Appendix J
Acoustic Assessment

MARSHALL DAY Acoustics

PAK ’N SAVE ROLLESTON
ASSESSMENT OF NOISE EFFECTS

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SUMMARY

Marshall Day Acoustics has assessed potential noise effects associated with a proposed new supermarket at the corner of Levi Road and Lincoln-Rolleston Road, Rolleston. This report provides a summary of predicted noise levels from various associated noise sources, along with an assessment against relevant noise standards and appropriate noise mitigation recommendations.

The proposal will result in operational noise generated by heavy goods vehicles, loading dock activity, customer car park movements and mechanical/refrigeration plant.

The Operative Selwyn District Plan (OSDP) is out of date and references superceded acoustic standards. While the review of the plan is underway it has not been finalised at this time. We understand that there is some uncertainty surrounding the status of the Proposed District Plan (PSDP). However, the noise limits and day/night definitions of the PSDP are consistent with appropriate guidance from other sources such as the World Health Organisation and NZS 6802:2008. In addition, Chapter 15 of the National Planning Standards 2019 mandates that new district plans adopt NZS 6802:2008 and other current acoustic standards, in addition to the L_{Aeq} noise parameter. We consider it best practice to assess noise against the SPDP proposed noise limits and day/night definitions rather than the SODP noise standards because of their consistency with typical guidance and conformance with the requirements of NPS.15.

We have made several recommendations intended to mitigate noise which may be incorporated as conditions of consent. These include:

- Provision of a noise control fence along a portion of the east side of the service road separating the rural zone boundary from the supermarket;
- Restricting the collection of waste and recycling to within daytime hours only; and
- Designing noise from mechanical services plant (excluding the emergency generator), which will run continuously at night, to achieve a design level below the District Plan noise standards.

We expect that potential adverse noise effects arising from the proposed activity will be acceptable based on our noise control recommendations and noting the brief duration of vehicle movements associated with night-time deliveries. We note that all other aspects of noise associated with the activity comply with the relevant District Plan standards and that the level of amenity provided will be acceptable, particularly given the location at the intersection of two arterial roads.

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1.0 INTRODUCTION

Marshall Day Acoustics has been engaged to assess the potential noise-related effects from a proposed supermarket located at the corner of Levi Road and Lincoln-Rolleston Road, Rolleston.

This report provides:

- An overview of the site and proposed supermarket development with respect to noise generation;
- A summary of relevant noise performance standards;
- Noise control recommendations;
- Predicted noise levels from the proposed supermarket development; and
- An assessment of the noise-related effects that may arise from the proposal.

A glossary of the technical terminology used in this report is provided in Appendix A.

2.0 PROPOSED SITE & ACTIVITIY DESCRIPTION

As the Selwyn District Plan is under review we will make reference below to both the operative district plan (OSDP) and proposed district plan (PSDP) where appropriate with reference to applicable National Planning Standards (NPS) where appropriate.

2.1 Proposed Site

The proposed supermarket site is shown in Figure 1. Under the OSDP the site lies within the Living Z (LZ) zone, with a mix of LZ and Living 1B (L1B) zones to the south, west, north and northeast, divided from the site by arterial roads (Levi Road and Lincoln-Rolleston Road). These zones are all residential in nature. To the east the site immediately adjoins land zoned Rural (Inner Plains).

Under the PSDP the site lies within the General Residential Zone, which encompasses all the area previously zoned as LZ or L1B in the vicinity of the site. This zone is again residential in nature. To the east, the site immediately adjoins land zoned General Rural (GRUZ).

Figure 1: Proposed supermarket site showing current (left) and proposed future land use zones (right)

2.2 Proposed Activity

The supermarket building and associated car parking is to be situated in the northern portion of the site. This layout is shown in Figure 2.

Figure 2: Proposed site layout and key vehicle access points

Supplied by McCoy Wixon Architects, with mark-up by MDA.

We understand the supermarket will operate as follows:

- Public opening hours: 0700-2200 hours, seven days per week;
- Some night-fill and cleaning staff will operate after 2200 hours; and
- Delivery trucks will be serviced by electric-powered forklifts and manual/electric pallet lifters within the unloading area and courtyard.

Abley Transportation Consultants estimate the site will generate 1013 vehicle movements per hour (vph) during the peak hour in the 2033 design year.

The peak hour for supermarkets generally occurs in the late afternoon (between 1645 and 1800). Based on the above we have assumed a typical (non-peak) hourly rate of 810 vph for our assessment.

Deliveries will occur largely during the daytime, with milk delivered shortly after 0700, followed by 30 to 40 delivery vehicles ranging in size from courier vans and small trucks to 12m rigid bodied trucks from approximately 0800 to 1000 hours. One 'ambient' B-Train (non-refrigerated) will access the site in the middle of the day. Night-time deliveries will consist of bread (0430 – 0500) and chilled and frozen produce (0445 – 0515) which will arrive in a specialist B-train contracted by Foodstuffs. Delivery vehicles will not coincide with peak-hour traffic movements.

3.0 NOISE PERFORMANCE STANDARDS, NATIONAL PLANNING STANDARDS & OTHER GUIDANCE

3.1 District Plan Noise Standards

The Selwyn District Plan provides noise performance standards through both the OSDP and the PSDP for activities within the application site.

3.1.1 OSDP

The Operative Plan references the 1999 versions of NZS 6801 and the 1991 version of NZS 6802. These versions of the Standards were superceded in 2008. Noise received within residential zones is covered by Rule 10.6.1 (Township Volume), while noise within rural zones is covered by Rule 9.16.1 (Rural Volume). These noise limits are summarised below in Table 1.

Table 1: Summary of relevant OSDP noise limits

Assessment Location	Assessment Period*	Daytime	Night-time
Living Zones At any point within the boundary.	Day – 0730 to 2000 hrs Night – 2000 to 0730 hrs	50 dB L_{A10} and 85 dB L_{Amax}	35 dB L_{A10} and 70 dB L_{Amax}
Rural Zones At any point within the notional boundary	Day – 0730 to 2000 hrs Night – 2001 to 0729 hrs	60 dB L_{A10} and 85 dB L_{Amax}	45 dB L_{A10} and 70 dB L_{Amax}

** The daytime and night-time hours are defined differently for the Residential and Rural zones.*

3.1.2 PSDP

The Proposed Plan references the 2008 versions of both NZS 6801 and NZS 6802. These versions differ from the earlier 1999 Standards in several respects, the key elements being the preference for use of the L_{Aeq} rather than L_{A10} noise parameter, and the way both averaging and assessment of noise is calculated. NZS 6802:2008 calculations result in a *rating level*, which is the activity noise level adjusted for factors such as special audible character, background noise, and duration (where permitted).

The applicable noise rules are NOISE-R1 and Noise-REQ, summarised in Table 2.

Table 2: Summary of relevant PSDP noise limits

Assessment Location	Assessment Period	Daytime	Night-time
GRZ At any point within the boundary.	Day – 0700 to 2200 hrs Night – 2200 to 0700 hrs	50 dB L_{Aeq}	40 dB L_{Aeq} and 70 dB L_{Amax}
GRUZ At any point within the notional boundary		55 dB L_{Aeq}	45 dB L_{Aeq} and 75 dB L_{Amax}

The District Plan also specifies that construction noise shall be measured and assessed in accordance with NZS 6803:1999.

3.2 National Planning Standards

The National Planning Standard November 2019, Chapter 15 (NPS.15) requires that district plans adopt the 2008 versions of NZS 6801 and 6802 (along with up-to-date versions of other 680X acoustics standards). Any plan rules must also adopt noise assessment methodology using the L_{Aeq} rating level and L_{max}, provided that the noise to be assessed falls within the scope of NZS 6802:2008.

We understand the application of the MDRS to the Rolleston residential zones by February 2022 will require aspects of the PSDP to be withdrawn and that SDC is currently considering withdrawing the entire residential chapter. While this places some doubt over how much weight to place on the PSDP,

the NPS.15 mandates that some elements of the PSDP noise rules will remain unchanged. These are the use of the updated noise standards, and the use of the L_{Aeq} rating level assessment methodology. Specific numerical noise limits and definitions of daytime and night-time may vary.

3.3 World Health Organisation Guidelines

The World Health Organisation (WHO) Guideline Values for Community Noise (Berglund and Lindvall, 1999) provide 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 and annoyance.

These Guideline values are the exposure levels that represent the onset of the effect for the general population.

Table 3: WHO Guideline 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_{AFmax}
Outdoor living area	Serious annoyance, daytime & evening	55	16	-
	Moderate annoyance, daytime & evening	50	16	-
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

3.4 New Zealand Noise Assessment Standard NZS 6802:2008

The latest version of NZS 6802:2008 "*Acoustics - Environmental Noise*" refers to the following guideline upper limits for sound exposure (rating level) at or within the notional boundary of a rural dwelling:

- Daytime: 55 dB $L_{Aeq\,(15\,min)}$
- Night-time: 45 dB $L_{Aeq\,(15\,min)}$ and 75 dB L_{AFmax}

While NZS 6802:2008 does not mandate a daytime, this is typically taken to be 0700 to 2200 daily.

3.5 Summary of Noise Guidance

Although the time-base used for averaging noise varies, the PSDP, NZS 6802:2008, and WHO Guidelines all provide consistent proposed noise limits and day/night definitions. The PSDP residential noise limit is slightly on the conservative side of guidance, with the rural noise limit at the upper end of typically recommended guidance. The use of the L_{Aeq} noise parameter and assessment using NZS 6802:2008 by the PSDP is consistent with NPS.15.

By contrast, the OSDP uses the L_{A10} noise parameter and NZS 6802:1991, which NPS.15 mandates be replaced. While the residential zone daytime and rural zone night-time noise limits are broadly consistent with typical guidance, the rural zone daytime noise limit is higher than would typically be expected without good supporting argument and the residential zone night-time noise limit is considerably more conservative than would typically be expected for an urban environment. Finally, the hours of daytime for the OSDP are unusually short compared to typical guidance and in our experience are unnecessarily restrictive of typical urban life and activity. The purpose of reduced night-time noise limits is to protect sleep amenity. The introduction of night-time noise limits at 2000 hours is not consistent with this requirement.

While recognising that the OSDP applies to this application, taking typical guidance into account, and the effect of NPS.15, we consider that the day/night definitions and guidance from NZS6802:2008 and WHO are more appropriate. The PSDP noise rules reflect the more conservative end of that guidance and can be considered a good proxy for assessment in our view.

4.0 NOISE GENERATION

Noise from supermarkets is typically governed by the following key sources:

- Car parking and light vehicle movements;
- Heavy vehicle movements (e.g. deliveries) and loading bay activity; and
- Mechanical services plant.

Each of these sources are addressed below. All predicted noise levels use the L_{Aeq} parameter. The L_{A10} can be derived by adding 3 dB onto the L_{Aeq}. based on previous experience, we do not expect L_{max} events to exceed either the OSDP or PSDP noise limits and accordingly we do not address these further.

We consider that a noise control fence will be required along part of the eastern goods vehicle access way and landscaping buffer that separates the site from the rural zoned land to the east. This is to ensure that appropriate noise levels are achieved during the night-time. This has been included in our calculations.

The right of way fence must be a minimum of two metres in height to provide sufficient screening between the vehicle movement paths and the existing rural notional boundary to the east. Fences must be of solid and durable construction, having a surface mass of at least 8 kg/m^2 and being free from cracks, gaps, and holes.

4.1 Car Parking and Light Vehicle Movements

We have assumed that light vehicle traffic will be split between access points 2, 3, 4, and 5 indicated in Figure 2 as described in the Abley transportation assessment. Two scenarios have been considered:

- Peak hour trip generation; and
- Typical hour trip generation coinciding with daytime deliveries.

The latter is discussed in the following section as it primarily relates to heavy vehicle activity.

Although vehicle movements numbers are commonly discussed on an hourly basis (including above), our calculations have been conducted on a 15-minute basis in accordance with NZS 6802:2008. An equal distribution of vehicles has been assumed in each 15-minute period over the hour.

4.1.1 Daytime Peak Hour

We have calculated a peak-hour traffic noise levels ranging from 40 dB $L_{Aeq\,(15\,min)}$ to 47 dB $L_{Aeq\,(15\,min)}$ at properties on the opposite sides of Levi and Lincoln Rolleston Roads within the adjacent residential zone. At the nearest rural notional boundary, the predicted noise level is 31 dB $L_{Aeq\,(15\,min)}$ as this receiver is remote from customer vehicle movements. The noise level predicted is closely linked to distance from an entry/exit point, with more distant properties predicted to have lower noise level during peak hour.

All nearby dwellings receive noise levels that comply with the OSDP and PSDP daytime noise limits.

4.1.2 Daytime Off-Peak &Night-time

During daytime off-peak hours, typical traffic noise levels ranging from 41 dB $L_{Aeq\,(15\,min)}$ to 48 dB $L_{Aeq\,(15\,min)}$ at properties on the opposite sides of Levi and Lincoln Rolleston Roads. Properties directly opposite site access points 2, 3, 4, and 5 may experience noise levels more than the OSDP night-time noise standard after 2000 hours, but not more than the PSDP daytime or night-time noise levels, which as noted in Section 3.5, are consistent with guidance derived from WHO, NZS 6802:2008, and utilising the L_{Aeq} parameter and assessment standards required by NPS.15.

Use of the car park at night (after 2200 hours) by staff will also generate some noise. Staff vehicle movements are predicted to generate below 30 dB $L_{Aeq\ (15\ min)}$ and 50 dB L_{Amax} at the residential boundary nearest access point 5.

4.2 Delivery and Service Vehicle Movements

Large heavy delivery vehicles such as B-trains, truck and trailer, or refrigerated trucks may carry out deliveries of bread or chilled and frozen goods during the night-time.

We have predicted delivery noise for trucks using access points 1 and 5, including consideration of noise from vehicles idling, brake system air release and loading dock activity.

Table 4 provides predicted noise levels for:

- The main morning delivery sequence in the morning assuming off-peak customer vehicle movements distributed across access points 2, 3, 4, and 5; and a 12m rigid truck, 2 x 3 tonne delivery trucks, and 2 x courier vans within a 15-minute period using access points 1 and 5.
- A rubbish or recycling truck at any point during the daytime using access points 1 and/or 5.
- Night-time deliveries only consisting of one large truck during a 15-minute period, entering via access 1 and departing via access 5, or vice versa. We have assumed that only one movement will occur at either access within a 15-minute period.

The range in predicted noise levels reported at residential zoned dwellings reflects the minimum and maximum levels for dwellings opposite the supermarket site on Levi and Lincoln Rolleston Roads.

Table 4: Predicted noise levels from heavy vehicle activity

Scenario	Residential zone (site boundary)	Rural zone (notional boundary)
	dB L_{Aeq}	dB L_{Aeq}
Daytime – customer traffic and deliveries	45 – 50	45
Daytime – rubbish/recycling only	34 – 48	44
Night-time – deliveries only	34 – 49	42

The combination of off-peak customer vehicle movements and morning daytime deliveries is predicted to comply with both the OSDP and PSDP noise limits at all dwellings. Should rubbish or recycling truck movements occur during this time, compliance will still be achieved.

Night-time deliveries are scheduled for bread and chilled and frozen goods. These deliveries will be made via two large trucks, similar to a truck and trailer or B-Train. The noise level received at dwellings closest to access points 1 and/or 5 is likely to exceed the night-time permitted noise standards in both the OSDP and PSDP. 134 to 154 Levi Road (excluding 139 Levi Road) will all receive noise levels exceeding the OSDP night-time noise limit for any 15-minute period in which a delivery vehicle uses access 1. When assessed against the PSDP, we estimate that only 140 to 150 Levi Road would exceed the night-time noise standard, again for any 15-minute period in which a delivery occurs.

Similarly, 341 and 353 Lincoln Rolleston and 1-3 Lowes Roads (a single dwelling) would exceed the OSDP night-time limit, while only 341 and 353 Lincoln Rolleston Road will exceed the PSDP night-time limit for any 15-minute period during use of the nearest access.

This noise exceedance is generated by an arriving delivery vehicle turning into the site from the arterial road and driving down the access away from residential zoned dwellings. Similarly, on departure, the noise is generated by the delivery vehicle driving down the access route towards the

arterial road and leaving the site. In both cases the noise will last under a minute during each movement. This will occur four times per night, with movements able to be distributed over both access points 1 and 5, meaning dwellings near either access point would experience these events twice per night.

The rural zone night-time limit at the notional boundary of 139 Levi Road, east of the loading dock, is not exceeded during deliveries.

4.3 Mechanical Services Plant

Noise from external mechanical services plant associated with the supermarket can be designed to achieve appropriate noise levels. We understand that most of the plant will be situated internally within a plantroom. While the exact details of external plant are yet to be confirmed, the plant is likely to be similar to the equipment used on other recent supermarket developments with which we have been involved. In our experience, adequate noise control can be achieved by running externally located fans at a lower speed during the night-time and/or fitting the equipment with attenuators or other noise control equipment.

We recommend that an appropriately worded condition of consent be included to ensure that noise levels from mechanical services plant are adequately controlled. An example condition is included in Section 6.0 (item 7).

5.0 ASSESSMENT OF NOISE EFFECTS

The main noise sensitive activity in the area is the residential land immediately to the north, west and south of the supermarket site. Land to the immediate east is currently zoned rural and is not noise sensitive. The notional boundary of 139 Levi Road is approximately 40m from the supermarket boundary and we propose additional noise mitigation via a standard noise control fence.

Dwellings within the residential zones to the north, west, and south are separated from the supermarket site by arterial roads. We understand from the transportation assessment that these roads are likely to become busier over time due to the growth of Rolleston and linkages to the Christchurch Southern Motorway, regardless of whether the supermarket is located at this site. Based on the transportation assessment (Section 7.5), trip generation caused solely by the supermarket will not have any perceptible effect on noise generated on these roads, owing to approximately 2/3 of the customer movements expected to be pass by and diverted trips already on the road network.

When large delivery vehicles access the site at early morning (0430 to 0530 hours) noise levels will exceed both the OSDP and PSDP night-time noise standards as described above at dwellings close to the access point in use. For the nearest dwellings that exceedance would be on the order of 17 dB greater than the conservative OSDP limit of 35 dB L_{A10} and 8 dB above the PSDP noise limit of 40 dB $L_{Aeq\,(15\,min)}$. based on comparison with guidance from WHO and NZS 6802:2008, we consider the PSDP night-time noise limit to be generally appropriate for residential zones, although somewhat conservative in a setting near the confluence of busy arterial roads. In our experience arterial roads tend to carry both larger traffic numbers into the night and early hours of the morning, but also pick up earlier and faster than local roads with the beginning of the morning commute. Arterial roads also typically carry more commercial and goods vehicle traffic. It would not be unusual for district plan noise limits in areas of high night-time activity to have noise limits more closely aligned with the upper end of guidance from NZS 6802:2008.

As we note above, a limited number of night-time deliveries will occur, currently assumed to be a maximum of two during the early morning. We do not anticipate that any significant adverse noise effects would result from these predicted noise levels given the brevity of the occurrence (on each occasion the noise will last less than a minute as the truck arrives or departs the access point), the small number of occurrences each night (two, or at most four movements at access points 1 and/or 5), and the similarity in character to other vehicles using the arterial routes.

Daytime traffic movements for customers and deliveries are predicted to comply with both the OSDP and PSDP. We are satisfied that noise from mechanical plant can be designed such that any cumulative noise emissions do not lead to further exceedance of the night-time noise limits, and no further adverse effect will arise.

Taking the factors discussed above into account, we consider that any potential adverse effects are acceptable and within acceptable guidance.

6.0 RECOMMENDATIONS

Based on guidance from WHO and NZS 6802:2008, we recommend that noise limits consistent with the PSDP apply to all activity on the site, other than truck deliveries during the night-time (conditions 1 and 2).

A noise control barrier or fence is required on the east side of the service lane at the location indicated in Figure 2. This barrier should conform to the requirements of proposed conditions of consent 3 and 4 below. The calculations in this report are predicated on the presence of this barrier.

Service vehicles associated with waste removal have the potential to generate impulsive noise events (bangs and crashes) that may disturb neighbours if this occurs at night. Though unlikely to be a strict compliance issue, we consider this unnecessary as collections can generally be timed to avoid the night-time. We recommend that these activities be limited to between 0700 and 1900 hours to minimise annoyance and disruption to neighbours (proposed condition 5).

Mechanical plant noise, as addressed in Section 4.3, should be designed to achieve night-time noise emissions below the District Plan noise standard at dwellings. This is to account for cumulative noise from night-time deliveries. We expect that a design level of 30 dB L_{Aeq} at dwellings is appropriate (proposed condition 6).

Construction noise has not been considered in detail in this report as there is not sufficient detail available regarding construction methodology at this stage. However, we note that the District Plan will be required to reference the construction noise standard (NZS 6803:1999) under NPS.15, and we recommend that construction activities be planned and managed in accordance with the guidance given in this Standard (proposed condition 7). Foodstuffs (SI) Ltd have committed to undertaking construction in accordance with NZS 6803:1999 and in our experience construction of supermarkets is generally able to comply with the noise limits in Tables 2 and 3 of that Standard. On this basis, we expect that noise effects during the construction phase of the project will be acceptable.

The recommendations above are summarised below to assist in the form of draft conditions of consent.

1. Noise from the activity (excluding heavy vehicle deliveries at night) should achieve the following limits:

Assessment Location	Time Period	Daytime	Night-time
Residential zone (any point within the boundary of any site in this zone)	0700 to 2200 hrs 2000 to 0700 hrs	50 dB $L_{Aeq\ (15\ min)}$	40 dB $L_{Aeq\ (15\ min)}$ 70 dB L_{Amax}
Rural zone (any point within the boundary of any other site)	0700 to 2200 hrs 2200 to 0700 hrs	55 dB $L_{Aeq\ (15\ min)}$	45 dB $L_{Aeq\ (15\ min)}$ 75 dB L_{Amax}

2. Deliveries must be in accordance with the consent application, with no more than two large goods vehicles arriving between 2200 and 0700 hrs (resulting in a total of four vehicle movements).
3. Noise barriers must be erected on the east side of the service road boundary with the rural zone to a minimum height of 2 metres.

4. The barrier must be of durable construction, free from gaps, cracks or holes and have a surface mass of at least 8 kg/m2. The location and extent of the barriers is indicated in Figure 2
5. Waste collection should only occur between the hours of 0700 and 1900 hrs.
6. Noise from mechanical services plant (except the generator) should be designed to meet a night-time noise limit of 30 dB $L_{Aeq\ (15\ min)}$, assessed at the boundary of neighbouring residential zoned dwellings and the notional boundary of any rural zoned dwellings.
7. Noise from construction activities should be measured and assessed in accordance with New Zealand Standard NZS 6803: 1999 “Acoustics - Construction Noise”.

APPENDIX A GLOSSARY OF TERMINOLOGY

Noise	A subjective term used to describe sound that is unwanted by, or distracting to, the receiver.
dB	Decibel. The unit of sound level.
A-weighting	A set of frequency-dependent sound level adjustments that are used to better represent how humans hear sounds. Humans are less sensitive to low and very high frequency sounds.
L_{A10}	The A-weighted sound level exceeded for 10% of the measurement period, measured in dB. Commonly referred to as the average maximum noise level.
L_{Aeq}	The equivalent continuous A-weighted sound level. Commonly referred to as the average sound level and is measured in dB.
L_{Amax}	The A-weighted maximum sound level. The highest sound level which occurs during the measurement period. Usually measured with a fast time–weighting i.e. L_{AFmax}
Ambient	The ambient noise level is the noise level measured in the absence of the intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.
Masking Noise	Intentional background noise that is not disturbing, but due to its presence causes other unwanted noises to be less intelligible, noticeable and distracting.
Special Audible Characteristics	Distinctive characteristics of a sound which are likely to subjectively cause adverse community response at lower levels than a sound without such characteristics. Examples are tonality (e.g. a hum or a whine) and impulsiveness (e.g. bangs or thumps).
Notional Boundary	A line 20 metres from any side of a dwelling, or the legal boundary where this is closer to the dwelling
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.