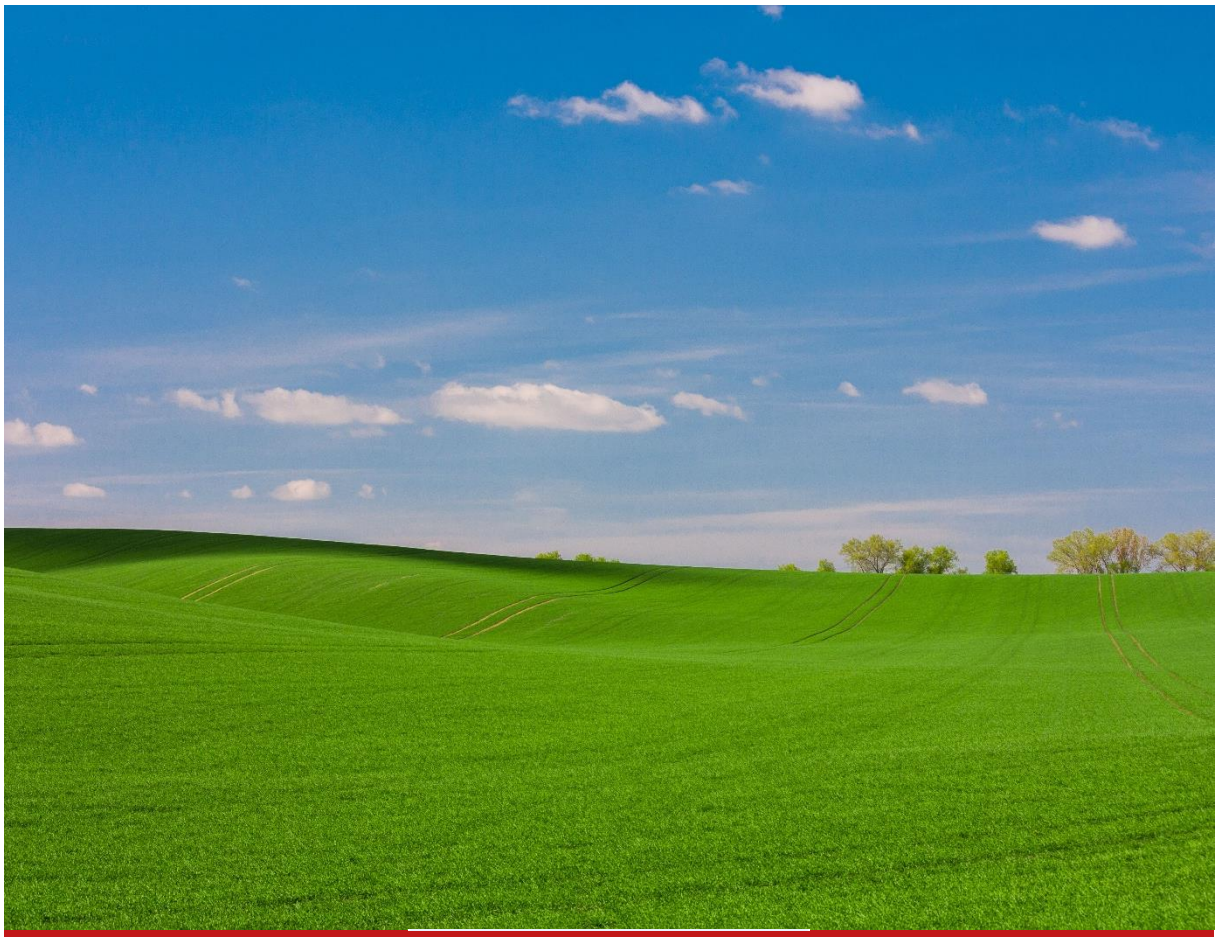
Appendix F

Noise Assessment

acoustic engineering services

+64 3 377 8952
www.aeservices.co.nz
office@aeservices.co.nz
PO Box 549, Christchurch 8140
Level 2, 518 Colombo Street, Christchurch 8011



Report Number: AC19149 – 02 – R2

Kirwee Recreation Reserve, Kirwee

Assessment of Environmental Noise Effects

Prepared for:
Derek Hayes
Selwyn District Council
2 Norman Kirk Drive
ROLLESTON 7643

Issued:
6 September 2019

ACENZ

Association of Australasian Acoustical Consultants

Revision History

Reference	Status	Date
AC19149 – 02 – R1	Revision 1	8 August 2019
AC19149 – 02 – R2	Revision 2	6 September 2019

Document Acceptance

Author	Signature
Aaron Zhao *ME (Mech)* Acoustic Engineer	
Reviewer	**Signature**
Ms Clare Dykes *MBSc, MASNZ* Senior Acoustic Engineer	
Approver	**Signature**
Dr Jeremy Trevathan *PhD (Acoustic) BE Hons (Mech)* Principal Acoustic Engineer	

Table of Contents

This page has been left intentionally blank.

1.0 BACKGROUND

Acoustic Engineering Services (AES) has been engaged by the Selwyn District Council (SDC) to provide acoustic engineering advice in relation to the proposed extension of the Kirwee Recreation Reserve as part of the Notice of Requirement to re-designate the site.

The purpose of this precinct is to provide a focal point for recreation within Kirwee, with outdoor sports and sports fields.

We have based our analysis on the following:

- Email correspondence with Derek Hayes titled *Kirwee Reserve NOR Master Plan comments*, received on the 19th of June 2019.
- Master plan titled *Kirwee Recreation Reserve,* Revision C, dated the 26th of June 2019, and received on the 2nd of September 2019.
- Traffic assessment report titled *Integrated Transport Assessment prepared for Selwyn District Council, Kirwee Reserve*, as prepared by Novo Group Ltd, and dated the 20th of August 2019.

1.1 Site and surrounding area

The Kirwee Recreation Reserve site is located to the northwest of the town centre. The site is located in the Living 1 (L1) and Outer Plains (OP) zones as defined by Selwyn District Council, as are the adjoining sites with the sites further to the north and south zoned in Living 2 (L2), as shown in figure 1.1 below.

The Living 1 zoned site to the north is Kirwee Cemetery, with the site to the east used as A & P Showgrounds, as shown in figure 1.1 below.

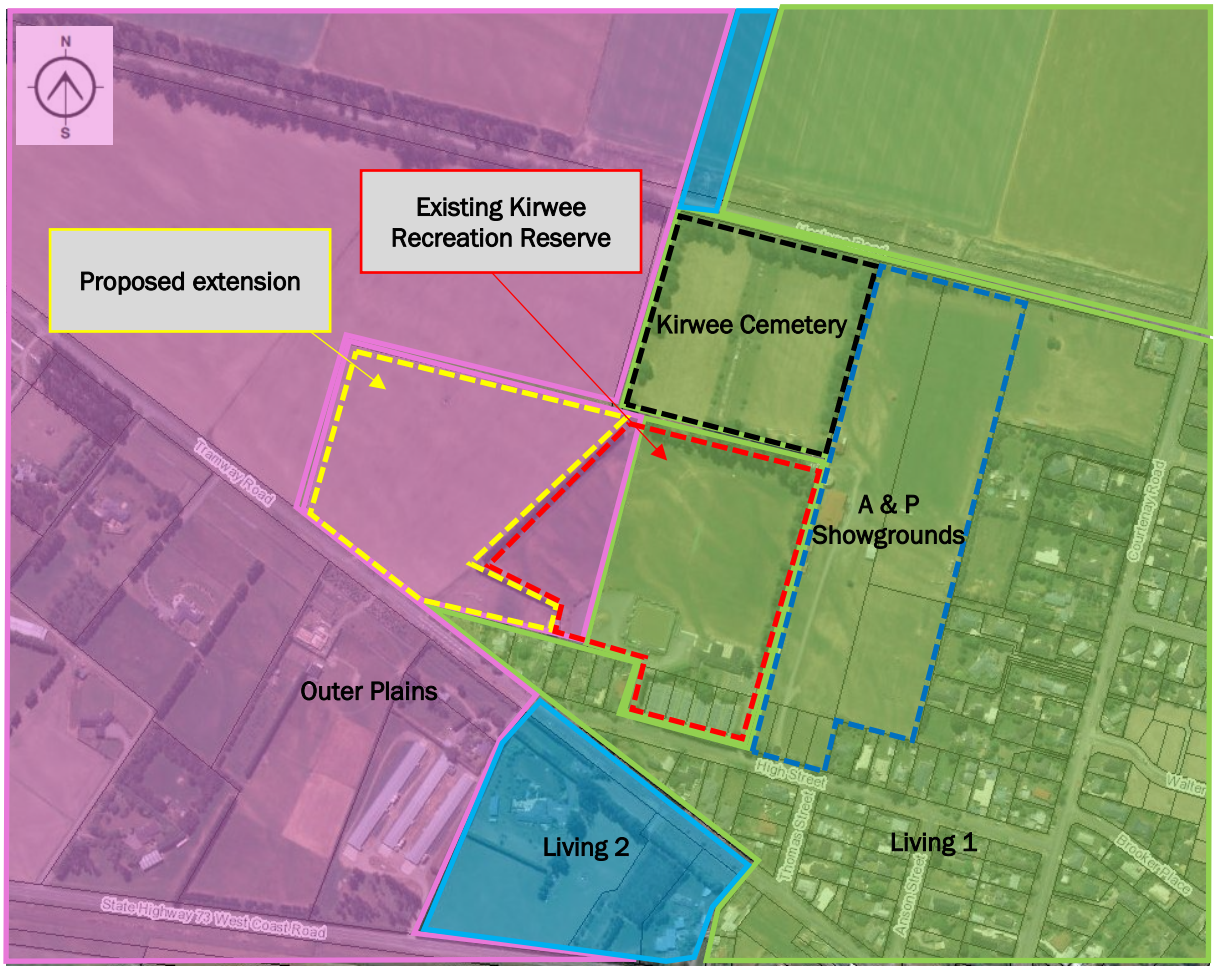


Figure 1.1 – Location of the Kirwee Recreation Reserve site

Currently the site caters for the following facilities, as shown in figure 1.2 below:

- Rugby / Cricket fields
- Tennis / Netball courts
- Bowling Green
- Playground
- Carparks
- Club / Pavilion building including changing rooms, toilet facilities, indoor and outdoor spaces for spectators, and facilities for the post-match gatherings and smaller functions

Based on correspondence and observations of other similar facilities in Canterbury, we expect that the outdoor sports facilities (including the rugby fields, cricket fields, tennis / netball courts and bowling green) would generally be used for senior and junior competitions on the weekends between 0730 and 2000 hours and for training on weekdays from 1530 to 2100 hours.

The sports on site operate seasonally, with rugby and netball in winter, and cricket, tennis and bowls in summer.

Based on correspondence, we understand that the main netball competition which occurs on Saturdays is undertaken in Lincoln or Darfield, and this is unlikely to change. Therefore, the netball courts on this site will be largely used for training purposes.

Two vehicle exit / entrance points are off High Street. Carparks are available at adjacent A & P Showgrounds during events when there is a overflow demand.

Figure 1.2 – Existing site layout

1.2 Proposed extension

Based on correspondence, we understand that some land to the west has been purchased for an extension to the existing reserve, as shown in yellow in figure 1.1 above.

The proposed site layout is shown in figure 1.3 below, including the existing facilities outlined above and the following additional features:

- No.2 Senior Rugby Field (existing field to be realigned);
- Junior Field (at the location of the existing No.2 Senior Rugby Field);
- No.1 Cricket Oval and Open Space / Dog Exercise Area;

- A Pump Track for children only;
- Proposed Basketball half court, Intermediate play area including flying fox, Junior and Senior play area and new carparks.

We expect that the operating hours of the outdoor sports facilities (including the rugby fields, cricket fields, tennis / netball courts and bowling green) with seasonal sports would be the same as for the existing activities.

The existing two vehicle exit / entrance points off High Street are to be retained, with a proposed new vehicle exit / entrance off Tramway Road.

Based on the traffic assessment report, we understand that there will be 201 carparks on the site after the extension, which will meet the parking demand of 184 spaces during the winter peak and 110 spaces during the summer peak.

Figure 1.3 – Proposed site layout

2.0 ACOUSTIC CRITERIA

The Resource Management Act requires consideration of the significance of any adverse effects associated with the proposal. Guidance as to the significance of any adverse noise effects may be obtained from several sources.

2.1 District Plan noise standards

As described in section 1.1 above, the site and surrounding area are comprised of a mixture of living and rural zones.

The noise standards which therefore apply to the portion of the site zoned Living are described in the Selwyn District Plan – *Township Volume – Rules and Definitions – C10 Activities*; and are as follows:

10.6.1 Any activity which is not a residential activity, spiritual activity or educational activity, shall be a permitted activity if the following noise limits are not exceeded within the time frames stated.

7.30am – 8.00pm *50 dBA L_{10} / 85 dBA L_{max}*

8.00pm – 7.30am *35 dBA L_{10} / 70 dBA L_{max}*

Note: *Sound levels shall be assessed at any point beyond the boundary of the site from which the source of noise is situated.*

The noise standards which apply to the portion of the site zoned Rural (Outer Plains) are described in the Selwyn District Plan – *Rural Volume – Rules and Definitions – C9 Activities*; and are as follows:

9.16.1 ...any activity shall be conducted so as to comply with the noise limits and within the time frames stated in the following tables in order to be a permitted activity:

Table C9.2 – Maximum noise limits at any Living Zone boundary

7.30am – 8.00pm *55 dBA L_{10} / 85 dBA L_{max}*

8.01pm – 7.29am *40 dBA L_{10} / 70 dBA L_{max}*

Table C9.3 – Noise limits assessed at the notional boundary of any dwelling, rest home, hospital, or classroom in any educational facility except where that dwelling, rest home, hospital or classroom is located within a Living zone

7.30am – 8.00pm *60 dBA L_{10} / 85 dBA L_{max}*

8.01pm – 7.29am *45 dBA L_{10} / 70 dBA L_{max}*

2.2 Existing noise environment

Aaron Zhao of AES visited the site between 1430 and 1545 hours on the 15th of June 2019 to observe the existing ambient noise environment. The results of this monitoring, along with notable noise sources observed, are presented in the following sections. We note that there was a rugby game underway on site during the noise measurements. However, the noise from the rugby game was inaudible at the measurement locations.

During our visit on a Saturday afternoon, noise source audible in the area included:

- Traffic on the adjacent road network

- Birds, wind in trees, and other noise associated with the natural environment

Traffic from State Highway 73 was audible in the area. Noise levels in the order of 46 dB L_{Aeq} were measured at the residential sites along High Street with no vehicles travelling on High Street.

2.3 New Zealand Standard 6802

NZS 6802:2008 *Acoustics – Environmental noise* outlines a guideline daytime limit of 55 dB L_{Aeq} (15 minute) (approximately 57 dB L_{A10}) and a night-time noise limit of 45 dB L_{Aeq} (15 minute) (approximately 47 dB L_{A10}) for "the reasonable protection of health and amenity associated with the use of land for residential purposes". A night-time noise limit of 75 dB L_{AFmax} is outlined in the Standard with no L_{AFmax} limit during the daytime period.

We note that the Standard provides guidelines in section 8.3 regarding 'daytime' and 'night-time' for use in situations where these are not specified. The timeframe recommended is 0700 to 2200 hours daytime, and 2200 hours to 0700 hours the following day for night-time.

The Standard also describes how a 3 dB adjustment may be applied to sound received for less than 50 % of the daytime period, and a 5 dB adjustment may be applied to sound received for less than 30 % of the daytime period.

2.4 World Health Organisation

Guidelines for Community Noise[1], a document produced by the World Health Organisation based on extensive international research recommends a guideline limit of 55 dB L_{Aeq} (16 hours) (approximately 57 dB L_{A10}) to ensure few people are seriously annoyed in residential situations. A guideline limit of 50 dB L_{Aeq} (approximately 52 dB L_{A10}) is recommended to prevent moderate annoyance. A guideline night time limit of 45 dB L_{Aeq} (approximately 47 dB L_{A10}) is recommended to allow occupants to sleep with windows open.

2.5 Other District Plan noise limits

We are familiar with existing noise rules for many other District Plans throughout New Zealand, and consider these to provide some context.

In particular, the specified hours for the daytime and night-time periods vary considerably between districts, with some also providing an 'evening' period. However, the period between 0700 and 2200 hours is most commonly used to define daytime, and 2200 hours to 0700 hours for night time.

Therefore, the current Selwyn District Plan noise rules which apply at the Living zone are more restrictive in terms of the hours assigned to the day, being 0730 to 2000 hours, only a 12 and a half hour period, whereas most District Plans, NZS 6802 and the WHO anticipate or provide for 15 hours of daytime.

We also note that it is more common in other District Plans to utilise the L_{eq} descriptor for intrusive or continuous noise.

2.6 National Planning Standards

New Zealand National Planning Standards (2019) is a document which seeks to standardise aspects of regional and district plans, and other documents required under the Resource Management Act. Noise and vibration metrics are specifically discussed, with all District or Resource Management Plans are required (when going through an update) to adopt various stated metrics.

Section 15 *Noise and Vibration Metrics Standard* in the National Planning Standards outlines the noise and vibration standards required to be referenced in District and Resource Management Plans. The National

[1] Edited by Berglund, B *et al. Guidelines for community noise.* World Health Organization 1999.

Planning Standard references New Zealand Standard NZS 6802:2008 *Acoustics – Environmental Noise* which uses the L_{eq} not L_{10} noise descriptor.

2.7 Discussion regarding appropriate noise levels

In general, where noise levels comply with the District Plan noise limits at neighbouring residential sites we would consider the effects to be acceptable; however, we note the following:

- The L_{10} descriptor referred to in the Selwyn District Plan is the noise level that is exceeded 10 % of the time, and therefore is directly related to the time period selected, the length of time that the noise source is on the site and the noise level they generate. This descriptor does not always well represent noise effects and is very difficult to calculate for intermittent noise sources, and hence is no longer used in the more recent standards.

- The noise limits within the Selwyn District Plan for activities which occur in Living 1 zoned site apply at any point beyond the noise generating site. For noise from vehicles the noise source is passing directly over the boundary. There will therefore be elevated noise levels on the High Street boundaries where there are access points to the site, regardless of the number of vehicle movements. It is more common to assess noise levels at the receiving site.

- The current Selwyn District Plan noise rules which apply at the living and rural zones are restrictive in terms of the hours assigned to the day, being 0730 to 2000 hours, only a 12 and a half hour period, whereas most District Plans, NZS 6802 and the WHO anticipate or provide for 15 hours of daytime.

- The adjacent A & P Showgrounds to the southeast and the Kirwee Cemetery to the northeast are zoned Living 1; however, we would not consider them to be noise sensitive. In addition, some existing carparks for the Kirwee Recreation Reserve are located in the adjacent A & P Showgrounds.

Based on the above, we consider noise at the following levels (measured and assessed in accordance with NZS 6801:2008 and NZS 6802:2008) when received at the boundary of the surrounding Living 1 zoned sites for residential purposes and at the notional boundary of the dwellings on the surrounding sites zoned in Outer Plains, will have a minimal adverse effect:

0700 to 2200 hours	50 dB L_{Aeq}
2200 to 0700 hours	40 dB L_{Aeq} / 70 dB L_{AFmax}

3.0 NOISE GENERATED BY THE ACTIVITY

Noise sources which may be associated with the use of the Kirwee Recreation Reserve are expected to be:

Noise from the existing activities

- Vehicles travelling about and parking on the site (engine noise, exhaust noise, road/tyre noise, reversing beepers and door slams)
- Seasonal sporting activities such as Rugby, Netball, Tennis, Bowling, Cricket and the like
- Spectators, referee whistles associated with existing sporting events
- Children playing in the existing playground
- Post-match gatherings or other events (for example, fund-raising) which may occur from time to time in the pavilion / clubrooms

Noise from the proposed activities

- Vehicles travelling about and parking on the site (engine noise, exhaust noise, road/tyre noise, reversing beepers and door slams)
- Seasonal sporting events such as Rugby and Cricket on the proposed fields
- Basketball half court
- Children playing in the proposed Intermediate play area including flying fox, Junior and Senior play area
- Pump Track
- Dogs barking in the Open Space / Dog Exercise Area

As discussed in section 1.2 above, the sports activities between 0700 and 2200 hours in the recreation reserve vary considerably during the winter and summer periods. Therefore, the expected noise levels and any resulting adverse effects from sports between 0700 and 2200 hours have been considered for both winter and summer activities. With regard to cumulative noise, we expect that the peak periods of traffic noise and sport noise from the site will not occur concurrently and so the noise levels outlined below represent the worst-case levels expected at any given time.

3.1 Site mitigation

We understand that there is an existing 1.8 metre high acoustic fence along the site boundary between the drive way to the west of tennis courts and the adjacent residential sites, as shown in blue in figure 3.1 below. A 2.0 metre high acoustic fence is proposed along the south site boundary between the carpark area and adjacent residential site boundaries, as shown in red in figure 3.1 below.

Acoustic fencing should meet the following minimum standards:

- Height – 2.0 metres
- Surface mass – at least 10 kg/m^2
- The fence must be continuous and maintained with no gaps or cracks. For timber fences, this will require palings to be well overlapped (25 mm minimum) or a “board and batten” system, and a

sleeper rail connecting the base of the palings to the ground. We also recommend a paling thickness of at least 25 mm to help resist warping.

- Suitable fencing materials which are commonly used include 25 mm timber, 9 mm fibre cement, 21 mm plywood, masonry and concrete.

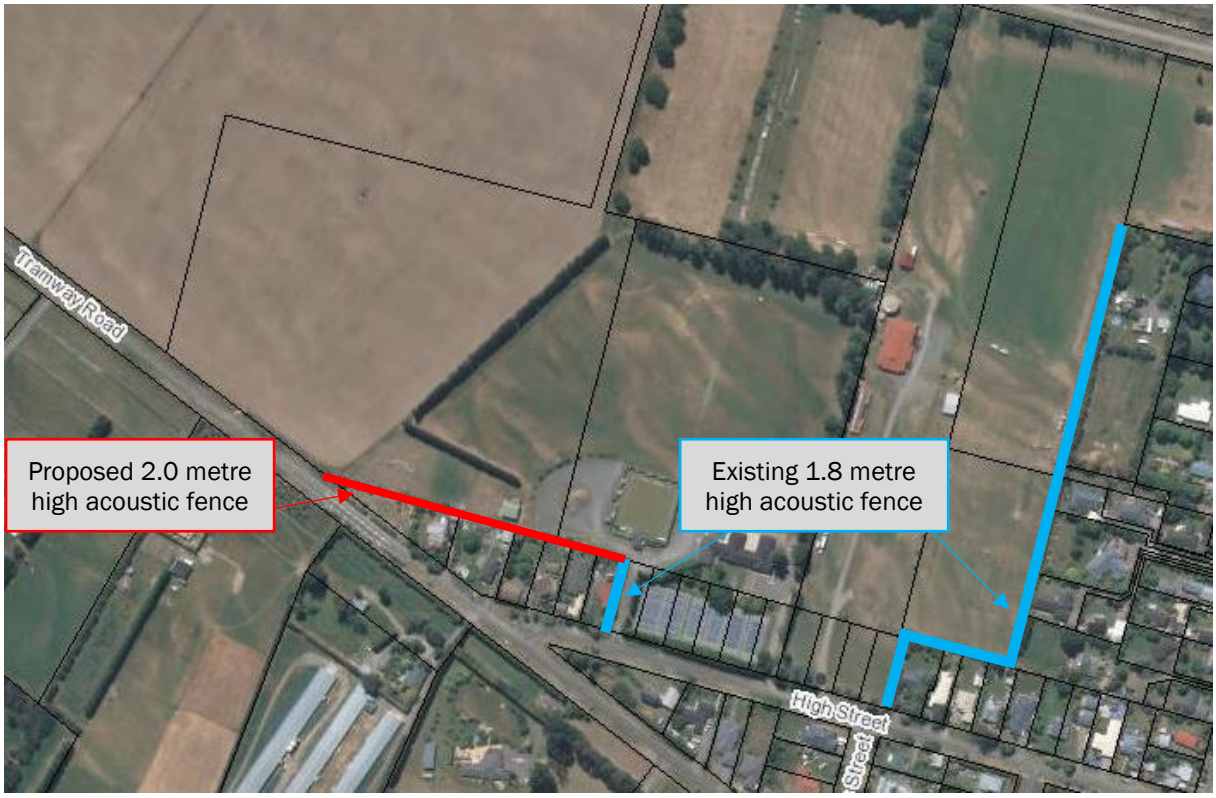


Figure 3.1 – Existing and recommended acoustic fence locations

3.2 Noise from activities between 0700 and 2200 hours

SoundPlan computational noise modelling based on ISO 9613 *Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation* has been used to calculate the propagation of noise from the site, taking into account the topography of the area, and sound power levels for each of the noise sources.

3.2.1 Peak activities in winter

Based on correspondence, we understand that rugby and netball activities only operate over the winter months.

In order to determine the potential noise generation from these types of activities, Aaron Zhao of AES visited the existing site on the 15th of June 2019. Noise measurements were undertaken at several locations around the No. 1 Senior Rugby court during a rugby match with the following level of activity:

- 30 players playing rugby;
- Approximately 60 spectators, officials and club volunteers at the sidelines of the field;
- At most, two players and two coaches were talking in raised voices calling commands to the players;
- There was sporadic whistle blowing for tries, penalties, fouls, half time, and the like;

- People were observed talking with a normal voice effort walking to or from the sports fields;

This resulted in the following measured noise levels:

- Noise levels of 58 – 66 dB L_{Aeq} were measured at approximately 9 metres from the field
- Noise levels of 50 – 52 dB L_{Aeq} were measured at approximately 35 metres from the field

We have considered a peak operating scenario based on a busy Saturday morning for events (with netball training) or Thursday evening for training with the following activities (and associated noise sources) occurring simultaneously within the reserve:

Existing activities

- Senior Rugby – No.1 Senior Rugby field in use (approximately 40 players plus up to 60 spectators, officials and club volunteers, with half the spectators speaking in raised voices on the sidelines, as well as 4 players / coaches speaking in raised voices)
- Junior Rugby – two fields in use (approximately 40 players plus up to 60 spectators, officials and club volunteers for each field, with half the spectators speaking in raised voices on the sidelines, as well as 4 players / coaches speaking in raised voices)
- Netball – two courts in use (approximately 12 players plus up to 12 spectators and coaches for each court, with half the spectators speaking in raised voices on the sidelines, as well as 4 players / coaches speaking in raised voices)
- Playground – 6 children with half speaking in raised voices in the existing playground

Proposed activities

- Senior Rugby – No.2 Senior Rugby field in use (approximately 40 players plus up to 60 spectators, officials and club volunteers, with half the spectators speaking in raised voices on the sidelines, as well as 4 players / coaches speaking in raised voices;)
- Basketball – 8 players playing basketball with half speaking in raised voices
- Play spaces – 6 children with half speaking in raised voices in each of the playing areas (Junior Play Space, Senior Play Space and Future Activity Space)
- Flying Fox – 1 child screaming for 5 minutes in a 15 minute period along the flying fox
- Pump Track – 6 children with half speaking in raised voices
- Open Space / Dog Exercise Area – Approximately 15 dogs barking for 1 minute out of 15 minutes

We note the following:

- We have previously measured a noise level of 98 dB L_{Aeq} at 1 metre from approximately 15 dogs barking. We have used this in our analysis and have assumed that the dogs would only bark for 1 minute out of the 15 minute period in the Open Space / Dog Exercise Area. This is a conservative assumption and we would expect the actual noise levels from the Open Space / Dog Exercise Area to be lower.
- Expected noise levels due to the conversation of players and spectators have been based on the American National Standards Institute Standard ANSI S3.5 – 1997 *Methods for calculation of the Speech Intelligibility Index*, which contains information on the typical speech levels for both male and

female speakers. Based on average values, for a raised voice effort, the sound power of a speaker may be deduced to be 78 dB L_{wA}.

- We have assumed a sound power level of 100 dB L_{wA} for the child screaming along the flying fox.

Based on above, the expected worst-case noise levels are shown in figure 3.2 below, considering both the existing and proposed activities.

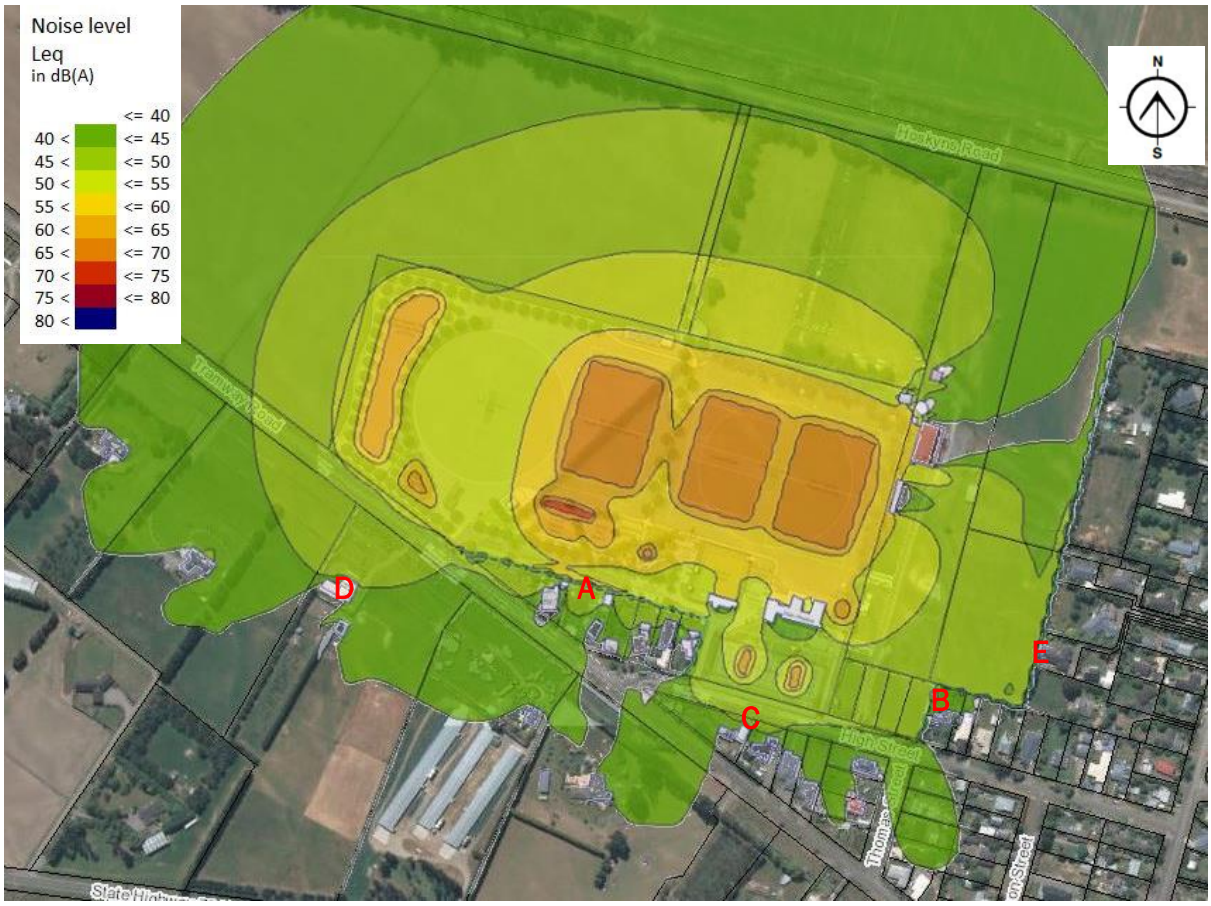


Figure 3.2 – Noise emissions associated with peak winter activities in a worst case 15 minute period

Based on the modelling, the worst-case noise levels shown in table 3.1 are expected at the nearest residential boundary or notional boundary labelled (A) to (E) in figure 3.2 above. This analysis includes the site acoustic fencing as discussed above.

Table 3.1 – Noise levels from winter activities in a peak 15 minute period

Location	Noise levels (dB L_{Aeq})
A: Site boundary of 50 High Street	47
B: Site boundary of 20 High Street	47
C: Site boundary of 15 High Street	46
D: Notional boundary of dwelling at 71 Tramway Road	47
E: Site boundary of 3/1299 Courtenay Road	39

We therefore expect noise levels of less than 50 dB L_{Aeq} between 0700 and 2200 hours at all neighbouring noise sensitive locations. We expect the effects of this noise to be minimal.

With regard to District Plan compliance, the noise limits within the District Plan are expressed in terms of the L_{A10} parameter (rather than the L_{Aeq} parameter recommended in most recent guidance) and L_{AFmax} limits. Based on our noise measurements of the netball and rugby activity, there is a + 3 dB difference between the L_{Aeq} and L_{A10} and a + 22 dB between the L_{Aeq} and L_{AFmax}. Based on these adjustments, we have the following comments:

- Noise levels from the activities occurring within the portion of the Kirwee Recreation Reserve site zoned Living 1 (existing activity) are expected to be up to 61 dB L_{A10} / 80 dB $L_{AF\ max}$ at the eastern boundary of the site (A & P Showgrounds) zoned Living 1. Therefore,
    - Between 0730 and 2000 hours, compliance with the District Plan noise limit of 85 dB L_{AFmax} is expected; however, the District Plan noise limit of 50 dB L_{A10} is exceeded.
    - If this worst-case scenario activity was to occur between 0700 and 0730 hours or between 2000 and 2200 hours, both the L_{A10} and L_{AFmax} noise limits would be exceeded.
- The activities occurring within the portion of the Kirwee Recreation Reserve site zoned Outer Plains are expected to result in noise levels of up to 57 dB L_{A10} / 76 dB L_{AFmax} at the site boundary of the neighbouring site (50 High Street) zoned Living 1. Therefore,
    - Between 0730 and 2000 hours, compliance with the District Plan noise limit of 85 dB L_{AFmax} is expected; however, the District Plan noise limit of 55 dB L_{A10} is exceeded.
    - If this worst-case scenario activity was to occur between 0700 and 0730 hours or between 2000 and 2200 hours, both the L_{A10} and L_{AFmax} noise limits would be exceeded.
- The activities occurring within the portion of the Kirwee Recreation Reserve site zoned Outer Plains are expected to result in noise levels of up to 50 dB L_{A10} / 69 dB $L_{AF\ max}$ at the notional boundary of the dwelling at the neighbouring site (71 Tramway Road) to the southwest zoned Outer Plains. Therefore,
    - Between 0730 and 2000 hours, compliance with the District Plan noise limits of 60 dB L_{A10} / 85 dB L_{AFmax} is expected.
    - If this worst-case scenario activity was to occur between 0700 and 0730 hours or between 2000 and 2200 hours, compliance with the District Plan noise limit of 70 dB L_{AFmax} is expected; however, the District Plan noise limit of 45 dB L_{A10} would be exceeded.

However, as discussed above, noise levels of less than 50 dB L_{Aeq} are expected at the closest noise sensitive locations and we therefore expect the associated noise effects to be minimal.

3.2.2 Peak activities in summer

Based on correspondence, we understand that cricket, tennis and bowls only operate over the summer months. We have considered a peak operating scenario based on a busy Saturday morning for events or Thursday evening for training with the following activities (and associated noise sources) occurring simultaneously within the reserve:

Existing activities

- Cricket – No.2 Cricket field in use (approximately 40 players plus up to 20 spectators, officials and club volunteers, with half the spectators speaking in raised voices on the sidelines, as well as 4 players / coaches speaking in raised voices)

- Tennis – six courts in use (based on double games with spectators – up to 40 people, with half the spectators speaking in raised voices on the sidelines, as well as 4 players / coaches speaking in raised voices)
- Bowls – four games underway (32 players, with half the spectators speaking in raised voices, as well as 4 players / coaches speaking in raised voices)
- Playground – 6 children with half speaking in raised voices in the existing playground

Proposed activities

- Cricket – No.1 Cricket field in use (approximately 40 players plus up to 20 spectators, officials and club volunteers, with half the spectators speaking in raised voices on the sidelines, as well as 4 players / coaches speaking in raised voices)
- Basketball – 8 players playing basketball with half speaking in raised voices
- Play spaces – 6 children with half speaking in raised voices in each of the playing areas (Junior Play Space, Senior Play Space and Future Activity Space)
- Flying Fox – 1 child screaming for 5 minutes in a 15 minute period along the flying fox
- Pump Track – 6 children with half speaking in raised voices
- Open Space / Dog Exercise Area – Approximately 15 dogs barking for 1 minute out of 15 minutes

Based on above, the expected worst-case noise levels are shown in figure 3.3 below.

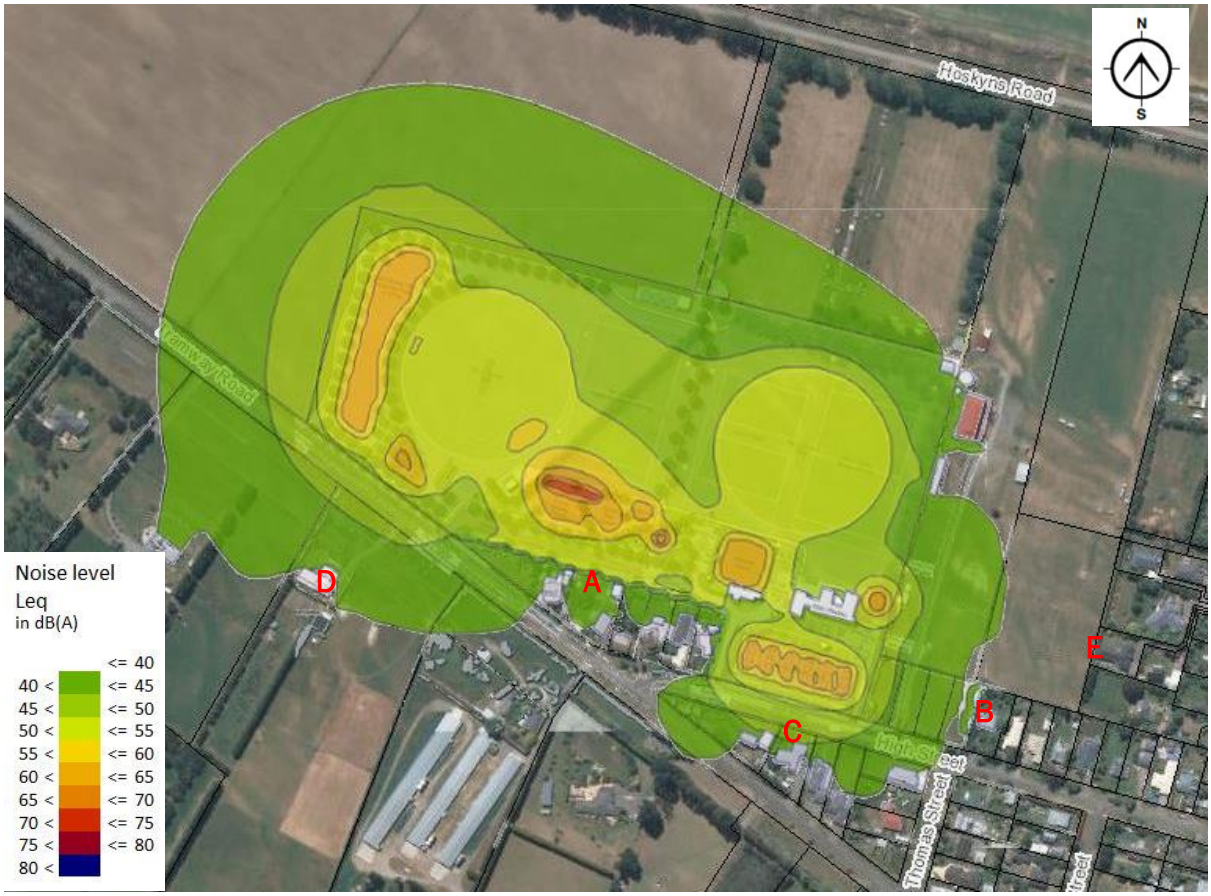


Figure 3.3 – Noise emissions associated with the peak summer activities

Based on the modelling, the worst-case noise levels shown in table 3.2 are expected at the nearest residential boundary or notional boundary labelled (A) to (E) in figure 3.3 above, with the site acoustic fencing discussed above.

Table 3.2 – Noise levels from the summer activities

Location	Noise levels (dB L_{Aeq})
A: Site boundary of 50 High Street	45
B: Site boundary of 20 High Street	36
C: Site boundary of 15 High Street	47
D: Notional boundary of dwelling at 71 Tramway Road	44
E: Site boundary of 3/1299 Courtenay Road	35

We therefore expect noise levels of less than 50 dB L_{Aeq} between 0700 and 2200 hours. We expect the effects of this noise to be minimal.

With regard to District Plan compliance, as discussed above, we have considered a + 3 dB difference between the L_{Aeq} and L_{A10} and + 22 dB between the L_{Aeq} and L_{AFmax} based on our measurements. Based on these adjustments, we have the following comments:

- The activities occurring within the portion of the Kirwee Recreation Reserve site zoned Living 1 (existing activity) are expected to result in noise levels of up to 58 dB L_{A10} / 77 dB $L_{AF\ max}$ at the eastern boundary of the site (A & P Showgrounds) zoned Living 1. Therefore,
    - Between 0730 and 2000 hours, compliance with the District Plan noise limit of 85 dB L_{AFmax} is expected; however, the District Plan noise limit of 50 dB L_{A10} is exceeded.
    - If this worst-case scenario activity was to occur between 0700 and 0730 hours or between 2000 and 2200 hours, both the L_{A10} and L_{AFmax} noise limits would be exceeded.
- The activities occurring within the portion of the Kirwee Recreation Reserve site zoned Outer Plains are expected to result in noise levels of up to 48 dB L_{A10} / 67 dB L_{AFmax} at the site boundary of the neighbouring site (50 High Street) zoned Living 1. Therefore,
    - Between 0730 and 2000 hours, compliance with the District Plan noise limits of 55 dB L_{A10} / 85 dB L_{AFmax} is expected.
    - If this worst-case scenario activity was to occur between 0700 and 0730 hours or between 2000 and 2200 hours, compliance with the District Plan noise limit of 70 dB L_{AFmax} is expected; however, the District Plan noise limit of 40 dB L_{A10} would be exceeded.
- The activities occurring within the portion of the Kirwee Recreation Reserve site zoned Outer Plains are expected to result in noise levels of up to 47 dB L_{A10} / 66 dB $L_{AF\ max}$ at the notional boundary of the dwelling at the neighbouring site (71 Tramway Road) to the southwest zoned in Outer Plains. Therefore,
    - Between 0730 and 2000 hours, compliance with the District Plan noise limits of 60 dB L_{A10} / 85 dB L_{AFmax} is expected.
    - If this worst-case scenario activity was to occur between 0700 and 0730 hours or between 2000 and 2200 hours, compliance with the District Plan noise limit of 70 dB L_{AFmax} is expected; however, the District Plan noise limit of 45 dB L_{A10} would be exceeded.

However, as discussed above, noise levels of less than 50 dB L_{Aeq} are expected at the closest noise sensitive locations and we therefore expect the associated noise effects to be minimal.

We note that post-match gatherings or community events may occur from time to time within the existing pavilion / clubrooms with the doors / windows open towards the fields. Based on the use of the building, the activities inside are not expected to occur concurrently with the other sporting activities outlined above. As this activity is already existing on site, the noise levels from the use of the building was not considered in our cumulative analysis.

3.2.3 Noise from vehicle movements

Based on the traffic assessment report, it is expected there will be a maximum of 217 vehicle movements in a worst-case one-hour period during a winter weekend. Assuming the vehicle movements during a worst-case period were evenly spaced over the hour, 54 vehicle movements would take place during a worst-case 15 minute period between 0700 and 2200 hours.

We understand that 201 carparks will be provided on site, which will meet the peak demand of 184 carparks. Based on the number of carparks in each area, the vehicle movements via each route shown in figure 3.4 below have been assumed in our calculations.

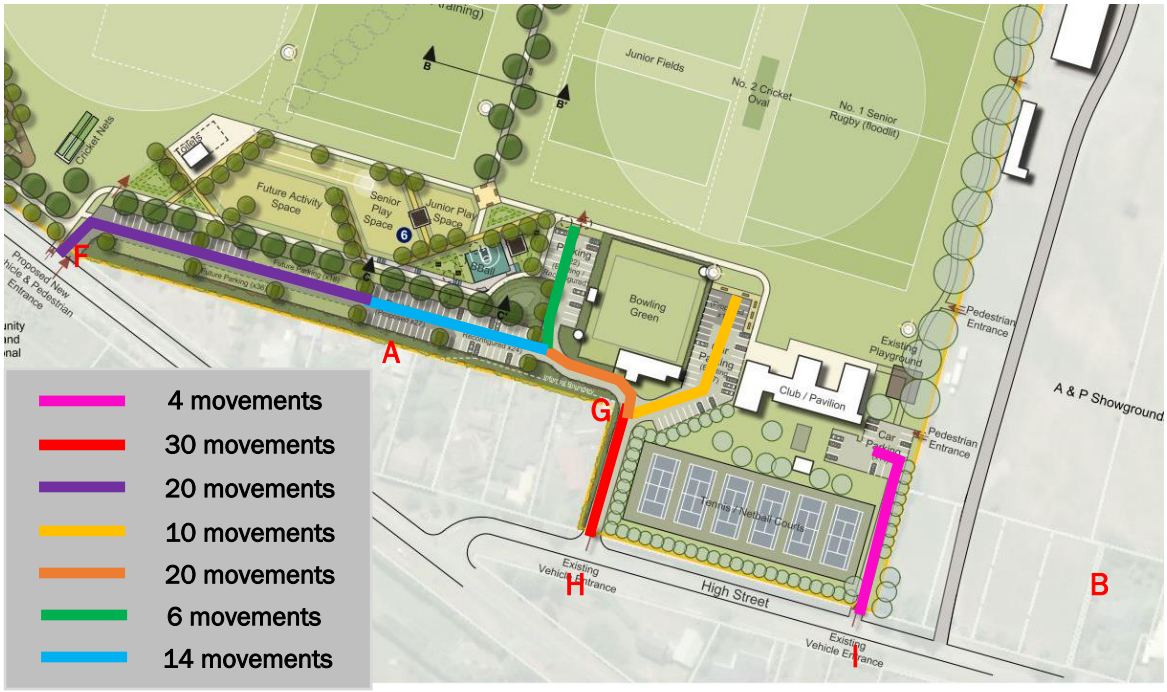


Figure 3.4 – Vehicle movement number and routes

We note that a typical light vehicle manoeuvring in a carpark setting is likely to emit a sound power of less than 90 dB L_{wA} with a speed of 10 km/hr.

Based on above, the following noise worst-case noise levels shown in table 3.3 are expected at the nearest residential boundaries (labelled A, B, F, G, H and I in figure 3.4 above), with the site acoustic fencing discussed above.

Table 3.3 – Noise levels from the vehicle movements

Location	Noise levels (dB L_{Aeq})
A: Site boundary of 50 High Street	46
B: Site boundary of 20 High Street	36
F: Site boundary of 24 Tramway Road	50
G: Site boundary of 42 High Street	49
H: Site boundary of 17 High Street	44
I: Site boundary of 9 High Street	39

We therefore expect noise levels of 50 dB L_{Aeq} or less between 0700 and 2200 hours. We expect the effects of this noise to be minimal.

With regard to District Plan compliance, we have considered whether the Selwyn District Plan L_{A10} permitted noise standard is likely to be complied with at the nearest neighbouring residential and rural sites in a worst-case scenario. As above a typical passenger vehicle manoeuvring in a carpark setting is likely to emit a sound power of less than 90 dB $L_{wA,}$ and we have considered a speed of 10 km/hr.

Our analysis indicates the following:

- Between 0730 and 2000 hours, we expect vehicles to result in noise levels above the L_{A10} noise limit at the residential sites zoned Living 1 to the south.

- If this level of activity on the site occurs between 0700 and 0730 hours, or between 2000 and 2200 hours, we expect the noise from vehicle leaving to result in noise levels above the L_{A10} limits at the notional boundaries of the dwelling at 71 Tramway Road and at the residential sites zoned in Living 1 and Living 2 to the south.

We have also considered noise levels generated by door slams and engine starts on the site. Calculations have been based on a maximum sound power level of 92 dB $L_{wA\ max}$. The highest L_{AFmax} levels are shown in table 3.5 below.

Table 3.5 – Noise levels from the door slams and engine starts on the site

Location	Noise levels (dB L_{AFmax})
A: Site boundary of 50 High Street	49
B: Site boundary of 20 High Street	48
F: Site boundary of 24 Tramway Road	47
G: Site boundary of 42 High Street	46
H: Site boundary of 17 High Street	55
I: Site boundary of 9 High Street	55

These noise levels comply with the District Plan noise limits of 85 dB L_{AFmax} between 0730 and 2000 hours, and 70 dB L_{AFmax} between 0700 and 0730 hours, and between 2000 and 2200 hours.

3.3 Noise from activities between 2200 and 0700 hours

We expect that use of the Open Space / Dog Exercise Area and vehicle movements will be the primary noise sources between 2200 and 0700 hours.

3.3.1 Noise from dog barking

We have considered the same assumptions for the dogs as discussed above. Based on this, the expected worst-case noise levels are shown in figure 3.5 below.

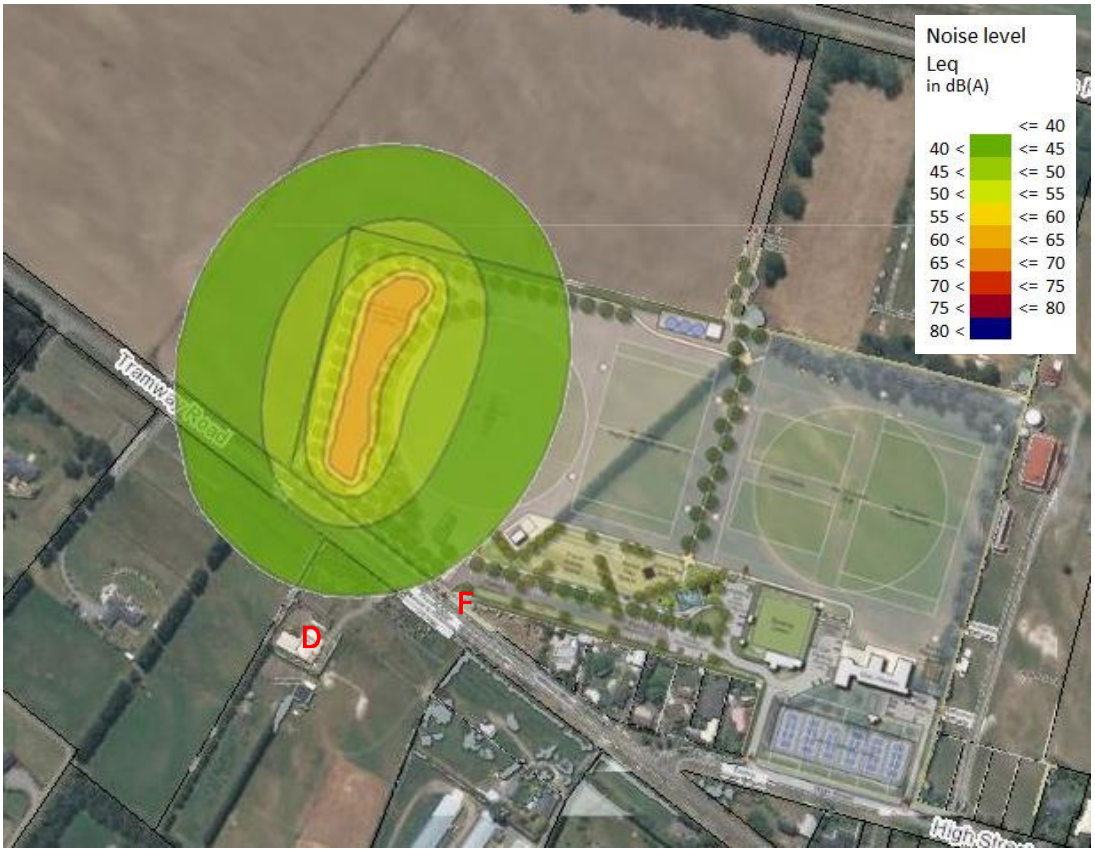


Figure 3.5 – Noise emissions associated with the use of the dog exercise area between 2200 and 0700 hours

Based on above, the following worst-case noise levels shown in table 3.6 are expected at the nearest residential boundary or notional boundary labelled (D) and (F) in figure 3.5 above, with the site acoustic fencing as discussed above.

Table 3.6 – Noise levels from dogs barking

Location	Noise levels (dB L_{Aeq})
D: Notional boundary of dwelling at 71 Tramway Road	40
F: Site boundary of 24 Tramway Road	39

We therefore expect noise levels of 40 dB L_{Aeq} or less to occur between 2200 and 0700 hours. We expect the effects of this noise to be minimal.

With regard to District Plan compliance, as discussed above, we have assumed dogs barking for 1 minute out of a 15 minute period and therefore less than 90 seconds within any 15-minute period. While dogs barking would potentially generate instantaneous noise levels in excess of 40 dBA at the neighbouring properties boundaries, they are not expected to spend enough time on the site to influence the L_{A10} noise level, and therefore compliance with the night-time noise limits of 40 dB L_{A10} and 45 dB L_{A10} is expected at all neighbouring properties. Compliance with the District Plan noise limit of 70 dB L_{AFmax} is also expected at all neighbouring properties.

3.3.2 Noise from vehicle movements

We have assumed two vehicle movements via each vehicle entrance point (8 vehicle movements in total) during a 15 minute period in the early morning or night-time period.

Based on above, the worst-case noise levels shown in table 3.7 are expected at the nearest residential boundaries (labelled A, B, F, G, H and I in figure 3.4 above), with the site acoustic fencing as discussed above.

Table 3.7 – Noise levels from the vehicle movements before 0700 hours

Location	Noise levels (dB L_{Aeq})
A: Site boundary of 50 High Street	35
B: Site boundary of 20 High Street	34
F: Site boundary of 24 Tramway Road	34
G: Site boundary of 42 High Street	26
H: Site boundary of 17 High Street	39
I: Site boundary of 9 High Street	32

We therefore expect noise levels of less than 40 dB L_{Aeq} at all neighbouring noise-sensitive site between 2200 and 0700 hours. We expect the effects of this noise to be minimal.

We have also considered noise levels generated by door slams and engine starts on the site. Calculations have been based on a maximum sound power level of 92 dB $L_{wA\ max}$. The highest L_{AFmax} levels would be the scenarios during the daytime which are shown in table 3.5 above. We therefore expect noise levels of 70 dB L_{AFmax} or less between 2200 and 0700 hours and the associated effects to be minimal.

With regard to District Plan compliance, vehicles would need to be generating noise within 23 – 220 metres of the boundaries (depending on the location) for a combined total of more than 90 seconds during any 15-minute period for the District Plan L_{A10} noise limits to be exceeded.

Therefore, assuming 8 vehicle movements during a worst-case 15 minute period, there is the potential that the vehicles would generate noise within the relevant distances for more than 90 seconds. Therefore the L_{A10} noise limits have the potential to be exceeded at the notional boundaries of the dwelling at 71 Tramway Road and at the residential sites zoned Living 1 and Living 2 to the south.

4.0 CONCLUSIONS

Noise from all sources expected to be associated with the extension of the Kirwee Recreation Reserve has been considered.

Based on a review of the Selwyn District Plan, World Health Organisation Guidelines, and NZS 6802, we consider noise at the following levels (measured and assessed in accordance with NZS 6801:2008 and NZS 6802:2008) when received at the boundary of the surrounding residential sites and at the notional boundary of the dwellings on the surrounding rural sites, will not be unreasonable, and will have a minimal effect on neighbouring properties:

0700 to 2200 hours	50 dB L_{Aeq}
2200 to 0700 hours	40 dB L_{Aeq} / 70 dB L_{AFmax}

Our modelling of noise emissions from the site has confirmed that activities on the site would result in noise levels of 50 dB L_{Aeq} or less between 0700 and 2200 hours with 40 dB L_{Aeq} / 70 dB L_{AFmax} or less between 2200 and 0700 hours at the residential site boundaries and at the notional boundary of the dwellings on the surrounding rural sites, with the existing 1.8 metre high and proposed 2.0 metre high acoustic fence along the residential site boundaries to the southwest as shown in figure 3.1.

In terms of compliance with the District Plan, we expect that the L_{A10} and L_{AFmax} noise limits maybe exceeded at the neighbouring properties. However, as discussed above, the noise levels are expected to comply with the recommended L_{Aeq} noise levels at the neighbouring noise sensitive sites. We would therefore expect the associated noise effects to be minimal.