Howe Gastmeier Chapnik Limited
2000 Argentia Road, Plaza One, Suite 203
Mississauga, Ontario, Canada L5N 1P7
t: 905.826.4044

Noise Feasibility Study
Proposed Residential Development
309 – 311 Hawthorn Street
Waterloo, Ontario

Prepared for:

Qing Yuan Investments Ltd.
20 Grove Avenue
Toronto, Ontario
N6J 3B6



Prepared by

Yvonne Lo, MEng, PEng

Reviewed by

Sheeba Paul, MEng, PEng

August 19, 2024

HGC Engineering Project No.: 02400560

VERSION CONTROL

Noise Feasibility Study,

309 – 311 Hawthorn Street,

Waterloo, Ontario.

Ver.	Date	Version Description / Changelog	Prepared By
0	August 19, 2024	Noise Feasibility Study prepared as part of the planning and approvals process.	Y.Lo/S.Paul

Limitations

This document was prepared solely for the addressed party and titled project or named part thereof, and should not be relied upon or used for any other project without obtaining prior written authorization from HGC Engineering. HGC Engineering accepts no responsibility or liability for any consequence of this document being used for a purpose other than for which it was commissioned. Any person or party using or relying on the document for such other purpose agrees, and will by such use or reliance be taken to confirm their agreement to indemnify HGC Engineering for all loss or damage resulting therefrom. HGC Engineering accepts no responsibility or liability for this document to any person or party other than the party by whom it was commissioned.

Any conclusions and/or recommendations herein reflect the judgment of HGC Engineering based on information available at the time of preparation, and were developed in good faith on information provided by others, as noted in the report, which has been assumed to be factual and accurate. Changed conditions or information occurring or becoming known after the date of this report could affect the results and conclusions presented.

Table of Contents

1 Introduction and Summary 1
2 Site Description and Sources of Sound 2
3 Sound Level Criteria 2
3.1 Road Traffic Noise Criteria 2
4 Traffic Noise Predictions 4
4.1 Road Traffic Data 4
4.2 Road Traffic Noise Predictions 4
4.3 Recommendations for Road Traffic Noise 5
4.3.1 Outdoor Living Areas 5
4.3.2 Indoor Living Areas and Ventilation Requirements 5
4.3.3 Building Façade Constructions 5
5 Warning Clauses 6
6 Stationary Noise Assessment 6
6.1 Description of Noise Sources 6
6.2 Criteria Governing Stationary Noise Sources 6
6.3 Stationary Noise Source Analysis 7
6.4 Predicted Sound Levels at Existing Noise Sensitive Receptors 9
6.5 Predicted Sound Levels at Proposed Noise Sensitive Receptors 9
7 Impact of the Development on Itself 10
8 Summary of Recommendations 11
8.1 Implementation 12
9 CONCLUSIONS 13

Figure 1: Key Plan
Figure 2a: Proposed Site Plan Showing Prediction Locations
Figure 2b: Proposed Penthouse Plan Showing Prediction Locations
Figure 3a: Proposed Stationary Noise Source Locations
Figure 3b: Existing Stationary Noise Source Locations
Figure 4a/4b: Predicted Maximum Daytime/Nighttime Sound Levels from Proposed Stationary Noise Sources, dBA (Without Mitigation)
Figure 5a/5b: Predicted Maximum Nighttime Sound Levels from Existing Stationary Noise Sources, dBA (Without Mitigation)

Appendix A: Road Traffic Data
Appendix B: Sample STAMSON 5.04 Output
Appendix C: Cadna Output
Appendix D: Consultant Declaration

1 Introduction and Summary

HGC Engineering was retained by Qing Yuan Investments Ltd. to conduct a noise feasibility study for a residential development to be located north of Hickory Street, on the west side of Hawthorn Street, in Waterloo, Ontario. The site is proposed to include one 6-storey residential building with one basement level. This study is required by the Regional Municipality of Waterloo (RMOW) as part of the planning and approvals process.

The primary sources of transportation noise are road traffic on Hickory Street. Forecasted traffic data obtained from the RMOW personnel was used to predict future sound levels at the residential facades and outdoor amenity area. The predicted sound levels were compared to the guidelines of the Ministry of the Environment, Conservation and Parks (MECP) and the Region.

The sound level predictions indicate that future road traffic sound levels will exceed MECP guidelines at the façades of the proposed building. There are no specific acoustic recommendations for the development and noise warning clauses will not be required. Any building construction meeting the minimum requirements of the Ontario Building Code (OBC) will provide adequate sound insulation for the proposed building.

An analysis was also conducted to determine the potential noise impact of the stationary noise sources associated with the proposed building on existing sensitive uses as well as the impact of existing noise sources on the proposed building and the impact of the building on itself. The analysis is based on a review of the latest site plan, site visits and experience with similar past projects in the absence of mechanical information at this time.

A computer model of the building was created using acoustic modelling software in order to predict the sound levels from proposed rooftop mechanical equipment at the closest façades of the existing and proposed sensitive uses. The results indicate that sound emissions from the assumed rooftop noise sources and existing noise sources are expected to be within MECP limits at the existing and proposed sensitive uses and physical mitigation measures are not required. The impact of the development on itself is also within the noise guidelines as long as the mechanical equipment including louvres are located on the other side of the proposed rooftop amenity area. When further details of the roof plans and mechanical equipment selections are available, an acoustical engineer

should verify that the source sound level specifications and locations for the HVAC units conform to the assumptions made in this report and that acceptable sound levels will result at all offsite residential receptors and at the proposed rooftop OLA.

2 Site Description and Sources of Sound

A key plan showing the location of the proposed residential development is attached as Figure 1. The subject site is located north of Hickory Street, on the west side of Hawthorn Street, in Waterloo, Ontario. A site plan dated April 9, 2024, prepared by Z Square Consulting Inc. is included as Figure 2. The development will consist of a 6-storey residential building with one basement level.

A site visit was conducted by HGC Engineering personnel in June 2024 to make observations of the acoustic environment and to identify the significant noise sources in the vicinity. The primary source of transportation noise is road traffic on Hickory Street. The subject site is currently occupied by two existing dwelling units which will be demolished to make way for the proposed development. There are existing residential uses in the surrounding area. There are existing institutional uses to the further northwest and south (Wilfred Laurier University and Waterloo Collegiate Institute). There are no significant sources of stationary noise within 500 m of the subject site.

3 Sound Level Criteria

3.1 Road Traffic Noise Criteria

Guidelines for acceptable levels of road traffic noise impacting residential developments are given in the MECP publication NPC-300 “Environment Noise Guideline Stationery and Transportation sources – Approval and Planning”, release date October 21, 2013, and are listed in Table I below. The Regional Municipality of Waterloo Noise Policy Implementation Guideline was also referenced. The values in Table I are energy equivalent (average) sound levels [L_{EQ}] in units of A-weighted decibels [dBA].

Table I: Road Traffic Noise Criteria (dBA)

Area	Daytime L_{EQ} (16 hour) Road	Nighttime L_{EQ} (8 hour) Road
Outdoor Living Areas	55 dBA	--
Inside Living/Dining Rooms	45 dBA	45 dBA
Inside Bedrooms	45 dBA	40 dBA

The MECP and Regional Municipality of Waterloo (RMOW) guidelines allow the sound level in an OLA to be exceeded by up to 5 dBA, without mitigation, if warning clauses are placed in the purchase and rental agreements to the property. Where OLA sound levels exceed 60 dBA, physical mitigation is required to reduce the OLA sound level to below 60 dBA and as close to 55 dBA as technically, economically and administratively feasible. Note that not all OLA's necessarily require protection, if there are other protected outdoor areas accessible to the residents.

The target sound level in an OLA is 55 dBA. The guidelines in the MECP publication allow the sound level in an OLA to be exceeded by up to 5 dBA, without mitigation, if warning clauses are placed in property and rental agreements. Where OLA sound levels exceed 60 dBA, physical mitigation is required to reduce the OLA sound level to 55 dBA. Where mitigation is not technically, economically and administratively feasible, a minor excess above 55 dBA is acceptable with the use of a noise warning clause with some justification.

MECP and RMOW guidelines require central air conditioning or other ventilation system to be installed prior to occupancy as an alternative means of ventilation to open windows for dwellings where nighttime sound levels outside bedroom or living/dining room windows exceed 60 dBA or daytime sound levels outside bedroom or living/dining room windows exceed 65 dBA. If the sound level in the plane of a bedroom or living/dining room window is greater than 55 dBA and less than or equal to 65 dBA, the dwelling should be designed with a provision for the installation of central air conditioning in the future, at the occupant's discretion. Building components such as walls, windows and doors must be designed to achieve indoor sound level criteria when the plane of window nighttime sound level is greater than 60 dBA or the daytime sound level is greater than 65 dBA due to road traffic noise.

Building components such as walls, windows and doors must be designed to achieve indoor sound level criteria when the plane of window nighttime sound level is greater than 60 dBA or the daytime

sound level is greater than 65 dBA due to road traffic noise.

Warning clauses to notify future residents of possible noise excesses are also required when nighttime sound levels exceed 50 dBA at the plane of the bedroom or living/dining room window, or daytime sound levels exceed 55 dBA in the outdoor living area and at the plane of the bedroom or living/dining room window due to road traffic.

4 Traffic Noise Predictions

4.1 Road Traffic Data

Road traffic data for Hickory Street were obtained from the RMOW in the form of forecasted traffic counts and is provided in Appendix A. The data is valid until December 31, 2025. A speed limit of 50 km/h and a regional day/night split of 90%/10% was applied for all roads. Commercial vehicle percentages for each road were also provided and included in the analysis.

Table II below summarizes the road traffic data used in the analysis. Road traffic information is included in Appendix A.

Table II: Forecasted Road Traffic Data

Road Name		Cars	Medium Trucks	Heavy Trucks	Total
Hickory Street	Daytime	3 793	39	39	3 870
	Nighttime	421	4	4	430
	Total	**4 214**	**43**	**43**	**4 300**

4.2 Road Traffic Noise Predictions

To assess the levels of road traffic noise which will impact the site in the future, predictions were made using STAMSON version 5.04, a computer algorithm developed by the MECP. STAMSON outputs are included in Appendix B.

Predictions of the traffic sound levels were made at the top-storey building façades and in the outdoor amenity area. Prediction locations are indicated in Figures 2a and 2b. The results of the predicted sound levels at the proposed building are summarized in Table III.

Table III: Predicted Future Traffic Sound Levels Without Mitigation, [dBA]

Prediction Location	Description	Daytime ($L_{EQ-16\ hr}$)	Nighttime ($L_{EQ-8\ hr}$)
A	South Façade	<55	<50
B	East Façade	<55	<50
C	North Façade	<55	<50
D	West Façade	<55	<50
E	OLA (rooftop)	<55	--

4.3 Recommendations for Road Traffic Noise

The predictions indicate that the traffic sound levels are expected to be within MECP limits during daytime and nighttime hours at the proposed residential building. The following discussion and recommendations are provided.

4.3.1 Outdoor Living Areas

The proposed residential units may have balconies and patios that are less than 4 m in depth. These areas are not considered to be outdoor amenity areas under MECP guidelines, and no noise mitigation measures are required.

The predicted sound level at the outdoor amenity area on the mechanical penthouse level (Prediction Location [E]) is less than 55 dBA during the daytime. Physical mitigation will not be required for this area.

4.3.2 Indoor Living Areas and Ventilation Requirements

The predicted future sound levels at all the lots are less than 50 dBA and 55 dBA during nighttime and daytime, respectively. This is below the MECP limit and thus there are no specific ventilation requirements for the proposed development.

4.3.3 Building Façade Constructions

Since the future road traffic sound levels outside all the dwelling units within the development will be less than 60 dBA at night and less than 65 dBA during the daytime, any exterior wall, insulated

metal exterior door and double glazed window construction meeting the minimum requirements of the Ontario Building Code (OBC) will provide adequate sound insulation.

5 Warning Clauses

The MECP guidelines recommend that warning clauses be included in the property and tenancy agreements.

Suitable wording to inform future residents of the adjacent institutional facilities and that sounds from these facilities may at times be audible.

Type E:

> Purchasers/tenants are advised that due to the proximity of the nearby institutional facilities, noise from the facilities may at times be audible.

These sample clauses are provided by the MECP as examples and can be modified by the Municipality as required.

6 Stationary Noise Assessment

6.1 Description of Noise Sources

The proposed rooftop mechanical equipment has been identified to have potential noise impact on surrounding sensitive receptors. Existing noise sources may also have potential noise impact on the proposed building. Information regarding rooftop mechanical equipment for the proposed building is not available during this time. Assumptions based on similar past projects have been made to determine the potential noise impact associated with the proposed rooftop mechanical equipment on surrounding sensitive uses.

6.2 Criteria Governing Stationary Noise Sources

An industrial or commercial facility is classified in the MECP guidelines as a stationary source of sound (as compared to sources such as traffic or construction, for example) for noise assessment purposes. The mechanical equipment associated with the proposed and existing buildings are considered stationary sources of sound which may impact surrounding sensitive uses. Note that there are no identified exhaust shafts (there are no underground parking levels) and the emergency

transformer is housed in its own room on the ground floor of the proposed building.

The Ministry of the Environment, Conservation and Parks (MECP) provides guidelines for the assessment of stationary noise sources. NPC-300 "Environment Noise Guideline Stationary and Transportation sources – Approval and Planning" referenced with regard to traffic noise is also intended for use in the planning of noise sensitive land uses adjacent to residential buildings.

The criteria is based on the background sound level at sensitive points of reception (which are the top-storeys of existing and proposed residences) in the quietest hour that the source can be in operation. Background sound includes sound from road traffic and natural sounds, but excludes the sources under assessment. For relatively quiet areas where background sound may fall to low levels during some hours, NPC-300 stipulates various minimum limits. The subject site is located in a Class 1 area. In Class 1 areas, the limits are 50 dBA during the day (07:00 to 23:00) and 45 dBA at night (23:00 to 07:00) at the façades and 50 dBA during the day at the outdoor amenity areas. To ensure a conservative analysis, the exclusionary minimum criteria will be adopted at the proposed residential building.

6.3 Stationary Noise Source Analysis

The potentially significant noise sources associated with the proposed residential building and existing uses nearby include the rooftop mechanical equipment. At this stage in the development, information regarding the proposed mechanical equipment are not currently available. Assumptions regarding the type of units and tonnage of the proposed equipment have been made based on HGC Engineering project files for buildings of similar nature. One make-up air unit and one cooling tower are included as potential noise sources for the proposed building in the analysis. The noise sources associated with the existing buildings include a cooling tower for the residential building to the northeast, and a make-up air unit and HVAC units for the school to the northwest.

The assumed source levels associated with the proposed and existing equipment are listed in Table IV below in terms of sound power level.

Table IV: Source Sound Power Levels [dB re 10-12 W]

HVAC Unit	ID	Octave Band Centre Frequency [Hz]								Overall [dBA]
		63	125	250	500	1k	2k	4k	8k	
Make-up Air Unit	MUA	89	87	85	87	87	83	78	72	91
Cooling Tower	CT	95	92	99	94	90	83	79	75	96
10 Ton HVAC Unit	10T	--	76	79	84	83	79	73	66	88

The above sound levels were used as input to a predictive computer model. The software used for this purpose (*Cadna-A version 2023 MR2 (32 bit), build: 201.5366*) is a computer implementation of ISO Standard 9613-2.2 "Acoustics - Attenuation of Sound During Propagation Outdoors." The ISO method accounts for reduction in sound level with distance due to geometrical spreading, air absorption, ground attenuation and acoustical shielding by intervening structures such as barriers.

The following information and assumptions were used in the analysis.

- The height of the existing mid-rise buildings to the east are assumed to be 18.0 to 21.0 m. The height of the existing single detached dwelling units in the surrounding area are assumed to be between 6.0 m.
- The proposed and existing noise sources and noise sensitive receptors are indicated in Figures 3a and 3b. The rooftop equipment are assumed to be 1.5 m in height. Sound data was assumed based on experience with similar buildings.

We have considered typical worst-case (busiest hour) scenarios for each time period to be as follows:

Assumed daytime worst-case hour scenario:

- All rooftop equipment operating continuously at 100% capacity (60 minutes in an hour);

Assumed nighttime worst-case hour scenario:

- All rooftop equipment operating on a 50% duty cycle (30 minutes in an hour);

Cadna Evaluation Parameters:

- Temperature: 10°C, Relative Humidity: 70%
- Reference Time: Day (07:00 – 23:00) and Night (23:00 – 07:00)
- Maximum Order of Reflections: 1
- Generally flat terrain
- Global Ground Absorption: 0.25

6.4 Predicted Sound Levels at Existing Noise Sensitive Receptors

The sound levels due to the rooftop mechanical equipment at the proposed buildings are summarized in Table V. Resultant sound levels at the surrounding sensitive uses are shown graphically in Figures 4a and 4b. Cadna output for receiver R1 (indicated in Figure 3a) is provided in Appendix C.

Table V: Predicted Maximum Sound Levels from Proposed Noise Sources at Surrounding Sensitive Uses, with No Mitigation [dBA]

Building	Description	Criteria (Day/Night)	Day	Night
R1	Existing 2-storey residential building to the southwest	50 / 45	46	43
R2	Existing 2-storey residential building to the southwest	50 / 45	45	42
R3	Existing 2-storey residential building to the south	50 / 45	45	42
R4	Existing 2-storey residential building to the southeast	50 / 45	42	39
R5	Existing 2-storey residential building to the east	50 / 45	33	30
R6	Existing 6-storey residential building to the northeast	50 / 45	39	35
R7	Existing 7-storey residential building to the northeast	50 / 45	35	32
OLA	Proposed Outdoor Living Area (rooftop)	50 / --	47	--

These predicted sound levels are expected to be within the MECP minimum exclusionary limit of 50 dBA during the daytime hours and 45 dBA during the nighttime hours at the surrounding sensitive receptors, based on this typical worst-case operating scenario. Noise mitigation measures are not required.

6.5 Predicted Sound Levels at Proposed Noise Sensitive Receptors

The sound levels due to the rooftop mechanical equipment at existing buildings are summarized in the Table VI below. Resultant sound levels at the surrounding sensitive uses are shown graphically in Figures 5a and 5b.

Table VI: Predicted Maximum Sound Levels from Existing Noise Sources at Proposed Sensitive Uses, with No Mitigation [dBA]

Location	Criteria (Day/Night)	Day	Night
North Façade	50 / 45	45	42
East Façade	50 / 45	45	42
South Façade	50 / 45	33	<30
West Façade	50 / 45	40	37
OLA	50 / --	44	--

These predicted sound levels are expected to be within the MECP minimum exclusionary limit of 50 dBA during the daytime hours and 45 dBA during the nighttime hours at the proposed building façades and outdoor living area, based on this typical worst-case operating scenario. Noise mitigation measures are not required.

7 Impact of the Development on Itself

Section 5.8.1.1 of the Ontario Building Code (OBC), released on January 1, 2020, specifies the minimum required sound insulation characteristics for demising partitions, in terms of Sound Transmission Class (STC) or Apparent Sound Transmission Class (ASTC) values. In order to maintain adequate acoustical privacy between separate suites in a multi-tenant building, inter-suite walls must meet or exceed STC-50 or ASTC-47. Suite separation from a refuse chute or elevator shaft must meet or exceed STC-55. In addition, it is recommended that the floor/ceiling constructions separating suites from any amenity or commercial spaces also meet or exceed STC-55. Tables 1 and 2 in Section SB-3 of the Supplementary Guideline to the OBC provide a comprehensive list of constructions that will meet the above requirements.

Tarion's Builder Bulletin B19R requires the internal design of condominium projects to integrate suitable acoustic features to insulate the suites from noise from each other and amenities in accordance with the OBC, and limit the potential intrusions of mechanical and electrical services of the building on its residents. If B19R certification is needed, an acoustical consultant is required to review the mechanical and electrical drawings and details of demising constructions and mechanical/electrical equipment, when available, to help ensure that the noise impact of the

development on itself is maintained within acceptable levels.

Noise from the rooftop mechanical equipment and louvres associated with the mechanical penthouse may have potential noise impact at the proposed rooftop outdoor amenity area. The rooftop mechanical penthouse building provides some shielding from mechanical equipment to the proposed OLA. Further, though exhaust vents are not currently indicated in the plans, there may be associated noise impacts from such sources at the closest proposed suites. Noise excesses from exhaust fans can typically be mitigated using quieter models and/or silencers.

When mechanical details are available including make/model and location, an analysis should be conducted to determine the potential noise impact of the proposed rooftop mechanical equipment on the outdoor amenity area and the exhaust shafts on the closest proposed suites.

8 Summary of Recommendations

The following list and Table VII summarize the recommendations made in this report. The reader is referred to the previous sections of the report where these recommendations are discussed in more detail.

For transportation noise sources

1. There are no specific ventilation requirements required.

2. Any building construction meeting the minimum requirements of the Ontario Building Code will provide sufficient acoustical insulation for the proposed building.

3. The use of warning clauses in the property and tenancy agreements is recommended to inform future residents of the proximity to existing institutional uses.

4. Tarion Builder's Bulletin B19R requires that the internal design of condominium projects integrates suitable acoustic features to insulate the suites from noise from each other and amenities in accordance with the OBC, and limit the potential intrusions of mechanical and electrical services of the buildings on its residents. If B19R certification is needed, an acoustical consultant is required to review the mechanical and electrical drawings and details of demising constructions and mechanical/electrical equipment, when available, to help ensure that the noise impact of the development on itself are maintained within acceptable levels. Outdoor sound emissions should also be checked to ensure compliance with the City of Waterloo's noise by-law.

For stationary noise sources

1) When details of the roof plans, mechanical equipment selection, and exhaust fan locations are available, an acoustical engineer should verify that the source sound level specifications and locations for the HVAC units conform to the assumptions made in this report and that acceptable sound levels will result at all surrounding sensitive receptors. Use of larger and louder rooftop equipment may result in the requirement for rooftop acoustic screens or mitigation for the exhaust fans.

Table VII: Summary of Noise Control Requirements and Noise Warning Clauses

Prediction Location	Description	Acoustic Barrier	Ventilation Requirements*	Type of Warning Clause	Building Construction
A	West Façade	--	--	E	OBC
B	North Façade	--			
C	East Façade	--			
D	South Façade	--			
E	OLA (rooftop)	--			

Notes:
-- no specific requirement
* The location, installation and sound rating of the air conditioning condensers must be compliant with MECP Guideline NPC-300.
OBC – meeting the minimum requirements of the Ontario Building Code

The reader is referred to previous sections of this report where these recommendations are discussed in more detail.

8.1 Implementation

To ensure that the noise control recommendations outlined above are fully implemented, it is recommended that:

1) Prior to the issuance of occupancy permits for this development, the Municipality's building inspector or a Professional Engineer qualified to provide acoustical engineering services in the Province of Ontario should certify that the suggested noise control measures have been properly incorporated, installed and constructed.

2) When further details of the roof plans, mechanical equipment selection, and exhaust fan locations are available, an acoustical engineer should verify that the source sound level

specifications and locations for the HVAC units conform to the assumptions made in this report and that acceptable sound levels will result at all offsite residential receptors. Use of larger and louder rooftop equipment may result in the requirement for rooftop acoustic screens.

9 Conclusions

The results of this study indicate that the proposed development located at 309 – 311 Hawthorn Street is feasible on this site from a noise impact perspective. A warning clause is recommended to advise residents of the proximity to existing institutional uses.



Figure 1: Key Plan

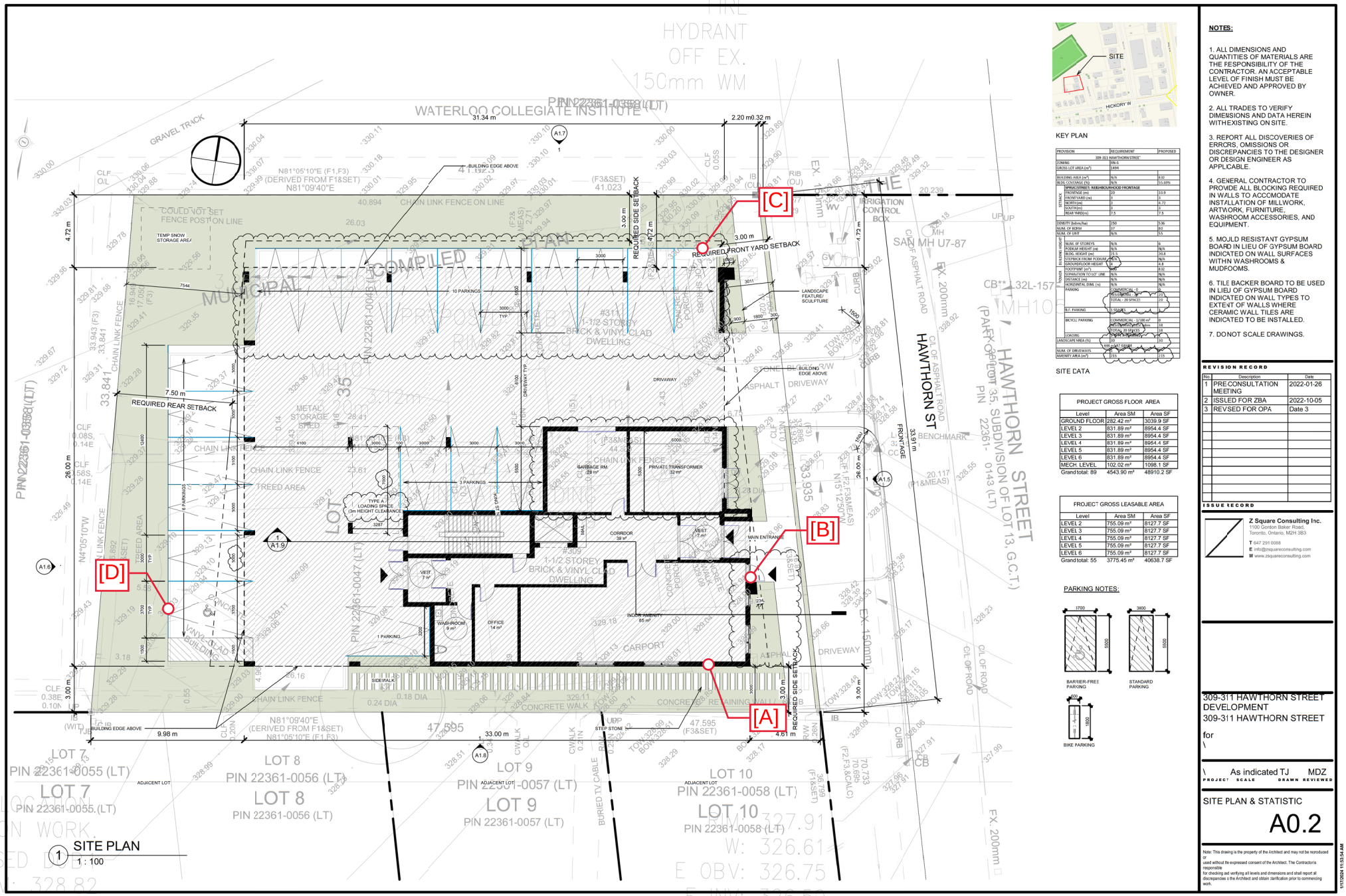


Figure 2a: Proposed Site Plan Showing Prediction Locations

KEY PLAN

PROVISION	REQUIREMENT	PROPOSED
309-311 HAWTHORN STREET		
ZONING	RN5	
GROSS LOT AREA (m²)	1494	
BUILDING AREA (m²)	N/A	832
BLDG COVERAGE (%)	N/A	55.68%
SETBACKS	SPRUCE STREET; NEIGHBOURHOOD FRONTAGE	
FRONTAGE (m)	20	33.9
FRONTYARD (m)	3	3
RIGHT(m)	3	4.72
SOUTH(m)	3	3
REAR YARD(m)	7.5	7.5
DENSITY (bdrms/ha)	250	536
NUM. OF BDRM	37	80
NUM. OF UNIT	N/A	55
BUILDING HEIGHT	NUM. OF STOREYS	N/A	6
	PODIUM HEIGHT (m)	N/A	N/A
	BLDG. HEIGHT (m)	23.5	20.8
	STEPBACK FROM PODIUM	N/A	N/A
	GROUNDFLOOR HEIGHT	3	4.4
PARKING	FOOTPRINT (m²)	N/A	832
	SEPARATION TO LOT LINE	N/A	N/A
	DISTANCE (m)	N/A	N/A
	HORIZONTAL DIM. (m)	N/A	N/A
	PARKING	COMMERCIAL - 0 RESIDENTIAL - 20 TOTAL - 20 SPACES	0 20 20
	B.F. PARKING	1 SPACE	1
	BICYCLE PARKING	COMMERCIAL - 1/100 m² RESIDENTIAL - 0.5/unit TOTAL - 55 SPACES	0 18 18
	LOADING	1 per building	1
LANDSCAPE AREA (%)		10	10
NUM. OF DRIVEWAYS		1	1
AMENITY AREA (m²)		215	215

SITE DATA

PROJECT GROSS FLOOR AREA

Level	Area SM	Area SF
GROUND FLOOR	282.42 m²	3039.9 SF
LEVEL 2	831.89 m²	8954.4 SF
LEVEL 3	831.89 m²	8954.4 SF
LEVEL 4	831.89 m²	8954.4 SF
LEVEL 5	831.89 m²	8954.4 SF
LEVEL 6	831.89 m²	8954.4 SF
MECH. LEVEL	102.02 m²	1098.1 SF
Grand total: 89	4543.90 m²	48910.2 SF

PROJECT GROSS LEASABLE AREA

Level	Area SM	Area SF
LEVEL 2	755.09 m²	8127.7 SF
LEVEL 3	755.09 m²	8127.7 SF
LEVEL 4	755.09 m²	8127.7 SF
LEVEL 5	755.09 m²	8127.7 SF
LEVEL 6	755.09 m²	8127.7 SF
Grand total: 55	3775.45 m²	40638.7 SF

PARKING NOTES:

NOTES:

1. ALL DIMENSIONS AND QUANTITIES OF MATERIALS ARE THE RESPONSIBILITY OF THE CONTRACTOR. AN ACCEPTABLE LEVEL OF FINISH MUST BE ACHIEVED AND APPROVED BY OWNER.

2. ALL TRADES TO VERIFY DIMENSIONS AND DATA HEREIN WITHEXISTING ON SITE.

3. REPORT ALL DISCOVERIES OF ERRORS, OMISSIONS OR DISCREPANCIES TO THE DESIGNER OR DESIGN ENGINEER AS APPLICABLE.

4. GENERAL CONTRACTOR TO PROVIDE ALL BLOCKING REQUIRED IN WALLS TO ACCOMODATE INSTALLATION OF MILLWORK, ARTWORK, FURNITURE, WASHROOM ACCESSORIES, AND EQUIPMENT.

5. MOULD RESISTANT GYPSUM BOARD IN LIEU OF GYPSUM BOARD INDICATED ON WALL SURFACES WITHN WASHROOMS & MUDFOOMS.

6. TILE BACKER BOARD TO BE USED IN LIEU OF GYPSUM BOARD INDICATED ON WALL TYPES TO EXTENT OF WALLS WHERE CERAMIC WALL TILES ARE INDICATED TO BE INSTALLED.

7. DONOT SCALE DRAWINGS.

REVISION RECORD

No	Description	Date
1	PRE CONSULTATION MEETING	2022-01-26
2	ISSUED FOR ZBA	2022-10-05
3	REVSED FOR OPA	Date 3

ISSUE RECORD

Z Square Consulting Inc.
1100 Gordon Baker Road,
Toronto, Ontario, M2H 3B3
T 647 291 0088
E info@zsquareconsulting.com
W www.zsquareconsulting.com

309-311 HAWTHORN STREET DEVELOPMENT
309-311 HAWTHORN STREET

for
\

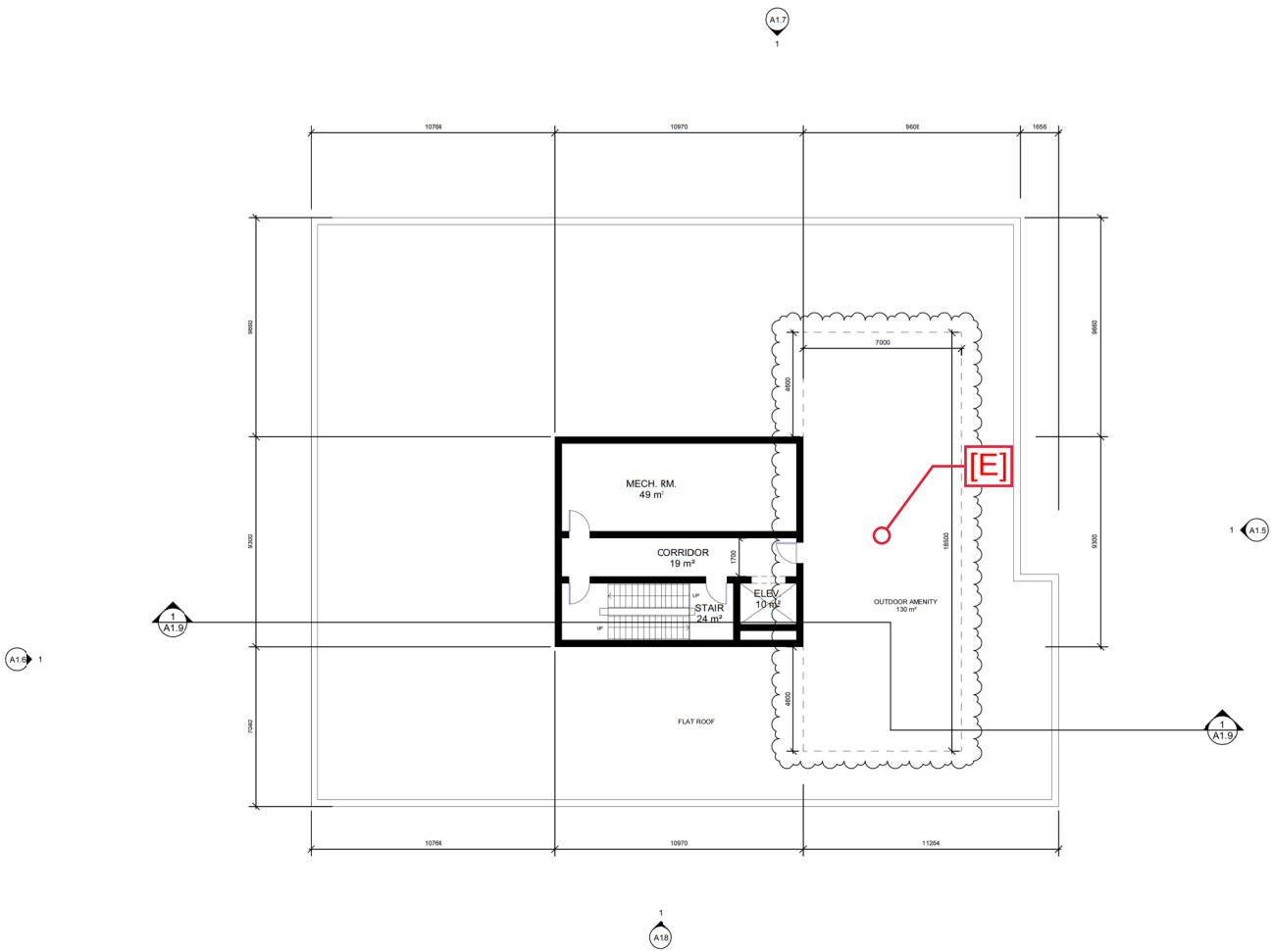
PROJECT	SCALE	DRAWN	REVIEWED
\	As indicated	TJ	MDZ

SITE PLAN & STATISTIC

A0.2

Note: This drawing is the property of the Architect and may not be reproduced or
used without the expressed consent of the Architect. The Contractoris responsible
for checking and verifying all levels and dimensions and shall report all discrepancies o the Architect and obtain clarification prior to commencing work.

11/7/2024 11:53:54 AM



1 MECH. LEVEL
1 : 100

NOTES:

1. ALL DIMENSIONS AND QUANTITIES OF MATERIALS ARE THE RESPONSIBILITY OF THE CONTRACTOR. AN ACCEPTABLE LEVEL OF FINISH MUST BE ACHIEVED AND APPROVED BY OWNER.

2. ALL TRADES TO VERIFY DIMENSIONS AND DATA HEREIN WITHEXISTING ON SITE.

3. REPORT ALL DISCOVERIES OF ERRORS, OMISSIONS OR DISCREPANCIES TO THE DESIGNER OR DESIGN ENGINEER AS APPLICABLE.

4. GENERAL CONTRACTOR TO PROVIDE ALL BLOCKING REQUIRED IN WALLS TO ACCOMODATE INSTALLATION OF MILLWORK, ARTWORK, FURNITURE, WASHROOM ACCESSORIES, AND EQUIPMENT.

5. MOULD RESISTANT GYPSUM BOARD IN LIEU OF GYPSUM BOARD INDICATED ON WALL SURFACES WITHN WASHROOMS & MUDFOOMS.

6. TILE BACKER BOARD TO BE USED IN LIEU OF GYPSUM BOARD INDICATED ON WALL TYPES TO EXTENT OF WALLS WHERE CERAMIC WALL TILES ARE INDICATED TO BE INSTALLED.

7. DONOT SCALE DRAWINGS.

REVISION RECORD

No	Description	Date
1	PRE CONSULTATION MEETING	2022-01-26
2	ISSLED FOR ZBA	2022-10-05
3	REVSED FOR OPA	Date 3

ISSUE RECORD

Z Square Consulting Inc.
1100 Gordon Baker Road,
Toronto, Ontario, M2H 3B3
T 647 291 0088
E info@zsquareconsulting.com
W www.zsquareconsulting.com

309-311 HAWTHORN STREET DEVELOPMENT
309-311 HAWTHORN STREET

for
\

\	1 : 100	TJ	MDZ
PROJECT	SCALE	DRAWN	REVIEWED

PANTHOUSE PLAN

A1.3

Note: This drawing is the property of the Architect and may not be reproduced or
used without the expressed consent of the Architect. The Contractoris responsible
for checking ad verifying all levels and dmensions and shall report all discrepancies o the Architect and obtain clarification prior to commencing work.

1/17/2024 11:53:57 AM

Figure 2b: Proposed Site Plan Showing Prediction Locations



Figure 3a: Existing Stationary Noise Source Locations



Figure 3b: Proposed Stationary Noise Source Locations



Figure 4a: Predicted Maximum Daytime Sound Levels from Proposed Stationary Noise Sources, dBA (Without Mitigation)



Figure 4b: Predicted Maximum Nighttime Sound Levels from Proposed Stationary Noise Sources, dBA (Without Mitigation)



Figure 5a: Predicted Maximum Daytime Sound Levels from Proposed Stationary Noise Sources, dBA (Without Mitigation)



Figure 5b: Predicted Maximum Nighttime Sound Levels from Proposed Stationary Noise Sources, dBA (Without Mitigation)

APPENDIX A

Road Traffic Data

Region of Waterloo AADT Forecast for Noise Studies

1. Development/Location	309-311 Hawthorn St, Waterloo

	Hickory St
2. Current AADT (2024)	3,700

	Hickory St
3. Forecast AADT (2034)	4,300

4. Commercial Vehicle Rates	Hickory St
% Medium Trucks	1%
% Heavy Trucks	1%

	Hickory St
5. Posted Speed Limit	50 km/h

6. Day/Night Splits	Regional Standard 90/10 Day/Night Split
7. Expiry	31-Dec-2025

8. Notes

This forecast is intended for the purpose of carrying out a noise study only. As Hickory St is under the juridiction of City of Waterloo, City of Waterloo should verify the forecast for this road segment. The Region of Waterloo should be contacted for an updated forecast if there are plans to use this forecast beyond the above validity period.

APPENDIX B

Sample STAMSON 5.04 Output

STAMSON 5.0 NORMAL REPORT Date: 20-08-2024 10:10:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: a.te Time Period: Day/Night 16/8 hours
Description: **Predicted daytime and nighttime sound levels at the south façade of the proposed building, prediction location [A].**

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

Car traffic volume : 3793/421 veh/TimePeriod *
Medium truck volume : 39/4 veh/TimePeriod *
Heavy truck volume : 39/4 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): 4300
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 1.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Hickory (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 48.00 / 48.00 m
Receiver height : 18.50 / 18.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hickory (day)

Source height = 1.00 m

ROAD (0.00 + 53.34 + 0.00) = 53.34 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	58.39	0.00	-5.05	0.00	0.00	0.00	0.00	53.34

Segment Leq : 53.34 dBA

```
Total Leq All Segments: 53.34 dBA

Results segment # 1: Hickory (night)
-----------------------------------

Source height = 0.98 m

ROAD (0.00 + 46.65 + 0.00) = 46.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90     90   0.00  51.70   0.00  -5.05   0.00   0.00   0.00   0.00
46.65
-------------------------------------------------------------------------
---

Segment Leq : 46.65 dBA

Total Leq All Segments: 46.65 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.34
                           (NIGHT): 46.65
```

APPENDIX C

Cadna Output

	R1	17538082	4814007	4.5																			
Src ID	Src Name	X	Y	Z	LxD	LxE	LxN	Adiv	K0	Dc	Agnd	Abar	Aatm	Afol	Ahous	CmetD	CmetE	CmetN	ReflD	ReflE	ReflN	LrD	LrE	LrN
MUA	Make-Up Air Unit	17538142	4814049	21.5	91	--	88	48.6	0	0.0	-1.8	5.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38	--	35
CT	Cooling Tower	17538144	4814040	21.5	96	--	93	48.2	0	0.0	-2.2	4.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45	--	42

Where: Lr = Lx - Adiv + K0 + Dc - Agnd - Abar - Aatm - Afol - Ahous + Cmet + Refl

APPENDIX D

Consultant Declaration