BEFORE A COMMISSIONER APPOINTED BY THE SELWYN DISTRICT COUNCIL

IN THE MATTER OF	the Resource Management Act 1991
AND	
IN THE MATTER OF	applications by KeaX Limited for resource consent to establish a solar array at 150 Buckleys Road, Brookside.

ADDENDUM EVIDENCE OF WILLIAM REEVE

ON BEHALF OF THE APPLICANT

(ACOUSTICS)

Dated: 23rd February 2023

KeaX Limited
Applicant
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1 BACKGROUND

1.1 My full name is William Peter Reeve.

1.2 I prepared a statement of evidence on acoustic matters dated the 9th of February 2023 and my qualifications and experience are outlined there. I have read and agree to comply with the Environment Court Code of Conduct for Expert Witnesses.

1.3 I have since reviewed the evidence prepared by Mr Mark Lewthwaite on behalf of the joint submitters and dated the 16th of February 2023 and provide comment in this statement.

1.4 Mr Lewthwaite's evidence is focussed on the nature of the receiving environment and changes as a result of this proposal. However, he also records his general agreement with the standards and guidance referenced in my report, noting in his conclusion that the predicted noise emissions from solar equipment are *"within appropriate standards and guidance criteria".*

1.5 Mr Lewthwaite also agrees with the recommendation for a Construction Noise and Vibration Management Plan.

1.6 Mr Lewthwaite, assisted by his colleague Mr O'Brien, has measured the ambient noise levels near the site on two occasions and provided a commentary on the sources of noise always evident in the environment (being *"quieter bird sounds, cicadas and, underlying those two sounds, distant road traffic"*).

1.7 He has then considered the proportion of time when these more natural sounds may be louder than "undesirable" sounds, such as road traffic, machinery and the like, both before and after the installation of the proposed solar farm.

1.8 The existing sound levels recorded by Mr Lewthwaite, and his broader commentary about the sources currently audible in the area generally match my own observations.

1.9 However, there is a difference in the way we have described the likely changes resulting from this proposal which Mr Lewthwaite draws attention to in paragraph 38 of his evidence. I have described the noise

from the solar farm as clearly audible at times during the day, whereas Mr Lewthwaite considers there are likely to be *"prolonged periods of days when the solar equipment is the most noticeable component of the sound environment".* These descriptions are not significantly different; however I provide some commentary on our assessment methodologies and reasoning below.

1.10 I also briefly discuss wind induced noise as Mr Lewthwaite has noted there has been no assessment of this.

2 METHODOLOGY USED IN MY ASSESSMENT

2.1 I agree that a detailed assessment of the existing sound environment, and likely change received by residents is important. This is why I undertook my own ambient noise study in preparation for this hearing.

2.2 However, an approach which focusses only on the background sound environment does not consider other guidance that is relevant to a balanced assessment of noise effects, in particular the District Plan permitted noise levels, but also other guidance.

2.3 To illustrate, the Selwyn District Plan outlines the intent of noise and vibration controls for various zones, both through the objectives and policies of the plan, and their implementation through noise rules.

2.4 I have reproduced below the relevant Operative and Proposed Selwyn District Plan objectives and policies which describe the basis for the noise rules in the Rural Zone.

2.5 The Operative District Plan (Rural Volume) outlines the following noise policy:

(a) Policy B3.4.13: *Recognise temporary noise associated with short-term, seasonal activities as part of the rural environment, but ensure continuous or regular noise is at a level which does not disturb people indoors on adjoining properties.*

2.6 The subsequent explanation section states that *"long-lasting noise effects should not disturb residents on adjoining properties when they are indoors. This includes noise which is continuous, for example, from a stationary motor; and noise which is intermittent but frequent and lasts longer than a few days. Policy B3.4.13 addresses noise,*

generally. It is implemented by rules that set noise limits for activities to be permitted activities (no resource consent needed)."

2.7 The Proposed District Plan (PDP) has the following objectives and policies in the Noise Chapter:

(a) Objective Noise-01: *The health and wellbeing of people and communities and their amenity values are protected from significant levels of noise.*

(b) Policy Noise-P1: *Manage noise effects by setting:*

1. *Maximum noise limits to reflect the character and amenity of each zone;*

2. *Limits on the location, frequency, and duration of specific activities that generate noise;*

3. *A vibration standard.*

2.8 In the case of both Plans these policies illustrate that the intent of the noise limits set in this area, is to reflect the intended amenity of the zone. The ODP and PDP outline daytime noise limits which are effectively 55 – 59 dB L_{Aeq} for a steady source, received at the notional boundary of residences. While the ODP limit in particular is generous compared with other districts in NZ, it aligns with the explanation in the District Plan that the rural area is considered as a business zone.

2.9 While the general noise rules reflect the intended amenity in a zone, I accept that they are a relatively blunt instrument, since they apply indiscriminately in a zone which could encompass a wide variety of noise environments and noise sources. This means they could permit substantial change in an environment. When determining the magnitude of effects for a particular site they should be one factor that is considered alongside the ambient noise environment and other guidance.

2.10 As part of my assessment I also reviewed other guidance from NZS 6802:2008 and the World Health Organisation (WHO) which outline daytime noise limits of between 50 and 55 dB L_{Aeq} for the reasonable protection of residential amenity.

2.11 I have undertaken ambient noise monitoring at the site. This has confirmed that there are extended daytime periods where noise levels are lower than these thresholds, at between 38 – 48 dB $L_{Aeq\ (15\ min)}$, often with several louder periods throughout the day. In my experience noise levels of this order are typical for rural areas removed from main roads.

2.12 Taking my ambient noise measurements, the relatively steady nature of the source, and the peer reviewer comments into account, I have agreed that a lower daytime noise limit of 50 dB L_{Aeq} would be appropriate in this context. The highest predicted noise levels, when assessed in a conservative manner are 2 dB below this threshold.

2.13 I note that Mr Lewthwaite appears to make no overall judgement about the noise effects as a result of this proposal, or what he considers an appropriate daytime limit to be, concluding only that there will be a shift in the balance of sound composition, to one with less natural sound.

3 COMPOSITION OF THE SOUND ENVIRONMENT

3.1 Mr Lewthwaite has assessed the sound composition of the environment based on four fifteen-minute samples. He has determined the percentage of time when predicted noise levels from the solar farm are likely to exceed current ambient noise levels in the environment, and compared the current contribution of anthropogenic noise to what may be expected following the installation of the solar farm.

3.2 This approach has some similarities to other assessment methods I am aware of, for example the "background plus" approach, or the Tranquillity Rating Prediction Tool (TRAPT) developed in the UK. These are not currently applied in New Zealand on a regular basis. Mr Lewthwaites analysis appears to give results that are more conservative than these methods.

3.3 The "background plus" approach was used in the superseded 1991 version of NZS6802. Using that approach, the limits of acceptability (in that case using L_{10}) were set so that they did not exceed the background sound level (the L_{95}) by more than 10 dB.

3.4 In his analysis, Mr Lewthwaite has made the simple assumption that when noise levels from the solar farm exceed the level of other noise in the area, it will become the most noticeable component. This is not necessarily the case, particularly as the source is broadband in nature and not as variable as other sources (for example traffic or bird noise). This also appears inconsistent with a "background plus" type approach to considering noise effects, which anticipates that noise levels which exceed the background sound level will still be acceptable.

3.5 I also note that as outlined in my evidence, the upper predicted level of 48 dB L_{Aeq} only has the potential to occur in favourable sound propagation conditions and a worst-case operating scenario. Normally there are more meteorological scenarios that lead to attenuation than enhancement.

3.6 Since the dwelling at 324 Branch Drain Road which is predicted to receive the highest levels is some distance from the closest skid site, at in the order of 200 metres, noise levels will vary due to weather. They will often be 5 dB or more below the predicted level. This variation will be even greater at other receivers which are more distant from key sources.

3.7 As outlined in my evidence, there are also further conservatisms inherent in my modelling, that also mean that the upper predicted level of 48 dB L_{Aeq} is unlikely to be received on a regular basis. As previously noted, I have made no allowance for directionality of sources, screening from the panel array or variable inverter fan speeds.

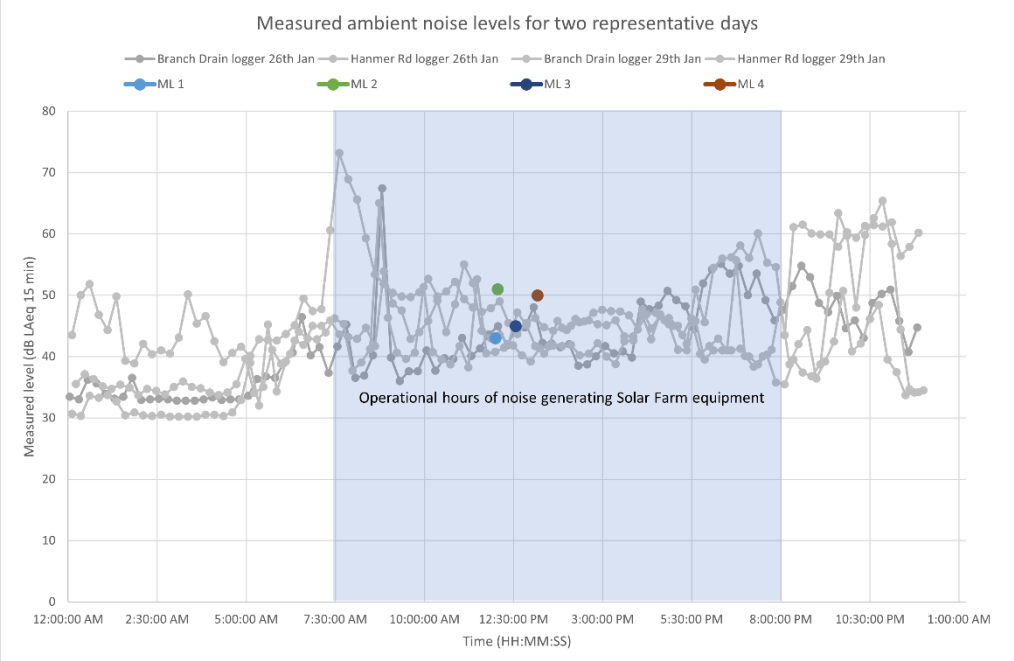
3.8 This provides some further context to the range of values that will be experienced in this environment on a day-to-day basis. I believe similar moderation should be applied to the analysis in Mr Lewthwaite's evidence. He notes in paragraph 32 of his evidence that he expects that the introduction of the solar farm will result in a change from 14% noise without the solar equipment to between 96% (with solar farm noise at 42 dB L_{Aeq}) and 100% (with solar farm noise at 48 dB L_{Aeq}).

3.9 While not explicit in his evidence it appears this analysis has been completed based on the quietest measured 15 minute period of the four samples (being 43 dB L_{Aeq} at 324 Branch Drain Road).

3.10 An assessment based on an average of the four samples has also been provided by Mr Lewthwaite in his paragraph 33. He expects that the introduction of the solar farm will result in a change from 31% noise without the solar equipment to between 82% (with solar farm noise at 42 dB L_{Aeq}) and 94% (with solar farm noise at 48 dB L_{Aeq}).

3.11 While I appreciate that Mr Lewthwaite had time limitations and was limited in the scope of measurements he was able to complete, the reported sample size is relatively small, being four 15 minute measurements.

3.12 I have overlaid Mr Lewthwaites measurement points over the longer-term measurements presented in my evidence in the figure below. While his samples are within the range of L_{Aeq} levels measured, the longer-term samples indicate that background noise levels in the environment exhibit variation, as will the contribution of anthropogenic sound. Table A1 of Mr Lewthwaites evidence confirms this, with the contribution of existing sound deemed unfavourable varying between 14% and 48.1% in the four samples. Mr Lewthwaite accepts in paragraph 35 of his evidence that changes in the environment will alter the balance of desirable sound and noise (including when noise sources involved in rural activities are evident).



3.13 It is also worth noting that sound from moderate wind or gusts is categorised as desirable sound in Mr Lewthwaites analysis in table A1

of his evidence. This contributes a moderate percentage of the "desirable sound" in some samples. While I do not necessarily disagree with this, in other approaches excessive wind noise can be counted as a negative factor affecting tranquillity. In my opinion this illustrates the subjective nature of the assessment.

3.14 Notwithstanding my technical reservations about the approach used by Mr Lewthwaite in his evidence, I do not disagree that there will be a change in the noise environment as a result of this proposal, or with Mr Lewthwaites conclusion that there will be sustained periods of days when solar equipment would be noticeable in the environment.

3.15 However I remain of the opinion that the predicted daytime noise levels are sufficiently low, and the proposed controls sufficiently conservative that the noise effects will remain minimal for residents near the solar farm.

4 **WIND NOISE**

4.1 Mr Lewthwaite notes in his para 16 that *"there is no assessment of noise generated (if any) from wind blowing across the solar panels and structure".*

4.2 I am not aware of any research which suggests that wind induced noise from solar arrays is a noteworthy issue if panels are installed correctly with no loose components.

4.3 In most cases it is not possible to accurately predict wind induced noise, and typically the approach taken is to identify aspects of a design that are obviously higher risk (for example openings, perforated panels or grids, particularly in taller buildings).

4.4 The small gaps between panels means there may be potential for some noise to be generated under certain wind conditions. However, this is not a detail that is unique to this installation and I consider this to be relatively low risk, and not likely to result in substantial noise levels off-site, given that arrays with similar details are often installed on the rooves of residential homes.

William Peter Reeve

23rd of February 2023