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Town Planning Assessment

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1 INTRODUCTION

Acoustic Logic (AL) has been engaged by Make Property Group Pty and Assemble NRM Pty Ltd to undertake an acoustic assessment of the proposed mixed-use development located at Allotment 2012 East of Elsternwick, Parish of Prahan - Neerim Road, Murrumbeena (NRM).

The assessment addresses external noise intrusion associated with the adjoining road network and surrounding land uses. The assessment has been conducted based on the following documentation;

Table 1 – Referenced Documents

Prepared By	Document	Reference	Date
Fieldwork Projects	Town Planning Architectural Drawings	Project 230022	5 February 2026
Victorian Planning Provisions	Clause 58.04-3	-	2017
EPA Victoria	Noise Limit and Assessment Protocol	Publication 1826.4	2021
SAI Global	Australian/New Zealand Standard AS/NZS 2107:2016	-	2016

2 SITE DESCRIPTION

The subject development is located at Neerim Road, Murrumbeena (NRM). It is bounded by the Pakenham and Cranbourne Sky Rail to the south which is elevated above ground, while below the skyrail to the south is a public car-park area. The site is bound by Neerim Road to the north, while further to the north are residential and commercial properties including two mechanical workshops. To the west of the site are additional commercial tenancies, while to the east is a shared walkway and public car-park areas. Approximately 150m to the west of the site is an industrial zoned area.

The proposed development will contain ground floor commercial tenancies including a supermarket, retail and F&B tenancies, residential apartments on levels 1-7, a common two-level basement for parking and communal rooftop terraced on levels 5 and 7.

Figure 1 below details the subject site and surrounding environment.

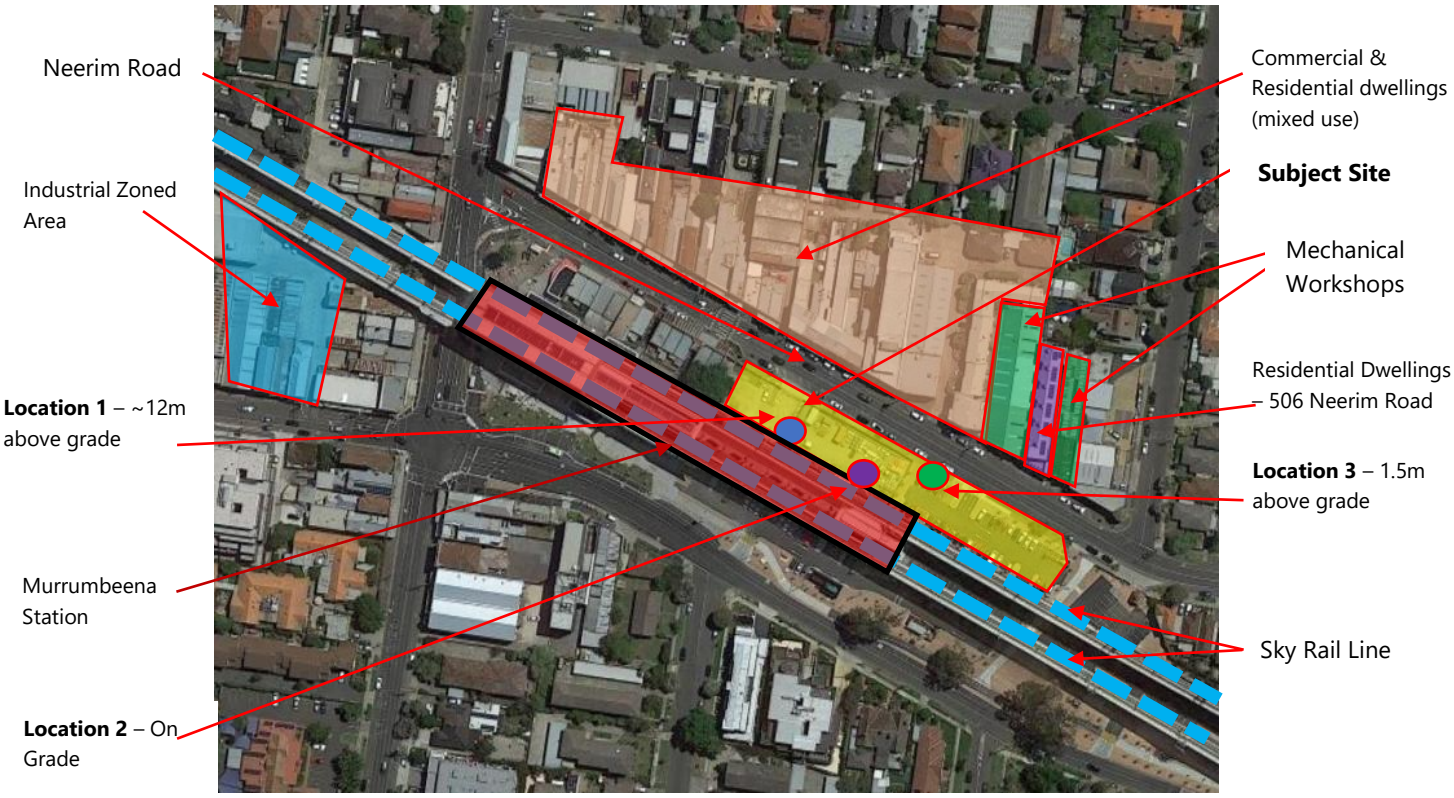


Figure 1: Subject site and surrounding environments (source: Google Maps)

2.1 LOCAL NOISE SOURCES

Acoustic Logic attended the site on multiple occasions. The following observations were made with respect to the subject site and its surrounding environment;

1) Noise sources impacting the subject site are those associated with general transportation on surrounding roadways, including the Pakenham and Cranbourne Sky Rail.
2) Neerim Road carries medium volumes of traffic, including the 624 bus route.
3) Opposite Neerim Road are 2 mechanical workshops situated on either side of a residential dwelling at 506 Neerim Road. Noise compliance with the Noise Protocol – Part 1 (previously SEPP N-1) at this residential dwelling will inherently result in compliance at the proposed development from mechanical workshop related activities as it located further away. Furthermore, during Acoustic Logic multiple site visits and noise from the workshops was not noticeable.
4) Noise from the carpark to the south and east of the site will be addressed to the recommended internal noise levels of AS2107. The acoustic treatment on the development on the southern and eastern façade to address rail noise will be sufficient to also address noise from the carpark areas to the south and east. As such no further assessment of the carpark is conducted.
5) An industrial zoned area is situated approximately 150m to the west of the site. Site inspection on multiple occasions concluded that noise from the industrial site was inaudible at the development site.

3 ENVIRONMENTAL NOISE DESCRIPTORS

Environmental noise constantly varies in level, due to fluctuations in local noise sources including traffic and rail. Accordingly, a 15-minute measurement interval is normally utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In the case of environmental noise three principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source depends on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{eq} is important in the assessment of traffic and rail noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of industrial noise.

The L_1 parameter (or the noise level exceeded for 1% of the time) is used during the night period to assess potential sleep arousal effects due to transient noise sources.

4 NOISE LEVEL MEASUREMENTS

4.1 TRAFFIC AND TRAIN NOISE MEASUREMENTS

Traffic and rail noise measurements were conducted around the proposed site as presented below.

4.1.1 Measurement Equipment

Unattended noise monitoring was conducted using a Ngara Acoustic Research Laboratories Pty Ltd Noise Monitor. The noise monitor was programmed to store 15-minute statistical noise levels through the monitoring period. Equipment was calibrated at the beginning and the end of the measurements using a Rion NC-74 calibrator; no significant drift was detected. All measurements were taken on fast response mode.

Attended noise measurements were conducted using a Rion NL-42 Sound Level Analyser. The equipment was calibrated at the beginning and the end of the measurement using a B&K 4231 calibrator; no significant drift was detected. All measurements were taken on fast response mode.

4.1.2 Measurement Locations and Time of Measurements

Refer to Figure 1 above for measurement locations, and *Appendix 1-Site Photos*;

> **Location 1:** Unattended noise monitoring was conducted between 8 July and 14 July 2021 on a boom lift approximately 12m above grade overlooking the rail line, in line with the future development southern façade.
>
> **Location 3:** Attended noise measurements were conducted on 29 July 2021 between 6:30am and 7:30am in line with the proposed northern façade facing Neerim Road at 1.5m above grade.

4.1.3 Train Noise Levels

Results from unattended measurements from site and surrounding areas are presented in the following table below;

Table 2 –Unattended Train Noise Measurements

Location	Period	Measured Noise Levels[1]
Location 1 (~12m above grade)	Day (6:00-22:00)	64 dB(A)$L_{eq,16hr}$
	Night (22:00-6:00)	57 dB(A)$L_{eq,8hr}$
	Night (22:00-7:00)	90 dB(A) L_{max}

Note 1: Noise measurements conducted in free field
Note 2: Measured level is taken as the 95th percentile L_{Max} over the measurement period

Table 3 – Attended Train Noise Measurements

Measurement Location	Date and Time of Measurements	Measured Noise Levels
Location 3	29/07/2021	80 dB(A) L_{max}

Note 1: Noise measurements conducted in free field
Note 2: Measured level is taken as the 95th percentile L_{Max} over the measurement period

4.1.4 Traffic Noise Levels

Traffic noise levels measured adjacent the site is provided in Table 4 below. Refer to Figure 1 for measurement location.

Table 4 – Measured Traffic Noise Levels – Attended Measurements

Measurement Location	Date and Time of Measurements	Measured Noise Levels $L_{eq,\ 15mins}$ dB(A)
Location 3	29/07/2021 (6:30am-6:45am)	62
	29/07/2021 (6:45am-7:00am)	63
	29/07/2021 (7:00am-7:15am)	63
	29/07/2021 (7:15am-7:30am)	65

Note 1: Noise measurements conducted in free field

BACKGROUND NOISE LEVELS

Background noise measurements were undertaken at Location 1 (refer to Figure 1).

4.1.5 Time of Measurement and Equipment

Unattended noise monitoring was conducted using a Ngara Acoustic Research Laboratories Pty Ltd Noise Monitor. The noise monitor was programmed to store 15-minute statistical noise levels through the monitoring period. Equipment was calibrated at the beginning and the end of the measurements using a Rion NC-74 calibrator; no significant drift was detected. All measurements were taken on fast response mode.

4.1.6 Background Noise Levels

Background noise level measurements were conducted at Location 1 as indicated in Figure 1 and presented below in Table 5.

Table 5 – Measured Ambient Noise Levels

Period	Time	Measured Background $L_{90,Period}$ dB(A)[1]
Day	7am – 6pm (Mon – Sat)	53
Evening	6pm – 10pm (Mon – Sat) 7am – 10pm (Sun)	49
Night	10pm – 7am	41

Note 1: Measurements were conducted in free field.

5 ASSESSMENT CRITERIA

5.1 STANDARD D16 AT CLAUSE 58.04-3

Standard D16 of Clause 58.04-3 contains the following condition:

To contain noise sources in developments that may affect existing dwellings.

To protect residents from external and internal noise sources.

Standard D16

Noise sources, such as mechanical plants should not be located near bedrooms of immediately adjacent existing dwellings.

The layout of new dwellings and buildings should minimise noise transmission within the site.

Noise sensitive rooms (such as living areas and bedrooms) should be located to avoid noise impacts from mechanical plants, lifts, building services, non-residential uses, car parking, communal areas and other dwellings.

New dwellings should be designed and constructed to include acoustic attenuation measures to reduce noise levels from off-site noise sources.

Buildings within a noise influence area specified in Table D3 should be designed and constructed to achieve the following noise levels:

- Not greater than 35dB(A) for bedrooms, assessed as an LAeq,8h from 10pm to 6am.
- Not greater than 40dB(A) for living areas, assessed LAeq,16h from 6am to 10pm.

Buildings, or part of a building screened from a noise source by an existing solid structure, or the natural topography of the land, do not need to meet the specified noise level requirements.

Noise levels should be assessed in unfurnished rooms with a finished floor and the windows closed.

Table D3 Noise influence area

Noise Source	***Noise influence area***
Zone interface	
Industry	*300 metres from the industrial 1, 2 and 3 zone boundaries*
Roads	
Freeways, tollways and other roads carrying 40,000 Annual Average Daily Traffic Volume	*300 metres from the nearest trafficable lane*
Railways	
Railway servicing passengers in Victoria	*80 metres from the centre of the nearest track*
Railway servicing freight outside Metropolitan Melbourne	*80 metres from the centre of the nearest track*
Railway servicing freight in Metropolitan Melbourne	*135 metres from the centre of the nearest track*

Note: The noise influence area should be measured from the closest part of the building to the noise source.

Decision guidelines

Before deciding on an application, the responsible authority must consider:

- The design response.
- Whether it can be demonstrated that the design treatment incorporated into the development meets the specified noise levels or an acoustic report by a suitably qualified consultant submitted with the application.
- Whether the impact of potential noise sources within a development have been mitigated through design, location and siting.
- Whether the layout of rooms within a dwelling mitigates noise transfer within and between dwellings.
- Whether an alternative design meets the relevant objectives having regard to the amenity of the dwelling and the site context.

Based on these conditions, the subject site has been reviewed as follows:

1. The development is within 300m of an industrial zone.
    - Site inspection indicated noise from the industrial zoned area to the west of the site as indicated in Figure 1 above was inaudible at the project site. Acoustic treatment to address rail noise will inherently address noise from the industrial zoned area.
2. The development is <u>not</u> within 300m of a freeway, tollway or road carrying an AADT >40,000
3. The development is within 80m of railway servicing passengers.
    - The development property boundary façade is approximately 6m from the centre of the nearest railway line which carries both passenger and freight trains. The apartment façade/entry door is approximately 11m from the centre of the nearest railway line.

Road traffic from other roads not addressed by Clause 58.04-3 will be assessed against the requirements of AS2107:2016 as set out below in Section 5.2.

5.2 AS/NZS 2107:2016

Australian Standard AS/NZS2107:2016 *"Recommended Design Sound Levels and Reverberation Times for Building Interiors"* sets out recommended design sound levels for residential developments depending on locality to minor or major roads. Table 6 below details the criterion set for this development;

Table 6 – AS/NZS 2107:2016 Criteria for Traffic

LOCATION	Required Internal Noise Level[1]	
	dB(A) $L_{eq\ 1hr}$ (7am – 10pm)	dB(A) $L_{eq\ 1hr}$ (10pm – 7am)
Bedrooms	40[2]	35
Living Areas	40	N/A

Note 1 – Assessment is based on apartments suitably furnished ready for occupation.
Note 2 – Bedrooms assessed as living rooms outside 10pm-7am.

5.3 SLEEP DISTURBANCE CRITERIA (TRAIN MOVEMENTS)

This section is to address train pass-by movements during the night time period to address sleep disturbance within bedrooms. Sleep arousal is a function of both the noise level and the duration of the noise.

As there are currently no enforceable sleep disturbance criteria in Victoria the sleep disturbance criteria for the use of this development have been based on those recommended in the NSW EPA Industrial Noise Policy. As recommended in the Application Notes to the EPA Industrial Noise Policy, to assess potential sleep arousal impacts, a two-stage test is carried out:

Step 1 - An "emergence" test is first carried out. That is, the L_1 noise level of any specific noise source should not exceed the background noise level (L_{90}) by more than 15 dB (A) outside a resident's bedroom window between the hours of 10pm and 7am.

Step 2 - If there are noise events that could exceed the emergence level, then an assessment of sleep arousal impact is required to be carried out taking into account the level and frequency of noise events during the night, existing noise sources, etc. This test takes into account the noise level and number occurrences of each event with the potential to create a noise disturbance. As is recommended in the explanatory notes of the EPA Industrial Noise Policy, this more detailed sleep arousal test is conducted using the guidelines in appendix B of the EPA *Environmental Criteria for Road Traffic Noise*.

Appendix B states that maximum internal noise levels below 50–55dB(A) are unlikely to cause awakening reactions, and that one or two noise events per night with maximum internal noise levels of 65–70 dB(A) are not likely to affect health and wellbeing significantly.

Based on the above, the sleep disturbance criteria for this development is detailed in the table below. We note that this is in line with the criteria nominated in other projects within Melbourne prepared by Acoustic Logic to address noise impacts from train movements.

Table 7 – Sleep Disturbance Criteria (10pm-7am) from Train Movements

LOCATION	Sleep Disturbance Criteria L_{max} dB (A)[1, 2]
Bedrooms	55

Note 1 – Assessment is based on apartments suitably furnished ready for occupation.
Note 2 – The dB(A) L_{Max} value is derived as the maximum noise level not exceeded by 95% of train pass-by events

5.4 SUMMARY OF PROJECT INTERNAL NOISE CRITERIA

Below is a summary of internal noise levels within the development from surrounding noise sources;

Table 8 – Internal Noise Level Criteria – (Train / Traffic Noise)

LOCATION	Required Maximum Internal Noise Level[1]
Bedrooms – Rail Noise	35 dB(A)[3] $L_{eq(8hr)}$ (10pm – 6am) 55 dB(A)[2, 4] L_{Max} (10pm – 7am)
Living Rooms - Rail Noise	40 dB(A)[3] $L_{eq(16hr)}$ (6am – 10pm)
Bedrooms – Road noise	40 dB(A)[2] $L_{eq\ (1\ hr)}$ (7am – 10pm) 35 dB(A)[2] $L_{eq\ (1\ hr)}$ (10pm – 7am)
Living rooms – Road noise	40 dB(A)[2] $L_{eq\ (1\ hr)}$ (7am – 10pm)

Note 1 – With external windows and doors closed
Note 2 – Noise level within furnished room ready for occupation
Note 3 – Noise Level within unfurnished room with finished floor
Note 4 – The dB(A) L_{Max} value is derived as the maximum noise level not exceeded by 95% of train pass-by events

5.5 RAILWAY VIBRATION ASSESSMENT

Trains induce ground borne vibration that is transmitted through the subsoil. This vibration can be perceptible, close to railways.

5.5.1 Vibration Within the Development

The development sites will potentially be subject to tactile vibration from the adjacent rail corridor due to the proximity to the subject site. The following criteria have been nominated to protect the amenity of future residents within the proposed development.

5.5.2 Vibration Dose Value (VDV) Criteria

There is currently *no vibration assessment criteria documented by Council or Victorian Authorities* to assess rail noise or vibration. Due to the absence of any rail vibration criteria applicable to Victoria assessment will be based on criteria nominated by Rail Infrastructure Corporation (RIC) and State Rail Authority (SRA) requirements (NSW). Criteria nominated by RIC and SRA have been used on other residential and commercial developments in Melbourne. RIC and SRA nominate criteria for residential development in their publication 'Interim Guidelines for Councils – Consideration of Rail Noise and Vibration in the Planning Process' dated 2003 which are assessed internally with windows closed. These are detailed below.

The criteria nominated are those recommended in British Standard BS 6472:2008 "Evaluation of Human Exposure to Vibration in Buildings" as this standard includes guidance for the assessment of human response to building vibration including intermittent vibrations such as that caused by trains.

Human response to vibration has been shown to be biased at particular frequencies which are related to the orientation of the person. This standard provides curves of equal annoyance for various orientations. These curves are applied as correction filters such that an overall weighted acceleration level is obtained. As the orientation of the resident is unknown or varying the weighting filter used is based on the combined base curve as given in ISO 2631 & Australian Standard 2670 "Evaluation of Human Exposure to Vibration and Shock in Buildings (1 to 80Hz)".

The standard assesses the annoyance of intermittent vibration by using the Vibration Dose Value (VDV). Alternatively, the VDV may be estimated by the eVDV which is derived by a simpler calculation using an empirical factor. The VDV or eVDV is calculated for the two periods of the day being the "Daytime" (7am-10pm) and "Night time" (10pm-7am). The overall value is then compared to the levels in Table 9. For this project, the aim will be for a low probability of adverse comment.

Table 9 – Vibration Dose Values ($m/s^{1.75}$) above which various degrees of adverse comment may be expected in residential buildings

Place	Low Probability of Adverse Comment	Adverse Comment Possible	Adverse Comment Probable
Residential Buildings 16hr day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential Buildings 8hr night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

5.5.3 Tactile Vibration Criteria

In addition to the above VDV criteria the following criteria nominated are those recommended in Australian Standard AS2670.2 - 1990 "Continuous and shock-induced vibration in buildings (1Hz to 80Hz)" and have been used on similar residential developments in Melbourne.

The standard nominates a base frequency dependant criteria (curve) for vibration in the three axes. The vertical axis has been used as the base curve for this development as vibration levels measured on site were highest in this direction, compliance with the vertical axis criteria will ensure compliance with the horizontal axes criteria.

The standard provides multiplication factors to the base curve depending on the use of the space under investigation and the time of day. The multiplication factor which has been used for this investigation is that given for residential spaces during the night-time period as this is the most stringent applicable criteria, namely 1.4.

The measured Maximum RMS vibration levels at the 1/3 Octave band frequencies from 1Hz to 80Hz are compared to the nominated curve. Time constant used for averaging the RMS of the vibrations was set to 'fast' (125ms). Figure 2 below details the criteria for this development.

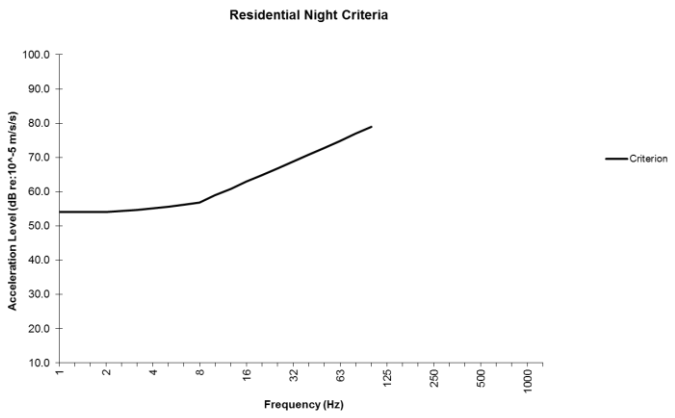


Figure 2 – Tactile vibration criteria within the development

5.6 PLANT EQUIPMENT NOISE AND LOADING DOCK NOISE

To ensure that noise emissions from the site and loading dock do not impact adversely on the amenity of the proposed development residents and surrounding noise sensitive areas, the proposed development should be designed to comply with the EPA Noise Protocol – Part 1.

5.6.1 Zoning Level

The 'Zoning' level is determined by the Influencing Factor (IF) and is calculated by the formula and the 'Zoning Level versus Influencing Factor' graph nominated in Section 1.1 of the EPA Noise Protocol and VicPlan Mapping. The IF is calculated from the proportion of industrial and commercial land around noise sensitive areas. Review of the surrounding area indicates an IF of approximately 0.36 which results in the zoning limits detailed in Table 10 below.

Table 10 - Zoning Levels

Period	Zoning Level dB(A)
Day time	57
Evening	50
Night time	45

5.6.2 EPA Noise Protocol – Part 1

Table 11 below details the assessment criteria based on both the zoning levels and the measured background noise levels.

Table 11 – Noise Limits

Period	Background dB(A) $L_{90,Period}$	Zoning limit	Classification	Project Noise Limits dB(A) L_{eq}
Day Monday – Saturday (7am – 6pm)	53	57	High	**59**
Evening Monday – Saturday (6pm – 10pm) Sunday (7am – 10pm)	49	50	High	**52**
Night Monday – Friday (10pm – 7am)	41	45	Neutral	**45**

6 EVALUATION OF EXTERNAL NOISE INTRUSION

Internal noise levels will primarily be as a result of noise transfer through the windows, doors and roof as these are relatively light building elements that offer less resistance to the transmission of sound. Walls that are proposed to be heavy masonry elements will not require upgrading.

The predicted noise levels through the windows, doors and roof are discussed below. The predicted noise levels have been based on the expected level and spectral characteristics of the external noise, the area of building elements exposed to traffic noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

Glazing/façade treatment was determined based on the measured noise levels and transmission loss of the façade. The constructions set out below are necessary for the satisfactory control of external noise.

6.1 RECOMMENDED GLAZING

The minimum glazing requirements schedule for this development is detailed in **Appendix 2 – Façade Mark-up**. The glass thicknesses shown in the schedule do not consider thermal, structural, safety or any other requirements other than acoustic requirements and thus may require upgrading in some instances. In these instances, increasing the glass thickness beyond the acoustic requirement will be acceptable. Where the glazing thickness has not been specified, standard glazing will be acceptable.

Table 12 below details the minimum Rw performance requirements for the glazing assembly installed. Where open-able windows or sliding doors are installed, the total Rw performance of the system shall not be lower than the values listed in Table 12. It is noted that the system supplied shall meet the overall minimum Rw ratings nominated based on a laboratory test report for the system. If an alternative system is proposed the system shall be reviewed and will require approval by a suitably qualified acoustic consultant to ensure that the proposed system is acceptable and will ensure compliance with the nominated internal noise design criteria.

Table 12 – Minimum External Glazing Requirements / Performance

Location	Required Glazing Construction[1]	Minimum Rw of Installed Window System	Acoustic Seals[2]
Refer Appendix 2	6/12/6mm lam IGU	29	Yes
	6/12/6.38mm lam or 6/12/8mm IGU	31	Yes
	6/12/11.52mm lam IGU	35	Yes
	6/12/13.52mm lam IGU	37	Yes

Note 1 – Alternative glazing system may be installed provided they are approved by a suitable qualified acoustic consultant.
Note 2 – Mohair Seals in windows and doors are not acceptable where acoustic seals are required. Seals in these instances shall be equal to Schlegel Q-lon. Bi-parting sliding doors are not acoustically acceptable.

6.2 EXTERNAL WALLS

Concrete or masonry walls will be sufficient to address external traffic noise intrusion and will not require further acoustic treatment. Lightweight external walls shall be constructed as per Figure 3 below. For extent of treatment, refer to Appendix 2.

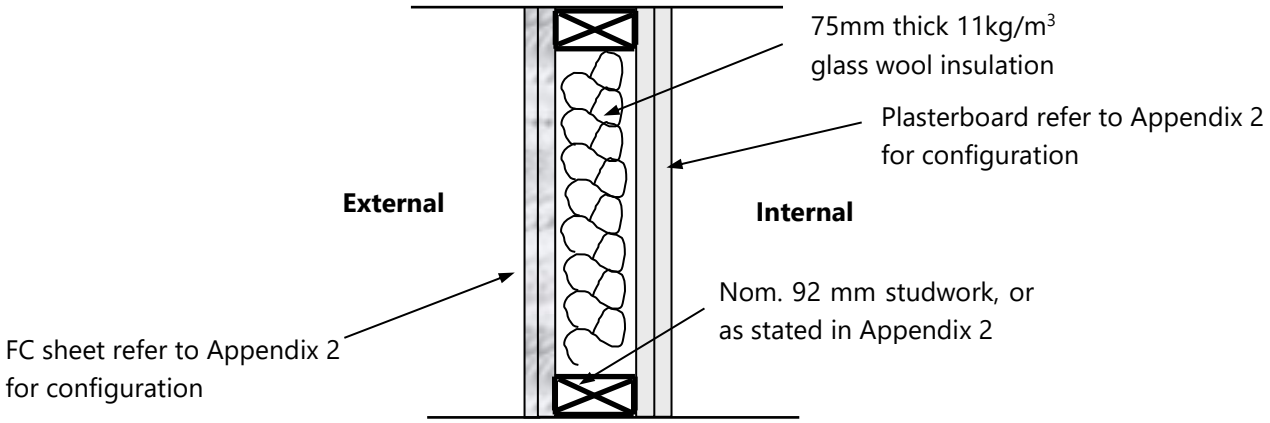


Figure 3 – Lightweight Wall Construction

Penetrations in walls must be sealed gap free with a flexible sealant. Any ventilation openings in should be acoustically treated to maintain the acoustic performance of the external wall construction.

6.3 FAÇADE OPENINGS FOR MECHANICAL VENTILATION

If ventilation openings are required facing the railway line they shall be reviewed by a suitably qualified acoustic consultant and may require additional acoustic treatment such as a non-return air damper at the façade.

Openings for mechanical ventilation above glazing to be reviewed at design stage with mechanical layout drawings.

6.4 ENTRY DOORS

On this project there are two types of entry doors:

1. Entry doors into studio apartments
    a. These shall be a 49mm thick door, with sheet metal facing to achieve Rw39 equal to Sontron R39 Door (by Spence Doors) with full perimeter acoustic seals equal to Raven RP10 perimeter seals and Raven RP38 drop seals, or alternative approved by a suitably qualified acoustic consultant.
2. Standard entry doors into typical apartments i.e. living space (not a bedroom).
    a. These shall be constructed from minimum 35mm thick solid core with full perimeter acoustic seals equal to Raven RP10 perimeter seals and Raven RP38 drop seals.

Refer to Appendix 2 indicating the location of each door.

6.5 ROOF

The roof is proposed to be constructed of concrete and will not require further acoustic treatment. If a lightweight roof construction is proposed it shall be reviewed by a suitable qualified acoustic consultant to ensure compliance with the internal noise level criteria is achieved.

7 VIBRATION ASSESSMENT

7.1 MEASUREMENTS

Vibration measurements were conducted to determine the impact from train movements on the development site.

7.1.1 Measurement Locations

Rail vibration measurements were conducted in the following locations (refer to Figure 1):

- Location 2 – Vibration monitoring approximately 8m from the nearest centre rail line on grade.

7.1.2 Time of Measurements

Attended vibration measurements of the sky rail was conducted on the 8 July 2021 between 11:30am and 3:00pm.

Unattended vibration measurements of the sky rail was conducted between 8 July and 14 July 2021

7.1.3 Measurement Equipment

Railway induced ground vibration levels surrounding the proposed building site were measured using the following equipment.

- Svan 958 AE Sound and Vibration Analyser connected to a Dytran 3233A triaxial accelerometer.

7.1.4 Measured Vibration Levels

The maximum train pass-by ground vibration acceleration, the typical pass-by period (gained from both the noise and vibration measurements) and the estimated number and type of train pass-bys were used to calculate the overall VDV values for each period of the day as detailed in the British and Australian Standards. The results are presented in Table 13 below.

Table 13 – Vibration Dose Values

Location	TIME PERIOD	CALCULATED VDV $m/s^{1.75}$	CRITERIA VDV $m/s^{1.75}$
Location 2	Day (7am-10pm)	< 0.2	0.2-0.4
	Night (10pm-7am)	< 0.1	0.1-0.2

The measured tactile vibration is compared to the Residential Night Criteria curve below.

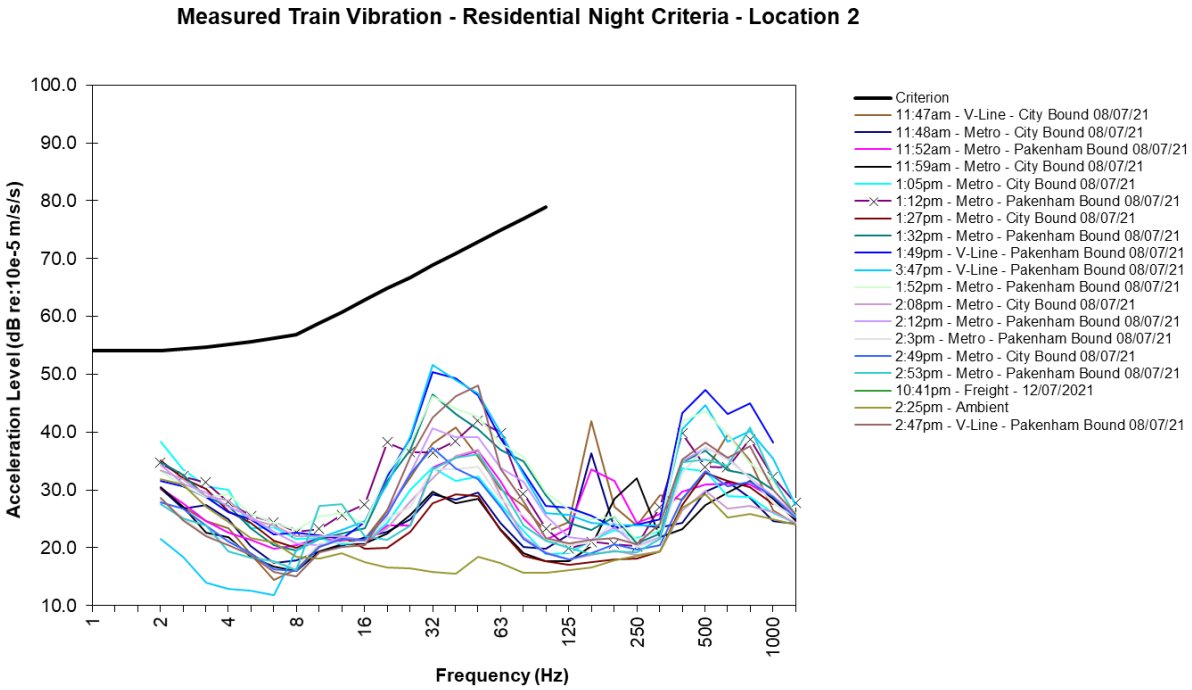


Figure 3 – Measured Vibration Level from Trains at Location 2

The above figure indicates that the measured train movements adjacent to the development site complies with night criteria tactile vibration levels of residential apartments in line with Australian Standard AS2670.2 – 1990.

8 MECHANICAL PLANT AND EQUIPMENT SERVING PROPOSED DEVELOPMENT

It is noted that plant and equipment selections/design have not yet been finalised. Therefore to ensure amenity for future residents and nearby noise sensitive receivers is preserved, mechanical plant and equipment shall be designed to ensure compliance with the EPA Noise Protocol – Part 1. This will be achieved by the use of standard acoustic treatment such as internally lined ductwork, acoustic louvres, acoustic attenuators, variable speed drives, and vibration isolation mounts.

9 PROPOSED RETAIL & COMMERCIAL

The following requirements shall be incorporated into the proposed retail and commercial tenancies;

- Any amplified music associated with the tenancies will be limited to background music only and be limited by the operator to ensure that they comply with the EPA Noise Protocol – Part 2 requirements.
- Staff are to be instructed not to drop heavy garbage items/bottle into bins – they must be placed so as to minimise impact noise.
- All mechanical plant and equipment associated with future tenants must comply with the EPA Noise Protocol – Part 1.
- Use of amplified music until close of business is permitted provided that it is background music only (conversation level) and is inaudible within residential dwelling living areas. Music noise shall only be played within the premises. Externally mounted speakers are not acceptable.
- Glass must not be emptied/transferred from one receptacle to another anywhere externally before 7am or after 10pm. Outside this time period all glass must be emptied / transferred within the premises and removed in containers.
- The collection of waste and recycling must only occur during the hours of garbage collection for the remainder of the development.
- Acoustic advice from an appropriately qualified person must be sought prior to the installation of any of any plant that is either located externally or ducted to an external louvre not specifically addressed in this report. This would include, but may not necessarily be limited to:
    - Exhaust Fans (as they are ducted to external areas).
    - Air-conditioning condensers.
    - Refrigeration plant (if external).

Any acoustic treatment must take into account:

- The location of noise sensitive properties
- Ambient noise levels at the nearest potentially affected property (determined by on-site measurement).
- The noise level from the plant item proposed to be installed (based on acoustic data sheets from manufacturer).
- The proposed time at which the plant will be used/operational.
- Allowable noise level based on typical Council acoustic requirements and/or conditions of consent.

Written advice regarding what acoustic treatments, if any must be provided. This advice must be sought prior to the installation of any plant.

10 REVIEW OF THE PROPOSED SUPERMARKET TENANCY

To ensure that the amenity of the nearby existing residential dwellings identified in Figure 1 and the future residences within the development are protected, the operation of the proposed supermarket located on the ground level of the development shall be designed to ensure compliance with the EPA Noise Protocol – Part 1. The impact from the supermarket operation is typically due to the mechanical plant and equipment and the loading dock activities. The following shall be implemented to ensure compliance with the Noise Protocol – Part 1 is achieved at all nearby noise sensitive receivers and future residences within the development.

10.1 SUPERMARKET TENANCY MECHANICAL PLANT

The mechanical plant and equipment associated with the supermarket tenancy shall be reviewed and designed by a suitably qualified acoustic consultant during the detailed design stage to ensure compliance with Noise Protocol – Part 1 is achieved. This will be achieved by the use of standard acoustic treatment such as internally lined ductwork, acoustic louvres, acoustic attenuators, variable speed drives, and vibration isolation mounts.

10.2 TRUCK MOVEMENT AND LOADING DOCK ACTIVITIES

Assessment of the truck movement entering and exiting the loading dock and the activities within the loading dock has been conducted to ensure compliance with Noise Protocol – Part 1 is achieved. The following sound power level of a large rigid (>7.5 tonne) truck driving at less than 15km/h and loading dock operation have been used in the assessment, which has been based on measurements conducted by AL of similar operations.

Table 14 – Sound Power Level

Type of Operation	Sound Power Level
Large Truck (>7.5 Tonne)	100 dB(A)
Loading Dock Operation	85 dB(A)

The following assumptions have been made:

1. The frequency of truck movement (i.e. deliveries / collection) for the ground floor supermarket is limited to 2 movements during the day in any half hour period, and 1 movement during the evening in any half hour period. The assessment is conducted for the period as the truck enters the loading bay from Neerim Road and when it exits the loading bay to Neerim Road.

2. A solid imperforate vehicle access door will be installed for the loading bay. Note that the door will generally be kept closed except during truck access. The engine of the truck shall be turned off once parked inside the loading bay and the entry door to be fully closed prior to loading / unloading activities.

3. Loading and unloading is to be limited to the day and evening times 7am to 10pm. Based on this, the operation is assessed against the Noise Protocol – Part 1 day and evening period criteria only. There are to be no truck deliveries during the night time period.

Based on the above, the following recommendations shall be implemented.

1. The vehicle access door shall be solid imperforate and acoustically isolated from the building structure. The doors shall be kept closed except during truck access, which ensure that the noise from loading / unloading activities to be contained within the loading bay / back-of-house area.

2. The impact from the loading bay and back-of-house area operation is typically generated by the pallet jacks / trolley movements on the slab. On this basis, the loading dock area where accessible to pallet jack / trolleys shall incorporate an isolated secondary slab which shall be designed during the detailed design stage by a suitably qualified acoustic consultant.

3. The slab soffit within the loading bay area shall be installed with absorptive material such as 30mm Envirospray or approved equivalent by a suitable qualified acoustic consultant.

4. Loading bay ventilation shall be acoustically treated to ensure compliance with the Noise Protocol – Part 1 at the nearby identified noise sensitive receivers is achieved. In-principle mechanical ventilation shall incorporate acoustic treatment such as attenuator, ductwork internal lining etc, whereas any natural ventilation shall incorporate acoustic treatment such as acoustic louvre or approved equivalent by a suitably qualified acoustic consultant.

5. The loading dock floor surface is recommended to have a floor finish which minimises tyre squeal.

Provided the acoustic treatment recommendations above are implemented, we confirm that the truck movement and operation of the loading bay will achieve compliance with the Noise Protocol – Part 1 at the nearby noise sensitive receivers identified in Figure 1 and the future residences within the development.

10.3 ACOUSTIC SEPARATION BETWEEN SUPERMARKET AND ADJOINING APARTMENTS

10.3.1 National Construction Code (NCC) Requirements

The acoustic requirements of the National Construction Code (NCC) are directed toward the provision of sound isolation between residential units and a separate occupancy. The overall objective is to acoustically isolate noise sources within one occupancy and prevent them from intruding upon an adjoining occupancy.

NCC 2019 contains the following condition:

BCA Clause F5.4 Sound insulation rating of floors

(a) A floor in a Class 2 or 3 building must have an $R_w + C_{tr}$ (airborne) not less than 50 and an $L_{n,w}$ (impact) not more than 62 is it separates —

-
  (i) sole-occupancy units; or
  (ii) a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification.

BCA Clause FP5.1

Floors separating —

(a) sole-occupancy units; or
(b) a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification must provide insulation against the transmission or airborne and impact generated sound sufficient to prevent illness or loss of amenity to the occupants.

Based on the above, the acoustic separation requirements between the ground floor supermarket and adjoining apartments (located above) are summarized in the table below.

Table 15 – BCA Requirements

Floor Separation	BCA Requirements
Floor between ground floor supermarket and residential apartments on level 2	$R_w + C_{tr}$ 50[1]

Note 1: The requirement to achieve the $L_{nT,w}$ (impact floor) criteria is to provide residential amenity. Where apartments are located above the supermarket, we confirm that the intent of the BCA is not to protect the amenity within the supermarket below but the residential apartments.

10.3.2 In-Principle Construction to Meet NCC Requirements

Review of the current documentation indicate that the concrete slab separating the ground floor supermarket and residential apartments on level 1 is minimum 200mm thick which will ensure compliance with the NCC requirements in Table 15 above.

Final floor construction shall be reviewed and approved by a suitable qualified acoustic consultant during the detailed design stage to ensure the floor separation achieves BCA compliance.

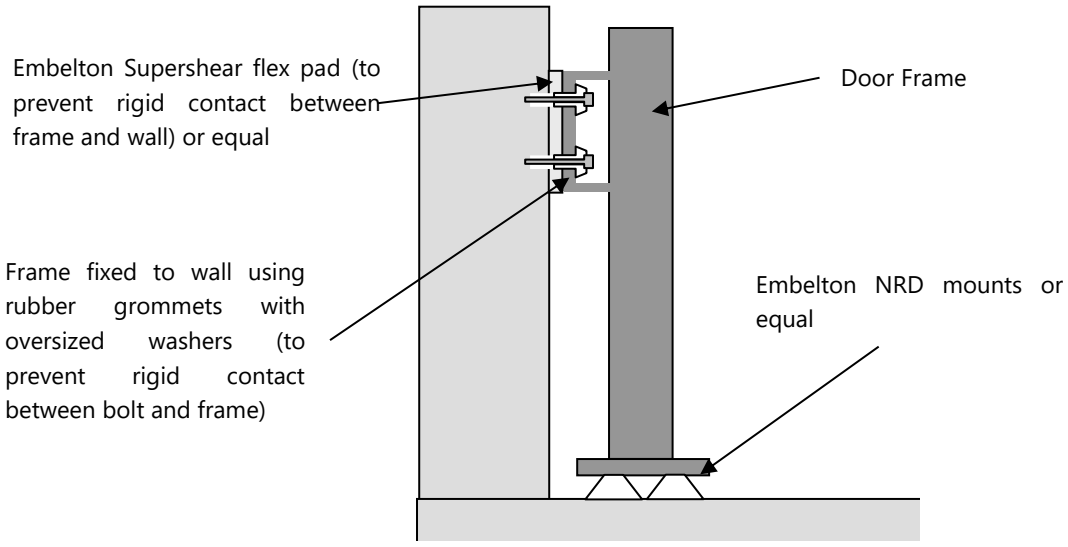
All penetrations in the slab shall be treated to maintain the acoustic rating of the floor.

11 VEHICULAR ACCESS DOORS

The following recommendations are provided to address carpark and loading dock entry and exit:

- It is recommended that the noise levels from the entry gate/door to not exceed 65 dB(A) L_{max} outside openable windows of bedrooms to the apartments above.
- Loading dock entry doors shall be vibration isolated from the building generally in accordance with the details below.
- Doors shall be quiet in operation.
- Entry and exit access doors are to be imperforate, and closed outside the hours of 7am-10pm
- Teflon guides shall be installed in all rails.
- Ensure that door panels do not rattle, and the operation of any door guides, rollers, etc. is smooth.
- Door guides should be fitted with vibration isolated fixings where required. Refer below.
- Door motors shall be fitted with a soft start/stop controller to minimise noise.
- The door shall be stopped approximately 5mm from the slab/ground to ensure the base of the door does not contact the concrete surface.
- Operation of the door shall comply with Noise Protocol – Part 1.

Isolation of the door structure is shown in the schematic below -



12 CONCLUSION

This report details our acoustic assessment for the proposed development Neerim Road, Murrumbeena. Provided the acoustic treatment recommendations are implemented, compliance with criteria detailed in Section 5 and the requirements of Standard D16 at Clause 58.04-3 will be achieved.

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Pty Ltd
Ben Mcclymont

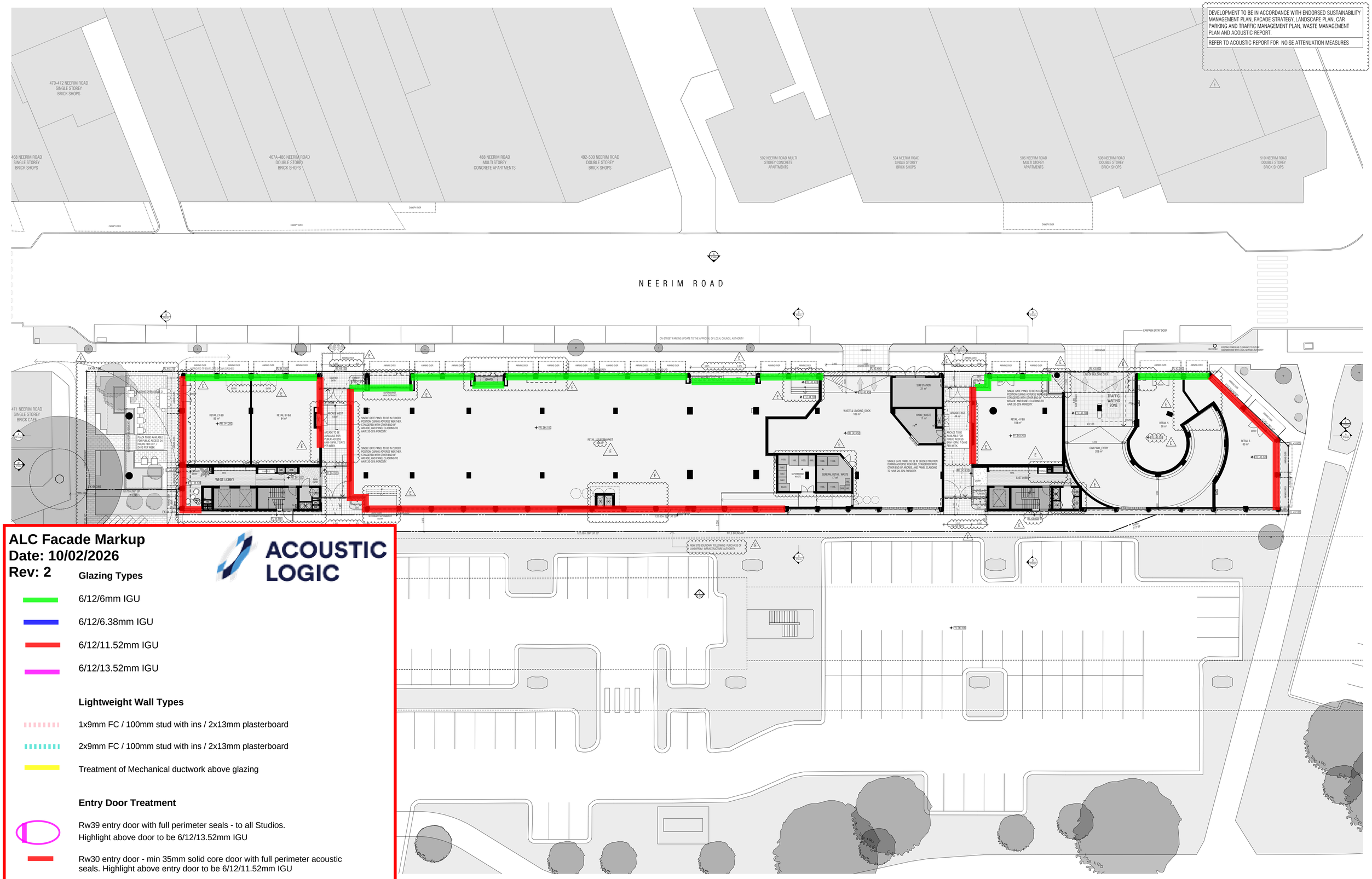
APPENDIX 1 - SITE PHOTOS

Noise Monitor within boom lift overlooking train line

APPENDIX 2 – FAÇADE MARK-UP

DEVELOPMENT TO BE IN ACCORDANCE WITH ENDORSED SUSTAINABILITY MANAGEMENT PLAN, FACADE STRATEGY, LANDSCAPE PLAN, CAR PARKING AND TRAFFIC MANAGEMENT PLAN, WASTE MANAGEMENT PLAN AND ACOUSTIC REPORT.

REFER TO ACOUSTIC REPORT FOR NOISE ATTENUATION MEASURES



ALC Facade Markup
Date: 10/02/2026
Rev: 2

ACOUSTIC LOGIC

Glazing Types

- 6/12/6mm IGU
- 6/12/6.38mm IGU
- 6/12/11.52mm IGU
- 6/12/13.52mm IGU

Lightweight Wall Types

- 1x9mm FC / 100mm stud with ins / 2x13mm plasterboard
- 2x9mm FC / 100mm stud with ins / 2x13mm plasterboard
- Treatment of Mechanical ductwork above glazing

Entry Door Treatment

- Rw39 entry door with full perimeter seals - to all Studios. Highlight above door to be 6/12/13.52mm IGU
- Rw30 entry door - min 35mm solid core door with full perimeter acoustic seals. Highlight above entry door to be 6/12/11.52mm IGU

GENERAL NOTES

All windows to contain Q-lon bulb, full perimeter seals
Hinged doors to contain multi-point latching
Bi-parting sliding doors not acoustically acceptable
External walls to contain minimum 75mm thick, 11kg/m3 insulation
Walls of a concrete construction will not require further acoustic treatment
Roof of a concrete construction and will not required further acoustic treatment

FIELDWORK

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Project Number
230022

Client
MAKE

Project Name
467-473 Neerim Rd Murrumbeena

Site Address
467-473 NEERIM ROAD MURRUMBEENA VIC 3163 AUSTRALIA

Drawing Name
GROUND FLOORPLAN

Date
5/02/2026

Status
TOWN PLANNING

Scale
1:200 @ A1

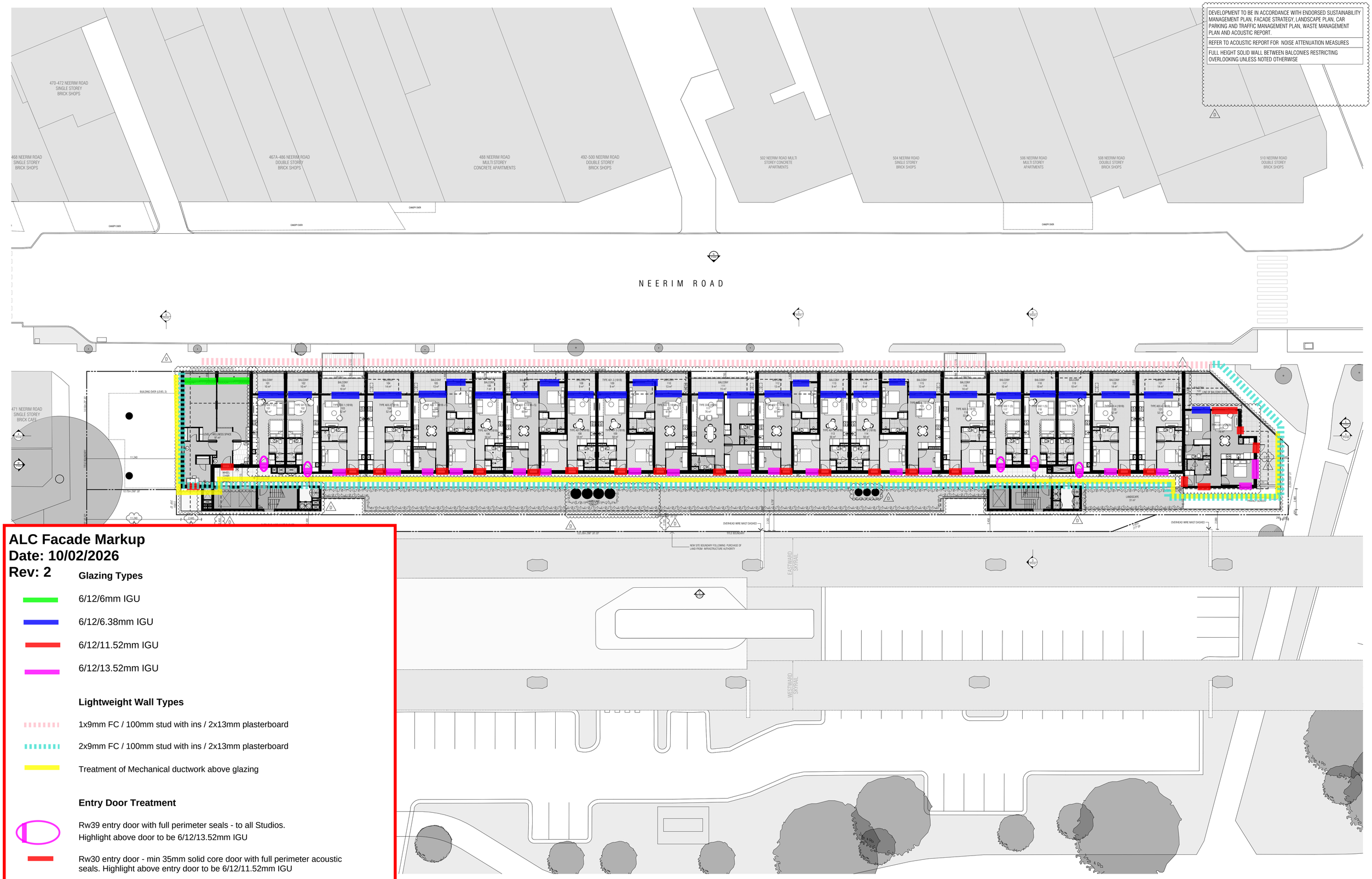
Drawing Number
TP2102

Revision
E

DEVELOPMENT TO BE IN ACCORDANCE WITH ENDORSED SUSTAINABILITY MANAGEMENT PLAN, FACADE STRATEGY, LANDSCAPE PLAN, CAR PARKING AND TRAFFIC MANAGEMENT PLAN, WASTE MANAGEMENT PLAN AND ACOUSTIC REPORT.

REFER TO ACOUSTIC REPORT FOR NOISE ATTENUATION MEASURES

FULL HEIGHT SOLID WALL BETWEEN BALCONIES RESTRICTING OVERLOOKING UNLESS NOTED OTHERWISE



ALC Facade Markup
Date: 10/02/2026
Rev: 2

Glazing Types

- 6/12/6mm IGU
- 6/12/6.38mm IGU
- 6/12/11.52mm IGU
- 6/12/13.52mm IGU

Lightweight Wall Types

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- 2x9mm FC / 100mm stud with ins / 2x13mm plasterboard
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Site Address
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Drawing Name
LEVEL 01 FLOOR PLAN

Date
5/02/2026

Status
TOWN PLANNING

Scale
1:200 @ A1

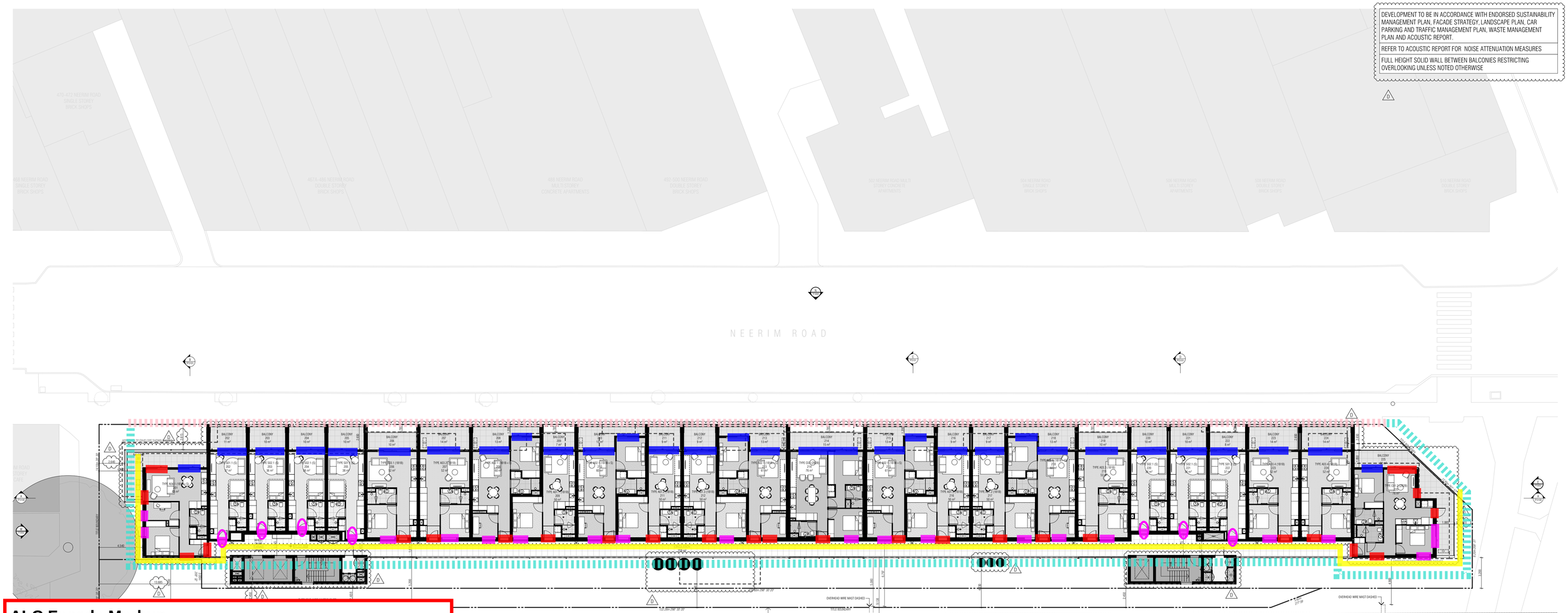
Drawing Number
TP2103

Revision
D

DEVELOPMENT TO BE IN ACCORDANCE WITH ENDORSED SUSTAINABILITY MANAGEMENT PLAN, FACADE STRATEGY, LANDSCAPE PLAN, CAR PARKING AND TRAFFIC MANAGEMENT PLAN, WASTE MANAGEMENT PLAN AND ACOUSTIC REPORT.

REFER TO ACOUSTIC REPORT FOR NOISE ATTENUATION MEASURES

FULL HEIGHT SOLID WALL BETWEEN BALCONIES RESTRICTING OVERLOOKING UNLESS NOTED OTHERWISE



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Date: 10/02/2026
Rev: 2

Glazing Types

6/12/6mm IGU

6/12/6.38mm IGU

6/12/11.52mm IGU

6/12/13.52mm IGU

Lightweight Wall Types

1x9mm FC / 100mm stud with ins / 2x13mm plasterboard

2x9mm FC / 100mm stud with ins / 2x13mm plasterboard

Treatment of Mechanical ductwork above glazing

Entry Door Treatment

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Drawing Name
LEVEL 02 FLOOR PLAN

Date
5/02/2026

Status
TOWN PLANNING

Scale
1:200 @ A1

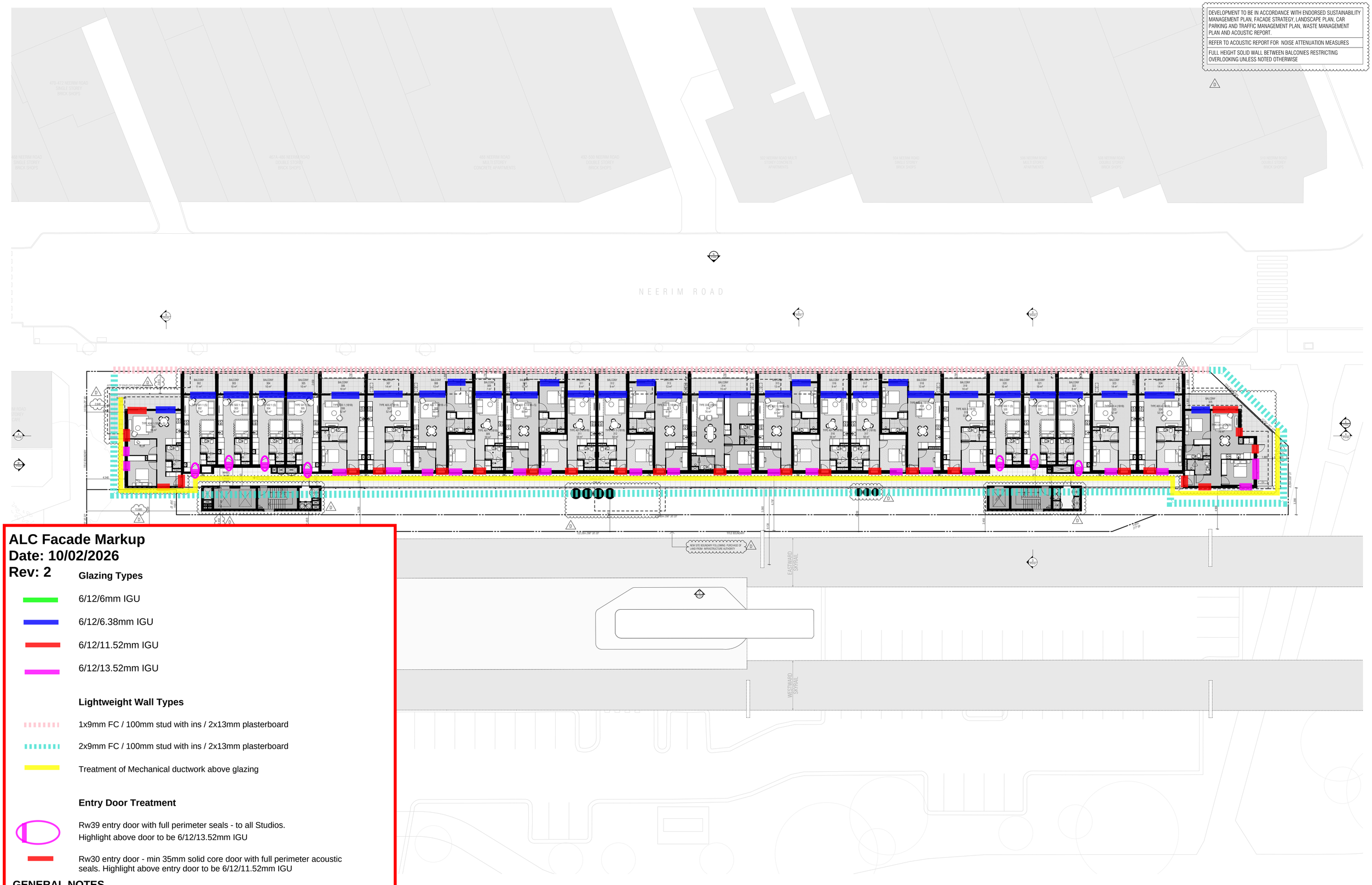
Drawing Number
TP2104

Revision
D

DEVELOPMENT TO BE IN ACCORDANCE WITH ENDORSED SUSTAINABILITY MANAGEMENT PLAN, FACADE STRATEGY, LANDSCAPE PLAN, CAR PARKING AND TRAFFIC MANAGEMENT PLAN, WASTE MANAGEMENT PLAN AND ACOUSTIC REPORT.

REFER TO ACOUSTIC REPORT FOR NOISE ATTENUATION MEASURES

FULL HEIGHT SOLID WALL BETWEEN BALCONIES RESTRICTING OVERLOOKING UNLESS NOTED OTHERWISE



ALC Facade Markup
Date: 10/02/2026
Rev: 2

Glazing Types

- 6/12/6mm IGU
- 6/12/6.38mm IGU
- 6/12/11.52mm IGU
- 6/12/13.52mm IGU

Lightweight Wall Types

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Drawing Name
LEVEL 03 FLOOR PLAN

Date
5/02/2026

Status
TOWN PLANNING

Scale
1:200 @ A1

Drawing Number
TP2105

Revision
D

DEVELOPMENT TO BE IN ACCORDANCE WITH ENDORSED SUSTAINABILITY MANAGEMENT PLAN, FACADE STRATEGY, LANDSCAPE PLAN, CAR PARKING AND TRAFFIC MANAGEMENT PLAN, WASTE MANAGEMENT PLAN AND ACOUSTIC REPORT.

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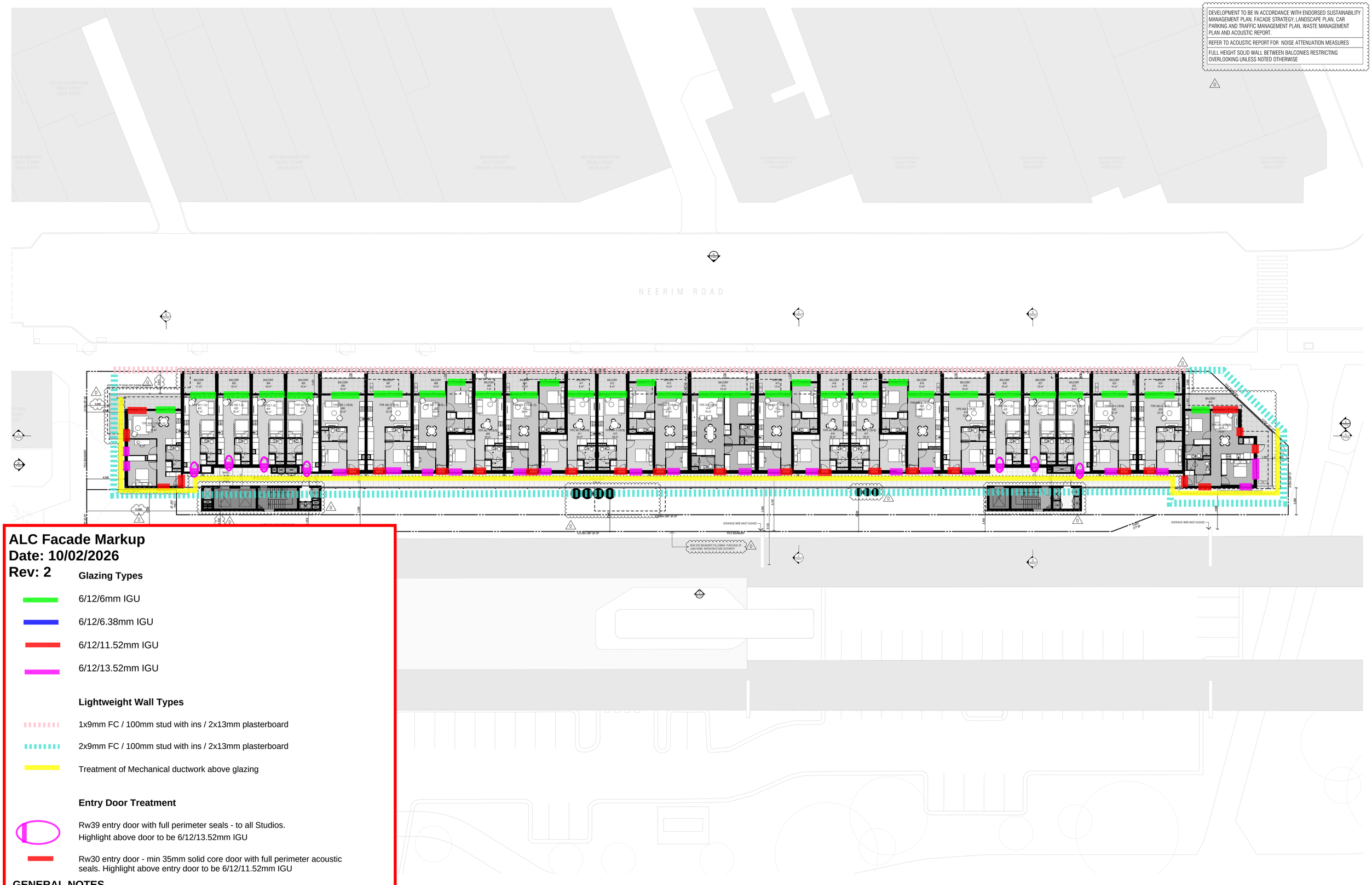

ALC Facade Markup
Date: 10/02/2026
Rev: 2

Glazing Types

- 6/12/6mm IGU
- 6/12/6.38mm IGU
- 6/12/11.52mm IGU
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Lightweight Wall Types

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Drawing Name
LEVEL 04 FLOOR PLAN

Date
5/02/2026

Status
TOWN PLANNING

Scale
1:200 @ A1

Drawing Number
TP2106

Revision
D

DEVELOPMENT TO BE IN ACCORDANCE WITH ENDORSED SUSTAINABILITY MANAGEMENT PLAN, FACADE STRATEGY, LANDSCAPE PLAN, CAR PARKING AND TRAFFIC MANAGEMENT PLAN, WASTE MANAGEMENT PLAN AND ACOUSTIC REPORT.

REFER TO ACOUSTIC REPORT FOR NOISE ATTENUATION MEASURES

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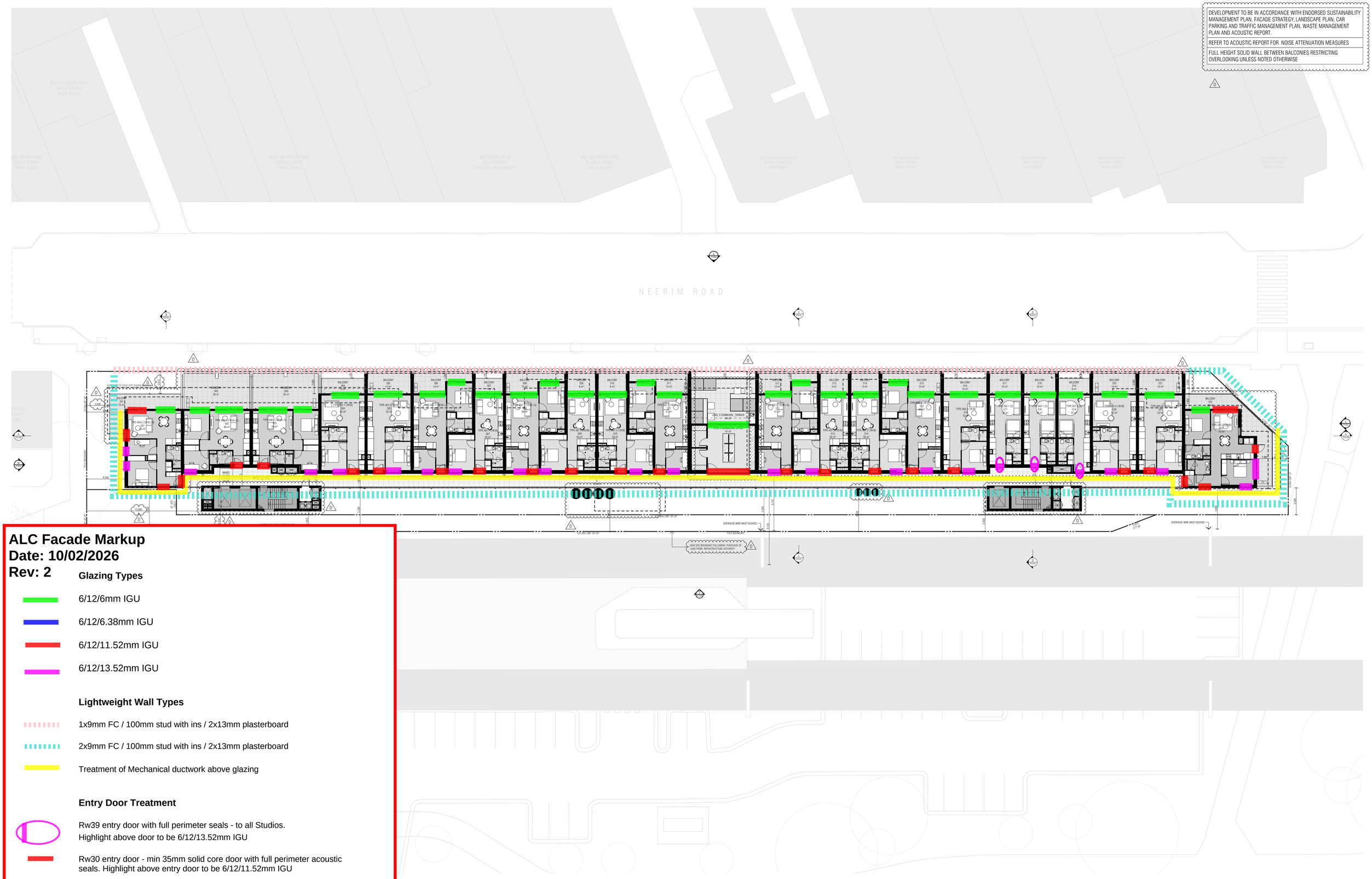

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Date: 10/02/2026
Rev: 2

Glazing Types

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Project Number
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467-473 Neerim Rd Murrumbeena

Site Address
467-473 NEERIM ROAD MURRUMBEENA VIC 3163 AUSTRALIA

Drawing Name
LEVEL 05 FLOOR PLAN

Date
5/02/2026

Status
TOWN PLANNING

Scale
1:200 @ A1

Drawing Number
TP2107

Revision
D

DEVELOPMENT TO BE IN ACCORDANCE WITH ENDORSED SUSTAINABILITY MANAGEMENT PLAN, FACADE STRATEGY, LANDSCAPE PLAN, CAR PARKING AND TRAFFIC MANAGEMENT PLAN, WASTE MANAGEMENT PLAN AND ACOUSTIC REPORT.

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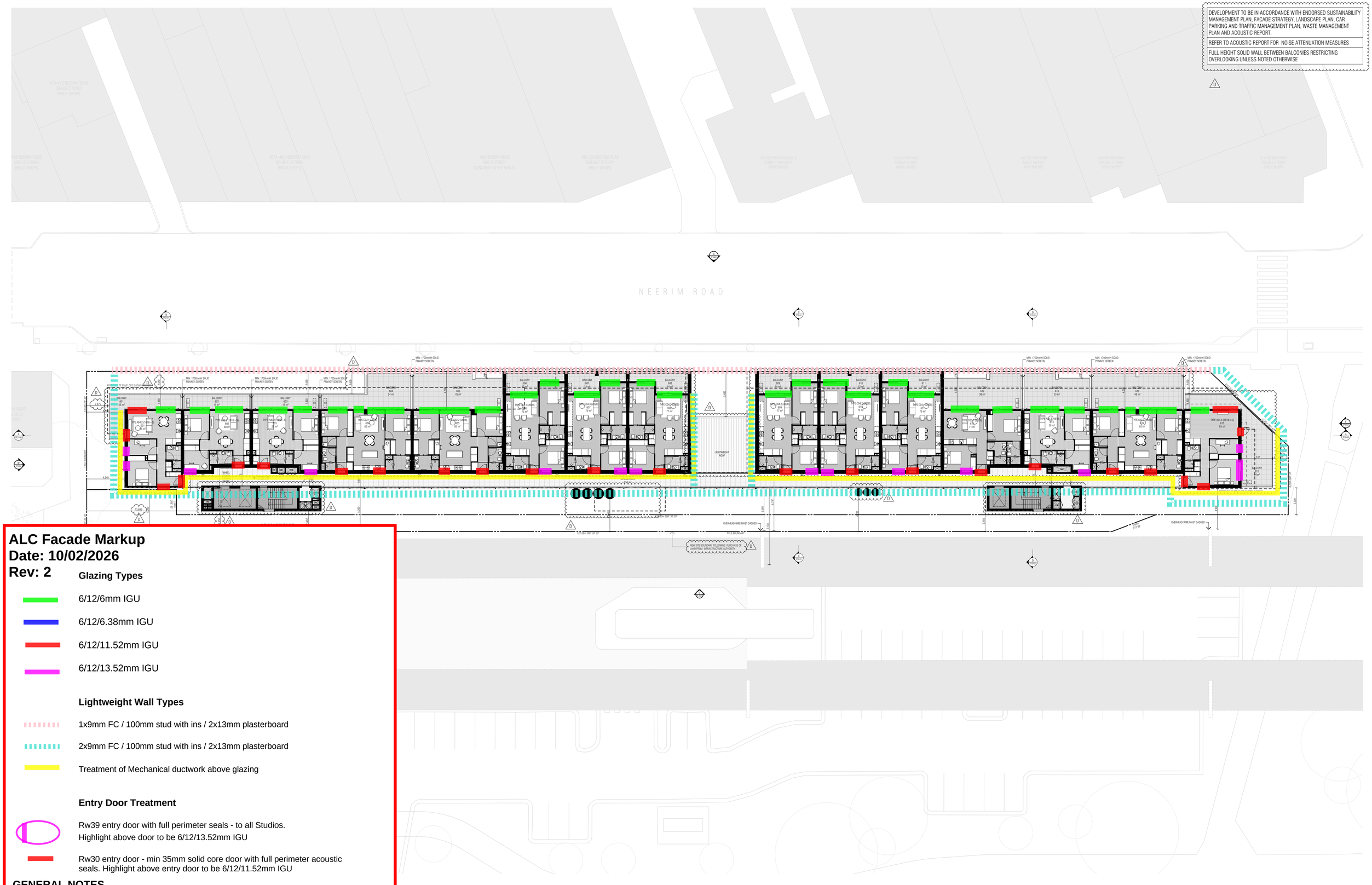

ALC Facade Markup
Date: 10/02/2026
Rev: 2

Glazing Types

6/12/6mm IGU

6/12/6.38mm IGU

6/12/11.52mm IGU

6/12/13.52mm IGU

Lightweight Wall Types

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Project Number
230022

Client
MAKE.

Project Name
467-473 Neerim Rd Murrumbeena

Site Address
467-473 NEERIM ROAD MURRUMBEENA VIC 3163 AUSTRALIA

Drawing Name
LEVEL 06 FLOOR PLAN

Date
5/02/2026

Status
TOWN PLANNING

Scale
1:200 @ A1

Drawing Number
TP2108

Revision
D

DEVELOPMENT TO BE IN ACCORDANCE WITH ENDORSED SUSTAINABILITY MANAGEMENT PLAN, FACADE STRATEGY, LANDSCAPE PLAN, CAR PARKING AND TRAFFIC MANAGEMENT PLAN, WASTE MANAGEMENT PLAN AND ACOUSTIC REPORT.

REFER TO ACOUSTIC REPORT FOR NOISE ATTENUATION MEASURES

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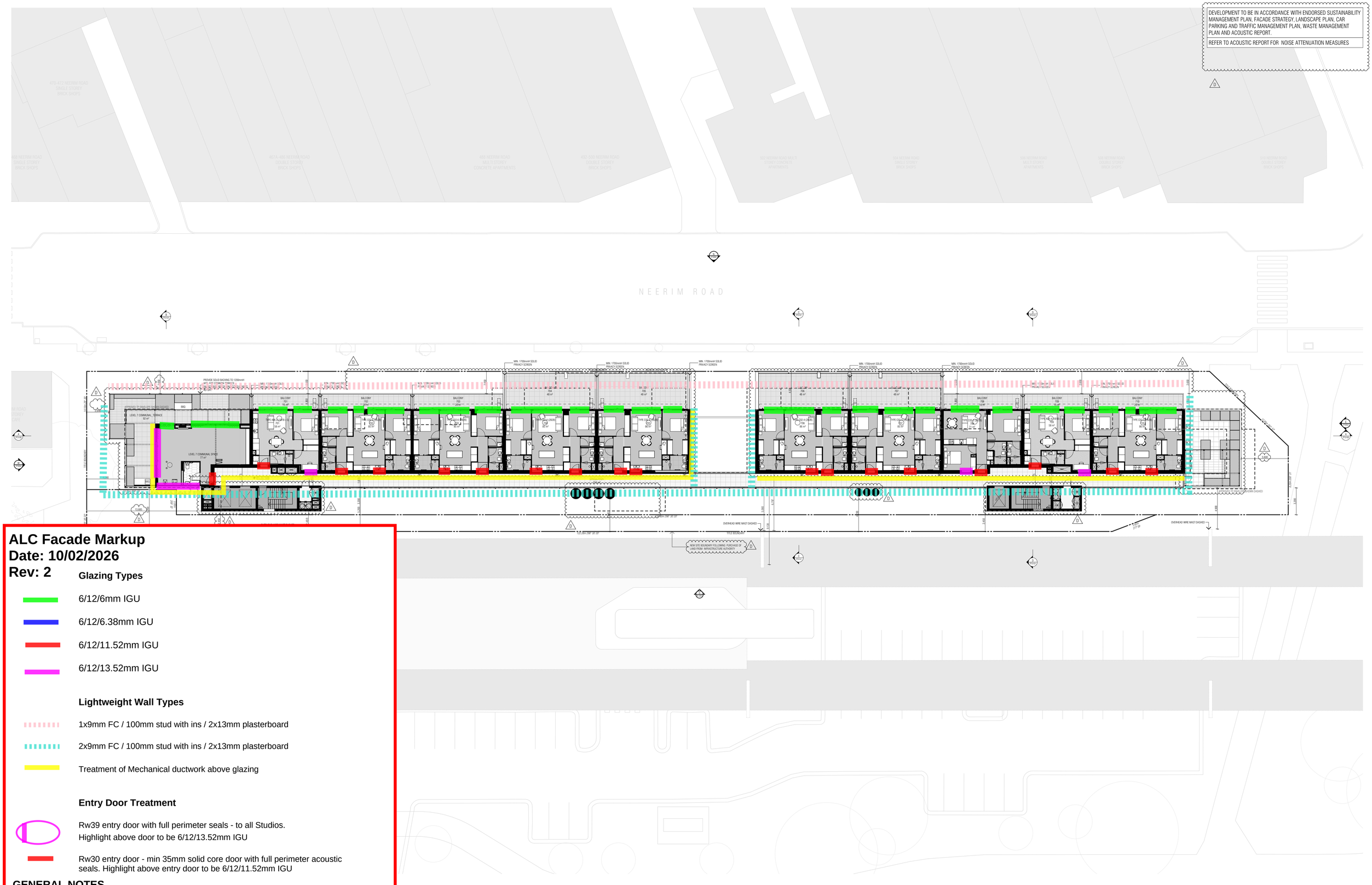

ALC Facade Markup
Date: 10/02/2026
Rev: 2

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Project Number
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Client
MAKE.

Project Name
467-473 Neerim Rd Murrumbeena

Site Address
467-473 NEERIM ROAD MURRUMBEENA VIC 3163 AUSTRALIA

Drawing Name
LEVEL 07 FLOOR PLAN

Date
5/02/2026

Status
TOWN PLANNING

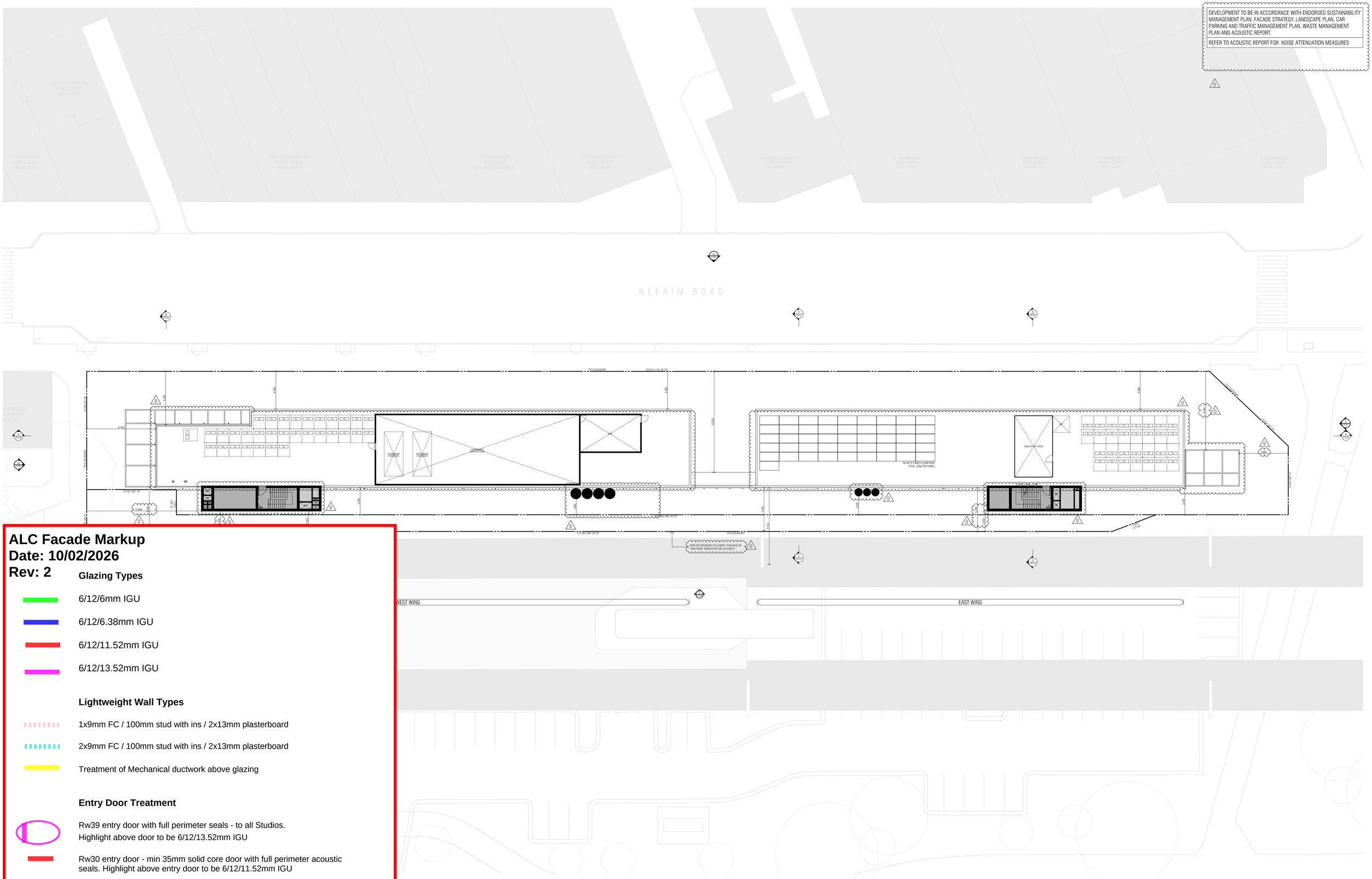
Scale
1:200 @ A1

Drawing Number
TP2109

Revision
D

DEVELOPMENT TO BE IN ACCORDANCE WITH ENDORSED SUSTAINABILITY MANAGEMENT PLAN, FACADE STRATEGY, LANDSCAPE PLAN, CAR PARKING AND TRAFFIC MANAGEMENT PLAN, WASTE MANAGEMENT PLAN AND ACOUSTIC REPORT.

REFER TO ACOUSTIC REPORT FOR NOISE ATTENUATION MEASURES



ALC Facade Markup
Date: 10/02/2026
Rev: 2

Glazing Types

- 6/12/6mm IGU
- 6/12/6.38mm IGU
- 6/12/11.52mm IGU
- 6/12/13.52mm IGU

Lightweight Wall Types

- 1x9mm FC / 100mm stud with ins / 2x13mm plasterboard
- 2x9mm FC / 100mm stud with ins / 2x13mm plasterboard
- Treatment of Mechanical ductwork above glazing

Entry Door Treatment

- Rw39 entry door with full perimeter seals - to all Studios. Highlight above door to be 6/12/13.52mm IGU
- Rw30 entry door - min 35mm solid core door with full perimeter acoustic seals. Highlight above entry door to be 6/12/11.52mm IGU

GENERAL NOTES

All windows to contain Q-lon bulb, full perimeter seals
Hinged doors to contain multi-point latching
Bi-parting sliding doors not acoustically acceptable
External walls to contain minimum 75mm thick, 11kg/m3 insulation
Walls of a concrete construction will not require further acoustic treatment
Roof of a concrete construction and will not required further acoustic treatment

FIELDWORK

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Project Number
230022

Client
MAKE.

Project Name
467-473 Neerim Rd Murrumbeena

Site Address
467-473 NEERIM ROAD MURRUMBEENA VIC 3163 AUSTRALIA

Drawing Name
ROOF FLOOR PLAN

Date
5/02/2026

Status
TOWN PLANNING

Scale
1:200 @ A1

Drawing Number
TP2110

Revision
D