External Noise Intrusion Assessment

63 The Corso Manly

Client:

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C/o Platform Architects

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Notice

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CONTENTS

GLOSSARY

NOISE

Noise is produced through rapid variations in air pressure at audible frequencies (20 Hz – 20 kHz). Most noise sources vary with time. The measurement of a variable noise source requires the ability to describe the sound over a particular duration of time. A series of industry standard statistical descriptors have been developed to describe variable noise, as outlined in Section 2 below.

NOISE DESCRIPTORS

L_{eq} – The sound pressure level averaged over the measurement period. It can be considered as the equivalent continuous steady-state sound pressure level, which would have the same total acoustic energy as the real fluctuating noise over the same time period.

dB – Decibels. The fundamental unit of sound, a Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell. Probably the most common usage of the Decibel in reference to sound loudness is dB sound pressure level (SPL), referenced to the nominal threshold of human hearing. For sound in air and other gases, dB(SPL) is relative to 20 micropascals (μPa) = 2×10^{-5} Pa, the quietest sound a human can hear.

R_w – Weighted Sound Reduction Index. A measure of sound insulation performance of a building element. The higher the number, the better the insulation performance.

A-WEIGHTING

"A-weighting" refers to a prescribed amplitude versus frequency curve used to "weight" noise measurements in order to represent the frequency response of the human ear. Simply, the human ear is less sensitive to noise at some frequencies and more sensitive to noise at other frequencies. The A-weighting is a method to present a measurement or calculation result with a number representing how humans subjectively hear different frequencies at different levels.

1 INTRODUCTION

1.1 SUMMARY

Acoustic Dynamics is engaged by the client (Invergowrie Properties) to assess external noise intrusion for the proposed residential development located at 63 The Corso Manly, in the Northern Beaches Council (Manly Council) of NSW.

This document provides a technical assessment, as well as recommendations for construction materials and methods to provide building occupants with a good level of acoustic comfort and achieve compliance with the relevant acoustic design criteria and requirements.

1.2 LOCATION OF PROPOSED DEVELOPMENT

The proposal is for the construction of a residential development (shop top housing) in the Northern Beaches Council area of NSW.

The proposed development site has two road frontages with The Corso to the south and Market Place to the north. Acoustic Dynamics understands that both roads are predominantly used for foot traffic with limited access provided for vehicular access. The other boundaries of the subject site are shared with The New Brighton Hotel to the east and the ANZ bank to the west.

The location of the proposed development is presented within **Appendix A**.

1.3 SCOPE

The following details the scope to provide an external noise intrusion assessment for the proposed residential development:

- Review appropriate SEPP, Council noise criteria and Australian Standards relevant to external noise intrusion at the proposed development;
- Review architectural drawings and existing and proposed construction and materials for the development;
- Predict the likely noise intrusion levels at the most-affected residential facades due to the noise emission from external noise sources;
- Conduct calculations and modelling to assess the suitability of the proposed building materials and construction;
- Calculation of the sound transmission reduction required to meet the criteria; and
- Recommendation of materials and construction techniques to mitigate external noise to internal areas of the subject development.

2 ASSESSMENT CRITERIA AND STANDARDS

Acoustic Dynamics has conducted a review of the local council, state government and federal legislation that is applicable to noise assessment for the proposed development. The relevant sections of the legislation are presented below. The most stringent criteria which have been used in the assessment of the proposed development are summarised below.

2.1 MOST RELEVANT CRITERIA

2.1.1 LOCAL ENVIRONMENT PLAN

A review of Manly Council Local Environment Plan (LEP) 2013 was conducted. No relevant acoustic requirements and relevant noise criteria were presented within the LEP.

2.1.2 DEVELOPMENT CONTROL PLANS

A review of Manly Council Development Control Plan (DCP) 2013 was conducted. The following relevant acoustic requirements and relevant noise criteria were presented within the DCP.

> ***"3.4.2 Privacy and Security***
>
> ***3.4.2.3 Acoustic Privacy (Noise Nuisance)***
>
> *See also Noise Guide for Local Government prepared by NSW Department of Environment, Climate Change and Water in 2010.*
>
> *(a) Consideration must be given to the protection of acoustical privacy in the design and management of development.*
> *(b) Proposed development and activities likely to generate noise including certain outdoor living areas like communal areas in Boarding Houses, outdoor open space, driveways, plant equipment including pool pumps and the like should be located in a manner which considers the acoustical privacy of neighbours including neighbouring bedrooms and living areas.*
> *(c) Council may require a report to be prepared by a Noise Consultant that would assess likely noise and vibration impacts and may include noise and vibration mitigation strategies and measures. See particular requirements for noise control reports for licensed premises below at paragraph g) below.*
>
> ***3.9 Mechanical Plant Equipment***
>
> ***Note**: Mechanical Plant Equipment refers to the necessary infrastructure to support and maintain services or operations including air conditioning (both heating and cooling systems and ventilation), swimming pool filtration and other mechanical systems. Plant may also maintain other systems, such as plumbing and lighting for larger developments.*

3.9.1 Plant Rooms

(a) Plant rooms are generally required to accommodate mechanical plant systems for commercial building or major residential development and used exclusively for that purpose. The design and size of these rooms will vary depending on the technical specifications of the systems and other factors such as access and ventilation.

(b) The provision of plant equipment in low density residential development rarely demands exclusive rooms for the occupation of plant i.e. a 'plant room', but where an exclusive plant room is proposed, the floor area must be no longer than the actual area which the plant and/or machinery occupies plus the equivalent of a 0.5m access/maintenance area surrounding the plant/machinery item for access and ventilation. Plant rooms are not to be used for other purposes such as for storage and laundry and the overall size of the plant room should generally be less than a size of habitable rooms and must not add to building bulk or result in excessive excavation. In considering the location of mechanical plant equipment in dwelling houses, the use of an otherwise non-habitable location/space or under storey that is well ventilated and which minimise noise impacts are preferred.*

***Note**: While additional space around the plant equipment may be required for occupational, health and safety reasons, (i.e. more than 0.5m around the plant) then the floor area will be calculated as gross floor area for the purposed of the FSR calculation.*

3.9.3 Noise from Mechanical Plant

External mechanical plant systems (for pools, air conditioning and the like) must be acoustically enclosed and located centrally and away from neighbours living areas of neighbouring properties and side and rear boundaries.

See also paragraph 3.4.2.4 Acoustical Privacy.

***Note**: Excessive noise from the operation of mechanical plant such as air conditioning units, swimming pool pumps, and ventilation and refrigeration systems can disturb residents, disrupt sleep, interfere with normal daily activities or significantly impact on people's health.*

2.2 NSW DEPARTMENT OF PLANNING & INFRASTRUCTURE (DP&I)

2.2.1 STATE ENVIRONMENTAL PLANNING POLICY (SEPP) (INFRASTRUCTURE) 2007

The NSW Department of Planning & Infrastructure's (DP&I) State Environmental Planning Policy (SEPP) (Infrastructure) 2007 provides information and criteria for the assessment of infrastructure development within NSW, and identifies matters to be considered in the assessment of development adjacent to particular types of infrastructure projects.

The policy details issues to be considered when assessing the impact of road traffic noise on residential development, such as the proposed development. The following relevant guidelines and criteria are set out within the policy:

> ***"102 Impact of road noise or vibration on non-road development***
>
> *(1) This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data published on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:*
>
> *(a) a building for residential use,*
> *(b) a place of public worship,*
> *(c) a hospital,*
> *(d) an educational establishment or child care centre.*
>
> *(3) If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:*
>
> *(a) in any bedroom in the building—35 dB(A) at any time between 10.00 pm and 7.00 am,*
> *(b) anywhere else in the building (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.*
>
> *(4) In this clause, freeway, tollway and transitway have the same meanings as they have in the Roads Act 1993."*

Table 2.1 – Internal Noise Criteria for Residential Buildings

Residential Buildings		
Type of Occupancy	**Internal $L_{Aeq(1hr)}$ Noise Level Criteria (dBA)**	**Applicable Time Period**
Sleeping areas (bedroom)	35	Night-time: 10 pm to 7 am
Other habitable rooms (excl. Garages, kitchens, bathrooms & hallways)	40	At any time

Although the SEPP requirements detailed above are unlikely to be specifically applicable at this location, they are provided for guidance. Compliance with the internal noise criteria will ensure the acoustic amenity of building occupants is suitable protected. The above planning conditions may be enforced under the Environmental Planning and Assessment Act of 1979.

2.3 AUSTRALIAN STANDARDS

Acoustic Dynamics has conducted a review of relevant Australian Standards in relation to the subject development. The following details this review.

2.3.1 AS2107 "ACOUSTICS – RECOMMENDED DESIGN SOUND LEVELS"

Australian Standard 2107:2016 recommends a design sound level range for various types of occupancy within buildings. AS 2107 recommends the following design sound level range for the various types of occupancies and areas within the proposed development.

Table 2.2 Recommended Design Sound Levels for Different Areas of Occupancy in Buildings (Extract from Australian Standard 2107 Table 1)

Type of Occupancy / Activity	*Design sound level ($L_{Aeq,t}$) range [dB]*	*Design reverberation time[1] (T) range, s*
7 RESIDENTIAL BUILDINGS		
Houses and apartments in inner city areas or entertainment districts or near major roads-		
Apartment common areas (e.g. foyer, lift lobby	*45 - 50*	-
Living Areas	*35 - 45*	-
Sleeping Areas (night time)	*35 - 40*	-
Work Areas	*35 - 45*	-

The reasonable expectation of acoustic amenity for residents within a development and the acceptability of a given noise depend on both the character of the noise and the character of the background sound within a given area. For example, within a highly developed land zone with numerous commercial, industrial and road noise sources, the expectation of acoustic amenity is generally lower and an intrusive noise source (such as patron noise, mechanical noise, traffic, music, etc.) could be deemed acceptable by the majority of residents.

Acoustic Dynamics advises that although the internal design sound level ranges presented above are 5 dB higher than the targets for apartments in suburban areas or near minor roads, occupants in residential buildings in busier areas tend to have an expectation of higher background noise levels and the expectation of acoustic amenity is generally lower.

2.4 INSTRUMENTATION & MEASUREMENT STANDARDS

All noise measurements are conducted in accordance with Australian Standard 1055.1-1997, *"Acoustics - Description and Measurement of Environmental Noise Part 1: General Procedures"*. Acoustic Dynamics' sound measurements are conducted using precision sound level meters conforming to the requirements of IEC 61672-2002 *"Electroacoustics: Sound Level Meters – Part 1: Specifications"*. The reference sound pressure level was checked prior to and after the measurements using the acoustic calibrator and remained within acceptable limits.

3 EXTERNAL NOISE INTRUSION ASSESSMENT

The following subsections provide an assessment of the subject development against the various noise criteria and objectives outlined in **Section 2** above.

3.1 SITE SURVEY & NOISE MONITORING

Acoustic Dynamics advises that the existing intrusive noise levels at the subject development site have been determined based on the results of unattended noise monitoring conducted within close proximity to the subject site. The logger data was recorded within close proximity (65m) at a site that is representative of the subject location (see **Appendix A**).

The external L_{Aeq} noise levels have been determined for daytime and night-time periods, in accordance with the relevant assessment guidelines. Further to the determination of existing noise levels at the subject site, Acoustic Dynamics has adopted a conservative worst case scenario **10 dB higher** than the prevailing L_{Aeq} noise levels. In addition, noise from nearby mechanical plant located to the east and west has been considered within the assessment.

The assessment is conducted in this way so that potential noise impacts due to neighbouring commercial operations and Corso related activities are sufficiently addressed. This conservative assessment methodology allows for an increase in noise levels during the operational hours of the adjacent venue and potential night time Corso related activities.

Based on previous experience and the drawings and information provided by the client, Acoustic Dynamics has conservatively undertaken modelling and calculations to predict the likely **maximum** internal noise levels at the proposed development resulting from the following noise sources and activities:

- Foot traffic on The Corso;
- Noise from patrons passing by the development site;
- The egress of patrons from the New Brighton Hotel adjacent;
- Amplified music and patron noise from the New Brighton Hotel adjacent;
- Items of mechanical plant located within close proximity to the site; and
- Reverberant noise within the courtyards, wintergarden areas and residents within adjacent wintergarden areas.

The external maximum $L_{Aeq(1hour)}$ noise levels have been determined for the daytime and night-time periods, in accordance with the relevant assessment guidelines. The following table presents the processed and corrected noise data obtained from the unattended noise logger.

Table 3.1 – Measured and Calculated $L_{Aeq(1\ hr)}$ Noise Levels

Location	Time of Day	Maximum $L_{Aeq(1hour)}$ Noise Level[1] [dB]	
		Measured	Calculated[2]
9-15 Central Avenue Manly	Daytime (7am – 10pm)	55	**65**
	Night-time (10pm – 7am)	52	**62**

Note: 1) Measured $L_{Aeq(1Hour)}$ noise levels at ground level location with no corrections included.
2) Calculated $L_{Aeq(1Hour)}$ noise level due to adjacent venue and Corso activities.

NB. Acoustic Dynamics advise that noise emission from adjacent commercial tenancies and commercial activities occurring along the Corso would generally be controlled by the relevant planning permit and consent conditions. The proposed development site L_{Aeq} noise levels would typically be lower than those presented above, however Acoustic Dynamics assesses to an assumed higher L_{Aeq} noise level to ensure the acoustic amenity of residents is adequately protected during periods of excessive noise.

3.2 INTERNAL DESIGN SOUND LEVELS

The internal design sound level for a particular area of the subject development is the permissible $L_{Aeq(1\ hour)}$ noise level within that area, with external windows and doors closed. The internal design sound levels applicable to the critical areas of any potential residential developments have been determined in accordance with the criteria and objectives of Australian Standards and the NSW DP&I and are presented in **Table 3.2**.

3.3 REQUIRED NOISE REDUCTION

The Required Noise Reduction is the level in dB of noise attenuation required to satisfy the relevant criterion. It is used to evaluate the suitability of building components to achieve the required noise reduction.

The Required Noise Reduction is determined by subtracting the **internal design sound level** for the internal spaces from the **maximum external noise level** at the facade of each area.

In addition, Australian Standard 717.1: 2004 "*Rating of sound insulation in buildings and of building elements – Part 1 Airborne sound insulation*" provides guidance for the rating of building component performance. To account for the characteristics of particular sound spectra (i.e. low frequency content) a spectrum adaptation term ($\mathbf{C_{tr}}$) can be used when specifying component performance requirements. This ensures greater reduction of low frequency noise by building facade components resulting in a better level of acoustic comfort for residents.

The likely Noise Reduction to be incorporated into any potential residential building's envelope has been determined in accordance with Australian Standards and DP&I's SEPP (Infrastructure). Acoustic Dynamics has conducted initial calculations to determine the $\mathbf{R_W + C_{tr}}$ for building components for the proposed residential development. The calculated noise attenuation required is presented in **Table 3.2**.

Table 3.2 – Noise Reduction & $R_w + C_{tr}$ for Proposed Development

Area	Indoor Design Sound Level[1] [dB(A)]	Calculated Maximum External Noise Level [dB(A)]	Required Noise Reduction [dB(A)]	Noise Attenuation Required		
				Walls $R_w + C_{tr}$	Glazing $R_w + C_{tr}$	Roof $R_w + C_{tr}$
U01 Bed	35	65	30	37	32	-
U01 Living	40	65	25	30	24	-
U02 Bed	35	65	30	37	32	-
U02 Living	40	65	25	30	24	-
U03 Bed	35	65	30	37	32	-
U03 Living	40	65	25	30	24	-
U04 Bed 1	35	65	30	30	33	-
U04 Bed 2	35	65	30	31	28	-
U04 Living	40	65	25	26[2]	33[2]	-
U04 Dining	40	65	25	22	28	-
U04 Ens.	45	65	20	32	31	-
U05 Bed 1	35	65	30	30	33	-
U05 Bed 2	35	65	30	31	28	-
U05 Living	40	65	25	26[2]	33[2]	-
U05 Dining	40	65	25	22	28	-
U05 Ens.	45	65	20	32	31	-
U06 Bed	35	65	30	37	32	-
U06 Living	40	65	25	28	24	-
U06 Study	45	65	20	29	28	-
U07 Bed	35	65	30	39	34	41
U07 Living	40	65	25	32	25	36
U08 Bed 1	35	65	30	34	36	41
U08 Bed 2	35	65	30	34	36	41
U08 Liv/Kit.	40	65	25	27	33 | 24[3]	40
U08 Ens.	45	65	20	37	31	36
U08 Bath	45	65	20	36	22	36
U09 Bed	35	65	30	30[2]	36[2]	-
U09 Liv/Kit.	40	65	25	30	35 | 24[3]	42
U10 Bed	35	65	30	30[2]	36[2]	-
U10 Liv/Kit.	40	65	25	29	34 | 24[3]	41
U11 Bed 1	35	65	30	34	36	41
U11 Bed 2	35	65	30	34	36	41

Area	Indoor Design Sound Level[1] [dB(A)]	Calculated Maximum External Noise Level [dB(A)]	Required Noise Reduction [dB(A)]	Noise Attenuation Required			
				Walls $R_w + C_{tr}$	Glazing $R_w + C_{tr}$		Roof $R_w + C_{tr}$
U11 Liv/Kit.	40	65	25	28	33	24[3]	38
U11 Ens.	45	65	20	37	31		36
U11 Bath	45	65	20	36	22		36
U12 Bed	35	65	30	39	34		41
U12 Living	40	65	25	31	27	24[3]	37
U12 Study	40	65	25	29	28		34

Note: 1) Maximum indoor design sound level based on AS2107 and SEPP criteria.

2) Required attenuation includes the acoustic benefit provided by the wintergardens (with wintergarden window(s) open).

3) Denotes acoustic requirement for skylight.

Construction systems and materials should be selected to provide the required design noise reduction shown in **Table 3.2** for the respective areas within the development. During peak periods of high noise levels, the calculated noise levels within some of the rooms for any potential development may exceed the relevant internal noise level criteria by more than 10 dB, with the windows open.

Acoustic Dynamics advises that air conditioning should be installed to service any potential residential development. This will provide the option for mechanical ventilation of the dwelling, and provide building occupants with the option to leave external windows closed, during peak periods of high noise levels.

4 RECOMMENDED INTERNAL DESIGN – EXTERNAL NOISE

Acoustic Dynamics' analysis and prediction calculations indicate the following recommendations should be incorporated into the proposed development, as a minimum, to ensure that the internal design sound levels are achieved in relation to external noise intrusion.

To ensure a greater level of acoustic comfort for residents, Acoustic Dynamics has specified building component performance requirements inclusive of a correction factor for low frequency noise intrusion (indicated by the spectral adaptation term **C_{tr}**).

The use of the $R_w + C_{tr}$ performance requirement means that low frequency noise (often a source of annoyance for building occupants), associated with noise sources such as environmental rumble, "disco" music and mechanical plant, will be reduced by a greater degree. The low frequency modifier ensures that building components have a higher acoustic performance than components with an equivalent R_w rating.

4.1 GLAZING RECOMMENDATIONS

The following table sets out the minimum required glazing for the various glazing partitions associated with the proposed development, which will ensure that internal design sound levels are achieved. Acoustic Dynamics has assessed all rooms that are proposed to be developed. **Table 4.1** shows the applicable glazing recommendations.

Table 4.1 - Recommended Glazing Thickness Schedule

Area of Glazing (Schedule)	Required $R_W + C_{tr}$ of Glazing Systems[1]	Minimum Glazing Recommended[2]	
		Option 1 (Preferred)	Option 2
U01 Bed (W03 Mez)	32	8.38mm Vlam	10mm Monolithic
U01 Living (W04 Mez)	24	6.38mm Vlam	6mm Monolithic
U02 Bed (W02 Mez)	32	8.38mm Vlam	10mm Monolithic
U02 Living (W01 Mez)	24	6.38mm Vlam	6mm Monolithic
U03 Bed (W13 L01)	32	8.38mm Vlam	10mm Monolithic
U03 Living (W14 L01)	24	6.38mm Vlam	6mm Monolithic
U04 Bed 1 (W16 L01)	33	8.5mm Vlam Hush	10.38mm Vlam
U04 Bed 2 (W17 L01)	28	6.38mm Vlam	6mm Monolithic
U04 Living	33	8.5mm Vlam Hush	10.38mm Vlam
U04 Dining (W18 L01)	28	6.38mm Vlam	6mm Monolithic
U04 Ensuite (W15 L01)	31	8.38mm Vlam	8mm Monolithic
U05 Bed 1 (W08 L01)	33	8.5mm Vlam Hush	10.38mm Vlam
U05 Bed 2 (W07 L01)	28	6.38mm Vlam	6mm Monolithic
U05 Living	33	8.5mm Vlam Hush	10.38mm Vlam
U05 Dining (W06 L01)	28	6.38mm Vlam	6mm Monolithic
U05 Ensuite (W09 L01)	31	8.38mm Vlam	8mm Monolithic
U06 Bed (W12 L01)	32	8.38mm Vlam	10mm Monolithic
U06 Living (W11 L01)	24	6.38mm Vlam	6mm Monolithic
U06 Study (W10 L01)	28	6.38mm Vlam	6mm Monolithic
U07 Bed (W11 L02)	34	8.5mm Vlam Hush	12.38mm Vlam
U07 Living (W12 L02)	25	6.38mm Vlam	6mm Monolithic
U07 Skylight	24	6.38mm Vlam	6mm Monolithic
U08 Bed 1 (W13 L02)	36	12.5mm Vlam Hush	10.5mm Vlam Hush
U08 Bed 2 (W14 L02)	36	12.5mm Vlam Hush	10.5mm Vlam Hush
U08 Living (W01 L02)	33	8.5mm Vlam Hush	10.38mm Vlam
U08 Bath (W15 L02)	22	6.38mm Vlam	6mm Monolithic
U08 Ensuite	31	8.38mm Vlam	8mm Monolithic
U08 Skylights	24	6.38mm Vlam	6mm Monolithic
U09 Bed	36	12.5mm Vlam Hush	10.5mm Vlam Hush
U09 Living (W02 L02)	35	12.5mm Vlam Hush	10.5mm Vlam Hush
U09 Skylights	24	6.38mm Vlam	6mm Monolithic
U10 Bed	36	12.5mm Vlam Hush	10.5mm Vlam Hush
U10 Living (W03 L02)	34	8.38mm Vlam	10mm Monolithic
U10 Skylights	24	6.38mm Vlam	6mm Monolithic
U11 Bed 1 (W07 L02)	36	12.5mm Vlam Hush	10.5mm Vlam Hush
U11 Bed 2 (W06 L02)	36	12.5mm Vlam Hush	10.5mm Vlam Hush
U11 Living (W04 L02)	33	8.5mm Vlam Hush	10.38mm Vlam

Area of Glazing (Schedule)	Required $R_W + C_{tr}$ of Glazing Systems[1]	Minimum Glazing Recommended[2]	
		Option 1 (Preferred)	Option 2
U11 Bath (W05 L02)	22	6.38mm Vlam	6mm Monolithic
U11 Ensuite	31	8.38mm Vlam	8mm Monolithic
U11 Skylights	24	6.38mm Vlam	6mm Monolithic
U12 Bed (W10 L02)	34	8.5mm Vlam Hush	12.38mm Vlam
U12 Living (W09 L02)	27	6.38mm Vlam	6mm Monolithic
U12 Study (W08 L02)	28	6.38mm Vlam	6mm Monolithic
U12 Skylight	24	6.38mm Vlam	6mm Monolithic
Wintergarden Windows & Frosted Fixed Glazing	≥ 28	6.38mm Vlam	6mm Monolithic

Note: 1) Given the high level of external noise special attention will be required to achieve the stated $R_w + C_{tr}$ values, particularly for openable or sliding windows or glass doors.

2) Minimum glazing has been specified to meet acoustic requirements. Acoustic Dynamics advises that some windows/glass doors may also need to meet applicable safety standards. Additional advice should be sought to verify such requirements.

Acoustic Dynamics advises that the installation of all windows and glass doors must ensure an adequate acoustic (air tight) seal when closed. Any sound flanking paths around the windows must be sealed to provide adequate acoustic insulation. All gaps between the window frame and the wall structure should be sealed using polystyrene rods and silicone mastic sealant, prior to the fitting of architraves.

It is advised that the acoustic performance of the selected windows frames should be confirmed with the suppliers, to ensure that the glazing and frame systems will achieve the acoustic performance levels ($R_w + C_{tr}$) recommended in **Table 4.1**.

4.2 EXTERNAL WALL SYSTEMS

Acoustic Dynamics understands that the proposed construction of the external walls is to be a lightweight cavity system with metal cladding, or existing masonry construction and should achieve a minimum $R_w + C_{tr} \geq 39$ to achieve the required external noise attenuation.

Acoustic Dynamics provides the following recommendations for external wall construction systems to be constructed at the subject development to achieve the required internal noise objectives as per AS 2107.

Table 4.2 – Recommended External Lightweight Metal Clad Walls with Plasterboard Construction[1]

External Wall Leaf
1. Selected cladding; fixed to 2. 1 x 7.5mm Cemintel™ Texture Base Sheet to exterior face; to 3. 1 layer of 16mm Fyrchek MR plasterboard; with
Wall Construction
4. 90mm thick timber studs at 600mm maximum centres; with
Cavity Infill
5. 75mm glass wool R1.5 Gold batts (or equivalent); to
Internal Wall Lining
6. 1 layer of 6mm CeminSeal wallboard (to frame); to 7. 1 layer of 16mm Fyrchek plasterboard.

Note. 1) Refer to CSR Red Book System CSR 5618a.

Table 4.3 – Recommended Masonry Construction[1]

External Wall Leaf
1. Masonry outer leaf (minimum thickness 90mm); to
Internal Wall Lining
2. 1 layer of 13mm thick cement render; or 3. 1 layer of 13mm fire rated plasterboard.

Note. 1) Refer to CSR Red Book System CSR 5618a.

The wall construction systems recommended within **Table 4.2** and **Table 4.3** will achieve an adequate design sound transmission performance for the various areas of the development. Any penetrations within the above wall systems will diminish the acoustic performance of the proposed system. Acoustic Dynamics recommends that specific advice be sought for any such penetrations.

4.3 ROOF SYSTEMS

Acoustic Dynamics understands that the construction of the roofing system is metal roof on truss with sarking and insulation under, or concrete slab and is required to achieve a minimum $R_w + C_{tr} \geq 42$. We provide the following recommendations for a roof system to be constructed at the proposed development to achieve the required internal noise objectives as per AS 2107.

Table 4.4 - Recommended Sheet Metal Roof System[1]

External
1. Selected metal deck roof sheeting; to 2. Layer of minimum 60mm foil faced blanket roof insulation (or equivalent); to 3. Minimum 150mm timber or steel, rafters or trusses at maximum 600mm centres; to
Insulation
4. Minimum 215mm thick R4.1 Gold Batts ceiling insulation (or equivalent); to
Internal
5. 2 layers of 13mm thick fire rated plasterboard.

Note. 1) Refer to CSR Red Book System CSR 6427c.

Table 4.5 - Recommended Concrete Roof System[1]

External
1. 150mm thick concrete slab; with 2. Clips direct fixed to concrete slab a 1200mm centres; to
Insulation/Airgap
3. Minimum 40mm cavity; with 4. 50mm GW Acoustigard insulation (or equivalent); to
Internal
5. Rondo furring channel at 450mm maximum centres; to 6. 1 layer of 13mm thick fire rated plasterboard.

Note. 1) Refer to CSR Red Book System CSR 6315b.

The roof/ceiling system recommended within **Table 4.4** and **Table 4.5** above will achieve an adequate design sound transmission performance ($R_w + C_{tr} = 42$) for the various areas of the development.

NB: Any penetrations within the above ceiling/roof system will diminish the acoustic performance of the proposed system. With the exception of penetrations for down lights, for which Acoustic Dynamics recommends the inclusion of acoustic cones within the ceiling space, Acoustic Dynamics recommends that specific advice be sought for any such penetrations. (Fireproof downlight cones can also be used however care should be taken when using these as manufacturers advise that downlights and their transformers should not be covered as they need space for heat to escape. Covering down lights can be a fire hazard. It is recommended that LED downlights be used where possible).

4.4 PROVISION OF VENTILATION

Due to the calculated maximum internal noise levels within the proposed residences when windows are open, Acoustic Dynamics advises there will be a requirement for appropriate mechanical ventilation to be installed to ensure compliance with the applicable acoustic requirements. The installation of mechanical ventilation (fresh air) would provide occupants with the option to leave windows closed, during peak periods of high external noise levels.

Alternatively, passive ventilation can be achieved through the use of a variety of ducted or louvred systems for habitable rooms adjacent to external areas. It is important to note that these systems must provide adequate acoustic attenuation in order to meet the AS2107 indoor design objective. We provide the following suitable passive ventilation system manufacturer details:

- AeroPac ® sound insulated ventilator: https://www.acoustica.com.au/ product/title/; and
- Silenceair acoustic vents: (https://silenceair.com/shop/.

4.5 COURTYARDS AND WINTERGARDENS

Acoustic Dynamics advises that the courtyards within the development are designed to be inaccessible for residents and as such there is no need to assess potential noise impacts caused by residents using the courtyards.

However, Acoustic Dynamics has considered externally generated potential noise impacts for rooms overlooking the courtyard areas and the wintergarden areas. Such external noise impacts would be reverberant noise within the courtyard area from adjacent rooftop mechanical plant, regenerated music noise from the adjacent venue, environmental noise, noise from residents on adjacent floors and noise from residents using adjacent wintergardens.

The building component acoustic requirements have been calculated in consideration of these potential impacts with no additional facade or glazing treatments required to ensure a good level of acoustic amenity for residents.

In addition, whilst there is no mandatory acoustic objective for the wintergarden areas, the implementation of the specified wintergarden glazing and facade construction will provide a satisfactory level of acoustic comfort for residents whilst occupying the wintergarden areas.

5 CONCLUSION

Acoustic Dynamics has conducted a review of the design and construction at the proposed residential development located at 63 The Corso Manly, to determine compliance with the acoustic requirements of Australian Standards, NSW DP&I SEPP and Council requirements. A review of the facade and glazing types and further recommendations (where required) have been provided in **Section 4** above.

The assessment examined the maximum exposure to road noise, commercial noise and patron noise intrusion. Accordingly, the minimum construction requirements (for achieving suitable acoustic amenity) have been determined for each area, allowing the selection of components to be optimised for the respective areas within the development.

Although noise emission from potential future uses and activities occurring along The Corso would generally be controlled by the relevant planning permit and consent conditions, Acoustic Dynamics adopted a higher than measured intrusive noise level when calculating building facade and glazing requirements.

In addition, high performance building components have been specified. The adoption of the higher intrusive noise level for the assessment and specification of high performance building components ensures a good level of acoustic amenity can be achieved for residents within the development even during a potential worst-case high noise event.

External noise impacts have been considered for all rooms overlooking The Corso, Market Place and for rooms overlooking the courtyards and wintergarden areas.

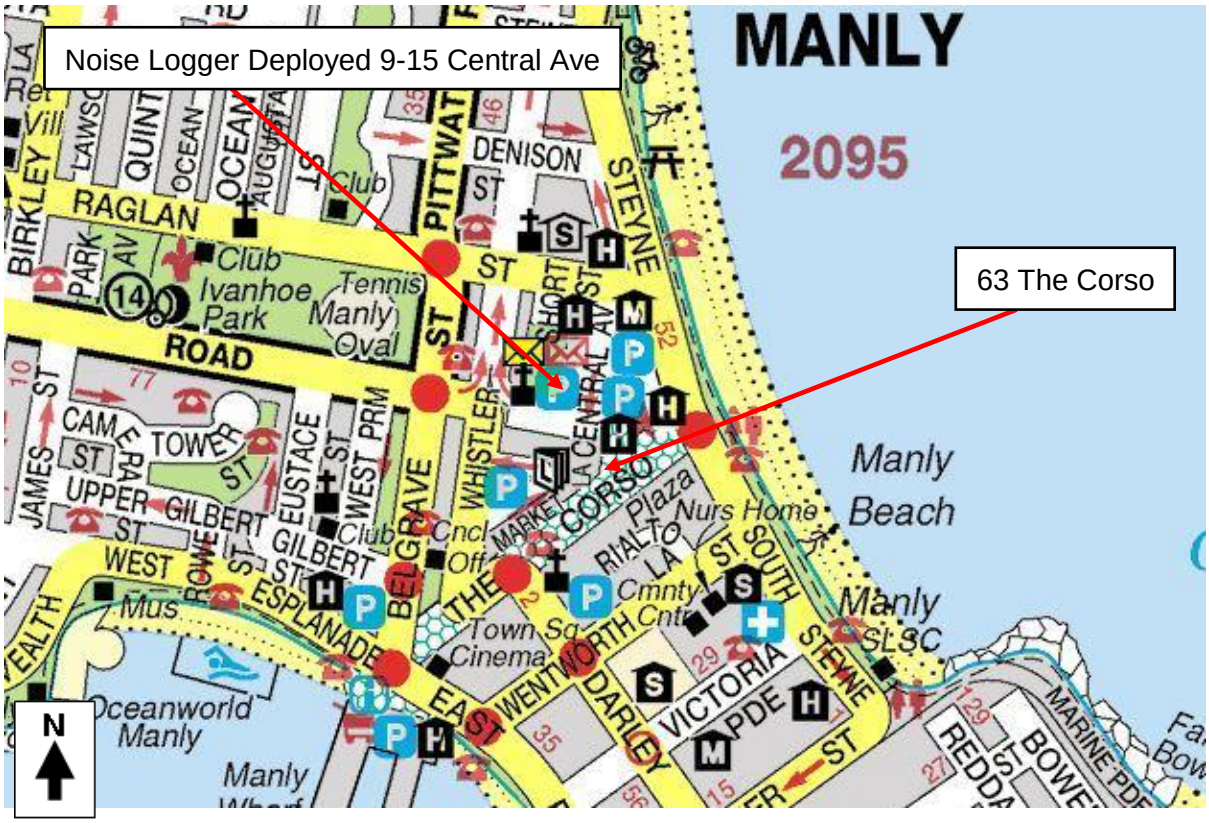
With the inclusion of the above design recommendations, the development can be constructed to ensure the acoustic amenity of building occupants can be adequately protected. In addition, with the implementation of the construction recommendations, internal noise levels are predicted **to comply** with the acoustic requirements and objectives of:

- AS2107:2016;
- The State Environmental Planning Policy; and
- Council DCP & LEP

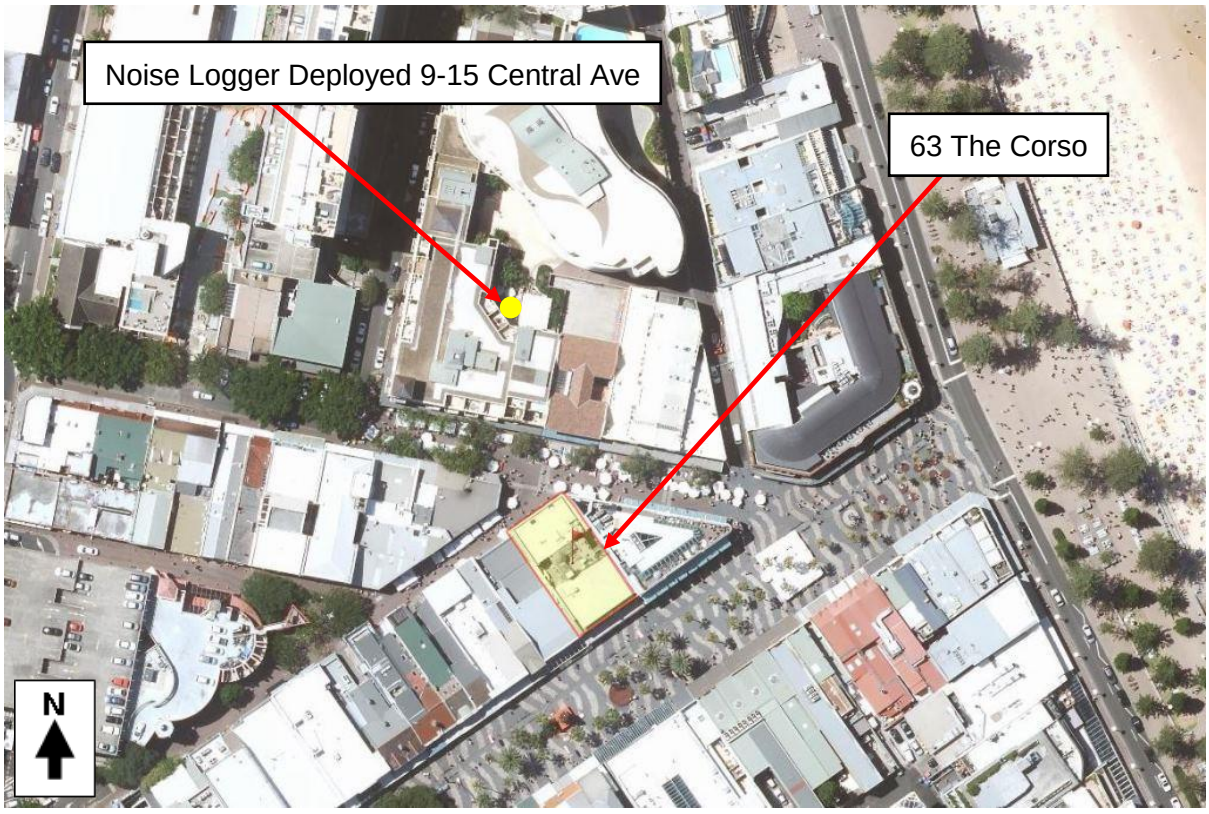
We trust the above information meets with your immediate requirements and expectations. Please do not hesitate to contact us on 02 9908 1270 should you require more information or clarification.

APPENDIX A – LOCATION MAP & AERIAL PHOTOGRAPH

A.1 LOCATION MAP

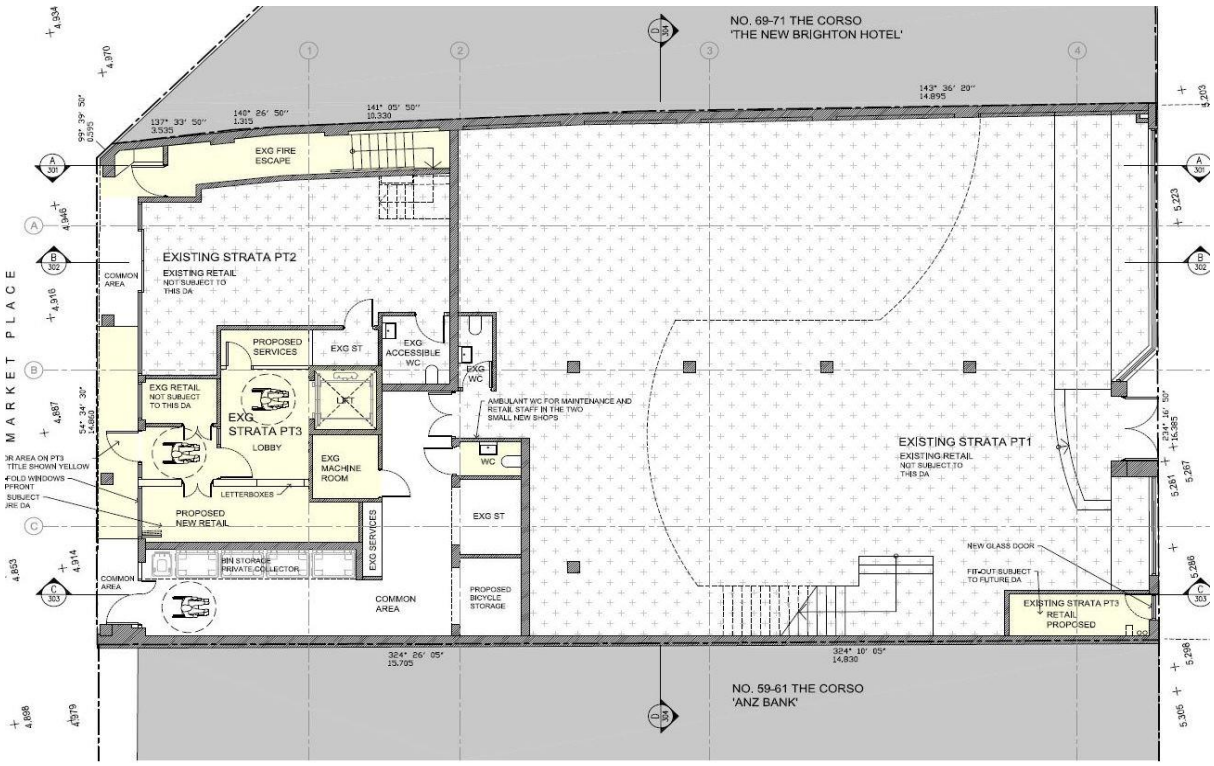


A.2 AERIAL PHOTOGRAPH

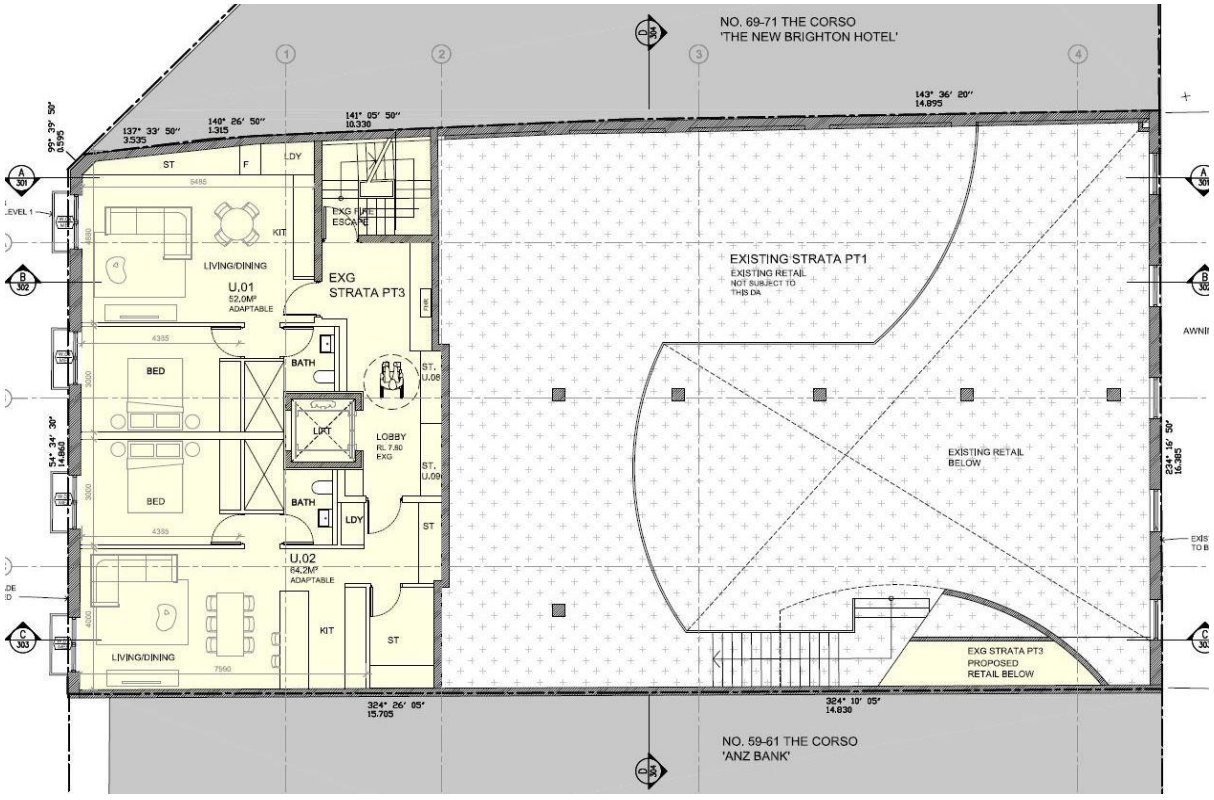


APPENDIX B - DRAWINGS & ADJACENT VENUE HOURS

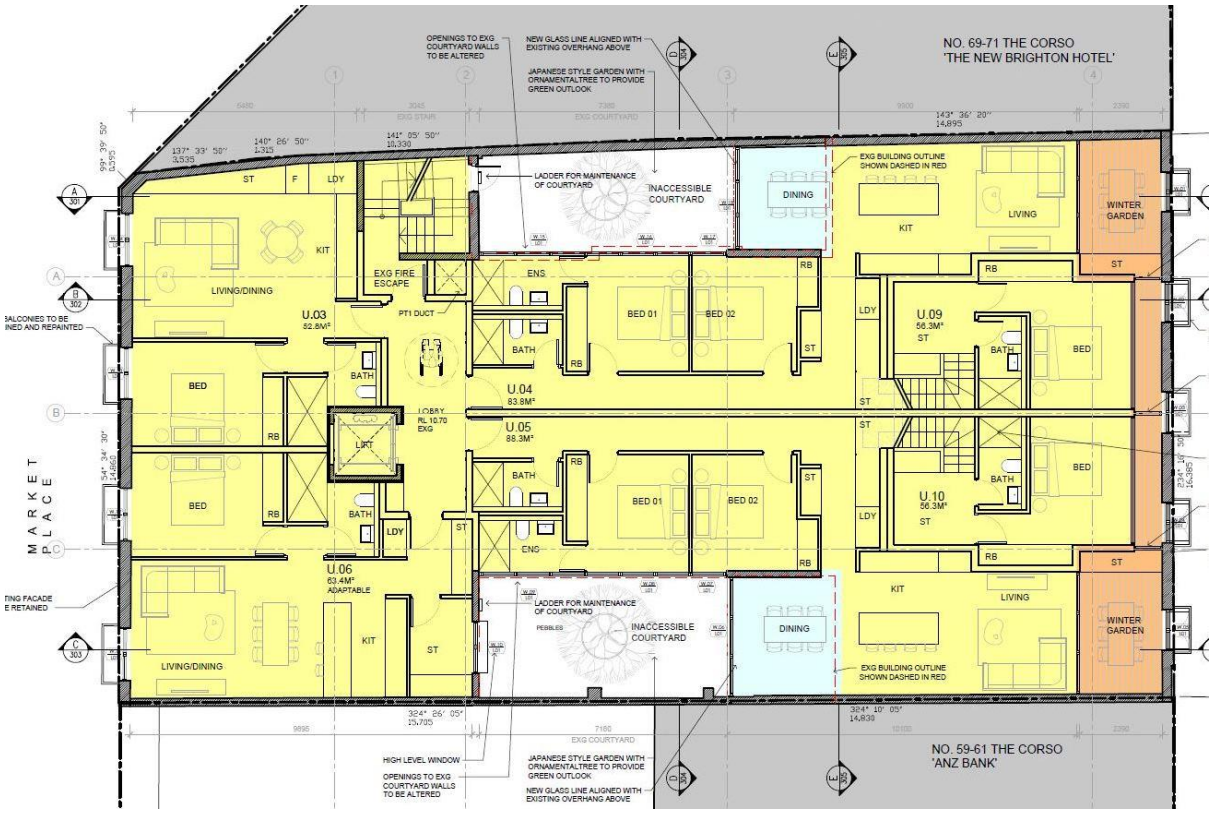
B.1 DRAWINGS



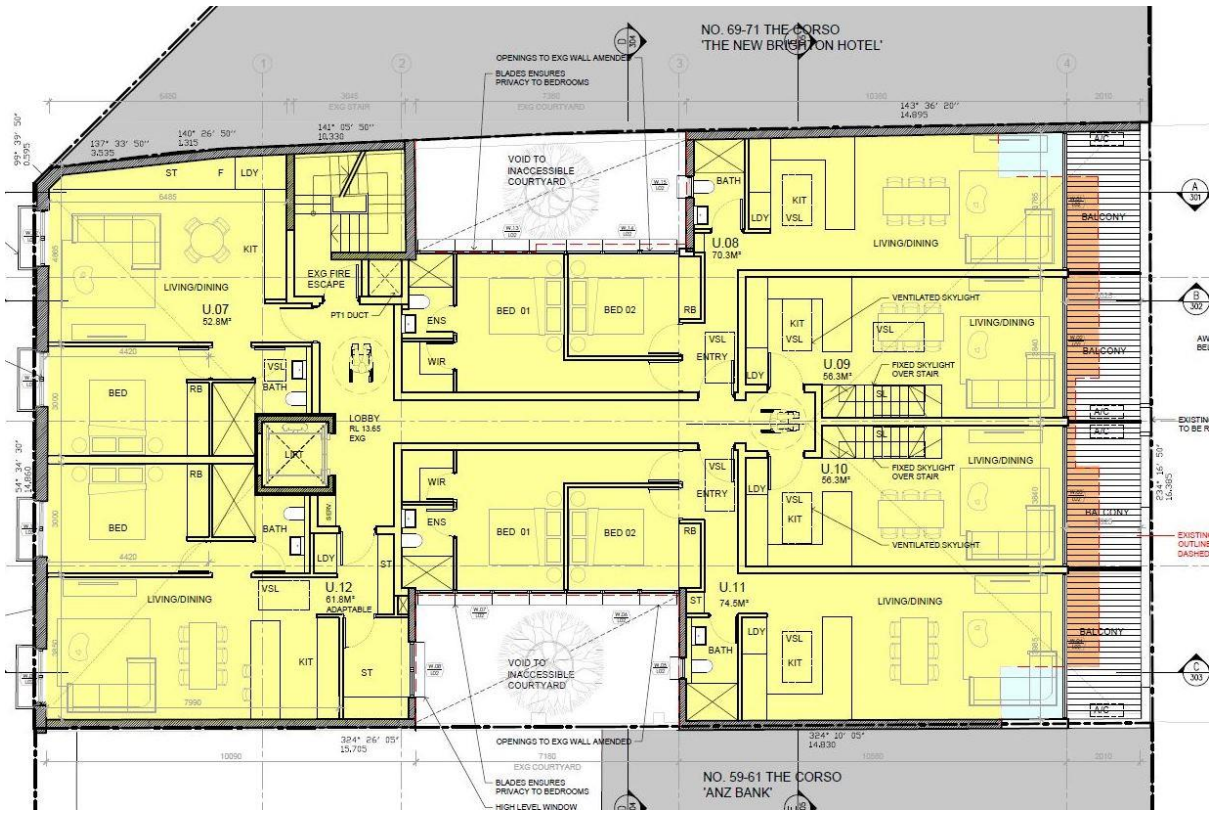
Ground Floor Plan



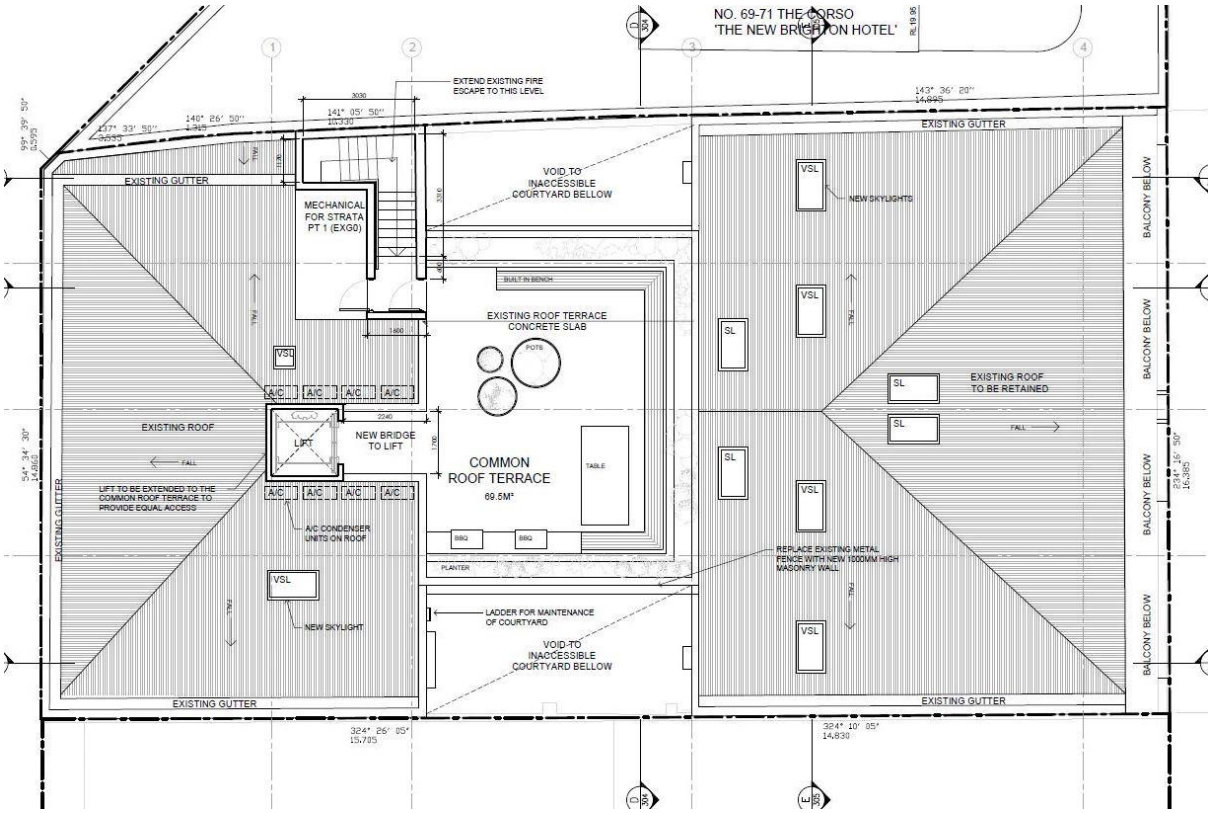
Mezzanine Floor Plan



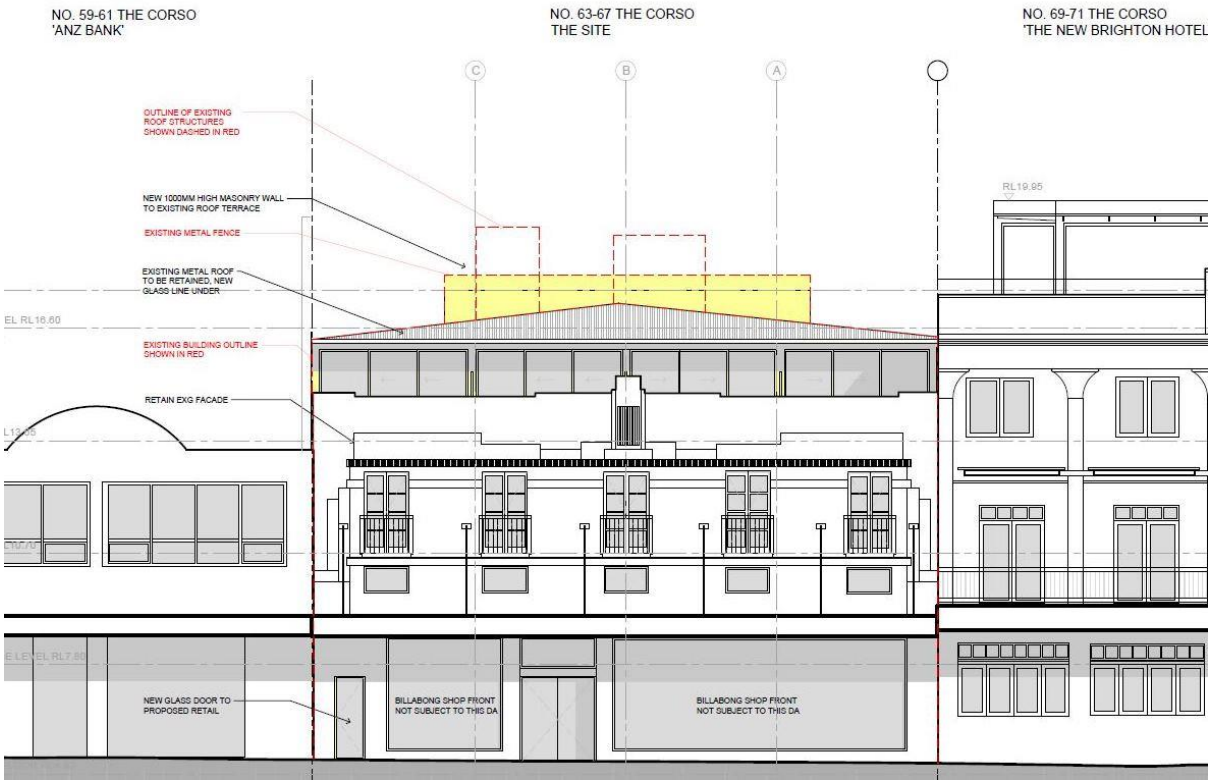
Level 1 Floor Plan



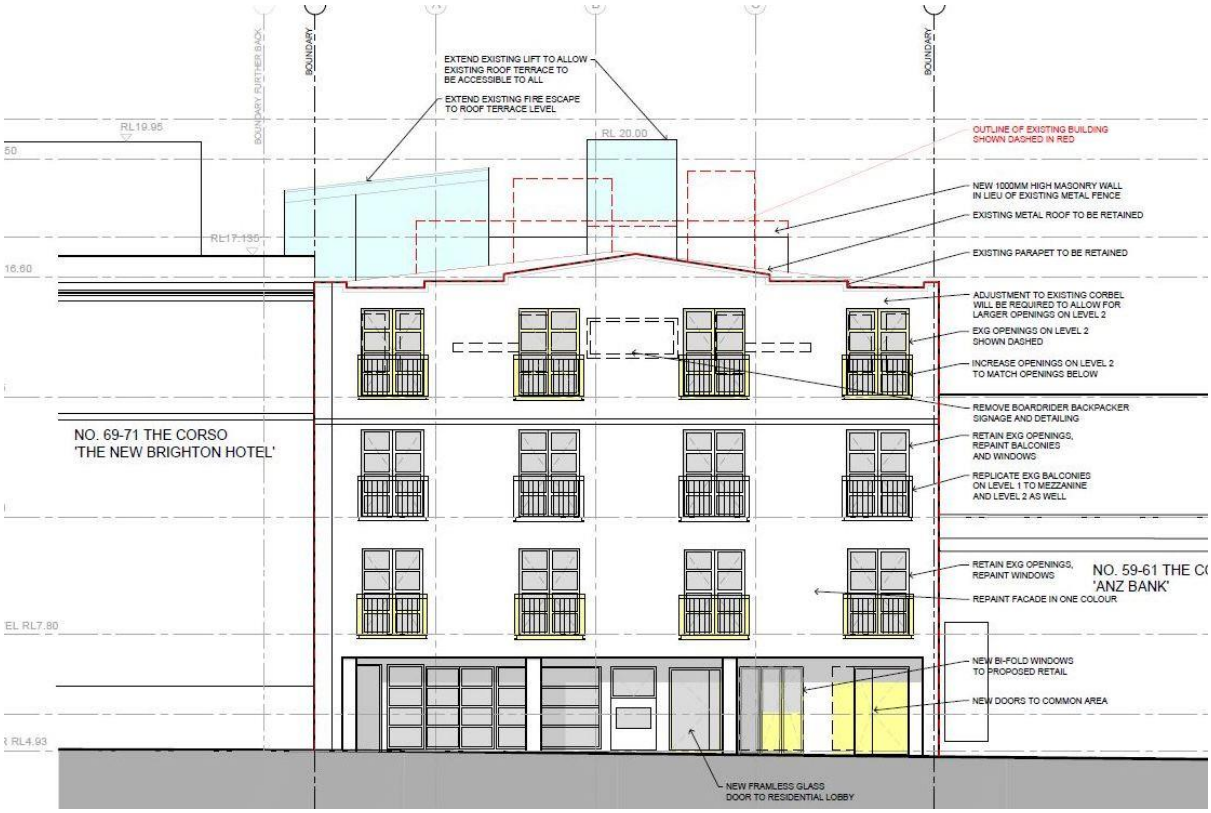
Level 2 Floor Plan



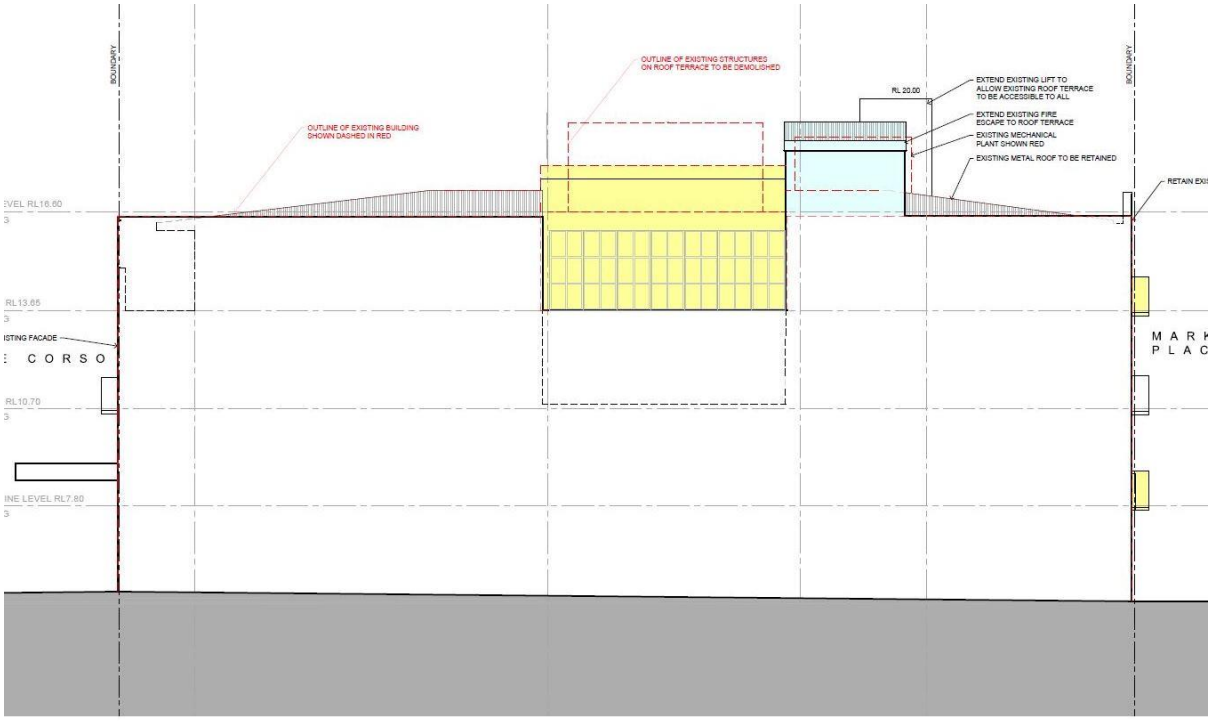
Roof Plan



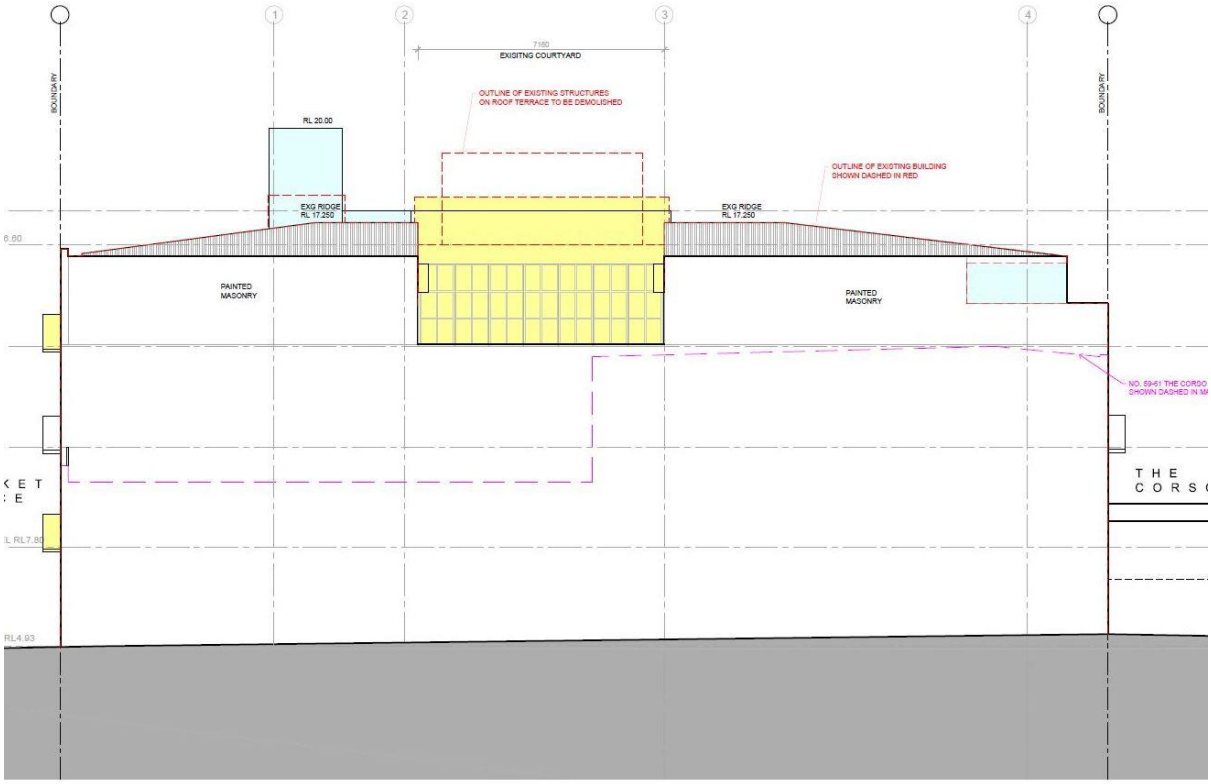
South Elevation



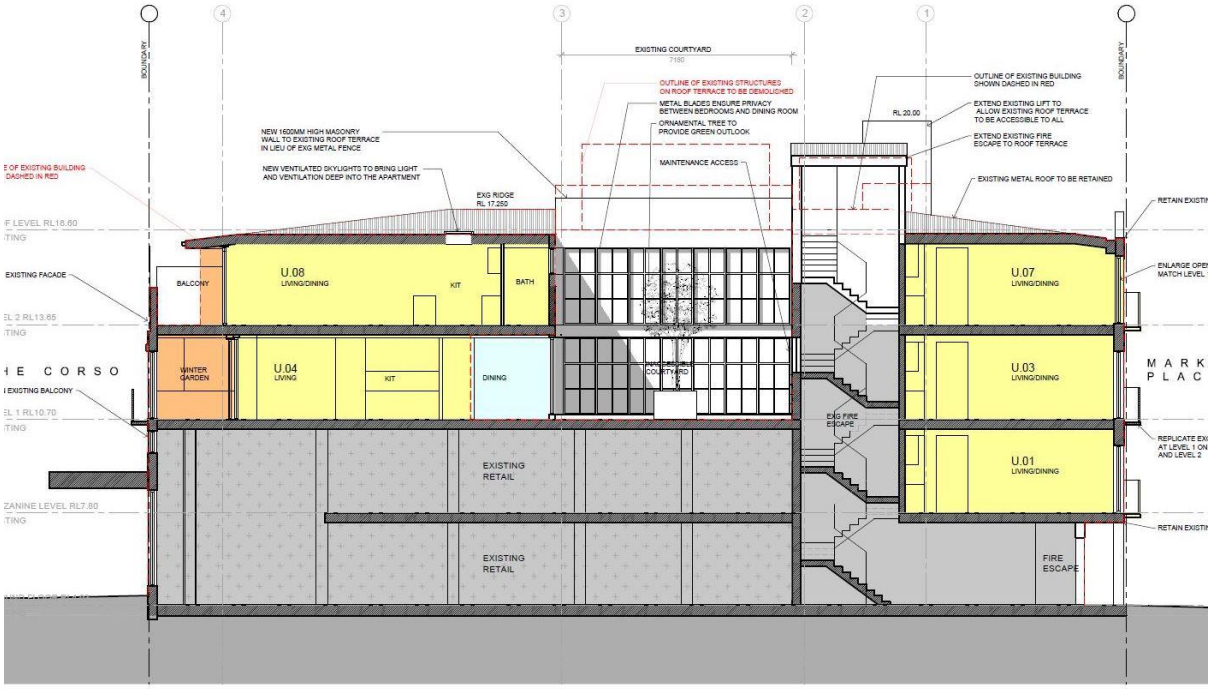
North Elevation



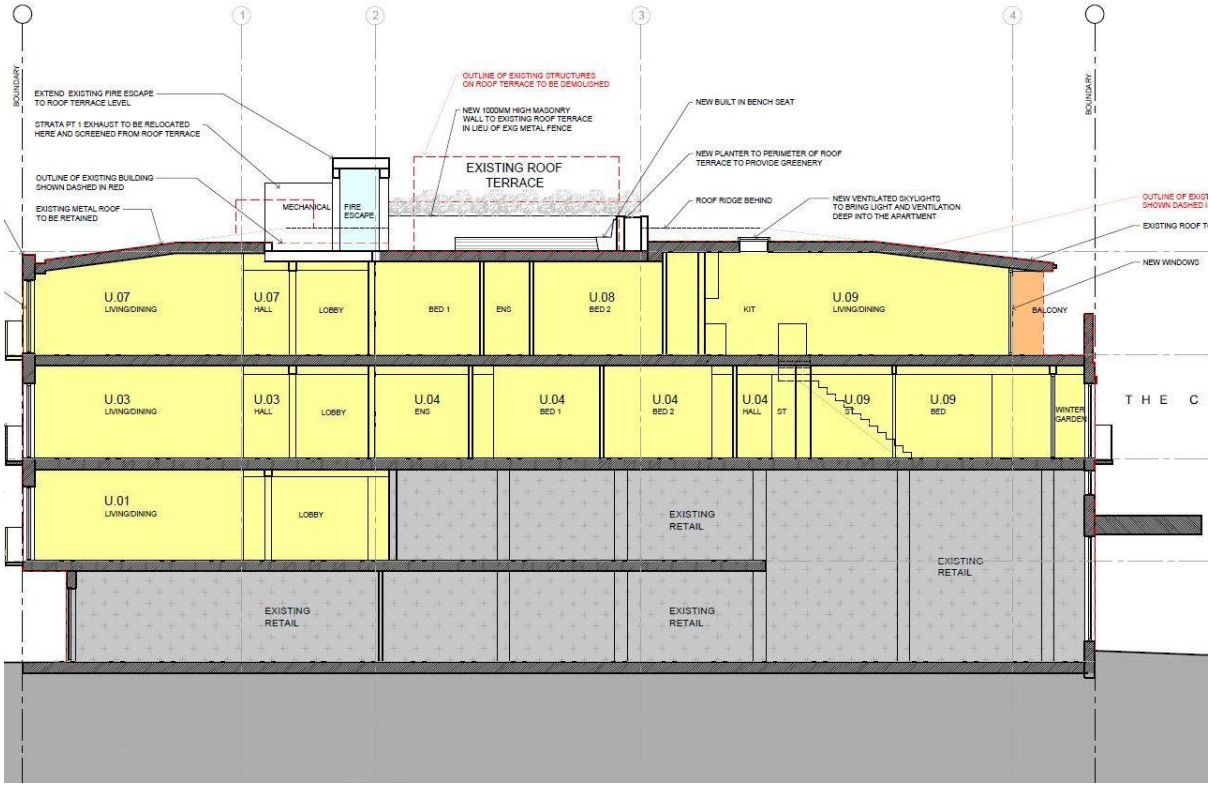
East Elevation



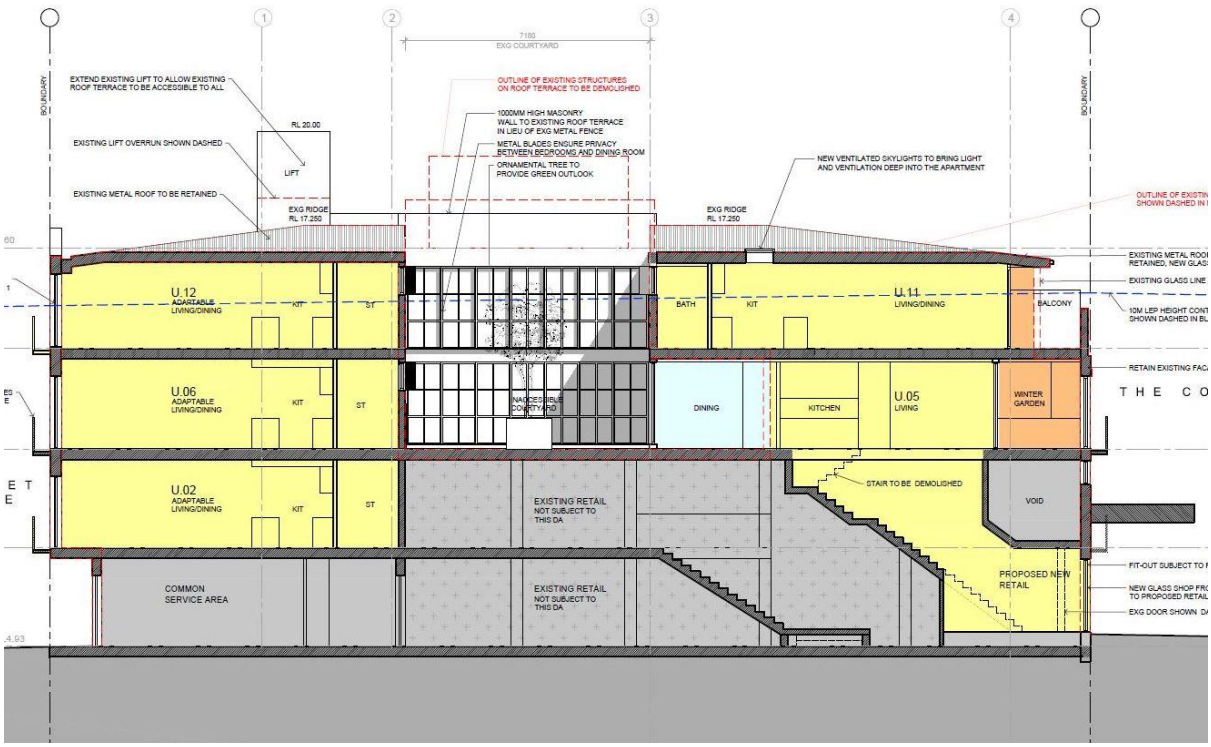
West Elevation



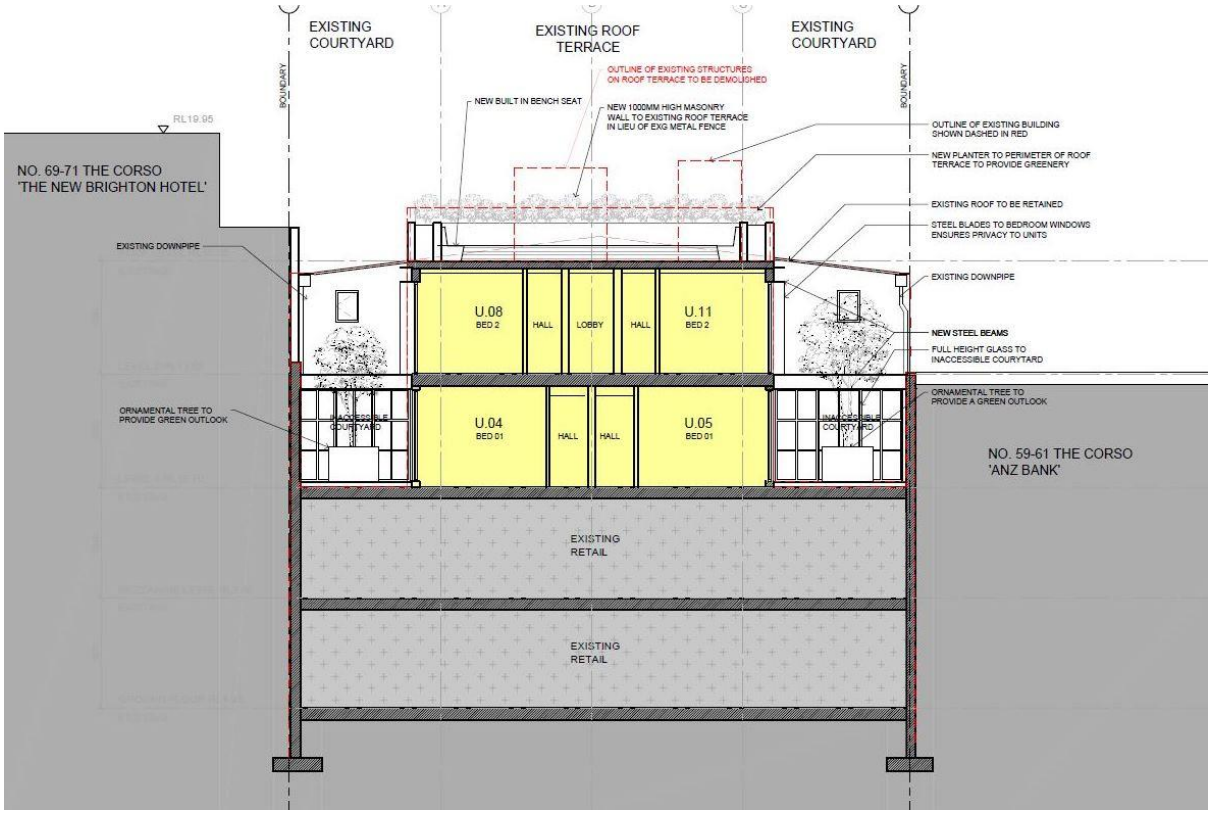
Section AA



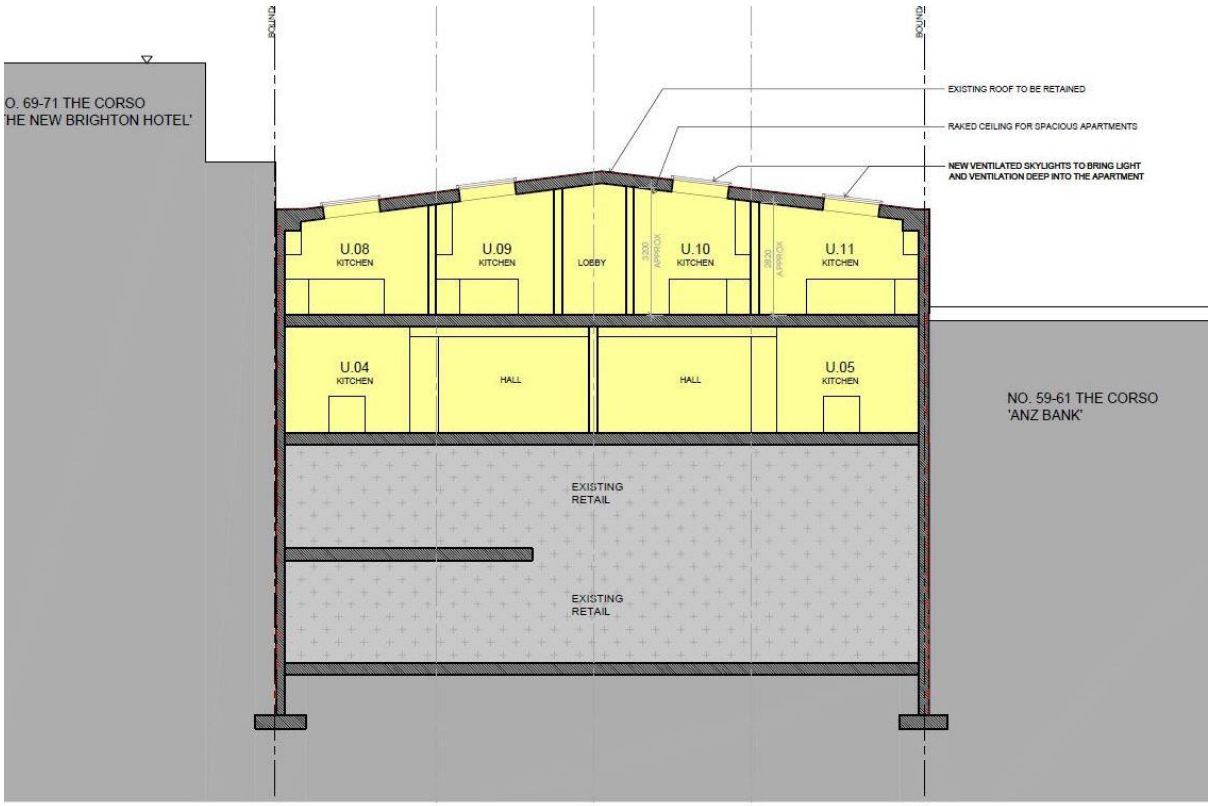
Section BB



Section CC



Section DD



Section EE

B.2 ADJACENT VENUE OPERATIONAL HOURS

Neighbouring Venue	Hours of Operation[1]
The New Brighton Hotel (Ground and First Floor)	10:00am to 1:00am, 7 days per week
33 Degrees (Second Floor)	12:00pm to 12:00am, Sunday to Wednesday
	12:00pm to 3:00am, Thursday to Saturday
Rooftop Garden Bar (Rooftop)	12:00pm to 11:00pm, 7 days per week

Note: 1) Hours of operation obtained from venue's website.