

APPENDIX 4 – REVISED NOISE ASSESSMENT



Project: **QUICK SERVE RESTAURANTS, EVANS STREET TIMARU**

Prepared for: **Home Centre Properties Ltd
Unit 6b, 1 Sir Tim Wallis Drive
Wanaka 9382**

Attention: **Alison Devlin**

Report No.: **Rp 001 R02 20250396**

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SUMMARY

Two drive-through restaurants and two food/retail shops are proposed, with on-site carparking

We have assessed noise effects from four primary sources associated with the development:

- Drive-through activities
- Mechanical services
- Heavy vehicle movements
- Carpark vehicle movements

The existing ambient noise is dominated by traffic on Evans Street (SH1)

Ambient noise measurements show that existing noise levels in the area are dominated by traffic on Evans Street (State Highway 1) and already exceed Timaru District Plan permitted noise limits at all times of day. Daytime noise levels were measured in the mid-50s to mid-60s dB L_{Aeq} , reducing to the low-50s dB L_{Aeq} at night.

Both the World Health Organisation and NZS 6802:2008 indicate that appropriate residential protection is achieved with limits of 55 dB L_{Aeq} during the day and 45 dB L_{Aeq} at night. Based on this guidance and the existing noise environment, we recommend adopting the following project noise limits:

- 0700 to 2200 hrs 55 dB L_{Aeq}
- 2200 to 0700 hrs 45 dB L_{Aeq} and 75 L_{Amax}

The activity will result in minimal noise effects

Daytime noise emissions from peak hour operation are anticipated to comply with the recommended daytime noise limit of 55 dB L_{Aeq} . During the night-time, the predicted noise levels from Starbucks (0500 and 0700 hrs), Popeyes (2200 and 0100 hrs) and retail shops (2200 and 0000 hrs) are expected to remain below the applicable 45 dB L_{Aeq} limit.

Achieving the predicted noise levels is contingent upon the construction of a 2-metre-high noise control fence along the residential boundary, including a 3.5-metre section adjacent to the food order station. It is recommended that this requirement be included as a condition of consent. A further condition is recommended, requiring the mechanical services plant design to be reviewed prior to the issue of building consent.

Overall, the predicted noise levels indicate that the development will maintain an appropriate level of residential amenity, and that noise effects on surrounding noise-sensitive sites will be minimal.

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GLOSSARY OF TERMINOLOGY

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1.0 INTRODUCTION

We have assessed the expected noise emissions from the proposed new Starbucks and Popeyes with drive throughs and two additional retail/food shops on Evans Street (State Highway 1) in Timaru. The site address is 192-208 Evans Street.

We have considered four main noise sources

- Patron ordering and payment activities
- Vehicle movements within the drive-through and on-site car park
- Delivery and rubbish truck movements
- Mechanical services plant

Appendix A contains a glossary of acoustic terminology used in this report.,

2.0 PROJECT OVERVIEW

2.1 Three single storey buildings with two drive-throughs and on-site carparking are proposed

The proposed site layout plan, including the location of the drive through lanes, is shown in Figure 1. The site boundary is highlighted in red. The two drive throughs run along the western boundary.

Figure 1: Proposed development map and zoning



Figure 1 illustrates the proposed development layout and underlying zoning. The site spans both Neighbourhood Commercial and Residential zones, with General Industrial zoned land located to the north and east. The closest noise-sensitive dwellings are situated within the residential zone to the east and south of the development.

3.0 EXISTING NOISE ENVIRONMENT

3.1 The ambient noise is dominated by traffic noise from Evans Street (SH1)

Both attended and unattended noise monitoring was conducted at positions that represent the existing residential noise environment of the adjacent dwellings. Full survey details are provided in Appendix B. The measurement locations are shown in Figure 1 and described as follows:

- MP 1 An unattended noise monitor was set up at this location to capture the noise environment experienced by dwellings that face onto Evans St. Data was collected over 15 hours between 1500 hrs on Friday 2 May to 0600 Saturday 3 May 2025.
- MP 2 This position is representative of traffic noise received at the façade of the dwelling at 190 Evans Street.
- MP 3 Measurements at this location captured noise levels similar to what 8 Grants Road would experience. Measurements were taken both during daytime and night-time at this location to capture traffic noise during multiple of the operating scenarios.

A summary of the results is shown in Table 1.

Table 1: Summary of results from the noise survey

Measurement position	0500 – 0700		0700 – 2200		2200 – 0100	
	dB L _{Aeq}	dB L _{Amax}	dB L _{Aeq}	dB L _{Amax}	dB L _{Aeq}	dB L _{Amax}
MP1	53	77	57	78	52	73
MP2	-	-	65	82	-	-
MP3	-	-	66	84	62	79

The measured noise levels indicate that 190 Evans Street experience ambient noise levels of 62dB L_{Aeq} (15min) during the day and 58 dB L_{Aeq} (15min) at night. The dwellings on Grants Road experience ambient noise levels of 60 dB L_{Aeq} (15min) during the day and 52 – 57 dB L_{Aeq} (15min) overnight.

State Highway 1 traffic was the dominant noise source at all locations during both the day and night. During the noise survey on Friday the carwash on the other side of Evans Street, was audible at a low level between lulls in traffic, with occasional low-level sound from self-serve carwash hose and dryer.

4.0 NOISE PERFORMANCE STANDARDS

4.1 Operative Timaru District Plan Noise Rules

The nearest dwellings are zoned Residential 1 in the operative Timaru District Plan (TDP). The applicable noise limits provided in Table 2 as stated in Rule 3.5.1.A.10, apply at the nearest residential boundary.

Table 2: Timaru District Plan Noise limits

Time period (hrs)	dB L _{A10}	dB L _{Amax}
0700 - 2200	50	-
2200 - 0700	40	70

The District Plan also specifies that noise shall be measured in accordance with New Zealand Standards NZS 6801:1991 “Measurement of Sound” and NZS 6802:1991 “Assessment of Environmental Sound”.

We note that the proposed Timaru District Plan has similar noise limits for day and night and introduces an evening shoulder period between 1900 and 2200 hrs with a noise limit of 45 dB L_{Aeq} . In keeping with current best practice, the parameter L_{Aeq} has been adopted instead of L_{A10} . For the purposes of assessing compliance, we have assumed that L_{Aeq} is numerically equivalent to L_{A10} .

4.2 World Health Organization

World Health Organisation (WHO) Guideline Values for Community Noise (Berglund and Lindvall, 1999) give guidelines for environmental noise exposure. For community or environmental noise, the critical health effects (those effects which occur at the lowest exposure levels) are:

- Sleep disturbance - The prevention of sleep disturbance is essential for good physiological and mental functioning of healthy people;
- Annoyance (slight, moderate, high) - Annoyance may, in turn, induce behavioural effects that decrease the quality of life and increase anti-social behaviour;
- Speech interference/communication disturbance. - This may lead to social isolation, particularly in vulnerable groups, that is contrary to Government policy on social inclusion.

The WHO Guideline Values for these three critical health effects for community or environmental noise are presented in Table 4. These Guideline Values are the exposure levels that represent the onset of the effect for the general population. That is, at these noise levels, critical health effects only begin to appear in a small number of vulnerable or sensitive groups.

Table 3: WHO Guidelines values for the critical health effects of community or environmental noise

Specific environment	Critical health effect(s)	dB L_{Aeq}	Time base (hours)	dB L_{Amax}
Outdoor Living area	Serious annoyance, daytime & evening	55	16	
Dwellings indoors	Speech Intelligibility and moderate annoyance, daytime & evening sleep disturbance, night-time	35 30	16 7	45
Outside bedrooms	Sleep disturbance, window open (outdoor values) night-time	45	8	60

4.3 NZ 6802:2008 Acoustics – Environmental Noise

The 2008 version of NZS 6802 (N.B. the District Plan refers to the 1991 version) makes reference to the following desirable upper limits of sound exposure at or within the boundary of any residential land use:

- Night-time (2200 to 0700 hours): 45 dB L_{Aeq} and 75dB L_{Amax}
- Daytime (0700 to 2200 hours): 55 dB L_{Aeq}

4.4 Discussion of Noise Assessment Criteria

With reference to the existing noise environment in Section 3.0, existing daytime and night-time noise levels are considerably above the applicable District Plan noise limits of 50 and 40 dB L_{A10} respectively. For example, the lowest measured night-time noise level is 52 dB L_{Aeq} at approximately 36m from the road which is 12 dB above the District Plan permitted activity residential zone noise limit. The current noise environment is such that an activity could exceed the District Plan permitted standards and have minimal impact on the existing noise effects experienced by residents in this receiving environment. As previously mentioned for the purposes of our analysis in this report, we have assumed that L_{Aeq} and L_{A10} are numerically equivalent.

Both the WHO guidance and NZS 6802:2008 indicate that day and night noise emissions up to 55 and 45 dB L_{Aeq} respectively are appropriate for the protection of residential amenity, and we consider

these limits to be appropriate for the neighbouring dwellings. If the proposed developed is granted consent, the traffic noise environment at these dwellings will reduce but not to noise levels below the District Plan permitted activity standard.

On this basis, we propose the following project noise limits are adopted for the project to ensure that noise effects are acceptable in the context of the existing noise environment and for maintaining an appropriate residential amenity.

- 0700 to 2200 hrs 55 dB L_{Aeq}
- 2200 to 0700 hrs 45 dB L_{Aeq} and 75 L_{Amax}

5.0 SITE NOISE SOURCES

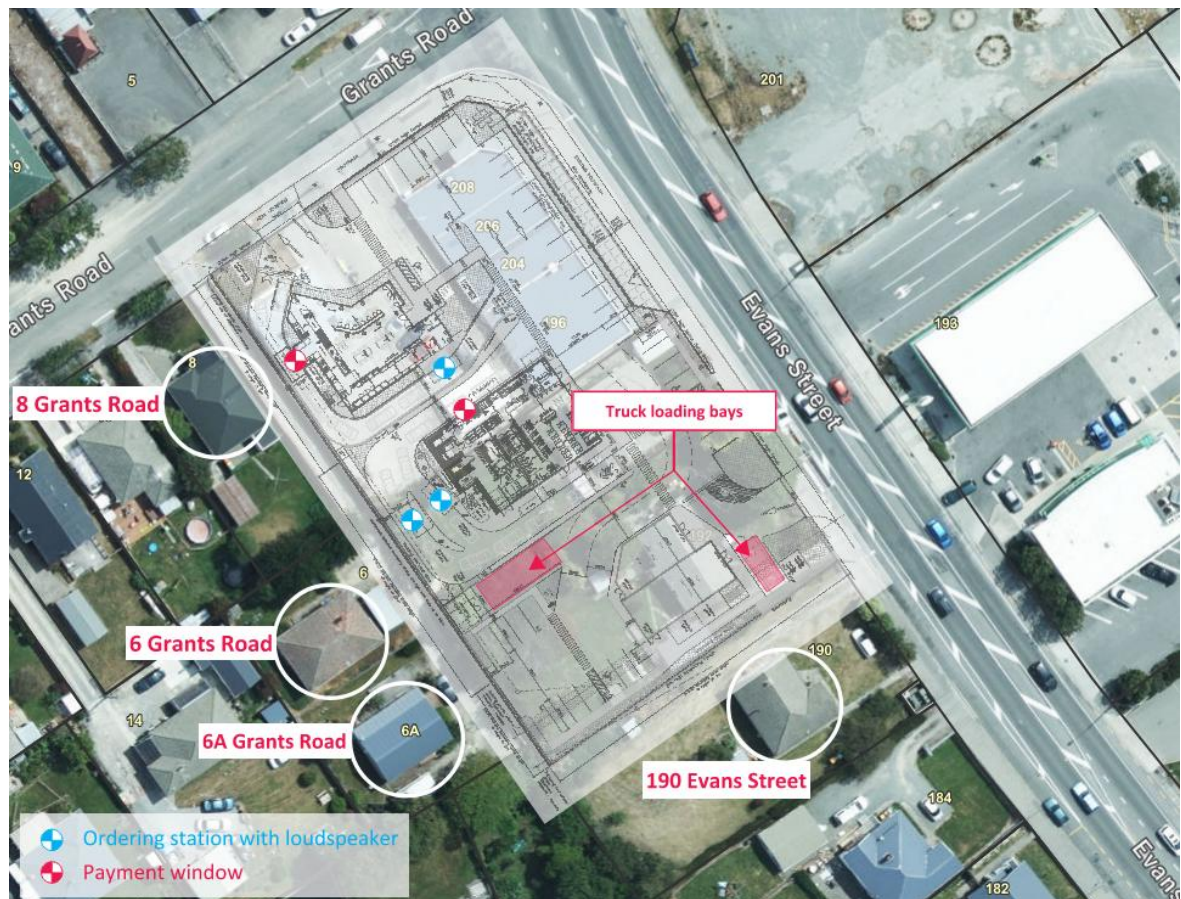
5.1 Proposed noise sources and operational hours

The primary noise sources affecting the adjacent dwellings are described below and identified in Figure 2:

1. Vehicle movements in the car park and drive through
2. Ordering station with loudspeaker
3. Payment window
4. Mechanical services plant

We have assumed that noise from patrons dining and food preparation within each restaurant/shop will be adequately controlled by the building envelope such that its contribution will be negligible at the site boundary.

Figure 2: Location of primary noise sources



The proposed trading hours for the site are provided in Table 4 and span the day and night-time periods as defined in the TDP. Operational hours for Shop 3 and 4 are to be confirmed but we have assumed that they will operate inside the daytime hours of 0700 – 2200 hrs.

Table 4: Proposed Trading hours

Title	Opening Time (hrs)	Closing Time (hrs)
Starbucks with drive through	0500	2200
Popeyes with drive through	0700	0000 (Sunday – Wednesday) 0100 (Thursday – Saturday)
Shop 3 and 4	0700	0000

5.2 We have based our assessment on noise levels measured at similar facilities

We have used noise data for the activities from measurements we have made at similar drive-through facilities during busy periods. The noise levels are summarised in Table 5.

Table 5: Source Noise Levels

Noise source	Measurement distance (m)	Noise levels
Vehicles moving in car park	3	70 dB L_{Ae}
Ordering station with loudspeaker	1	72 dB L_{Aeq}
Payment window	1	66 dB L_{Aeq}
Delivery truck (with refrigeration)	10	66 dB L_{Aeq}

We consider that the ordering station will have Special Audible Characteristics (SAC) when assessed in accordance with Section 6.3 of NZS 6802:2008 and have included a +5 dB penalty in the predicted noise levels discussed in Section 6.

5.3 Mechanical plant noise

At this early stage of the project, details of the mechanical plant are not available but are likely to include chillers and condenser units in a plant enclosure at ground level, and extract fans on the roof. We have assumed a nominal individual sound power of 66 dB L_{WA} for chillers and 69 dB L_{WA} for the cooker extract fan. Mechanical plant with higher noise levels can be specified, provided that appropriate noise mitigation is included into the design. We have proposed a consent condition requiring the mechanical plant noise emissions to be assessed by a suitably qualified and experienced acoustic engineer prior to the issue of building consent.

5.4 Heavy vehicle movements

Observations from other similar sites found that an average of 1 or 2 delivery vehicles are likely each day, comprising of food service delivery or rubbish trucks that will park at the designated areas. We expect that trucks will be on site for approximately 5 to 10 minutes per visit.

The ITA states that truck activity will occur before 10 am, during a period of minimal site activity however specific truck numbers are not stated. This timing avoids the restaurant's busiest operational hours when noise levels are highest and the period that has been the focus of the noise assessment. In other words, the conservative operational restaurant noise levels in section 6.4 are unlikely to change because of truck activity, as it will occur at a different time.

Further assessment of this activity is included in Section 6.6.

5.5 Vehicle noise on-site and in the drive-throughs was considered based on the provided ITA

The Integrated Traffic Assessment (ITA) from Avanzar provided a PM peak on site vehicle information for the expected entry and exits from the car park in an hour. There were tables included in the ITA which were originally sourced from the NSW “Guide to Transport Impact Assessment” which provided more details as to the number of vehicles in and out of these kinds of restaurants during morning and evening peak hours.

Based on the ITA, our calculations assume the following traffic movements for the three scenarios described in Table 6.

Table 6: Predicted traffic generation

Scenario	Time period	Restaurant(s) operating	Site Vehicle Movements (per 15 minutes)
Morning	0500 – 0700	Starbucks	18
Daytime	0700 – 2200	Starbucks, Popeyes and Shop 3/4	30
Night	2200 - 0000	Popeyes and Shop 3/4	18
Night	0000 – 0100	Popeyes	9

Our calculations adopt the conservative assumption that every car entering the car park will go through the drive through for the Morning scenario. We have also assumed that two thirds of vehicles will go through the two drive throughs in the Daytime and the other third will park in the southern corner. For the Night scenario we assumed that half the cars will go through the drive through, and the other half will park in the southern corner. In practice, this is unlikely as all tenancies are operating walk-in restaurants, so the resulting noise generation from drive through cars is likely to be lower than predicted.

6.0 PREDICTED NOISE LEVELS

6.1 Operational scenarios

As Table 6 shows, three different operating scenarios have been assessed:

- ‘Morning’ when Starbucks is operating,
- ‘Daytime’ when all drive through restaurants and shops are operating and,
- ‘Night’ when Popeyes and shops are operating.

Both ‘Morning’ and ‘Night’ scenarios are subject to the TDP noise limit of 40 dB L_{A10} at the residential boundary.

6.2 Noise levels at four neighbouring dwellings were assessed

The closest dwellings to the proposed site that were included in the assessment are indicated in Figure 3. By managing the noise emissions to these sites, the noise to other neighbouring properties will also be controlled.

Figure 3: Closest receivers to the proposed operation



As shown in Figure 3, a 2-metre-high noise control fence will be needed around the boundary with these residential dwellings. A section of this fence opposite the order stations is required to be 3.5 metres high, to reduce the noise from the order stations that are close to the south-west residential boundary. Indicative construction details of the fence are included in Appendix C.

6.3 Noise Prediction Methodology

We have predicted operational noise levels in general accordance with ISO 9613-2:1996 which considers a range of frequency dependent attenuation factors including spherical spreading, atmospheric absorption, and ground absorption.

To accurately predict noise levels, noise modelling based on ISO 9613-2:1996 “Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation” was conducted. This method has the scope to consider a range of factors affecting the sound propagation including:

- The magnitude of the noise source in terms of sound power;
- The distance between source and receiver;
- The presence of obstacles such as screens or barriers in the propagation path;
- The presence of reflecting surfaces;
- The hardness of the ground between the source and receiver;
- Attenuation due to atmospheric absorption; and
- Meteorological effects such as wind gradient, temperature gradient and humidity.

In ISO 9613, the effect of meteorological conditions is significantly simplified by calculating the average downwind sound pressure level. The Standard adopts the conservative approach of assuming that wind is always blowing from the noise sources to the receiver locations. The equations and calculations also hold for average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights.

The noise contour plot included in Appendix D shows the calculated night-time noise levels as described in Table 8 based on the operation of Popeyes and Restaurant between the hours of 2200 and 0100 hrs.

6.4 Daytime restaurant and retail operations will comply with the District Plan noise limit

The noise emissions from daytime operations will comply with the applicable TDP limit of 50 dB L_{A10} at all the neighbouring dwellings as summarised in Table 7, and are below our proposed project noise limit of 55 dB L_{Aeq} discussed in Section 4.4. Noise emissions are also substantially below the existing ambient traffic noise environment.

Table 7: Daytime noise emission levels at each neighbouring dwelling

#	Receiver location	Noise level	TDP Noise limit	Existing ambient noise level
		dB L_{Aeq}	dB L_{A10}	dB L_{Aeq}
1	8 Grants Road	46	50	60
2	6 Grants Road	47	50	59
3	6a Grants Road	45	50	59
4	190 Evans Street	37	50	62

6.5 At night the closest noise sensitive receivers will experience an exceedance of 5dB or less

Table 8 shows that night-time operation, both between 0500 to 0700 hrs and 2200 to 0100 hrs, will exceed the applicable TDC noise limit of 40 dB L_{A10} but remain below 45 dB L_{Aeq} at all locations which will ensure an appropriate level of night-time noise amenity is achieved.

Table 8: Highest night-time noise emission levels at each neighbouring dwelling

		Noise level	TDP Noise limit	Existing ambient noise level
#	Receiver location	dB LAeq	dB LA10	dB LAeq
Morning				
1	8 Grants Road	39	40	56
2	6 Grants Road	42	40	52
3	6a Grants Road	37	40	52
4	190 Evans Street	33	40	58
Night				
1	8 Grants Road	43	40	57
2	6 Grants Road	44	40	53
3	6a Grants Road	43	40	53
4	190 Evans Street	35	40	58

The 5dB penalty for Special Audible Character (SAC) was included in the calculated levels.

6.6 The noise level from delivery trucks is expected to be 55 dB L_{Aeq} or less

There are two proposed loading zones as shown in Figure 2. Noise levels from each loading zone at the residential boundary are expected to be in the range of 45 to 50 dB $L_{Aeq(15\text{ min})}$ depending on the type of truck and its duration on site. For our assessment, we have assumed a conservative scenario where both loading bays are occupied by trucks with over-cab refrigeration units and remain on site for an entire 15 minute period. Rubbish collection trucks will typically result in lower noise levels over the same assessment period.

Table 9: Daytime refrigeration truck noise level at each neighbouring dwelling

#	Receiver location	Noise level	TDP Noise limit	Existing ambient noise level
		dB L_{Aeq}	dB L_{A10}	dB L_{Aeq}
1	8 Grants Road	46	50	60
2	6 Grants Road	51	50	59
3	6a Grants Road	51	50	59
4	190 Evans Street	55	50	62

While the noise levels from the truck may exceed the TDP noise limit at 6 and 6A Grants Road and 190 Evans Street however will not exceed the 55 dB L_{Aeq} recommended limit. Predicted levels are also significantly below the ambient noise levels of 59 - 63 dB L_{Aeq} .

In practice, we consider the actual adverse noise effects of relatively infrequent loading bay activity will be minimal because of the existing daytime State Highway 1 traffic noise environment.

7.0 ASSESSMENT OF NOISE EFFECTS AND RECOMMENDATIONS

Our predicted noise levels show that the proposed activity can operate and comply with the recommended daytime noise limit of 55 dB L_{Aeq} . Daytime operation excluding when trucks are onsite will comply with the permitted activity daytime noise limit of 50 dB L_{A10} .

The TDP night-time noise limit of 40 dB L_{A10} has the potential to be breached at the following times:

- 0500 to 0700 hrs; and
- 2200 to 0000 hrs (Sunday – Wednesday) and 2200 and 0100 hrs (Thursday – Saturday)

During these times, noise from the proposed activity will remain below 45 dB L_{Aeq} and therefore noise effects will be appropriate for the protection residential night-time noise amenity.

Moreover, dwellings to the west of the site at 8, 6 and 6A Grants Road experience an existing ambient noise environment of 50 – 57 dB $L_{Aeq(15\text{ min})}$ during the time of the predicted TDP noise limit breach. Noise levels at 190 Evans Street are higher with an existing ambient noise environment of 58 – 63 dB $L_{Aeq(15\text{ min})}$. The existing noise levels are substantially above the levels that will be generated by the proposed activity.

Based on the above, we consider the proposed activity will have minimal effect on residential amenity of surrounding noise-sensitive sites, and the existing level of residential amenity will be maintained.

8.0 RECOMMENDED CONDITIONS OF CONSENT

Should consent be granted, we recommend that the following text should be drafted into appropriate conditions:

1. The consent holder shall ensure that all activities on the site shall not exceed the following noise limits at any point within any residential site during the following time frames:
 - i. 0700 to 2200 hrs 55 dB L_{Aeq}
 - ii. 2200 to 0700 hrs 45 dB L_{Aeq} and 75 L_{Amax} .
2. Noise shall be measured in accordance with NZS 6801:2008 *Acoustics – Measurement of environmental sound* and assessed in accordance with NZS 6802:2008 *Acoustics - Environmental Noise*.
3. A noise control fence shall be constructed along the boundary of the site to the height and extent shown in *Figure 3 (N.B the final condition should reference the appropriate site plan in the AEE)*. The fence shall have a minimum surface mass of 9 kg/m² and shall be maintained to be free of gaps or cracks that reduce its sound transmission loss.

Advice note: Option for the noise control fence construction is provided in Appendix D
4. Prior to the issue of building consent, a design report prepared by a suitably qualified and experienced acoustic engineer, shall be submitted to [appropriate person] that confirms cumulative noise emissions from all mechanical plant on site does not exceed the noise limits in Condition 1.

9.0 RESPONSE TO RFI QUERIES

Below we provide our response to the Malcolm Hunt Consulting [MHC] Noise Review for Resource Consent 102.2025.81.1 that was based on the June 2025 version of our report which related to different site layout. We expect that several of the queries remain relevant.

While there are several comments throughout the MHC report, this letter responds to the queries set out in *Section 4 Summary and Recommendations*.

We have provided each MHC query followed by our response.

- 1) *Regarding the main body of the Noise AEE report, we consider the report deficient in terms of the assessment failing to consider noise effects generated by on-site heavy vehicle goods delivery and waste removal vehicles. We consider the consultant should provide an amended report or report addendum which covers the cumulative noise from on-site activity noise (vehicles, mechanical plant, outdoor speakers, etc.) which will be received, at times, concurrently with noise from heavy vehicles and waste removal vehicles using the loading zone and associated goods yard. Should these additional noise effects cause potential non-compliance, we recommend the consultant review the fence height requirements in affected areas or other practical mitigation measures.*

MDA response: We have addressed this in Section 5.4 and Section 6.6 of this updated report.

- 2) *Regarding suggested noise conditions set out within Section 8.0 of the Noise AEE, we consider the following matters need to be addressed;*
 - a. *Recommended noise condition 3 stipulating site fence requirements to mitigate noise effects needs to include both the minimum surface mass and specify height(s) above ground level. We do not support condition 3 referring to Appendix D of the Noise AEE report as this is advisory. Instead we recommend reference be made to the fence design specified in Appendix 2 drawing SK 1.3 Rev A of the main AEE document, with both minimum surface mass and fence heights specified within the condition wording.*

MDA response: We have no objection to the peer reviewer's request assuming the drawings in the main AEE are updated for the changed length of the 3.5m section that is included in this report.

- b. *We have identified a lack of activity controls within conditions governing night time operating hours for each activity. As explained above (Section 3.3.2) night time cumulative noise effects are a concern. Having regard to the additive effect of cumulative activity noise levels received within adjacent residential sites, it is evident from Table 8 that non-compliance with the night time 45 dB limit is likely if ALL THREE proposed commercial activities be undertaken after 10pm or if TWO or more commercial activities are undertaken concurrently before 7am. As currently worded, we consider recommended noise conditions set out within Section 8.0 of the Noise AEE are insufficient to ensure cumulative noise effects are adequately controlled to meet the LAeq 45 dB noise limit proposed between 2200hrs and 0700 hrs. We recommend an additional 'operating hours control' condition needs to be included to deal with this potential non-compliance.*

MDA response: Given the conservatism in our assessment, and the stated hours of operation in the application, we disagree non-compliance is likely. The reviewer is describing a situation with all three restaurants operating that does not align with what is being applied for – only Popeyes and shops 3/4 will be operating after 2200 hrs and Starbucks between 0500 and 0700 hrs.

- c. *Any consent condition included to deal with traffic effects of on-site heavy vehicle activity (as recommended by the ITA report) should avoid on-site heavy vehicle movements during noise sensitive period of after 10pm and before 7am.*

MDA response: We have no objection to the peer reviewer's recommendations to avoid on site truck movements between 10pm and 7am. We understand that truck movements are most likely to occur between 7am and 10am.

GLOSSARY OF TERMINOLOGY

SPL or L_p	<u>Sound Pressure Level</u> . A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 μ Pa RMS) and expressed in decibels.
SWL or L_w	<u>Sound Power Level</u> . A logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
dB	Decibel - The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of $P_r=20 \mu\text{Pa}$, i.e. $\text{dB} = 20 \times \log(P/P_r)$
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
dBA	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
$L_{\text{Aeq}}(t)$	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{A90}	The A-weighted sound level which is equalled or exceed for 90% of the measurement period. L_{A90} is an indicator of the mean minimum noise level and is used as a descriptor for background noise.
L_{A10}	The A-weighted sound level which is equalled or exceeded for 10% of the measurement period. L_{A10} is an indicator of the mean maximum noise level and is used in New Zealand as the descriptor for intrusive noise.
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
NZS 6801:2008	New Zealand Standard NZS 6801:2008 <i>"Acoustics – Measurement of environmental sound"</i>
NZS 6802:2008	New Zealand Standard NZS 6802:2008 <i>"Acoustics – Environmental Noise"</i>
NZS 6803:1999	New Zealand Standard NZS 6803: 1999 <i>"Acoustics - Construction Noise"</i>
Noise	A sound that is unwanted by, or distracting to, the receiver.
Ambient Noise	Ambient Noise is the all-encompassing noise associated with any given environment and is usually a composite of sounds from many sources near and far.
Prescribed time frame	'Daytime', 'night-time', 'evening', or any other relevant period specified in any rule or national environmental standard
Rating Level	A derived level used for comparison with a noise limit. Takes into account any and all corrections described in NZS 6801 and NZS 6802, e.g. duration, special audible character, residual sound etc.
Reference time interval	The time interval over which the time average A-weighted sound pressure levels is determined. Typically 15 minutes

APPENDIX A NOISE SURVEY DETAILS

The key details of the noise survey are as follows:

Date: 02/05/2025 1500 - 0700 hrs

Personnel: Elena Salmond, Marshall Day Acoustics

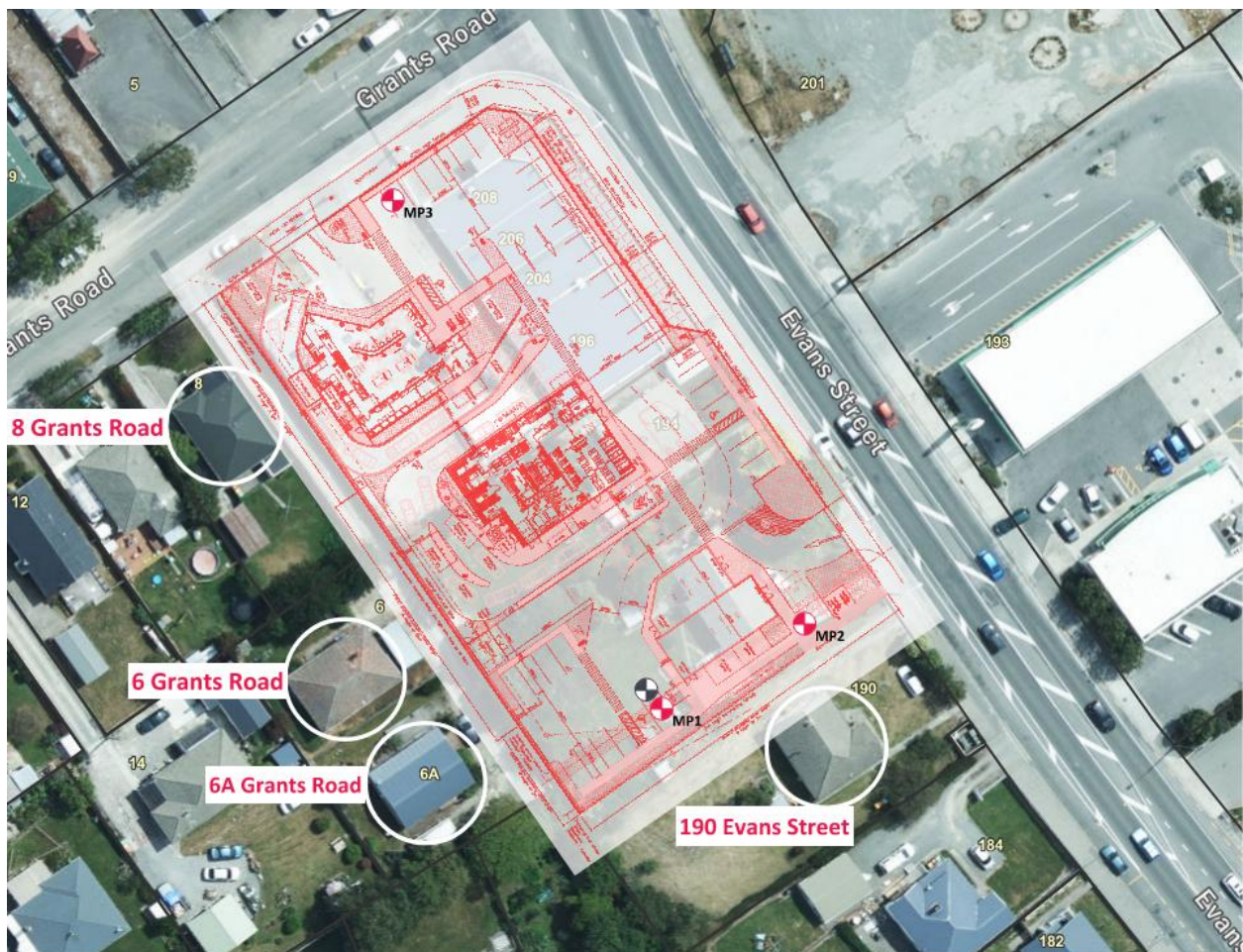
Weather: Average temperature 13°C, 0% cloud coverage, calm south westerly wind less than 4m/s

Instrumentation:

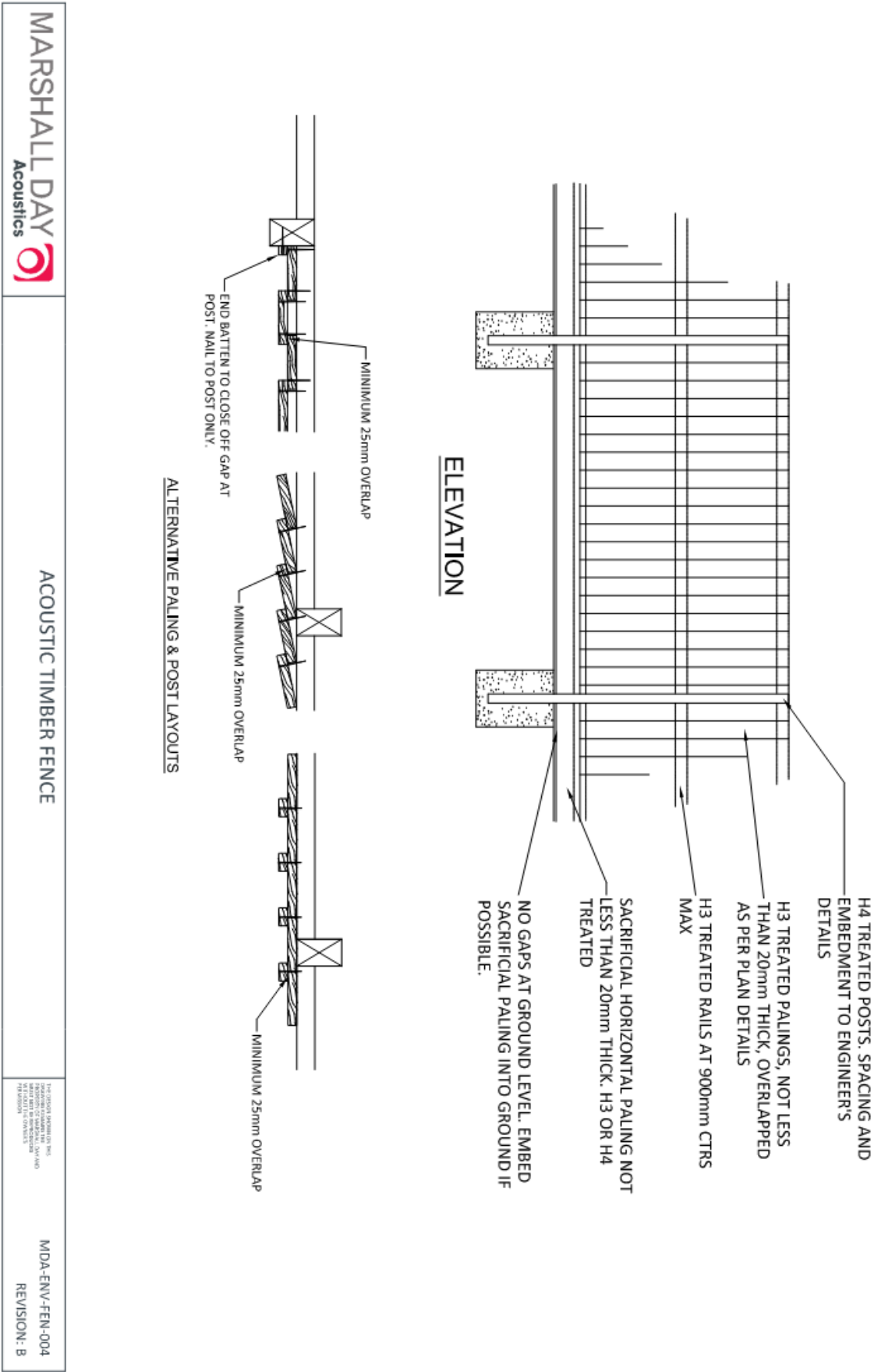
Sound Level Meter: NTI XL2 SN A2A-2046-E0 Calibration due 04/04/2026

Calibrator: Brüel & Kjær Type 4231 SN 1882775 Calibration due 22/02/2026

Calibration: Field calibration of the equipment was carried out before measurements, and the calibration checked after measurements. Observed change less than 0.1 dB.



APPENDIX C OPTION FOR NOISE BARRIER CONSTRUCTIONS



APPENDIX D NOISE CONTOURS FOR NIGHT-TIME SCENARIO

Noise contours for Night-time operation (2200 to 0100 hrs) of Popeyes and Shop 3/4

