (unit 603 upper bedroom)

3.2.3 Impact Assessment

An environmental noise model was prepared using CadnaA software (Reference 8), configured to conform to ISO Standard 9613 (Reference 9). A plot showing the elements of the noise model, key dimensions, and results is included as Figure 11. The model includes the proposed buildings, nearby portions of W.E. Gowling Public School, and St. Teklehaimanot Church. The local topography is modelled as being flat. The default ground surface is set as sound-absorptive, with sound-reflective ground covering set within the property line of the site and at the entrance to the church.

The Acoustic Assessment Summary Table for off-site Stationary Source noise is provided below as Table 14. It is concluded that off-site Stationary Source noise will comply with the applicable sound level limits at all worst-case PORs during all time-periods. Noise control is not required for the identified off-site equipment noise sources.

Appendix D Includes sound level calculation results for individual noise sources at each POR, and the distances between noise sources and PORs.

Table 14: Off-Site Stationary Source Acoustic Assessment Summary Table

Point of Reception ID	Point of Reception Description	Time of Day	Sound Level at Point of Reception (dBA Leq)	Performance Limit (dBA Leq)	Compliance with Performance Limit (Yes/No)
SSG	Rear yard	Day-Evening	43.7	50.0	Yes
SSE4a	4th floor window, east facade	Day-Evening	47.7	50.0	Yes
		Night	32.1	45.0	Yes
SSE4b	4th floor window, east facade	Day-Evening	47.0	50.0	Yes
		Night	22.1	45.0	Yes
SSE6	5th floor window, east facade	Day-Evening	48.0	50.0	Yes
		Night	32.8	45.0	Yes
SSN5	5th floor window, north facade	Day-Evening	46.1	50.0	Yes
		Night	40.4	45.0	Yes
SSN7	5th floor window, north facade	Day-Evening	46.4	50.0	Yes
		Night	39.5	45.0	Yes

3.3 ASSESSMENT OF THE SITE AS A STATIONARY SOURCE

With reference to the ENCG and NPC-300, operation of the Merivale Apartment Building, in its entirety, is considered a “Stationary Source”. As part of the mechanical design, all equipment with external noise emissions and serving common areas of the building must be selected to comply with City of Ottawa Stationary Source noise limits at adjacent noise-sensitive land uses. Given the nature of the proposed development, its location, and the surrounding environment, technical solutions will be available to ensure that the applicable sound level limits are met.

Mechanical equipment dedicated to individual apartments (e.g. condensing units for air conditioning systems) will also need to be selected to comply with the City of Ottawa Noise By-Law (Reference 7).

At the time of preparation of this Report, the selection of mechanical equipment has not been completed.

4.0 WARNING CLAUSES

Recommended wording for Notices-On-Title for all units is provided below. These are based on the recommended wording found in the ENCG Part 4, Appendix A Table A1, with minor edits as applicable to the proposed development. The content is consistent with NPC-300 Warning Clauses Types A and D.

> Purchasers/tenants are advised that sound levels due to increasing road traffic will interfere with outdoor activities as the sound levels exceed the sound level limits of the City and the Ministry of the Environment.
>
> To help address the need for sound attenuation this development includes multi-pane glass windows and balcony doors. To ensure that provincial sound level limits are not exceeded it is important to maintain these sound attenuation features.
>
> This dwelling unit has been supplied with a central air conditioning system and other measures 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 City and the Ministry of the Environment.

5.0 SUMMARY AND CONCLUSIONS

The results of the Noise Impact Assessment Study are summarized below.

1. Central air conditioning (or an alternative mechanical ventilation system meeting the requirements described in NPC-300) must be provided for units 201, 202, 301, 302, 401, 402, 501, 502, 601, and 602.

2. Building envelope components must be designed to ensure that indoor sound level limits are met, for units 201, 202, 301, 302, 401, 402, 501, 502, 601, and 602. The minimum requirements for windows and balcony doors are provided in Table 11. Double glazing with each pane 3 mm thick and a 6 mm gap between panes would allow the indoor sound level target to be met in all cases.

3. The predicted noise levels at the proposed Outdoor Living Area (identified as the “Proposed Softscape Area” on the project drawings) exceed the applicable limit. However, there are no practical options to mitigate outdoor noise levels. The predicted noise level is within a 5 dB tolerance limit per the ENCG. Deletion of the OLA is not recommended.

4. Outdoor equipment was identified at two off-site properties with the potential to impact the future residential units: an air conditioner on the roof of St. Teklehaimanot Church north of the site, and two rooftop HVAC units at W.E. Gowling Public School east of the site. An assessment of environmental noise was completed, and the results are summarized in Table 14. It is concluded that noise emissions from off-site noise sources will comply with the applicable sound level limits. Noise control is not required for the identified off-site stationary noise sources.

5. On-site mechanical equipment will need to be selected and designed to comply with City of Ottawa requirements for noise emissions from a Stationary Source and the City of Ottawa Noise By-Law. No concerns regarding the feasibility of on-site noise sources to meet the applicable sound level limits have been identified.

6. Notices-on-Title with respect to environmental noise are also required. Recommended wording is included as Section 4.0.

We conclude that the the project can be developed such that all requirements for noise from transportation sources and Stationary Sources are met.

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2024-04-03

This Noise Impact Assessment Study was prepared by Integral DX Engineering for the account of Marc Amyote. The material in it reflects Integral DX Engineering's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this Report, or any reliance on or decisions to be made based on it, are the responsibilities of such third parties. Integral DX Engineering accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this Report.

FIGURES

Figure 1: Scaled Area Location Plan

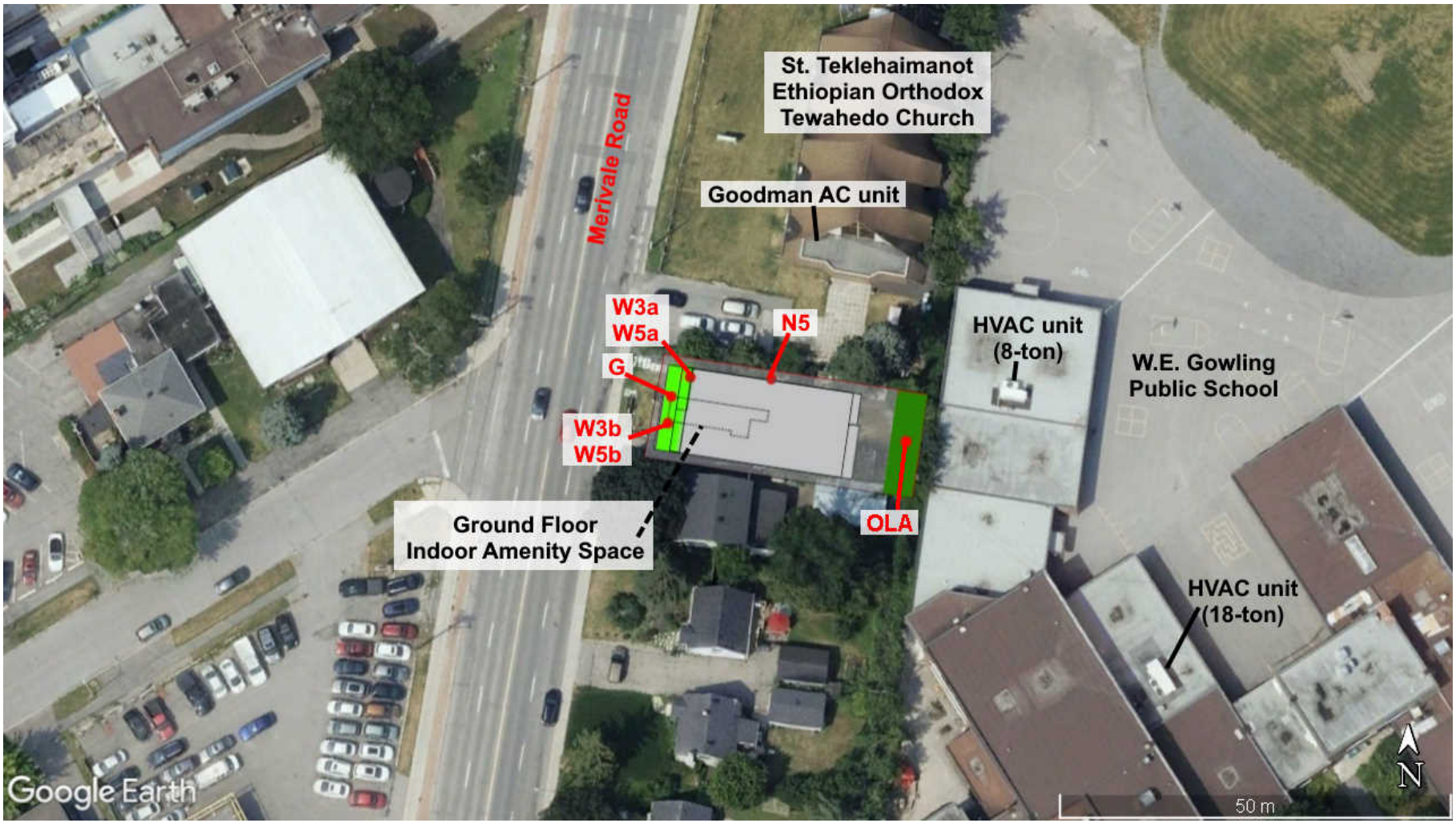


Figure 2: Site Plan

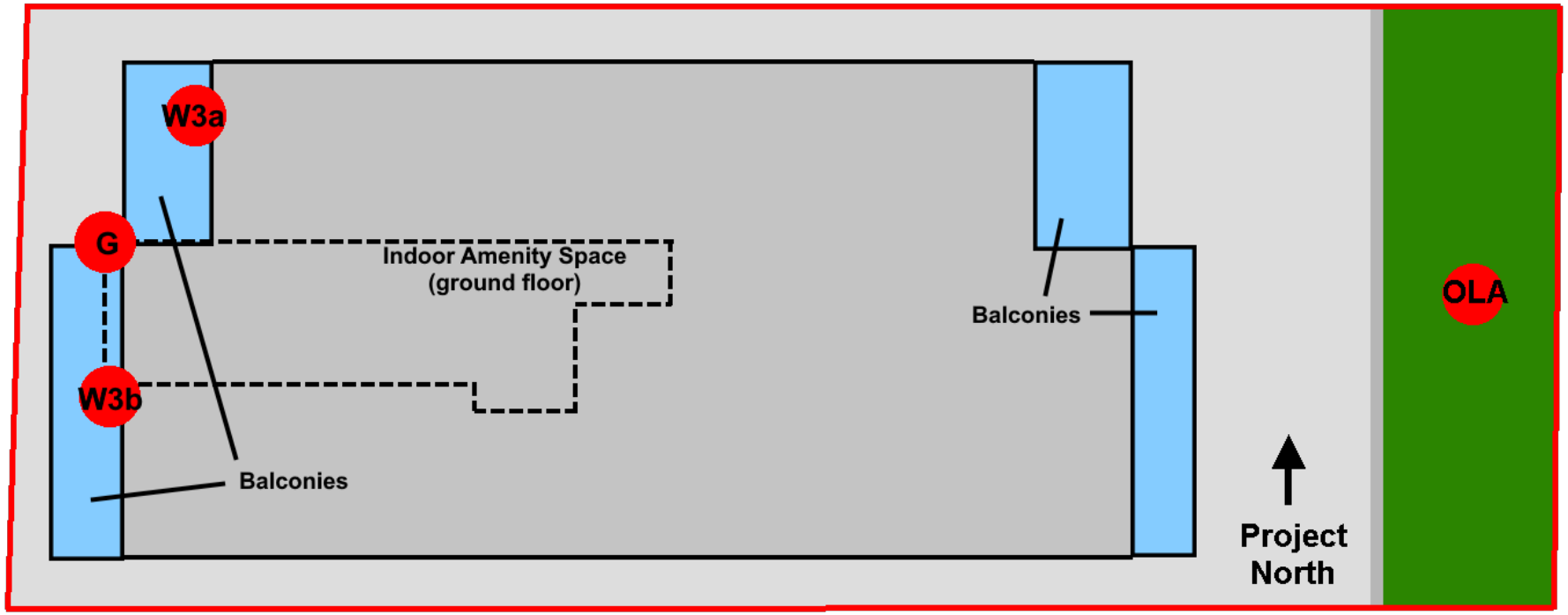


Figure 3: POA Locations – OLA, Ground Floor and Level 3

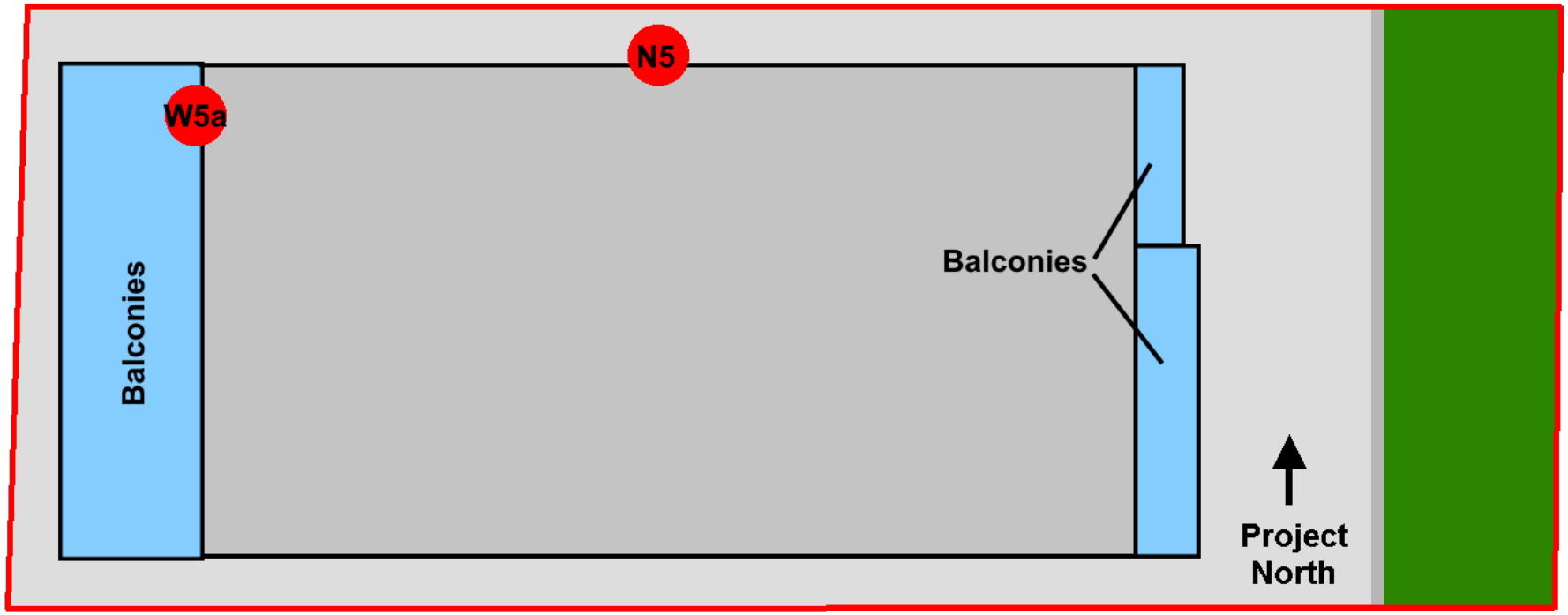
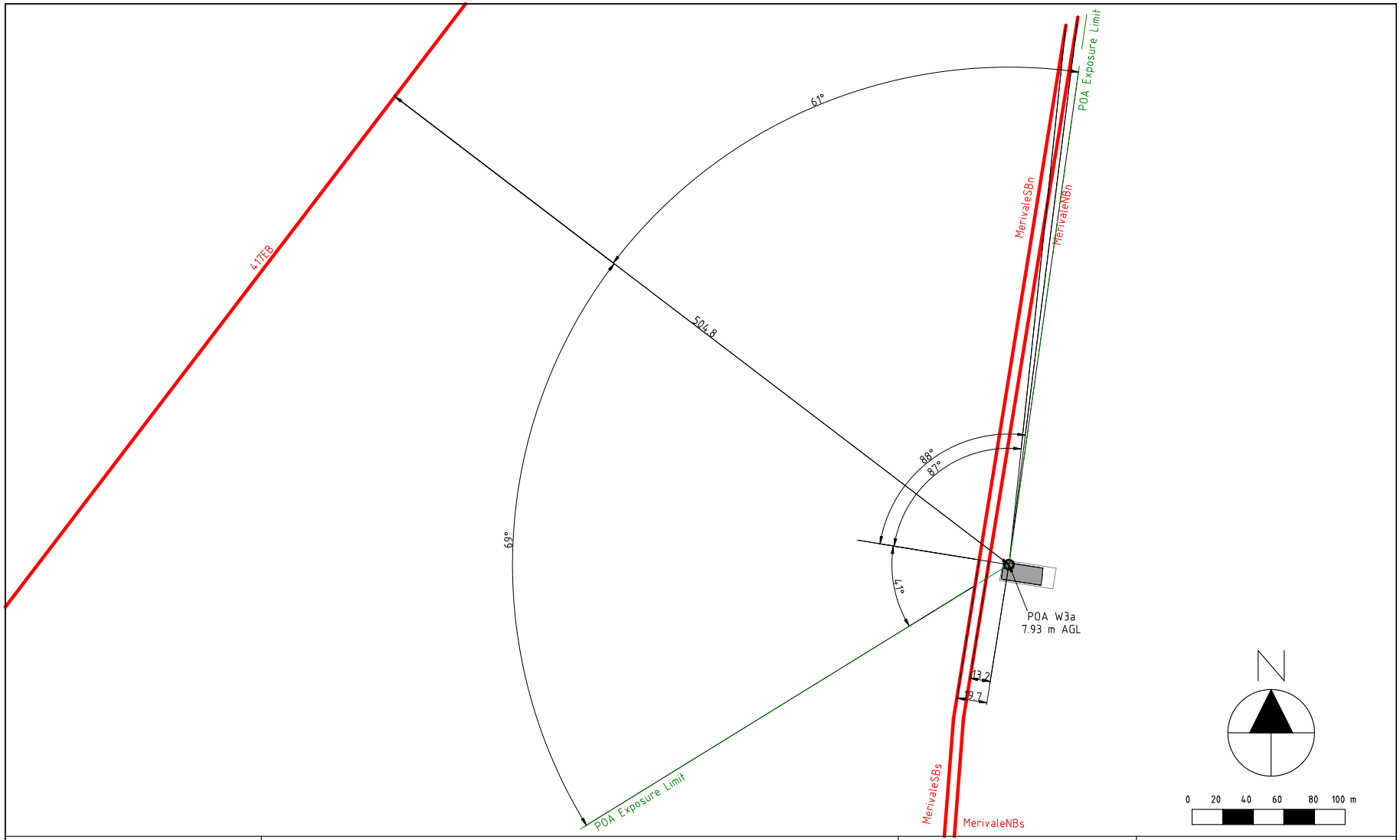


Figure 4: POA Locations – Level 5



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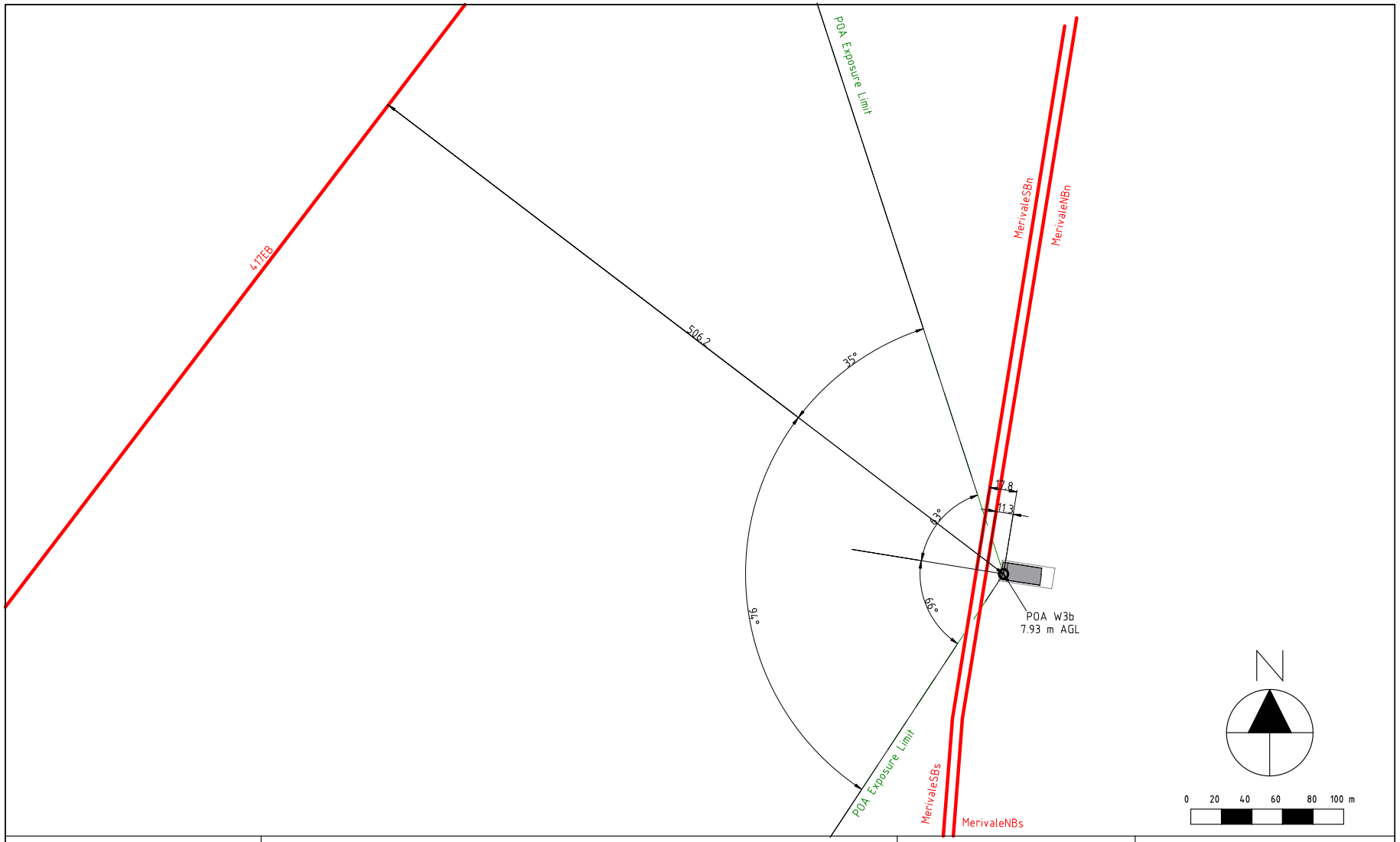
POA W3a Plan View

Plan view of POA, including distances and angles to roadway segments.
AGL = Above Grade Level.
All dimensions are in metres.

Rev:	0
Date:	2024-03-20
Drawn By:	PGL
Scale:	as shown

Figure 5

917 Merivale Road Apartment Building
Ottawa, Ontario



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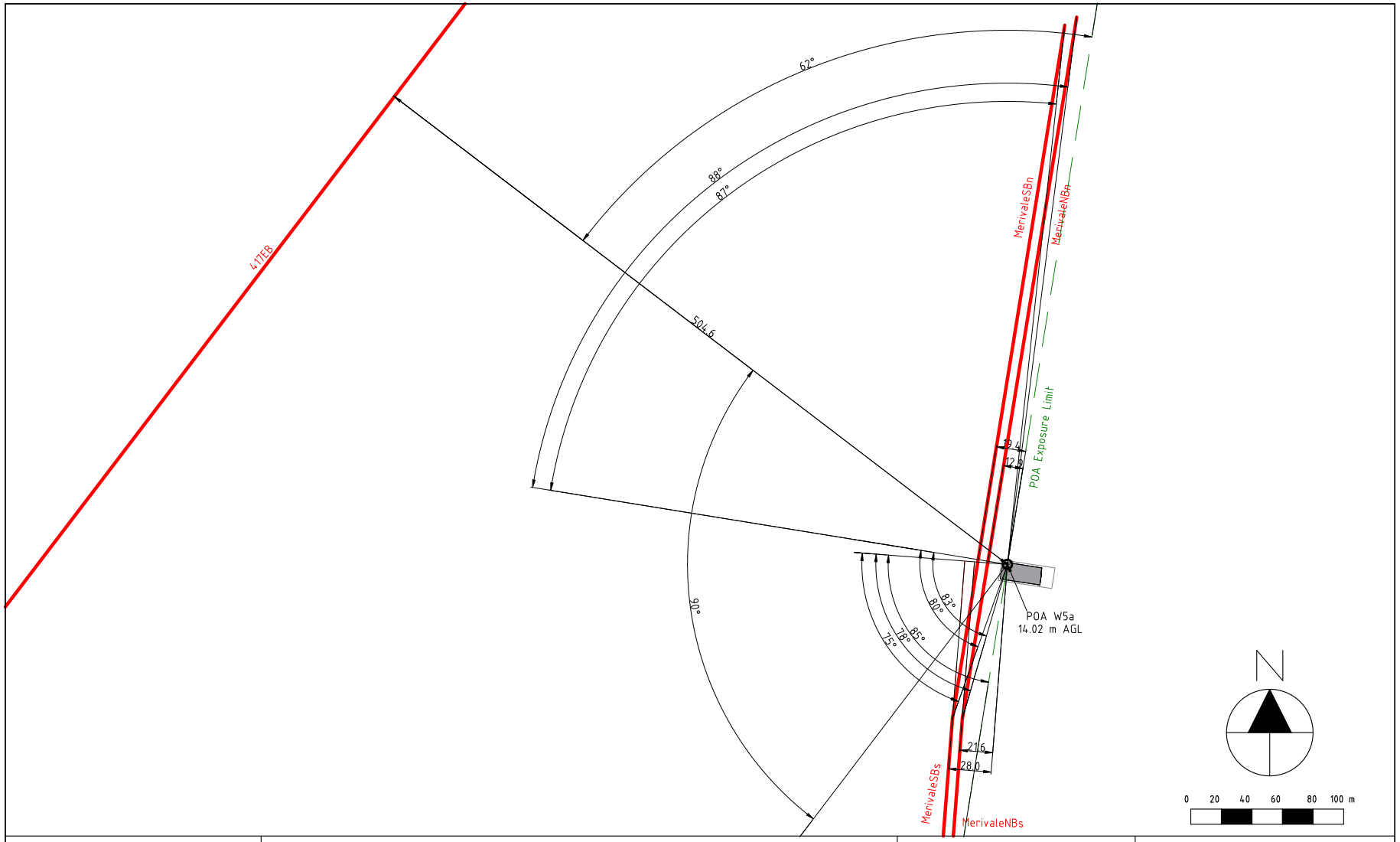
POA W3b Plan View

Plan view of POA, including distances and angles to roadway segments.
AGL = Above Grade Level.
All dimensions are in metres.

Rev:	0
Date:	2024-03-20
Drawn By:	PGL
Scale:	as shown

Figure 6

917 Merivale Road Apartment Building
Ottawa, Ontario



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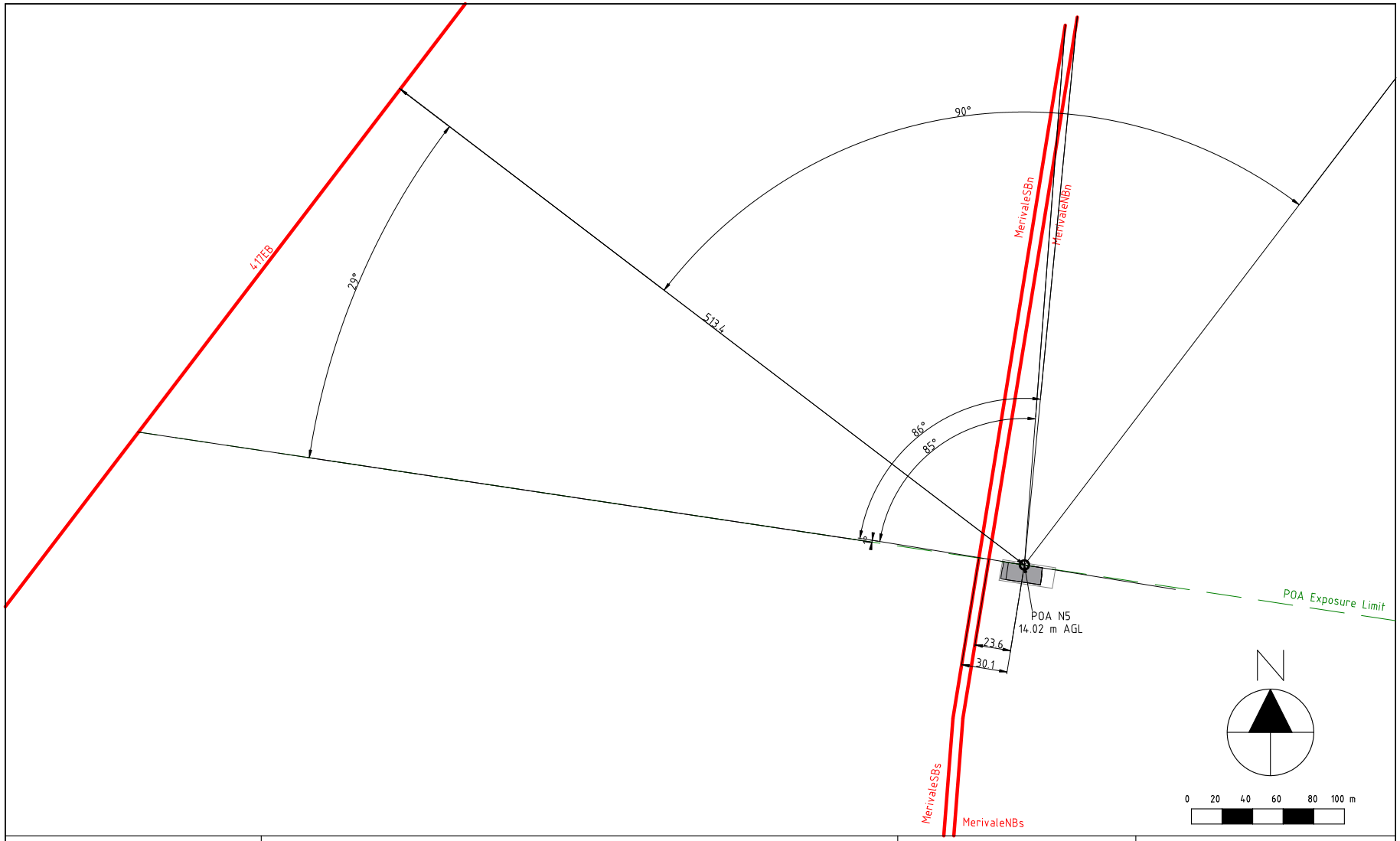
POA W5a Plan View

Plan view of POA, including distances and angles to roadway segments.
AGL = Above Grade Level.
All dimensions are in metres.

Rev:	0
Date:	2024-03-20
Drawn By:	PGL
Scale:	as shown

Figure 7

917 Merivale Road Apartment Building
Ottawa, Ontario



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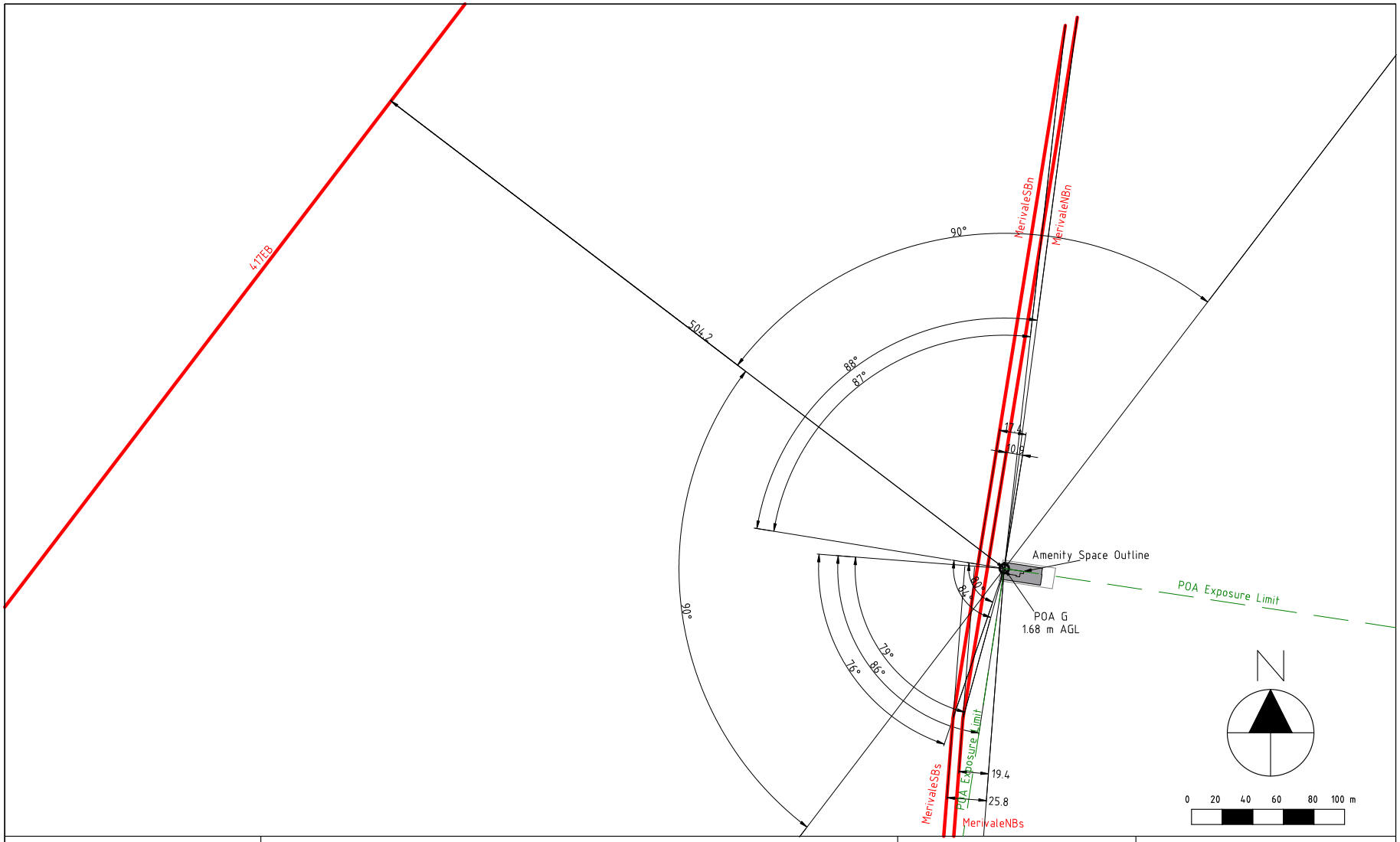
POA N5 Plan View

Plan view of POA, including distances and angles to roadway segments.
AGL = Above Grade Level.
All dimensions are in metres.

Rev:	0
Date:	2024-03-20
Drawn By:	PGL
Scale:	as shown

Figure 8

917 Merivale Road Apartment Building
Ottawa, Ontario



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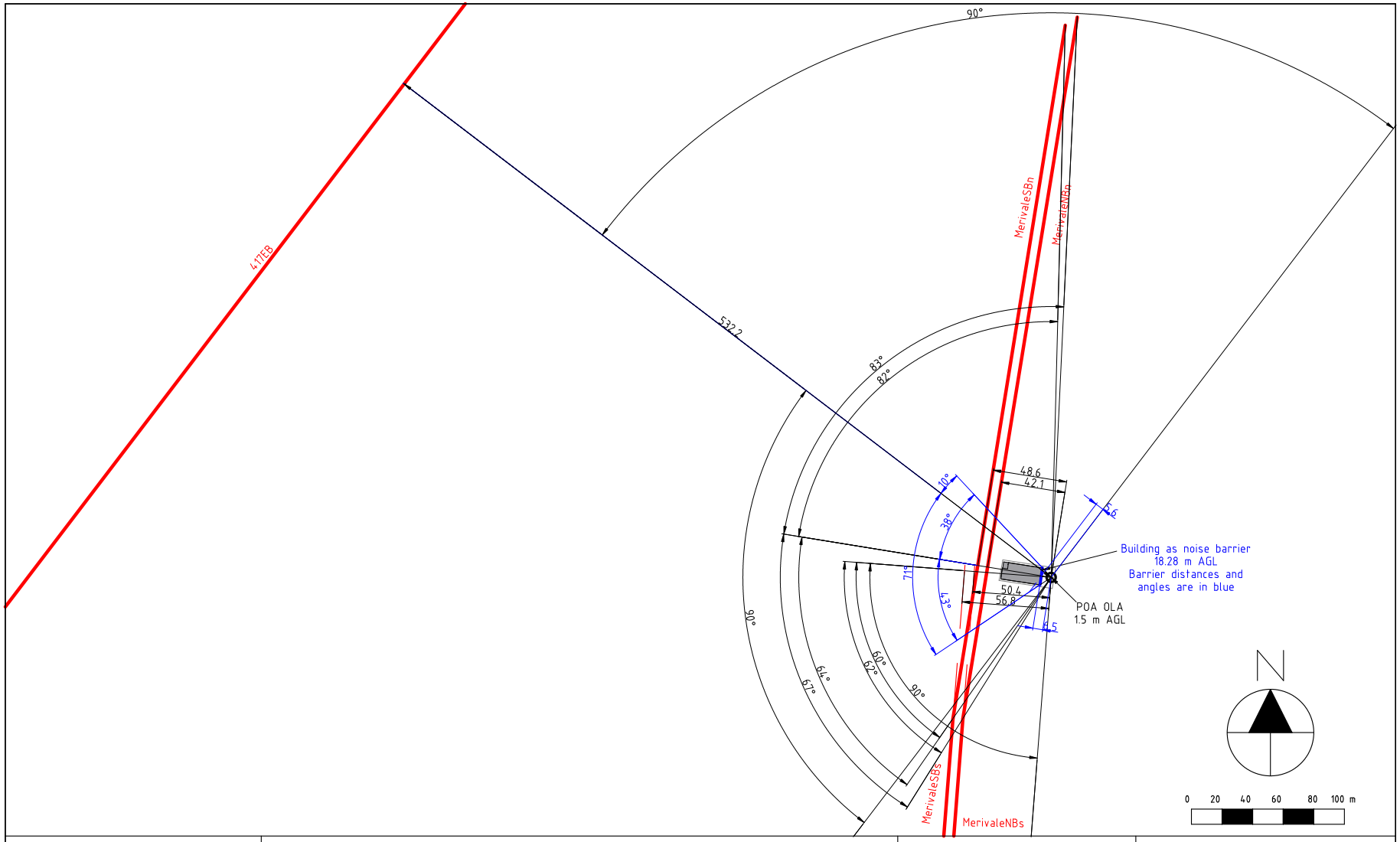
POA G Plan View

Plan view of POA, including distances and angles to roadway segments.
AGL = Above Grade Level.
All dimensions are in metres.

Rev:	0
Date:	2024-03-20
Drawn By:	PGL
Scale:	as shown

Figure 9

917 Merivale Road Apartment Building
Ottawa, Ontario



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POA OLA Plan View

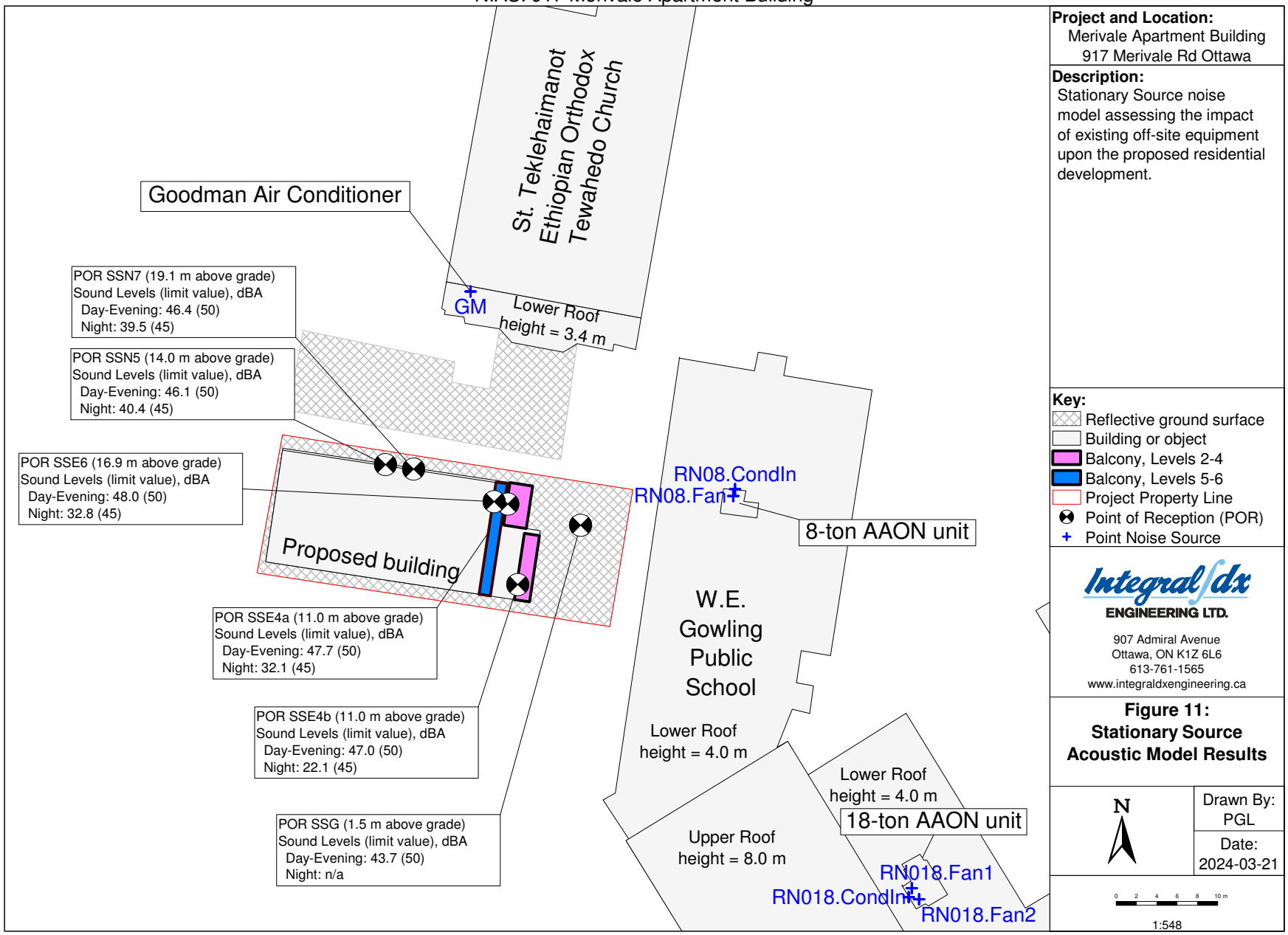
Plan view of POA, including distances and angles to roadway segments.
AGL = Above Grade Level.
All dimensions are in metres.

Rev:	0
Date:	2024-03-20
Drawn By:	PGL
Scale:	as shown

Figure 10

917 Merivale Road Apartment Building
Ottawa, Ontario

NIAS: 917 Merivale Apartment Building



Project and Location:
Merivale Apartment Building
917 Merivale Rd Ottawa

Description:
Stationary Source noise model assessing the impact of existing off-site equipment upon the proposed residential development.

Key:
- Reflective ground surface
- Building or object
- Balcony, Levels 2-4
- Balcony, Levels 5-6
- Project Property Line
- Point of Reception (POR)
- Point Noise Source

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Figure 11:
Stationary Source Acoustic Model Results

N

Drawn By: PGL

Date: 2024-03-21

0 2 4 6 8 10 m

1:548

APPENDICES

APPENDIX A: STAMSON CALCULATION RESULTS

```
STAMSON 5.0        SUMMARY REPORT        Date: 21-03-2024 11:45:05
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: W3a.TE              Time Period: Day/Night 16/8 hours
Description: West faade third floor north window


Road data, segment # 1: MerivaleNBn (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: MerivaleNBn (day/night)
---------------------------------------------
Angle1   Angle2           : -41.00 deg   88.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :   7.93 / 7.93   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: MerivaleSBn (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 # 2: MerivaleSBn (day/night)
---------------------------------------------
Angle1   Angle2           : -41.00 deg   87.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  19.70 / 19.70  m
Receiver height           :   7.93 / 7.93   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: 417EB (day/night)
-----------------------------------------
Car traffic volume  : 59370/5163  veh/TimePeriod  *
Medium truck volume :  4723/411   veh/TimePeriod  *
Heavy truck volume  :  3373/293   veh/TimePeriod  *
Posted speed limit  :   100 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):  73332
    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 # 3: 417EB (day/night)
---------------------------------------
Angle1   Angle2           : -69.00 deg   61.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      6 / 6
House density             :     50 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 500.00 / 500.00 m
Receiver height           :   7.93 / 7.93   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Result summary (day)
--------------------

                    !  source  !   Road   !  Total
                    !  height  !   Leq    !   Leq
                    !    (m)   !  (dBA)   !  (dBA)
--------------------+----------+----------+----------
 1.MerivaleNBn      !     1.50 !    67.03 !    67.03
 2.MerivaleSBn      !     1.50 !    65.82 !    65.82
 3.417EB            !     1.50 !    54.85 !    54.85
--------------------+----------+----------+----------
                      Total                  69.62 dBA


Result summary (night)
----------------------

                    !  source  !   Road   !  Total
                    !  height  !   Leq    !   Leq
                    !    (m)   !  (dBA)   !  (dBA)
--------------------+----------+----------+----------
 1.MerivaleNBn      !     1.50 !    59.44 !    59.44
 2.MerivaleSBn      !     1.50 !    58.22 !    58.22
 3.417EB            !     1.49 !    47.26 !    47.26
--------------------+----------+----------+----------
                      Total                  62.03 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 69.62
                           (NIGHT): 62.03
```

```
STAMSON 5.0        SUMMARY REPORT        Date: 21-03-2024 11:45:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: W3b.TE              Time Period: Day/Night 16/8 hours
Description: West faade third floor south window


Road data, segment # 1: MerivaleNBn (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: MerivaleNBn (day/night)
---------------------------------------------
Angle1   Angle2           : -66.00 deg   63.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :   7.93 / 7.93   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: MerivaleSBn (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 # 2: MerivaleSBn (day/night)
---------------------------------------------
Angle1   Angle2           : -66.00 deg   63.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  17.80 / 17.80  m
Receiver height           :   7.93 / 7.93   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: 417EB (day/night)
-----------------------------------------
Car traffic volume  : 59370/5163  veh/TimePeriod  *
Medium truck volume :  4723/411   veh/TimePeriod  *
Heavy truck volume  :  3373/293   veh/TimePeriod  *
Posted speed limit  :   100 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):  73332
    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 # 3: 417EB (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   35.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      6 / 6
House density             :     50 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 500.00 / 500.00 m
Receiver height           :   7.93 / 7.93   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Result summary (day)
--------------------

                    !  source  !   Road   !  Total
                    !  height  !   Leq    !   Leq
                    !    (m)   !  (dBA)   !  (dBA)
--------------------+----------+----------+----------
 1.MerivaleNBn      !     1.50 !    67.03 !    67.03
 2.MerivaleSBn      !     1.50 !    66.29 !    66.29
 3.417EB            !     1.50 !    54.68 !    54.68
--------------------+----------+----------+----------
                      Total                  69.82 dBA


Result summary (night)
----------------------

                    !  source  !   Road   !  Total
                    !  height  !   Leq    !   Leq
                    !    (m)   !  (dBA)   !  (dBA)
--------------------+----------+----------+----------
 1.MerivaleNBn      !     1.50 !    59.44 !    59.44
 2.MerivaleSBn      !     1.50 !    58.69 !    58.69
 3.417EB            !     1.49 !    47.09 !    47.09
--------------------+----------+----------+----------
                      Total                  62.23 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 69.82
                           (NIGHT): 62.23
```

```
STAMSON 5.0        SUMMARY REPORT        Date: 21-03-2024 11:45:20
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: W5a.TE              Time Period: Day/Night 16/8 hours
Description: West faade fifth floor north window


Road data, segment # 1: MerivaleNBs (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: MerivaleNBs (day/night)
-----------------------------------------------
Angle1   Angle2           : -85.00 deg   -78.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  21.60 / 21.60  m
Receiver height           :  14.02 / 14.02  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: MerivaleNBn (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 # 2: MerivaleNBn (day/night)
-----------------------------------------------
Angle1   Angle2           : -83.00 deg   88.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :  14.02 / 14.02  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: MerivaleSBs (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 # 3: MerivaleSBs (day/night)
---------------------------------------------
Angle1   Angle2           : -85.00 deg   -75.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  28.00 / 28.00  m
Receiver height           :  14.02 / 14.02  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 4: MerivaleSBn (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 # 4: MerivaleSBn (day/night)
---------------------------------------------
Angle1   Angle2           : -80.00 deg   87.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  19.40 / 19.40  m
Receiver height           :  14.02 / 14.02  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 5: 417EB (day/night)
-----------------------------------------
Car traffic volume  : 59370/5163  veh/TimePeriod  *
Medium truck volume :  4723/411   veh/TimePeriod  *
Heavy truck volume  :  3373/293   veh/TimePeriod  *
```

```
Posted speed limit  :   100 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):  73332
    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 # 5: 417EB (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   62.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      6 / 6
House density             :     50 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 500.00 / 500.00 m
Receiver height           :  14.02 / 14.02  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Result summary (day)
--------------------

                    !  source  !   Road   !  Total
                    !  height  !   Leq    !   Leq
                    !   (m)    !  (dBA)   !  (dBA)
--------------------+----------+----------+----------
 1.MerivaleNBs      !     1.50 !    52.79 !    52.79
 2.MerivaleNBn      !     1.50 !    68.26 !    68.26
 3.MerivaleSBs      !     1.50 !    53.22 !    53.22
 4.MerivaleSBn      !     1.50 !    67.04 !    67.04
 5.417EB            !     1.50 !    55.53 !    55.53
--------------------+----------+----------+----------
                      Total                  70.97 dBA


Result summary (night)
----------------------

                    !  source  !   Road   !  Total
                    !  height  !   Leq    !   Leq
                    !   (m)    !  (dBA)   !  (dBA)
--------------------+----------+----------+----------
 1.MerivaleNBs      !     1.50 !    45.20 !    45.20
 2.MerivaleNBn      !     1.50 !    60.66 !    60.66
 3.MerivaleSBs      !     1.50 !    45.62 !    45.62
 4.MerivaleSBn      !     1.50 !    59.44 !    59.44
 5.417EB            !     1.49 !    47.94 !    47.94
--------------------+----------+----------+----------
                      Total                  63.37 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 70.97
                           (NIGHT): 63.37
```

```
STAMSON 5.0        SUMMARY REPORT        Date: 21-03-2024 11:45:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: N5.TE               Time Period: Day/Night 16/8 hours
Description: North faade fifth floor window


Road data, segment # 1: MerivaleNBn (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: MerivaleNBn (day/night)
---------------------------------------------
Angle1   Angle2           :  -1.00 deg   86.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  23.60 / 23.60  m
Receiver height           :  14.02 / 14.02  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: MerivaleSBn (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 # 2: MerivaleSBn (day/night)
---------------------------------------------
Angle1   Angle2           :  -1.00 deg   85.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  30.10 / 30.10  m
Receiver height           :  14.02 / 14.02  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: 417EB (day/night)
------------------------------------------
Car traffic volume  : 59370/5163  veh/TimePeriod  *
Medium truck volume :  4723/411   veh/TimePeriod  *
Heavy truck volume  :  3373/293   veh/TimePeriod  *
Posted speed limit  :   100 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):  73332
    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 # 3: 417EB (day/night)
---------------------------------------
Angle1   Angle2           : -29.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      6 / 6
House density             :     50 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 500.00 / 500.00 m
Receiver height           :  14.02 / 14.02  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Result summary (day)
--------------------

                    !  source  !   Road   !  Total
                    !  height  !   Leq    !   Leq
                    !   (m)    !  (dBA)   !  (dBA)
--------------------+----------+----------+----------
 1.MerivaleNBn      !     1.50 !    62.18 !    62.18
 2.MerivaleSBn      !     1.50 !    60.79 !    60.79
 3.417EB            !     1.50 !    54.47 !    54.47
--------------------+----------+----------+----------
                      Total                  64.96 dBA


Result summary (night)
----------------------

                    !  source  !   Road   !  Total
                    !  height  !   Leq    !   Leq
                    !   (m)    !  (dBA)   !  (dBA)
--------------------+----------+----------+----------
 1.MerivaleNBn      !     1.50 !    54.58 !    54.58
 2.MerivaleSBn      !     1.50 !    53.20 !    53.20
 3.417EB            !     1.49 !    46.87 !    46.87
--------------------+----------+----------+----------
                      Total                  57.36 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 64.96
                           (NIGHT): 57.36
```

```
STAMSON 5.0        SUMMARY REPORT        Date: 21-03-2024 11:45:35
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: G.TE                 Time Period: 16 hours
Description: Ground floor indoor common area


Road data, segment # 1: MerivaleNBs
----------------------------------
Car traffic volume  : 12144 veh/TimePeriod  *
Medium truck volume :   966 veh/TimePeriod  *
Heavy truck volume  :   690 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: MerivaleNBs
----------------------------------
Angle1   Angle2           : -86.00 deg   -79.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  19.40 m
Receiver height           :   1.67 m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: MerivaleNBn
----------------------------------
Car traffic volume  : 12144 veh/TimePeriod  *
Medium truck volume :   966 veh/TimePeriod  *
Heavy truck volume  :   690 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: MerivaleNBn
----------------------------------
Angle1   Angle2           : -84.00 deg    88.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 m
Receiver height           :   1.67 m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 3: MerivaleSBs
----------------------------------
Car traffic volume  : 12144 veh/TimePeriod  *
Medium truck volume :   966 veh/TimePeriod  *
Heavy truck volume  :   690 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 3: MerivaleSBs
----------------------------------
Angle1   Angle2           : -86.00 deg   -76.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  25.80 m
Receiver height           :   1.67 m
```

```
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 4: MerivaleSBn
-----------------------------------
Car traffic volume  : 12144 veh/TimePeriod  *
Medium truck volume :   966 veh/TimePeriod  *
Heavy truck volume  :   690 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 4: MerivaleSBn
---------------------------------
Angle1   Angle2           : -80.00 deg   87.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  17.40 m
Receiver height           :   1.67 m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 5: 417EB
-----------------------------
Car traffic volume  : 59370 veh/TimePeriod  *
Medium truck volume :  4723 veh/TimePeriod  *
Heavy truck volume  :  3373 veh/TimePeriod  *
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 5: 417EB
---------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      6
House density             :     50 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 500.00 m
Receiver height           :   1.67 m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Result summary
--------------

                    !  source  !   Road    !  Total
                    !  height  !   Leq     !   Leq
                    !    (m)   !  (dBA)    !  (dBA)
--------------------+----------+-----------+----------
 1.MerivaleNBs      !     1.50 !    53.26  !    53.26
 2.MerivaleNBn      !     1.50 !    68.28  !    68.28
 3.MerivaleSBs      !     1.50 !    53.57  !    53.57
 4.MerivaleSBn      !     1.50 !    67.51  !    67.51
 5.417EB            !     1.50 !    56.27  !    56.27
--------------------+----------+-----------+----------
                      Total                   71.22 dBA



TOTAL Leq FROM ALL SOURCES:       71.22
```

```
STAMSON 5.0        SUMMARY REPORT        Date: 21-03-2024 12:13:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: OLA.TE              Time Period: 16 hours
Description: Softscape Area (OLA)


Road data, segment # 1: MerivaleNBs
----------------------------------
Car traffic volume  : 12144 veh/TimePeriod  *
Medium truck volume :   966 veh/TimePeriod  *
Heavy truck volume  :   690 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: MerivaleNBs
---------------------------------
Angle1   Angle2           : -90.00 deg   -62.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1
House density             :     50 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  50.40 m
Receiver height           :   1.50 m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: MerivaleNBn
----------------------------------
Car traffic volume  : 12144 veh/TimePeriod  *
Medium truck volume :   966 veh/TimePeriod  *
Heavy truck volume  :   690 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: MerivaleNBn
---------------------------------
Angle1   Angle2           : -67.00 deg   83.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1
House density             :     50 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  42.10 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -43.00 deg   Angle2 : 38.00 deg
Barrier height            :  18.29 m
Barrier receiver distance :   6.50 m
Source elevation          :  78.00 m
Receiver elevation        :  78.00 m
Barrier elevation         :  78.00 m
Reference angle           :   0.00


Road data, segment # 3: MerivaleSBs
----------------------------------
Car traffic volume  : 12144 veh/TimePeriod  *
Medium truck volume :   966 veh/TimePeriod  *
Heavy truck volume  :   690 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)
```

```
Data for Segment # 3: MerivaleSBs
---------------------------------
Angle1   Angle2           : -90.00 deg   -60.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1
House density             :     50 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  56.80 m
Receiver height           :   1.50 m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 4: MerivaleSBn
-----------------------------------
Car traffic volume  : 12144 veh/TimePeriod  *
Medium truck volume :   966 veh/TimePeriod  *
Heavy truck volume  :   690 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 4: MerivaleSBn
---------------------------------
Angle1   Angle2           : -64.00 deg   82.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1
House density             :     50 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  48.60 m
Receiver height           :   1.50 m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            : -43.00 deg   Angle2 : 38.00 deg
Barrier height            :  18.29 m
Elevation                 :   0.00 m
Barrier receiver distance :   6.50 m
Source elevation          :  78.00 m
Receiver elevation        :  78.00 m
Barrier elevation         :  78.00 m
Reference angle           :   0.00


Road data, segment # 5: 417EB
-----------------------------
Car traffic volume  : 59370 veh/TimePeriod  *
Medium truck volume :  4723 veh/TimePeriod  *
Heavy truck volume  :  3373 veh/TimePeriod  *
Posted speed limit  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 5: 417EB
---------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      7
House density             :     50 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 500.00 m
Receiver height           :   1.50 m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            : -71.00 deg   Angle2 : 10.00 deg
Barrier height            :  18.29 m
Elevation                 :   0.00 m
Barrier receiver distance :   5.60 m
```

```
Source elevation          :  78.00 m
Receiver elevation        :  78.00 m
Barrier elevation         :  78.00 m
Reference angle           :   0.00
```

Result summary

	source height (m)	Road Leq (dBA)	Total Leq (dBA)
1.MerivaleNBs	1.50	44.62	44.62
2.MerivaleNBn	1.50	52.42	52.42
3.MerivaleSBs	1.50	44.27	44.27
4.MerivaleSBn	1.50	51.25	51.25
5.417EB	1.50	52.64	52.64
Total			57.38 dBA

TOTAL Leq FROM ALL SOURCES: 57.38

APPENDIX B: DETAILED AIF CALCULATION RESULTS

The following table shows intermediate calculation results for the AIF analysis. The calculations were completed per BRN148 (Reference 6). Worst-case noise sensitive indoor locations were considered, factoring in façade noise levels, indoor noise level limits, floor areas, façade component areas, and the number of façade components. Table 6 from BRN148 is reproduced on the following page, with the construction details of NRC exterior wall type EW2 highlighted.

Table B.1: Intermediate AIF Calculation Results

Indoor Location	Road Noise				N (1)	Average AIF Needed	Floor Area (m^2)	Components				
	Indoor Limit		Facade Level					Type (2)	Area (m^2)	AR (3)	Actual Performance	
	Day	Night	Day	Night							AIF	▲PWL (4)
Unit 402 3rd floor bachelor apartment	45	40	69.94	62.34	4	33	24.7	EW	4.1	16.7	46	-22
								OP-W	1.9	7.7	32	6
								F-W	3.8	15.2	32	6
											Total	-10
Unit 401 4th floor bedroom	45	40	70.51	62.92	3	32	11.0	EW	3.5	31.3	43	-30
								F-W	4.4	39.9	30	20
											Total	-10
Unit 502 5th floor bachelor apartment	45	40	70.51	62.92	3	33	27.9	OP-W	1.9	6.8	35	-12
								F-W	5.8	20.8	33	0
											Total	-12
Unit 501 bachelor apartment	45	40	71.34	63.74	4	34	22.7	EW	6.2	27.2	44	-22
								OP-W	1.9	8.4	34	0
								F-W	6.3	27.9	32	15
											Total	-7
Unit 602 lower bedroom	45	40	64.96	57.36	2	25	19.4	EW	0.5	2.5	46	-45
								F-W	7.1	36.7	28	-25
											Total	-70
Ground floor indoor amenity space	50	n/a	71.98	n/a	2	27	36.0	OP-W	3.7	10.3	31	-30
								F-W	43.1	119.6	25	29
											Total	-1

Notes:
(1) N refers to the number of different types of components.
(2) Component Types:
EW = Exterior Wall
OP-W = Operable Window (including glass balcony doors)
F-W = Fixed Window
(3) AR refers to the ratio of the component area and floor area, expressed as a percentage value.
(4) ▲PWL refers to the change in transmitted sound power for the specified component, compared to a component with an AIF rating equal to the average required level. The room total value is provided, and must be less than or equal to 0 to meet the indoor sound level limit.

TABLE 6: ACOUSTIC INSULATION FACTOR FOR VARIOUS TYPES OF EXTERIOR WALL

	Percentage of exterior wall area to total floor area of room										Type of Exterior Wall
	16	20	25	32	40	50	63	80	100	125	160	
	45	44	43	42	41	40	39	38	37	36	35	EW1
	46	45	44	43	42	41	40	39	38	37	36	EW2
	47	46	45	44	43	42	41	40	39	38	37	EW3
	48	47	46	45	44	43	42	41	40	39	38	EW4
Acoustic	55	54	53	52	51	50	49	48	47	46	45	EW5 or EW1R
Insulation	56	55	54	53	52	51	50	49	48	47	46	EW2R or EW3R
Factor	57	56	55	54	53	52	51	50	49	48	47	EW4R
	58	57	56	55	54	53	52	51	50	49	48	EW6
	59	58	57	56	55	54	53	52	51	50	49	EW7
	61	60	59	58	57	56	55	54	53	52	51	EW5R
	63	62	61	60	59	58	57	56	55	54	53	EW8 or EW6R
	64	63	62	61	60	59	58	57	56	55	54	EW7R

Note: Where the calculated percentage wall area is not presented as a column heading, the nearest percentage column in the table should be used.

Source: National Research Council, Ottawa, November 1976.

Explanatory Notes:

1) EW1 denotes exterior wall as in Note 2), plus sheathing, plus wood siding or metal siding and fibre backer board.
EW2 denotes exterior wall as in Note 2), plus rigid insulation (25-50 mm), and wood siding or metal siding and fibre backer board.
EW3 denotes simulated mansard with structure as in Note 2), plus sheathing, 38 x 89 mm framing, sheathing, and asphalt roofing material.
EW4 denotes exterior wall as in Note 2), plus sheathing and 20 mm stucco.
EW5 denotes exterior wall as in Note 2), plus sheathing, 25 mm air space, 100 mm brick veneer.
EW6 denotes exterior wall composed of 12.7 mm gypsum board, rigid insulation (25-50 mm), 100 mm back-up block, 100 mm face brick.
EW7 denotes exterior wall composed of 12.7 mm gypsum board, rigid insulation (25-50 mm), 140 mm back-up block, 100 mm face brick.
EW8 denotes exterior wall composed of 12.7 mm gypsum board, rigid insulation (25-50 mm), 200 mm concrete.
2) The common structure of walls EW1 to EW5 is composed of 12.7 mm gypsum board, vapour barrier, 38 x 89 mm studs, and 50 mm (or thicker) mineral wool or glass fibre batts.
3) R signifies the mounting of the interior gypsum board on resilient clips.
4) An exterior wall conforming to rainscreen design principles and composed of 12.7 mm gypsum board, 100 mm concrete block, rigid insulation (25-50 mm), 25 mm air space, and 100 mm brick veneer has the same AIF as EW5.
5) An exterior wall described in EW1 with the addition of rigid insulation (25-50 mm) between the sheathing and the external finish has the same AIF as EW3.

APPENDIX C: STATIONARY SOURCE NOISE DATA

Relevant emails regarding the AAON HVAC units are included below.

Email #1: confirms that condensing sections of the AAON units do not operate at night.

Subject:
Re: [External Sender] Re: Rooftop equipment details for 917 Merviale Noise Study - Nighttime noise
From:
Alex Zurawlev <alex.zurawlev@ocdsb.ca>
Date:
18/03/2024, 11:06 a.m.
To:
Pier-Gui Lalonde <pier-gui@integraldxengineering.ca>
CC:
Chris Hennessey <chris.hennessey@ocdsb.ca>, Greg Clunis <greg@integraldxengineering.ca>

Pier-Gui
Good Morning
Compressors are lock out and do not come on between 10 PM and 7 AM
Regards
Alex

On Mon, Mar 18, 2024 at 9:53 AM Pier-Gui Lalonde <pier-gui@integraldxengineering.ca> wrote:

> Hi Chris,
>
> This is to follow-up on my question below - can you provide comment on nighttime condenser use of these units?
>
> Many thanks,
> Pier-Gui

Email #2: noise data for AAON units

The attachment is included following, with markups showing the noise data used.

Subject:
Re: Outdoor noise data for installed AAON RN rooftop units
From:
Graham Falt <graham.falt@totalhvac.com>
Date:
07/03/2024, 11:30 a.m.
To:
Total HVAC Parts <parts@totalhvac.com>
CC:
Pier-Gui Lalonde <pier-gui@integraldxengineering.ca>, Greg Clunis <greg@integraldxengineering.ca>

Good morning,

Please see attached which shows radiated sound power data for AAON RN units. We won't be able to find published data for the older RN-018, you can use attached as a ballpark.

AAON Standard Condenser Fan Radiated Sound Levels

Updated 10/26/2018

		Fans	Dia	RPM	Sound Power Level 63	125	250	500	1000	2000	4000	8000	LwA	Sound Pressure Level in a Hemispherical Free Field (Dist (ft) 15) 63	125	250	500	1000	2000	4000	8000	dBA
RQ 2 & 3 Ton	Inlet	1	30	850	79	74	72	70	66	62	59	59	72	58	53	51	48	44	41	38	38	50
	Outlet				81	77	71	71	67	62	59	58	73	60	56	49	50	46	41	38	37	51
	Total				83	79	74	73	69	65	62	61	75	62	58	53	52	48	44	41	40	54
RQ 4-6 Ton & RN 6 & 7 Ton	Inlet	1	30	1085	85	79	77	75	71	68	65	64	77	63	58	56	54	50	46	44	43	56
	Outlet				86	83	76	76	72	68	65	63	78	65	62	55	55	51	46	44	42	57
	Total				89	84	80	79	75	71	68	67	80	67	63	58	57	53	49	47	46	59
RN 8 & 10 Ton	Inlet	1	30	1085	92	86	85	82	78	75	72	71	84	71	65	63	61	57	54	51	50	63
	Outlet				94	90	83	83	79	75	72	71	85	72	69	62	62	58	54	51	49	64
	Total				96	91	87	86	82	78	75	74	88	75	70	66	65	60	57	54	53	66
RN 09 & 11 Ton	Inlet	2	30	1085	88	82	80	78	74	71	68	67	80	66	61	59	57	53	49	47	46	59
	Outlet				89	86	79	79	75	71	68	66	81	68	65	58	58	54	49	47	45	60
	Total				92	87	83	82	78	74	71	70	83	70	66	61	60	56	52	50	49	62
RN 13-20 Ton	Inlet	2	30	1085	95	89	88	85	81	78	75	74	87	74	68	66	64	60	57	54	53	66
	Outlet				97	93	86	86	82	78	75	74	88	75	72	65	65	61	57	54	52	67
	Total				99	94	90	89	85	81	78	77	91	78	73	69	68	63	60	57	56	69
	Inlet				97	91	90	89	85	82	79	78	90	78	72	70	68	64	62	59	58	69

Let me know if you need anything else.

TOTAL HVAC
ESTABLISHED 1996

Graham Falt
LEAD INSIDE SALES / PROJECT MANAGER
613-723-4611 X 103 | 613-203-6854
graham.falt@totalhvac.com
4-1050 Baxter Rd, Ottawa ON K2C 3P1
www.totalhvac.com
Find me on LinkedIn!

AAON Standard Condenser Fan Radiated Sound Levels

AAON HVAC Units - Sound Power Data

Updated 10/26/2018

Source: RN08.CondIn

Source: RN08.Fan

Source: RN018.CondIn

Sources: RN018.Fan1, RN018.Fan2
-3 dB per band applied to each fan noise source, for equal total sound power.

					Sound Power Level									Sound Pressure Level in a Hemispherical Free Field, Dist (ft) 15								
		Fans	Dia	RPM	63	125	250	500	1000	2000	4000	8000	LwA	63	125	250	500	1000	2000	4000	8000	dBA
RQ 2 & 3 Ton	Inlet	1	30	850	79	74	72	70	66	62	59	59	72	58	53	51	48	44	41	38	38	50
	Outlet				81	77	71	71	67	62	59	58	73	60	56	49	50	46	41	38	37	51
	Total				83	79	74	73	69	65	62	61	75	62	58	53	52	48	44	41	40	54
RQ 4-6 Ton & RN 6 & 7 Ton	Inlet	1	30	1085	85	79	77	*75*	*71*	*68*	*65*	*64*	77	63	58	56	54	50	46	44	43	56
	Outlet				86	83	76	*76*	*72*	*68*	*65*	*63*	78	65	62	55	55	51	46	44	42	57
	Total				89	84	80	79	75	71	68	67	80	67	63	58	57	53	49	47	46	59
RN 8 & 10 Ton	Inlet	1	30	1085	92	86	85	82	78	75	72	71	84	71	65	63	61	57	54	51	50	63
	Outlet				94	90	83	83	79	75	72	71	85	72	69	62	62	58	54	51	49	64
	Total				96	91	87	86	82	78	75	74	88	75	70	66	65	60	57	54	53	66
RN 09 & 11 Ton	Inlet	2	30	1085	88	82	80	78	74	71	68	67	80	66	61	58	56	52	50	49	48	59
	Outlet				89	86	79	79	75	71	68	66	81	68	65	58	58	54	49	47	45	60
	Total				92	87	83	82	78	74	71	70	83	70	66	61	60	56	52	50	49	62
RN 13-20 Ton	Inlet	2	30	1085	95	89	88	85	81	78	75	74	87	74	68	66	64	60	57	54	53	66
	Outlet				97	93	86	86	82	78	75	74	88	75	72	65	65	61	57	54	52	67
	Total				99	94	90	89	85	81	78	77	91	78	73	69	68	63	60	57	56	69
RN 25 & 30 Ton	Inlet	3	30	1085	97	91	89	87	83	80	77	76	89	75	70	68	66	62	58	55	55	68
	Outlet				98	95	88	88	84	80	77	75	90	77	73	67	67	63	58	55	54	69
	Total				101	96	92	91	86	83	80	79	92									
RN 26,31 & 40 Ton	Inlet	4	30	1085	98	92	91	88	84	81	78	77	90									
	Outlet				100	96	89	89	85	81	78	77	91									
	Total				102	98	93	92	88	84	81	80	94									
RN 50,60 & 70 Ton	Inlet	6	30	1085	100	94	92	90	86	83	80	79	92									
	Outlet				101	98	91	91	87	83	80	78	93	80	76	70	70	66	61	58	57	72
	Total				104	99	95	94	89	86	83	82	95	82	78	73	72	68	64	61	60	74
RN E 55,65 & 75 Ton LN & LZ 45-60 Ton RZ 45-75	Inlet	4	30	1170	92	86	87	87	86	85	85	78	92	71	65	66	66	65	64	64	57	71
	Outlet				92	86	87	87	86	85	85	78	92	71	65	66	66	65	64	64	57	71
	Total				95	89	90	90	89	88	88	81	95	74	68	69	69	68	67	67	60	74
RN E 90-140 Ton LN & LZ 75-140 Ton RZ 90-140	Inlet	8	30	1170	95	89	90	90	89	88	88	81	95	74	68	69	69	68	67	67	60	74
	Outlet				95	89	90	90	89	88	88	81	95	74	68	69	69	68	67	67	60	74
	Total				98	92	93	93	92	91	91	84	98	77	71	72	72	71	70	70	63	77
RZ 145-180	Inlet	12	30	1170	97	91	92	92	91	90	90	83	97	76	70	71	71	70	69	69	62	76
	Outlet				97	91	92	92	91	90	90	83	97	76	70	71	71	70	69	69	62	76
	Total				100	94	95	95	94	93	93	86	100	79	73	74	74	73	72	72	65	79
RZ 200-240	Inlet	16	30	1170	98	92	93	93	92	91	91	84	98	77	71	72	72	71	70	70	63	77
	Outlet				98	92	93	93	92	91	91	84	98	77	71	72	72	71	70	70	63	77
	Total				101	95	96	96	95	94	94	87	101	80	74	75	75	74	73	73	66	80

Tested in Accordance with AMCA 300 - Updated 6-15-15

Goodman
Air Conditioning & Heating

Goodman AC Unit - Representative Unit

GSXV9

High-Efficiency, Variable-Speed, Inverter Driven Split System Air Conditioner Up TO 22.5 SEER2 2 TO 5 Tons

Contents

ComfortBridge™ technology

CoolCloud™

COMFORT SPEED™

Standard Features

- Variable-speed swing and scroll compressors
- High-density compressor sound blanket
- Integrated communicating ComfortBridge™ Technology
- Commissioning and diagnostics via indoor board Bluetooth with the CoolCloud™ phone and tablet application
- Variable-speed DC outdoor fan motor
- Control algorithmic logic
- In communicating mode, only two low-voltage wires to outdoor unit required
- Diagnostic indicator lights, seven-segment LED display, and fault code storage
- Field-selectable boost mode increases compressor speed during unusually high loads
- Field-installed bi-flow filter drier
- Coil and ambient temperature sensors
- AHRI Certified; ETL Listed

Cabinet Features

- Heavy-gauge, galvanized-steel cabinet
- Removable grille-style top design compliant with UL 60335-2-40
- Venturi for increased velocity of airflow
- Baked-on powder-paint finish
- 500-hour salt-spray tested
- Wire fan discharge grille
- Steel louver coil guard
- Top and side maintenance access
- Sweat connection service valves with easy access to gauge ports
- Single-panel access to controls with space provided for field-installed accessories
- When properly anchored, meets the 2020 Florida Building Code unit integrity requirements for hurricane-type winds (Anchor bracket kits available.)

LIFETIME COMPRESSOR LIMITED WARRANTY*

10 YEAR UNIT REPLACEMENT LIMITED WARRANTY*

10 YEAR PARTS LIMITED WARRANTY*

Intertek

AHRI CERTIFIED

COMPANY WITH QUALITY SYSTEM CERTIFIED BY DNV GL ■ ISO 9001 ■

COMPANY WITH ENVIRONMENTAL SYSTEM CERTIFIED BY DNV GL ■ ISO 14001 ■

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ENERGY STAR ASK ABOUT ENERGY STAR

Proper sizing and installation of equipment is critical to achieving optimal performance. Split system air conditioners and heat pumps must be matched with appropriate coil components to meet ENERGY STAR® criteria. Ask your contractor for details or visit www.energystar.gov.

* Complete warranty details available from your local dealer or at www.goodmanmfg.com. To receive the Lifetime Compressor Limited Warranty (good for as long as you own your home), 10-Year Unit Replacement Limited Warranty and 10-Year Parts Limited Warranty, online registration must be completed within 60 days of installation. Online registration is not required in California or Québec.

Tonnage	Speed	Total Unit Sound Rating (dBA)	Octave Band Spectrum Frequency (Hz) Analysis (dB)						
			125	250	500	1000	2000	4000	8000
2-Ton	Maximum	71	61.3	62.8	67.0	63.6	63.3	65.3	57.2
3-Ton	Maximum	74	61.9	64.6	68.9	67.4	69.1	64.6	55.2
4-Ton	Maximum	75	70.3	72.8	71.0	69.0	67.6	68.0	61.5
5-Ton	Maximum	75	71.2	66.5	74.2	69.1	68.4	62.0	53.2

Note: Tested in accordance with AHRI Standard 270.

Noise Source: GM

APPENDIX D: STATIONARY SOURCE POR IMPACT TABLE

Table D.1: Point of Reception Noise Impact

Source ID	SSG			SSE4a			SSE4b			SSE6			SSN5			SSN7		
	D (m)	Sound Level (dBA Leq)		D (m)	Sound Level (dBA Leq)		D (m)	Sound Level (dBA Leq)		D (m)	Sound Level (dBA Leq)		D (m)	Sound Level (dBA Leq)		D (m)	Sound Level (dBA Leq)	
		Day-Evening	Night		Day-Evening	Night		Day-Evening	Night		Day-Evening	Night		Day-Evening	Night		Day-Evening	Night
GM	25.6	39.4	39.4	22.2	32.1	32.1	29.9	22.1	22.1	24.3	32.8	32.8	21.3	40.4	40.4	23.5	39.5	39.5
RN018. CondIn	48.9	23.5		55.6	28.9		49.6	31.7		57.6	35.2		67.4	20.0		65.9	21.4	
RN018. Fan1	48.5	22.9		55.1	28.4		49.2	31.9		57.1	36.6		67.0	18.6		65.4	23.2	
RN018. Fan2	49.8	22.6		56.3	27.9		50.4	31.7		58.3	36.4		68.2	18.4		66.7	23.0	
RN08. CondIn	15.9	33.8		23.3	43.1		24.2	39.8		26.8	42.4		35.7	41.9		34.9	42.1	
RN08. Fan	15.7	40.6		23.0	45.4		23.7	45.6		26.3	45.0		35.5	41.4		34.5	42.4	