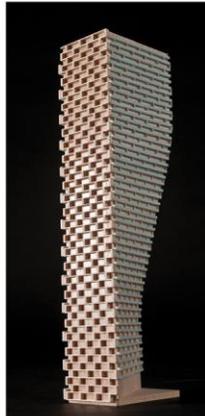


**TRANSPORTATION NOISE
AND VIBRATION
ASSESSMENT**

31-33 George Street
Brampton, Ontario

REPORT: GWE20-276-Noise



May 9, 2022

PREPARED FOR

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&

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EXECUTIVE SUMMARY

This report describes a transportation noise assessment performed for a proposed development located at 31-33 George Street in Brampton, Ontario. The development comprises of two towers with a shared podium of irregular planform. The major sources of transportation noise are the GO / CN rail line, and the roadways surrounding the development. 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) requirements; (ii) future vehicular traffic volumes based on roadway classification and train information obtained from GO Transit; and (iii) architectural drawings provided by Sweeney & Co Architects in April 2022.

The results of the current analysis indicate that noise levels will range between 58 and 70 dBA during the daytime period (07:00-23:00) and between 55 and 67 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e., 70 dBA) occur along the west façade of Tower 1, which is nearest and most exposed to the GO/CN railway.

The noise levels predicted due to roadway and railway traffic exceed the criteria listed in Section 4.2 for building components. Upgraded building components, including STC rated glazing elements and exterior walls, will be required where noise levels exceed 65 dBA, as discussed in Section 4.2.1. Typically the required noise attenuation can be achieved using common 25 mm thick insulated glass units, which have a minimum STC rating of 30. Results of the calculations also indicate that the development will require air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will also be required be placed in all Lease, Purchase and Sale Agreements.

Noise levels at some of the rooftop terraces are expected to exceed 60 dBA during the daytime period. If this area is to be used as an outdoor living area, noise control measures are required to reduce the L_{eq} to 60 dBA or below. It was found that a 2 m noise barrier at the perimeter of the OLA's represented by receptors 9 & 10 will reduce noise levels to acceptable levels. Warning Clauses will also be required in all Lease, Purchase and Sale Agreements



With respect to noise impacts from the buildings on the surroundings and the building itself, noise from HVAC equipment can generally be minimized by judicious selection and placement of the equipment. Locating large pieces of equipment, such as cooling towers, generators, and air handling units, on a high roof, allows the building to shield nearby sensitive areas from noise exposure. Where necessary noise levels can be controlled by adding silencers, acoustic barriers, or noise screens. A stationary noise study should be conducted for the site during the detailed design once mechanical plans for the proposed building become available. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels fall below NPC-300 limits. The surroundings of the proposed development consist of predominantly low rise residential and commercial buildings which will coincide with insignificant sources of stationary noise.

Since the distance between the property line of the proposed development and the nearest railway track is greater than 75 m, vibrations induced by railway traffic does not need to be considered as per the railway guidelines ¹and is not expected to create noticeable vibrations in the proposed development.

¹ Guidelines for New Development in Proximity to Railway Operations, J.E. Coulter Associates LTD, May 2013.



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1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Greenwin Corporation to undertake a transportation noise assessment in support of a Site Plan Application (SPA) for the proposed development at 31-33 George Street in Brampton, Ontario. This report summarizes the methodology, results, and recommendations related to a transportation noise assessment investigating exterior noise generated by local roadway and railway traffic.

The assessment was performed based on theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP) NPC-300 guidelines. Noise calculations were based on architectural drawings received from Sweeney & Co Architects in April 2022, with future traffic volumes corresponding to projected roadway traffic counts based on roadway classification and railway traffic volumes corresponding to data received from GO Transit and CN.

2. TERMS OF REFERENCE

The focus of this transportation noise assessment comprises a 42-storey (Tower 1) and 37-storey (Tower 2) building connected by an 'L' shaped 1 storey podium. Tower 1 rises from the podium and sets back from the north at the 8th and 10th level to provide space for an outdoor amenity and a green roof, respectively. Tower 2 rises from the podium and sets back from the 6th and 9th level to provide room for an outdoor amenity and green roof, respectively. There are also private terraces located on Tower 1 & 2, however, terraces with a depth less than 4 m do not need to be considered as an OLA. The site includes one level of below-grade parking, as well as parking, a retail space, and hotel lobby to the north at level 0, additional retail and hotel spaces at level 1, and four levels of above-grade parking. To the south of the site at grade is an atrium connected to a heritage building, a residential lobby and residential units. The site also contains indoor amenities at level five, a terrace at level 6 & 10, and hotel units from levels five to 10. The remaining levels contain residential units. The proposal is based on drawings provided by Grepault Development Ltd, in February 2022.

The site is surrounded by low-to-mid rise commercial and residential buildings. The major sources of transportation noise are the GO/CN railway to the north and George Street North, Nelson Street West, Queen Street West, and Elizabeth Street North. Since the railway is greater than 75m from the property line of the proposed building, vibration caused by train traffic does not have to be considered as per railway



guidelines ²and vibrations levels at the building will be negligible at this setback distance. Any arterial or collector roadways greater than 100m from the proposed development are not included in the analysis as per NPC-300.

3. OBJECTIVES

The main goals of this work are to (i) calculate the future noise levels on the study buildings produced by local transportation sources, and (ii) determine whether exterior noise and vibration levels exceed the allowable limits specified by the MECP Noise Control Guidelines – NPC-300 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 (2×10^{-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 Transportation Noise

4.2.1 Criteria for Transportation Noise

For vehicle traffic, the equivalent sound energy level, L_{EQ} , provides a measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a period of time. For roadways, the L_{EQ} is commonly calculated on the basis of a 16-hour (L_{EQ16}) daytime (07:00-23:00)/8-hour (L_{EQ8}) nighttime

² Guidelines for New Development in Proximity to Railway Operations, J.E. Coulter Associates LTD, May 2013.



(23:00-07:00) split to assess its impact on residential buildings. The NPC-300 guidelines specify that the recommended indoor noise limit range (that is relevant to this study) is 50, 45 and 40 dBA for office space, residence living rooms and sleeping quarters respectively, as listed in Table 1. However, to account for deficiencies in building construction and to control peak noise, these levels should be targeted toward 47, 42 and 37 dBA. Indoor noise levels due to railway traffic are 5 dB lower.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD & RAIL)³

Type of Space	Time Period	L _{eq} (dBA)	
		Road	Rail
General offices, reception areas, retail stores, etc.	07:00 – 23:00	50	45
Living/dining/den areas of residences , hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, individual or semi-private offices, conference rooms, etc.	07:00 – 23:00	45	40
Sleeping quarters of hotels/motels	23:00 – 07:00	45	40
Sleeping quarters of residences , hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40	35

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise while a standard closed window is capable of providing a minimum 20 dBA noise reduction⁴. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation for the building should consider the need for having windows and doors closed, which normally triggers the need for central air conditioning (or similar systems). If roadway noise is the dominant noise source, then where noise levels exceed 65 dBA daytime and 60 dBA nighttime, upgraded building components will be required. If railway noise is the dominant noise source, then where noise levels exceed 60 dBA daytime and 55 dBA nighttime, upgraded building components will be required.

³ Adapted from Table C-2, Part C, Section 3.2.3 of NPC-300

⁴ Burberry, P.B. (2014). Mitchell’s Environment and Services. Routledge, Page 125



The sound level criterion for outdoor living areas (OLA) is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA, mitigation should be provided to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion. When noise levels at the OLA exceed 60 dBA, mitigation is required to reduce noise levels to 60 dBA or lower.

4.2.2 Roadway and Railway Traffic Volumes

NPC-300 dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes have been considered for the mature state of development based on roadway classification and train information obtained from GO Transit⁵ and CN. Table 2 & 3 (below) summarizes the volumes used for each roadway and railway included in this assessment.

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Class	Speed Limit (km/h)	AADT Count
Queen Street West	2-Lane Arterial	50	15,000
George Street North	2-Lane Collector	50	8,000
Nelson Street West	2-Lane Collector	50	8,000
Elizabeth Street North	2-Lane Collector	50	8,000

TABLE 2: RAILWAY TRAFFIC VOLUMES

Train Type	Speed Limit (km/h)	Locomotives Per Train	Cars Per Train	Projected 2032 AADT Count
GO	50	1	12	68/22*
		2	12	44/3*
Freight		4	140	11/8*
Way-Freight		4	25	5/0*
Passenger		2	10	5/0*

* - Daytime/nighttime volumes

⁵ Harrison Rong, Project Coordinator, Metrolinx



4.2.3 Theoretical Transportation Noise Predictions

The impact of transportation noise sources on the development was determined by computer modelling. Transportation noise source modelling is based on the software program *Predictor-Lima* which utilizes the United States Federal Highway Administration’s Traffic Noise Model (TNM) to represent the roadway line sources, and the International Standards Organization (ISO) standard 9613 Parts 1 and 2 to represent railway line sources. This computer program can represent three-dimensional surfaces and first reflections of sound waves over a suitable spectrum for human hearing. The TNM analysis model has been recognised by the Ministry of Transportation Ontario (MTO) as the recommended noise model for transportation projects (ref. Environmental Guide for Noise, dated February 2022⁶). The Ministry of Environment, Conservation and Parks has also adopted the TMN model as per their “Draft Guideline Noise Pollution Control Publications 306 (NPC-306)⁷”.

Roadway and railway traffic noise calculations were performed by treating each roadway and railway segment as a separate line source of noise, and by using existing building locations as noise barriers. The same process was carried out for calculation railway noise. The impact from roadway and railway noise is then combined using a logarithmic addition at each point of reception and compared to the relevant criteria. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- The day/night split for all roadway traffic was taken as 90%/10%, respectively.
- Truck traffic on all roadways was taken to comprise a conservative 5% heavy trucks and 7% medium trucks.
- Absorptive intermediate ground surfaces were assumed, except where roads and parking lots existed, which were modelled as reflective.
- Surrounding buildings were used as noise barriers.
- The study site was treated as having gently sloping topography.
- Noise receptors were strategically placed at 11 locations around the study area, as illustrated in Figure 2.

⁶ Ministry of Transportation Ontario, “*Environmental Guide for Noise*”, February 2022

⁷ Ministry of Environment, Conservation and Parks, Ontario, “Methods to determine Sound Levels Due to Road and Rail Traffic”, Draft February 12, 2020



- Whistle events were not considered because there are no level crossings in the area.
- Rail lines were assumed to be welded.
- Railway traffic volumes were predicted for 10 years into the future assuming a growth rate of 2.5%.

5. RESULTS AND DISCUSSION

5.1 Transportation Noise Levels

The results of the roadway noise calculations are summarized in Table 3 below.

TABLE 3: EXTERIOR NOISE LEVELS DUE TO TRANSPORTATION SOURCES

Receptor Number	Plane of Window Receptor Location	Height (m)	Roadway Noise Level (dBA)		Railway Noise Level (dBA)		Total Noise Level (dBA)	
			Day	Night	Day	Night	Day	Night
1	Level 42 – North Façade - POW	139	57	51	65	65	66	65
2	Level 42 – East Façade - POW	139	58	52	59	59	62	60
3	Level 42 – South Façade - POW	139	63	57	62	62	66	63
4	Level 42 – West Façade - POW	139	67	61	66	66	70	67
5	Level 34 – West Façade - POW	125.75	62	55	63	63	66	64
6	Level 34 – North Façade - POW	125.75	54	47	60	60	61	60
7	Level 34 – East Façade - POW	125.75	58	52	51	51	59	55
8	Level 34 – South Façade - POW	125.75	66	59	59	59	67	62
9	Level 11 – Terrace - OLA	41	55	N/A	65	N/A	65	N/A
10	Level 12 – Terrace - OLA	48.5	54	N/A	63	N/A	64	N/A
11	Level 9 – Terrace - OLA	35	58	N/A	46	N/A	58	N/A



The results of the current analysis indicate that noise levels will range between 58 and 70 dBA during the daytime period (07:00-23:00) and between 55 and 67 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e., 70 dBA) occur along the west façade of Tower 1, which is nearest and most exposed to the GO/CN railway.

5.2 Noise Control Measures

The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4.2 for building components. As discussed in Section 4.3, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels). Detailed STC calculations will be required to be completed prior to building permit application for each unit type. The STC requirements for the windows are summarized below for various units within the development (see Figure 3), façades not listed do not require upgraded building components:

Bedroom Windows

- (i) Bedroom windows on the west façades of Tower 1 will require a minimum STC of 38.
- (ii) Bedroom windows on the north and south façades of Tower 1 and the west and south façades of Tower 2 will require a minimum STC of 34.

Living Room Windows

- (i) Living room windows on the west façades of Tower 1 will require a minimum STC of 33.
- (ii) Living room windows on the north and south façades of Tower 1 and the west and south façades of Tower 2 will require a minimum STC of 29.

Retail Windows

- (i) Retail windows on the west façades of Tower 1 will require a minimum STC of 28.
- (ii) Retail windows on the north and south façades of Tower 1 and the west and south façades of Tower 2 will require a minimum STC of 24.



Exterior Walls

- (i) Exterior wall components on the north, south, and west façades will require a minimum STC of 45, which will be achieved with brick cladding or an acoustical equivalent according to NRC test data⁸.

The window STC requirements apply to windows, doors, spandrel panels, curtainwall, and window wall elements. If exterior wall components, such as stud walls, on these façades are used, it is recommended they have a minimum STC of 45, where a punch window and wall system is used. A review of window supplier literature indicates that the specified STC ratings can be achieved by a variety of window systems having a combination of glass thickness and inter-pane spacing. Several manufacturers and various combinations of window components, such as those proposed, will offer the necessary sound attenuation rating. It is the responsibility of the manufacturer to ensure that the specified window achieves the required STC. This can only be assured by using window configurations that have been certified by laboratory testing. The requirements for STC ratings assume that the remaining components of the building are constructed and installed according to the minimum standards of the Ontario Building Code. The specified STC requirements also apply to swinging and/or sliding patio doors.

The results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will also be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6.

5.3 Barrier Investigation

Noise levels at the OLA exceed 60 dBA during the daytime period. This exceed NPC-300 criteria and noise mitigation measures will be required to bring noise levels to below or equal to 60 dBA. It was found that a 2 m acoustic barrier at the perimeter of the OLA's described by Receptor 9 and a 1.1 m barrier surrounding the OLA described by Receptor 10 will result in noise levels that meet the criteria, as shown in Figure 4 and presented in Table 5. The barrier should be of solid construction, contain no gaps and have a minimum surface density of 20kg/m².

⁸ J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.



TABLE 5: BARRIER INVESTIGATION

Receptor Reference	Height (m)	Location	Daytime Leq Noise Levels (dBA)		
			Without Barrier	1.1 m Barrier	2 m Barrier
R9	32.3	OLA – West Tower –9 th Level	65	62	60
R10	14.2	OLA –Podium – 2 nd Level	64	60	59
R11	28.7	OLA – East Tower – 6 th Level	58	54	49

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 58 and 70 dBA during the daytime period (07:00-23:00) and between 55 and 687 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e., 70 dBA) occur along the west façade of Tower 1, which is nearest and most exposed to the GO/CN railway.

The noise levels predicted due to roadway and railway traffic exceed the criteria listed in Section 4.2 for building components. Upgraded building components, including STC rated glazing elements and exterior walls, will be required where noise levels exceed 60 dBA, as discussed in Section 4.2.1. Specific STC requirements are outlined in Section 5.2. The results also indicate that the development will require air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, the following Warning Clause will be required be placed on all Lease, Purchase and Sale Agreements:

Type D

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



Noise levels at some of the rooftop terraces are expected to exceed 60 dBA during the daytime period. If this area is to be used as an outdoor living area, noise control measures are required to reduce the L_{eq} to 60 dBA or below. An acoustic barrier with a height of 2 m for the OLA described by receptor 9 and 1.1 m for the OLA described by receptor 10 will result in noise levels that meet the criteria. The following Warning Clauses will also be required on all Purchase, Lease, and Sale Agreements.

Type B

“Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment.”

The following Warning Clauses are required as per GO/Metrolinx and CN requirements due to proximity of the proposed building to the railway:

GO/Metrolinx Warning Clause:

“Metrolinx, carrying on business as GO Transit, and its assigns and successors in interest has or have a right-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the rail facilities on such right-of way in the future including the possibility that GO Transit or any railway entering into an agreement with GO Transit to use the right-of-way or their assigns or successors as aforesaid may expand their operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). Metrolinx will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid right-of-way.”

CN Warning Clause:

“Warning: Canadian National Railway Company or its assigns or successors in interest has or have a rights-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the railway facilities on such rights-of-way in the future



including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). CNR will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid rights-of-way."

As discussed in Section 4.3, existing stationary sources are not expected to have a significant impact on the development and transportation sources are expected to dominate the sound field. During detailed design, mechanical equipment on the building should be reviewed by a qualified acoustical consultant.

With respect to noise impacts from the buildings on the surroundings and the building itself, noise from HVAC equipment can generally be minimized by judicious selection and placement of the equipment. Locating large pieces of equipment, such as cooling towers, generators, and air handling units, on a high roof, allows the building to shield nearby sensitive areas from noise exposure. Where necessary noise levels can be controlled by adding silencers, acoustic barriers, or noise screens. A stationary noise study should be conducted for the site during the detailed design once mechanical plans for the proposed building become available. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels fall below NPC-300 limits. The surroundings of the proposed development consist of predominantly low rise residential buildings which will coincide with insignificant sources of stationary noise.

Since the distance between the property line of the proposed development and the nearest railway track is greater than 75 m, vibrations induced by railway traffic does not need to be considered and is not expected to create noticeable vibrations in the proposed development.



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.

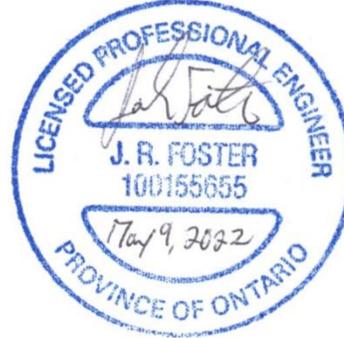
Sincerely,

Gradient Wind Engineering Inc.

p.p. 

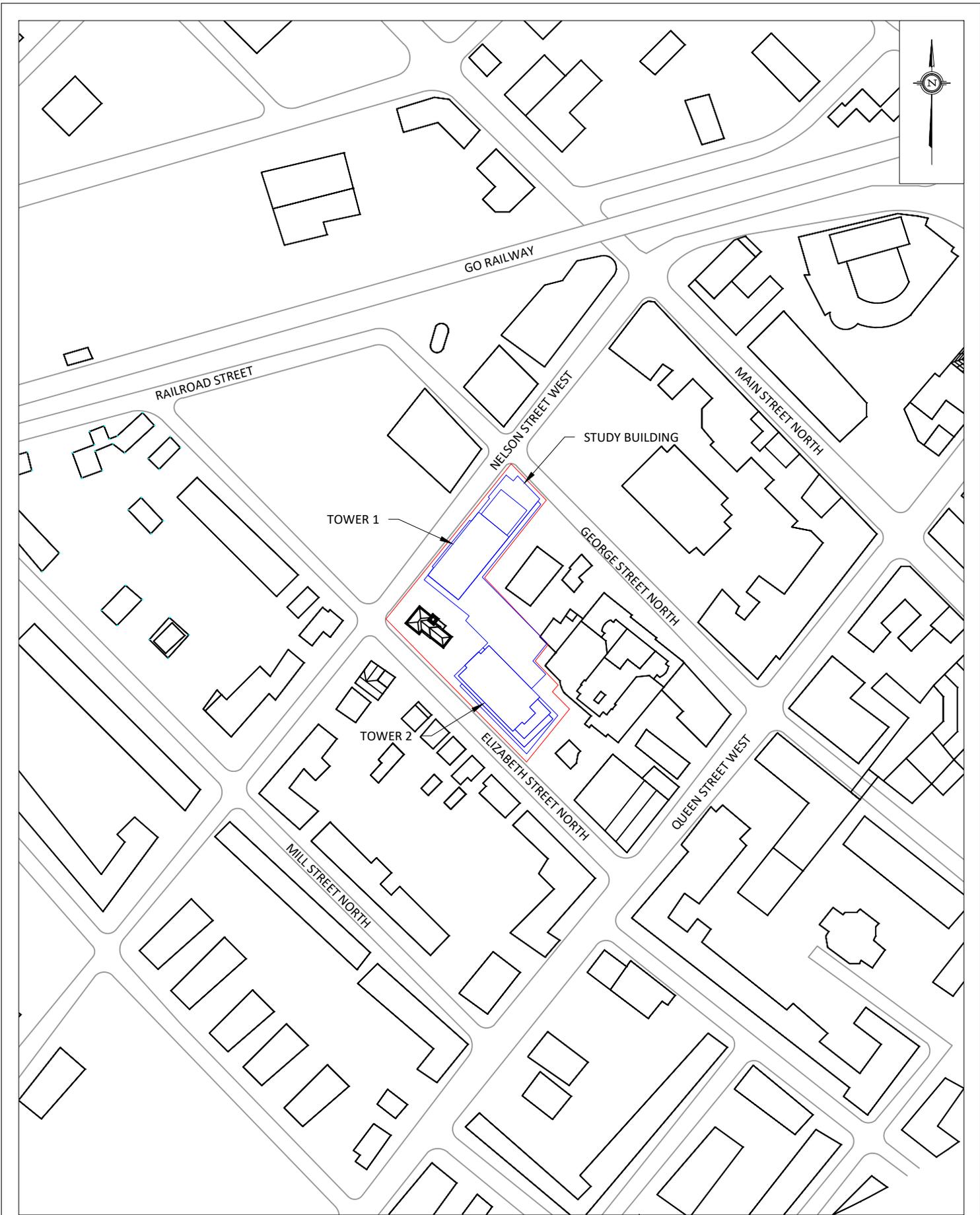
Caleb Alexander
Junior Environmental Scientist

GWE20-276

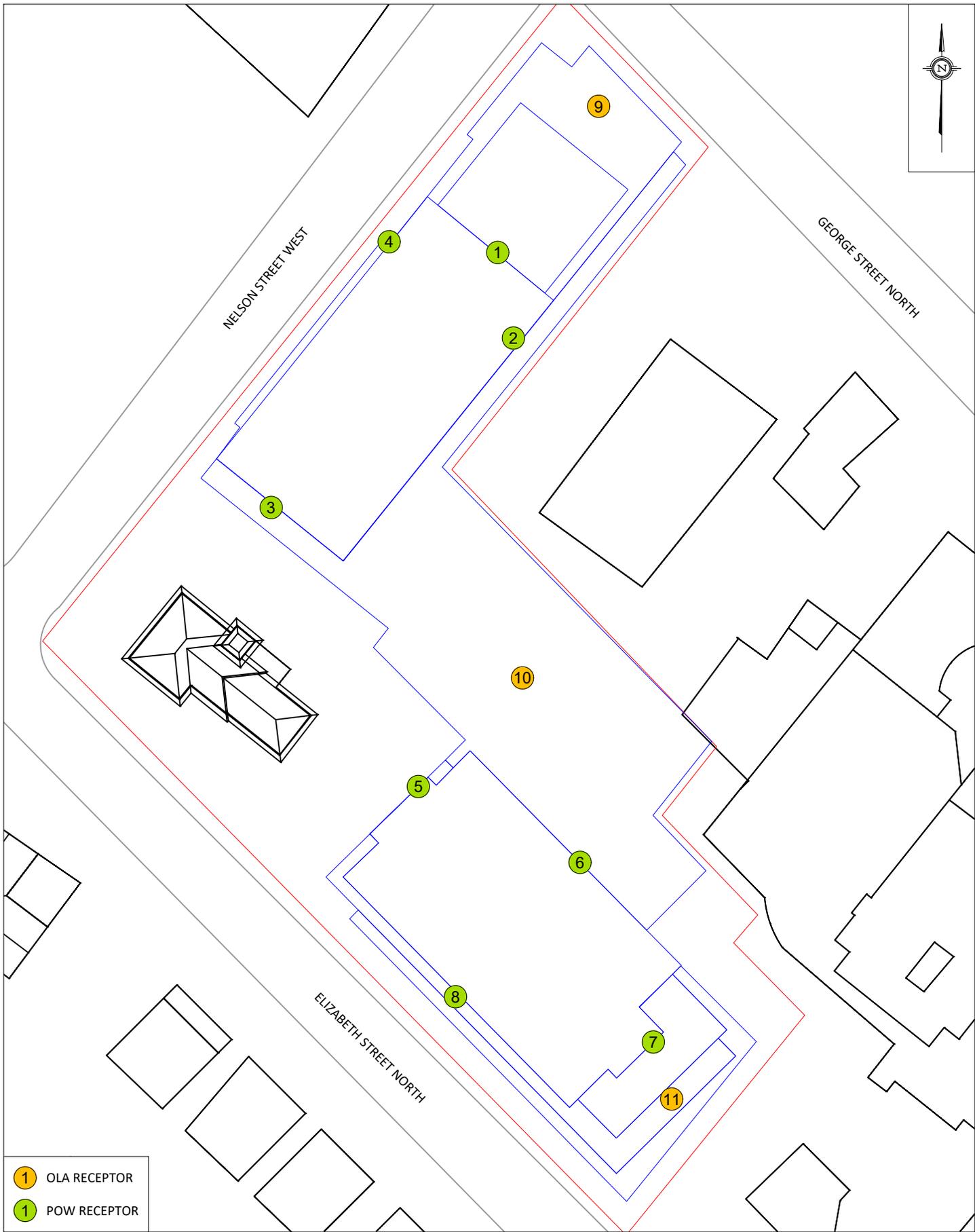


Joshua Foster, P.Eng.
Lead Engineer





PROJECT	31-33 GEORGE STREET NORTH, BRAMPTON TRANSPORTATION NOISE ASSESSMENT	
SCALE	1:3000 (APPROX.)	DRAWING NO. GW20-276-1
DATE	MAR 11, 2022	DRAWN BY C.A.



- 1 OLA RECEPTOR
- 1 POW RECEPTOR

PROJECT	31-33 GEORGE STREET NORTH, BRAMPTON TRANSPORTATION NOISE ASSESSMENT	
SCALE	1:650 (APPROX.)	DRAWING NO. GW20-276-2
DATE	MARCH 11, 2022	DRAWN BY C.A.



NELSON STREET WEST

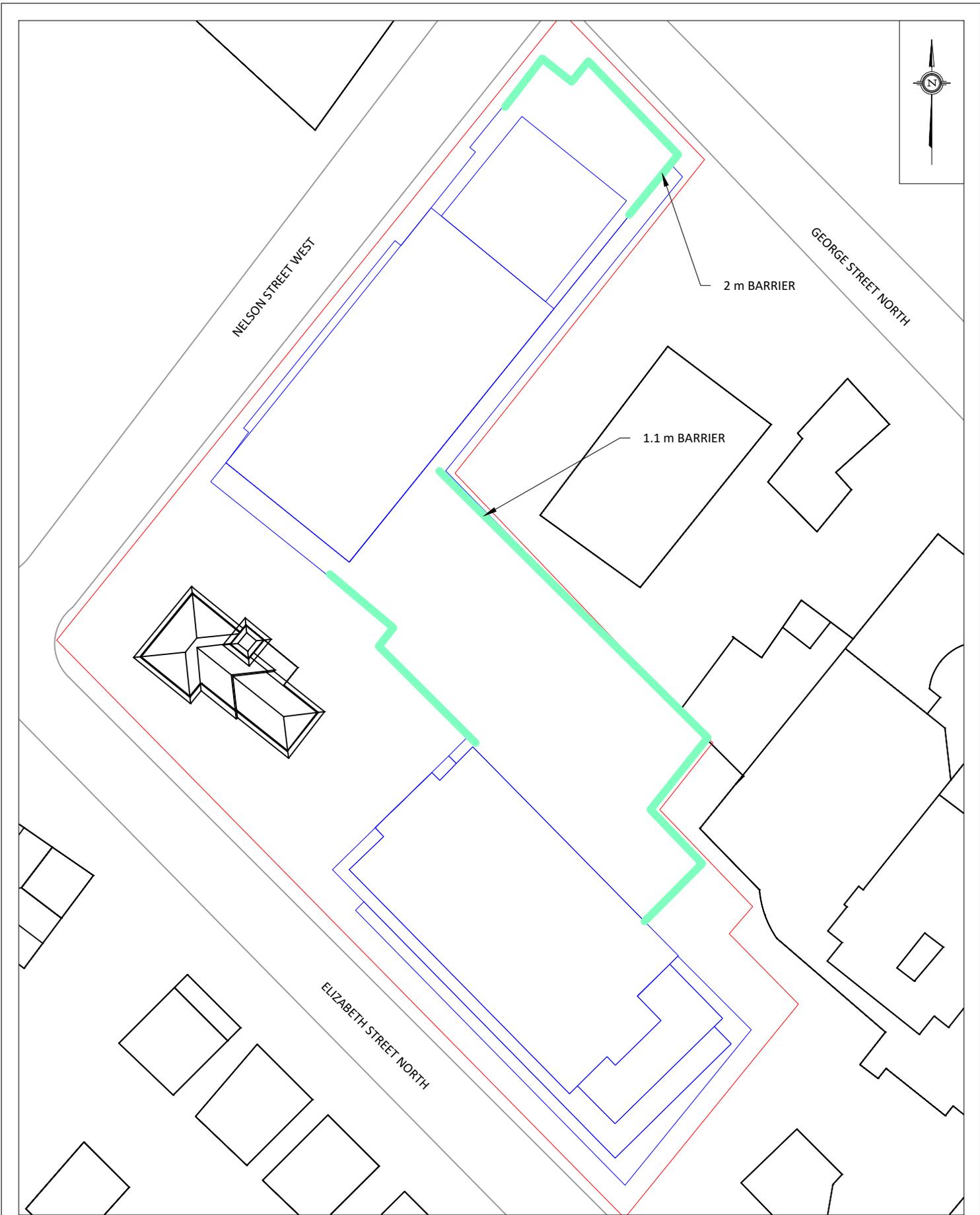
GEORGE STREET NORTH

ELIZABETH STREET NORTH

-  BEDROOM/LIVING ROOM/RETAIL WINDOWS: STC 38/33/28
-  BEDROOM/LIVING ROOM/RETAIL WINDOWS: STC 34/29/24

PROJECT	31-33 GEORGE STREET NORTH, BRAMPTON TRANSPORTATION NOISE ASSESSMENT	
SCALE	1:650 (APPROX.)	DRAWING NO. GW20-276-3
DATE	MARCH 11, 2022	DRAWN BY C.A.

DESCRIPTION	FIGURE 3: UPGRADED BUILDING COMPONENTS
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PROJECT	31-33 GEORGE STREET NORTH, BRAMPTON TRANSPORTATION NOISE ASSESSMENT	
SCALE	1:650 (APPROX.)	DRAWING NO. GW20-276-4
DATE	MARCH 11, 2022	DRAWN BY C.A.

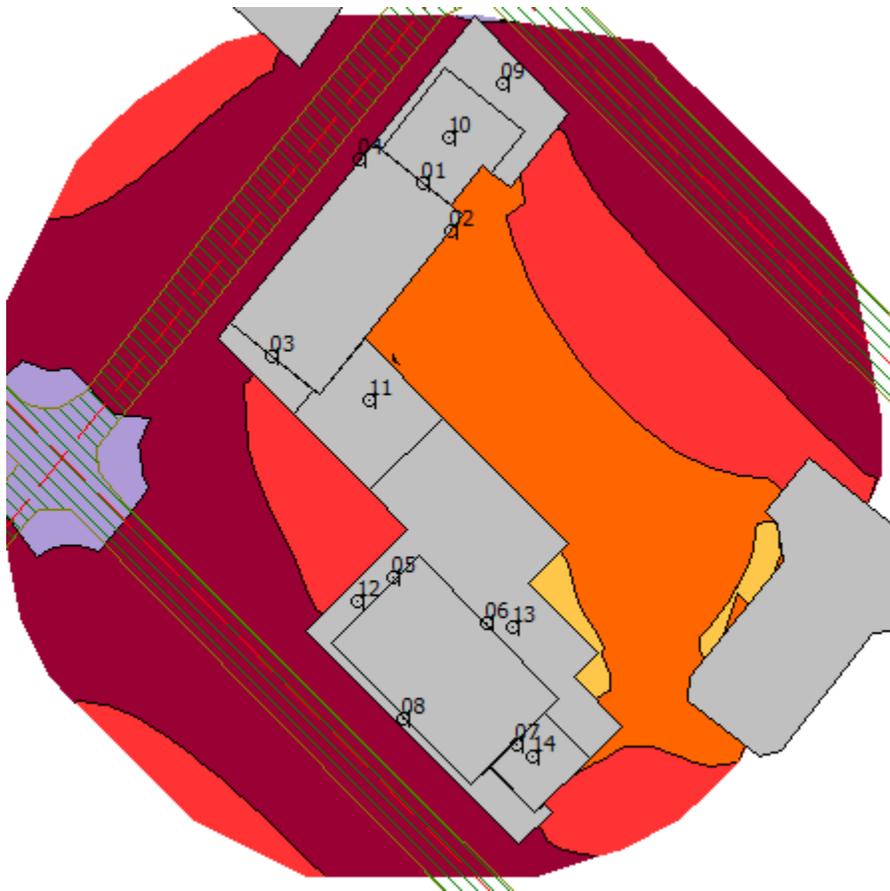
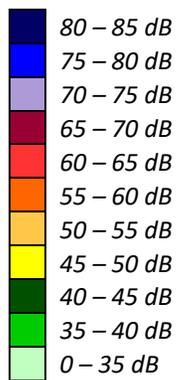


FIGURE 5: DAYTIME NOISE CONTOURS (30 M ABOVE GRADE)



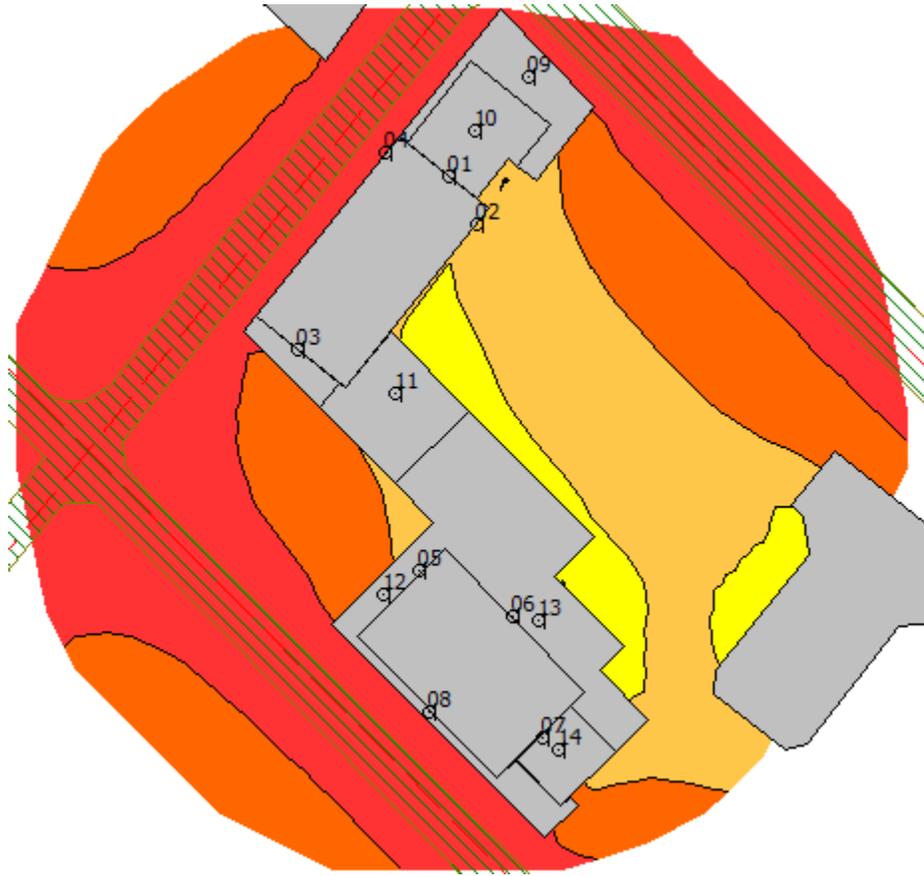


FIGURE 6: NIGHTTIME NOISE CONTOURS (30 M ABOVE GRADE)

